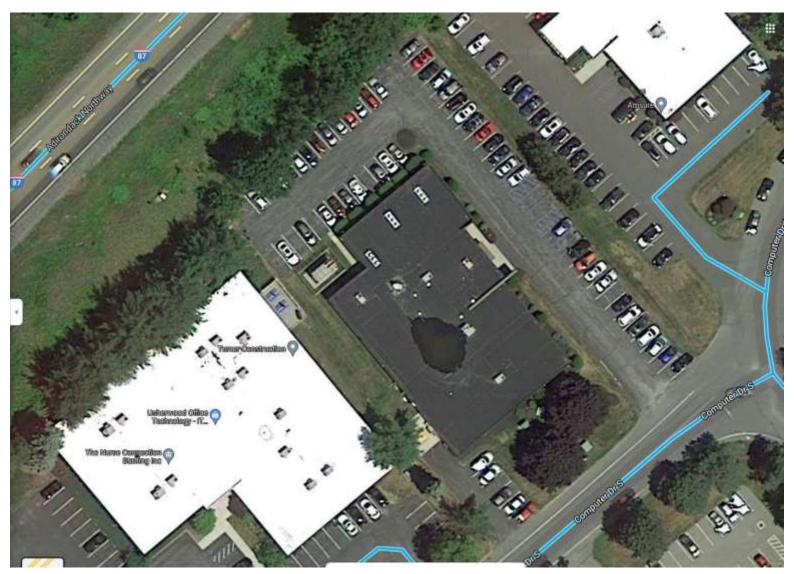
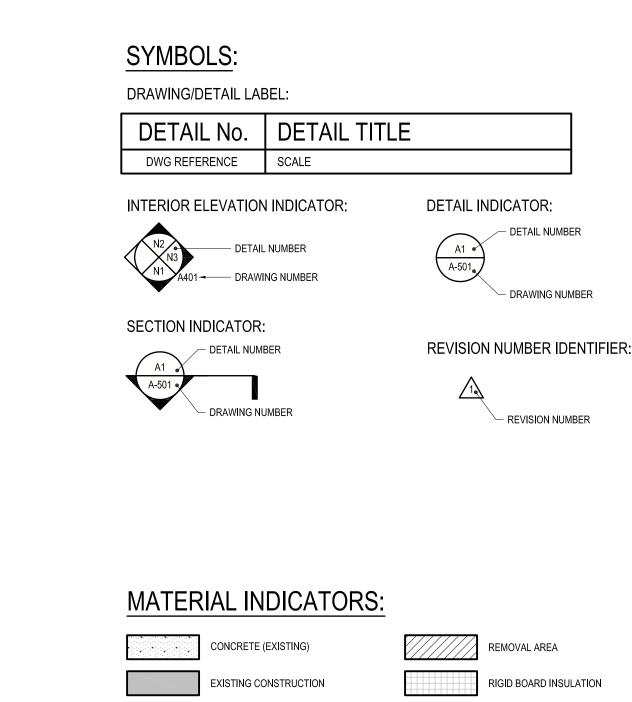
Rooftop – Albany 8 Office
(8 Computer Drive West, Albany, NY)









GYPSUM BOARD

NON-SHRINK GROUT

SPRAY FOAM INSULATION

//////// STRUCTURAL STEEL

WOOD (DIMENSIONAL

VAPOR RETARDER

LUMBER)

WOOD BLOCKING

NYS UNIFORM BUILDING CODE DATA

BUILDING INFORMATION

OCCUPANCY GROUP

CONSTRUCTION TYPE MIXED OCCUPANCIES

INCIDENTAL USE AREAS CONTROL AREAS

EXISTING BUILDING CODE

METHOD, CHAPTERS 7 AND 8.

PROTECTED EXTERIOR WALLS

PROTECTED EXTERIOR WALL OPENINGS

ALLOWABLE WALL OPENING AREA

FIRE AND SMOKE RESISTANT CONSTRUCTION

HEIGHT AND AREA

BUILDING AREA

FIRE WALLS

FIRE BARRIERS

FIRE PARTITIONS

SMOKE BARRIERS

INTERIOR FINISHES

WALLS AND CEILINGS: EXITS

WALLS AND CEILINGS: ROOMS

FIRE PROTECTION SYSTEMS

FIRE EXTINGUISHING SYSTEM

SMOKE DETECTION SYSTEM

SMOKEPROOF ENCLOSURE

FIRE ALARM SYSTEM

EMERGENCY VOICE

SMOKE CONTROL

ACCESSIBILITY

PORTABLE FIRE EXTINGUISHERS

WORK IMPACT ITEMS RELATED TO ACCESSIBILITY.

WALLS AND CEILINGS: EXIT ACCESS

BUILDING HEIGHT

COMPLIANCE METHOD CLASSIFICATION

ALL WORK MUST COMPLY WITH THE UNIFORM FIRE PREVENTION CODE OF NYS STATE OR THE "UNIFORM CODE". THE PUBLICATIONS INCORPORATED BY

OFFICE AND DATA CENTER

ALTERATION LEVELS 1 AND 2

ALLOWABLE

NOT REQUIRED

COMPLY WITH THE FOLLOWING REGULATORY REQUIREMENTS FOR CONSTRUCTION, INCLUDING, BUT NOT LIMITED TO:

2020 FIRE CODE OF NEW YORK STATE, CHAPTER 33, FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION

2020 BUILDING CODE OF NEW YORK STATE, CHAPTER 33, SAFÉGUARDS DURING CONSTRUCTION

REQUIRED

ROUTE TO PRIMARY FUNCTION AREAS ARE NOT REQUIRED TO BE UPGRADED TO BE ACCESSIBLE PER EBCNYS SECTION 305.7 , EXCEPTION 3. NO OTHER ALTERATIONS OR

2020 EXISTING BUILDING CODE, CHAPTER 15, CONSTRUCTION SAFEGUARDS

OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION)

ALL ITEMS BELOW INDICATED WITH '*N/A*' ARE NOT REQUIRED TO BE MODIFIED OR

UPGRADED TO MEET BCNYS 2020 CRITERIA PER THE WORK AREA COMPLIANCE

REFERENCE INCLUDE THE 2020 BUILDING CODE OF NEW YORK STATE, THE 2020 PLUMBING CODE OF NEW YORK STATE, THE 2020 MECHANICAL CODE OF NEW YORK STATE, THE 2020 FUNDED THE CODE OF NEW YORK STATE, THE 2020 PROPERTY MAINTENANCE CODE OF NEW YORK STATE.

ACTUAL

NOT REQUIRED PER EBCNYS SECTION 803.2.2.2

1 DURING CONSTRUCTION REQUIRED

INTERIOR ENVIRONMENT

ENERGY CONSERVATION

BELOW SLAB INSULATION

MECHANICAL SYSTEM TYPE

WATER HEATING SYSTEM TYPE

DUCT AND PIPE INSULATION

LIGHTING FIXTURE SCHEDULE

EMERGENCY AND STANDBY POWER

MEANS OF EGRESS ILLUMINATION

DUCTS AND AIR TRANSFER OPENINGS

CHIMNEYS, FLUES, AND GAS VENTS

AVAILABLE STREET WATER PRESSURE

LIGHTING WATTAGE / CONTROL NARRATIVE

C503.1 EXCEPTION 3 - EXISTING CEILING, WALL OR FLOOR CAVITIES EXPOSED DURING

CLASS C

NOT REQUIRED

REQUIRED

REQUIRED

CONSTRUCTION, PROVIDED THAT THESE CAVITIES ARE FILLED WITH INSULATION.

MECHANICAL SYSTEM DESIGN CRITERIA

VENTILATION

CLIMATE ZONE

ECONOMIZER CONTROLS

FAN MOTOR

DUCT SEALING

DAYLIGHT ZONES

ROOF ASSEMBLY

CLASSIFICATION

ELECTRICAL

MECHANICAL

COMBUSTION AIR

PLUMBING

ELEVATOR

EMERGENCY OPERATION

FIXTURE COUNT

- GENERAL CONSTRUCTION NOTES
- 1.1. ITEMS INDICATED "NIC" (NOT IN CONTRACT). 1.2. EXISTING CONSTRUCTION, EXCEPT WHERE SUCH CONSTRUCTION IS TO BE REMOVED, REPLACED, OR ALTERED. 2. DETAILS SHOWN ARE TYPICAL: SIMILAR DETAILS APPLY TO SIMILAR CONDITIONS UNLESS OTHERWISE INDICATED. THESE DRAWINGS ARE NOT INTENDED AS STAND ALONE DOCUMENTS. REFER TO FULL CONSTRUCTION DOCUMENT PACKAGE
- FOR COMPLETE PROJECT INFORMATION AND DETAILS. 4. ALL DIMENSIONS ARE TO FRAME UNLESS OTHERWISE NOTED.
- 5. DO NOT SCALE DRAWINGS.
 6. EXAMINE THE CONTRACT DOCUMENTS THOROUGHLY AND PROMPTLY REPORT ANY ERRORS OR DISCREPANCIES TO THE OWNER'S REPRESENTATIVE BEFORE COMMENCING THE WORK.
 6.1. CONTINUE TO VERIFY ALL CONDITIONS AS THE WORK PROGRESSES.
- 6.2. REPORT ANY ADDITIONAL DISCREPANCIES BETWEEN EXISTING CONDITIONS AND CONTRACT DOCUMENTS TO THE OWNER'S REPRESENTATIVE BEFORE CONTINUING WITH WORK.
- 7. DO NOT CHANGE SIZE OR SPACING OF FRAMING OR OTHER ELEMENTS WITHOUT PRIOR AUTHORIZATION IN WRITING FROM THE OWNER'S REPRESENTATIVE. 8. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AS REQUIRED BY THE MEANS AND METHODS UNDERTAKEN. 9. COMPONENTS NECESSARY FOR CONSTRUCTION SAFETY ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- 10. DO NOT DIMINISH THE LEVEL OF LIFE SAFETY DURING THE PERFORMANCE OF THE WORK. 11. OBSERVE ALL CURRENT OSHA REQUIREMENTS IN CONSTRUCTION ACTIVITIES. 12. PROTECT INSTALLED WORK/PRODUCTS AND EXISTING PROPERTY DURING PERFORMANCE OF THE WORK WITH TEMPORARY
- AND REMOVABLE PROTECTION. CONTROL ACTIVITY IN IMMEDIATE WORK AREA TO PREVENT DAMAGE. 13. PROTECT FINISHED FLOORS AND OTHER SURFACES FROM TRAFFIC, DIRT, WEAR, DAMAGE, AND MOVEMENT OF HEAVY OBJECTS BY COVERING THEM WITH DURABLE SHEET MATERIALS.
- 14. TARPAULINS SHALL BE FLAMEPROOF.
- 15. MAINTAIN THE BUILDING IN A WATERTIGHT CONDITION DURING PERFORMANCE OF THE WORK. 16. CLEANING TOOLS OF CEMENTITIOUS AND OTHER INSOLUBLE MATERIALS: 16.1. DO NOT WASH DEBRIS FROM TOOLS IN SINKS OR OTHER SANITARY DRAINAGE SYSTEMS THAT CAN CLOG OR DAMAGE PIPING AND FIXTURES.
- 16.2. TAKE ALL PRECAUTIONS NECESSARY TO PREVENT CEMENTITIOUS AND OTHER INSOLUBLE MATERIALS FROM FLOWING INTO FLOOR OR SITE DRAINS. 16.3. DISPOSE OF EXCESS CEMENTITIOUS AND OTHER INSOLUBLE DEBRIS WITH THE RUBBISH. 17. TEMPORARY DUST BARRIERS:
- 17.1. PROVIDE TEMPORARY DUST BARRIERS TO PREVENT THE SPREAD OF DUST FROM THE WORK AREAS. 17.2. CONSTRUCT THE DUST BARRIERS OF WOOD FRAMING SHEATHED WITH 6 MIL POLYETHYLENE FILM. SECURE THE DUST BARRIERS IN PLACE WITHOUT DAMAGING EXISTING CONSTRUCTION.
 18. DO NOT USE FLAMMABLE LIQUIDS, OTHER THAN THOSE SPECIFIED WITHIN A BUILDING WITHOUT WRITTEN APPROVAL FROM
- THE OWNER'S REPRESENTATIVE. DO NOT USE ASBESTOS CONTAINING MATERIALS FOR THE WORK OF THIS PROJECT.
 COMPLY WITH THE FOLLOWING REQUIREMENTS DURING CONSTRUCTION INCLUDING BUT NOT LIMITED TO THE FOLLOWING: 20.1. OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION) 20.2. 2020 BUILDING CODE OF NEW YORK STATE, CHAPTER 33, SAFEGUARDS DURING CONSTRUCTION. 20.3. 2020 EXISTING BUILDING CODE, CHAPTER 15, CONSTRUCTION SAFEGUARDS. 20.4. 2020 FIRE CODE OF NEW YORK STATE, CHAPTER 33, FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION.

GENERAL REMOVAL NOTES

- 1. IF DEMOLITION IS PERFORMED IN EXCESS OF THAT INDICATED, RESTORE AFFECTED AREAS AT NO ADDITIONAL COST.
- 2. OBJECTS SHOWN ON THE REMOVALS PLAN WITH A DASHED LINE ARE TO BE REMOVED IN THEIR ENTIRETY, REFER TO REMOVAL NOTES FOR FURTHER DETAIL.
- 3. NOTIFY OWNER'S REPRESENTATIVE IMMEDIATELY OF ANY DISCREPANCIES BETWEEN THE DRAWINGS AND ACTUAL CONDITIONS RELATED TO REMOVALS, INCLUDING BUT NOT LIMITED TO LOAD BEARING STRUCTURAL ELEMENTS.

PAINTING NOTES:

PAINTING: INTERIOR ACRYLIC PAINT, COLOR AND SHEEN TO MATCH EXISTING. 1. PAINT NEW SUBSTRATES WITH ONE COAT OF PRIMER AND TWO FINISH COATS.

2. PAINT EXISTING SUBSTRATES WITH TWO FINISH COATS.

ABBREVIATIONS:

ACM	ASBESTOS CONTAINING MATERIAL	INT	INTERIOR
ACP	ACOUSTIC CEILING PANEL	Ĺ	ANGLE
ADDL	ADDITIONAL	LAV	LAVATORY
ADJ	ADJACENT	LB/LBS	POUND/POUNDS
AFF	ABOVE FINISHED FLOOR	LF	LINEAR FEET
ALUM	ALUMINUM	LOC	LOCATION
APPROX	APPROXIMATE	LVL	LAMINATED VENEER LUMBE
B/	BOTTOM OF	MAX	MAXIMUM
BLDG	BUILDING	MDF	MEDIUM DENSITY FIBERBOA
BOT	BOTTOM	MECH	MECHANICAL
BOD	BASIS OF DESIGN	MEZZ	MEZZANINE
BP	BASE PLATE	MTL	METAL
BSMT	BASEMENT	MFR	MANUFACTURE/MANUFACT
CG	CORNER GUARD	MIN	MINIMUM
CJ		MISC	MISCELLANEOUS
CJ	CONTROL, CONTRACTION, OR	MO	MASONRY OPENING
CI	CONSTRUCTION JOINT	MR	MOISTURE RESISTANT
CL	CENTERLINE		
CLO	CLOSET	NA	NOT APPLICABLE
CLG	CEILING	NIC	NOT IN CONTRACT
CMU	CONCRETE MASONRY UNIT	No.	NUMBER
CO	CLEANOUT	NTS	NOT TO SCALE
COL	COLUMN	OC	ON CENTER
CONC	CONCRETE	OD	OUTSIDE DIAMETER
CONT	CONTINUOUS	OPNG	OPENING
CPT	CARPET	OPP	OPPOSITE
CT	CERAMIC TILE	OZ	OUNCE
CY	CUBIC YARD	PAF	POWDER ACTUATED FASTE
DF	DRINKING FOUNTAIN	PCF	POUNDS PER CUBIC FOOT
DIA	DIAMETER	PERF	PERFORATED
DIAG	DIAGONAL	PERP	PERPENDICULAR
DIM	DIMENSION	PL	PLATE
DH	DOUBLE HUNG	PLAM	PLASTIC LAMINATE
DN	DOWN	PLF	POUNDS PER LINEAR FOOT
DO	DITTO	PSF	POUNDS PER SQUARE FOO
DWG	DRAWING	PSI	POUNDS PER SQUARE INCH
EA	EACH	PT	PRESSURE TREATED
EF	EXHAUST FAN	PVC	POLYVINYL CHLORIDE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM	QTY	QUANTITY
EL	ELEVATION	R	RISER
EJ	EXPANSION JOINT	RD .	ROOF DRAIN
EPS	EXPANDED POLYSTYRENE BOARD	REF	REFERENCE DRAWING
		REQD	
EPDM	ETHYLENE PROPYLENE DIENE MONOMER	REINF	REQUIRED
ES	EACH SIDE		REINFORCED
EQ	EQUAL	REV	REVISED, REVISION
EQUIP	EQUIPMENT	RM	ROOM
EW	EACH WAY	RO	ROUGH OPENING
EXST	EXISTING	SF	SQUARE FEET/FOOT
EXP	EXPANSION	SIM	SIMILAR
EXT	EXTERIOR	SH	SINGLE HUNG
FD	FLOOR DRAIN	SPEC	SPECIFICATION
FDN	FOUNDATION	SQ	SQUARE
FF	FINISH FLOOR	SST	STAINLESS STEEL
FLUOR	FLUORESCENT	STC	SOUND TRANSMISSION CLA
FOW	FACE OF WALL	STD	STANDARD
FRP	FIBER REINFORCED PLASTIC	STL	STEEL
FS	FARSIDE	Т	TREAD
FT	FEET	T/	TOP OF
FTG	FOOTING	T & G	TONGUE AND GROOVE
GA	GAUGE	TEMP	TEMPORARY
GAL	GALLON	TYP	TYPICAL
GALV	GALVANIZED	UL	UNDERWRITERS LABORATO
GC	GENERAL CONTRACTOR	UNO	UNLESS NOTED OTHERWISE
GWB	GYPSUM WALL BOARD	VCT	VINYL COMPOSITION TILE
HDG	HOT DIP GALVANIZED	VERT	VERTICAL
		VERT	VERTICAL VERIFY IN FIELD
HDPE	HIGH DENSITY POLYETHYLENE		
HORIZ	HORIZONTAL	VWC	VINYL WALL COVERING
HR	HOUR	W/	WITH
HSS	HOLLOW STRUCTURAL PIPE	W/O	WITHOUT
HVAC	HEATING, VENTILATING & AIR	WC	WATER CLOSET
	CONDITIONING	WWR	WELDED WIRE REINFORCE
ID	INSIDE DIAMETER		
ILIEO	INFORMATION		
INFO	1111 01111111111		
INFO INSUL	INSULATION		

THIS LIST IS ONLY TO BE USED TO LOOK UP ABBREVIATIONS CONTAINED IN THE CONTRACT DRAWINGS. IT IS NOT AN INDICATION THAT ANY SPECIFIC MATERIAL, PROCESS, ETC. IS NOT INCLUDED IN THIS WORK OF CONTRACT. NOT ALL ABBREVIATIONS LISTED ABOVE ARE USED IN THE DRAWINGS OF THE CONTRACT.

ENERGY CODE STATEMENT:

WITH THE 2020 UNIFORM CODE.

TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE WITH THE 2020 ENERGY CODE.

UNIFORM CODE STATEMENT: TO THE BEST OF THE REGISTERED DESIGN PROFESSIONAL'S KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT, THESE PLANS AND/OR SPECIFICATIONS ARE IN COMPLIANCE

CODE PLAN SCALE: 1/16"= 1'-0"

— AREA: 3200 SF

OCCUPANTS: 22

150 SF/PER PERSON

,CÓMMON PATH OF EGRESS TRAVEL

EXIT CAPACITY DOOR: 190 PEOPLE ACTUAL OCCUPANT LOAD: 30 PEOPLE

OCCUPANTS: # OCCUPANT LOAD

— — — TRAVEL PATH DIRECTION

1 HR FIRE RESISTANCE RATED WALL

150 SF/PERSON: OCCUPANT LOAD FACTOR

EXISTING TO REMAIN; NO WORK

MOST REMOTE POINT

TRAVEL DISTANCE IN FEET

EGRESS TRAVEL DISTANCE

EXIT CAPACITY DOOR: 180 PEOPLE

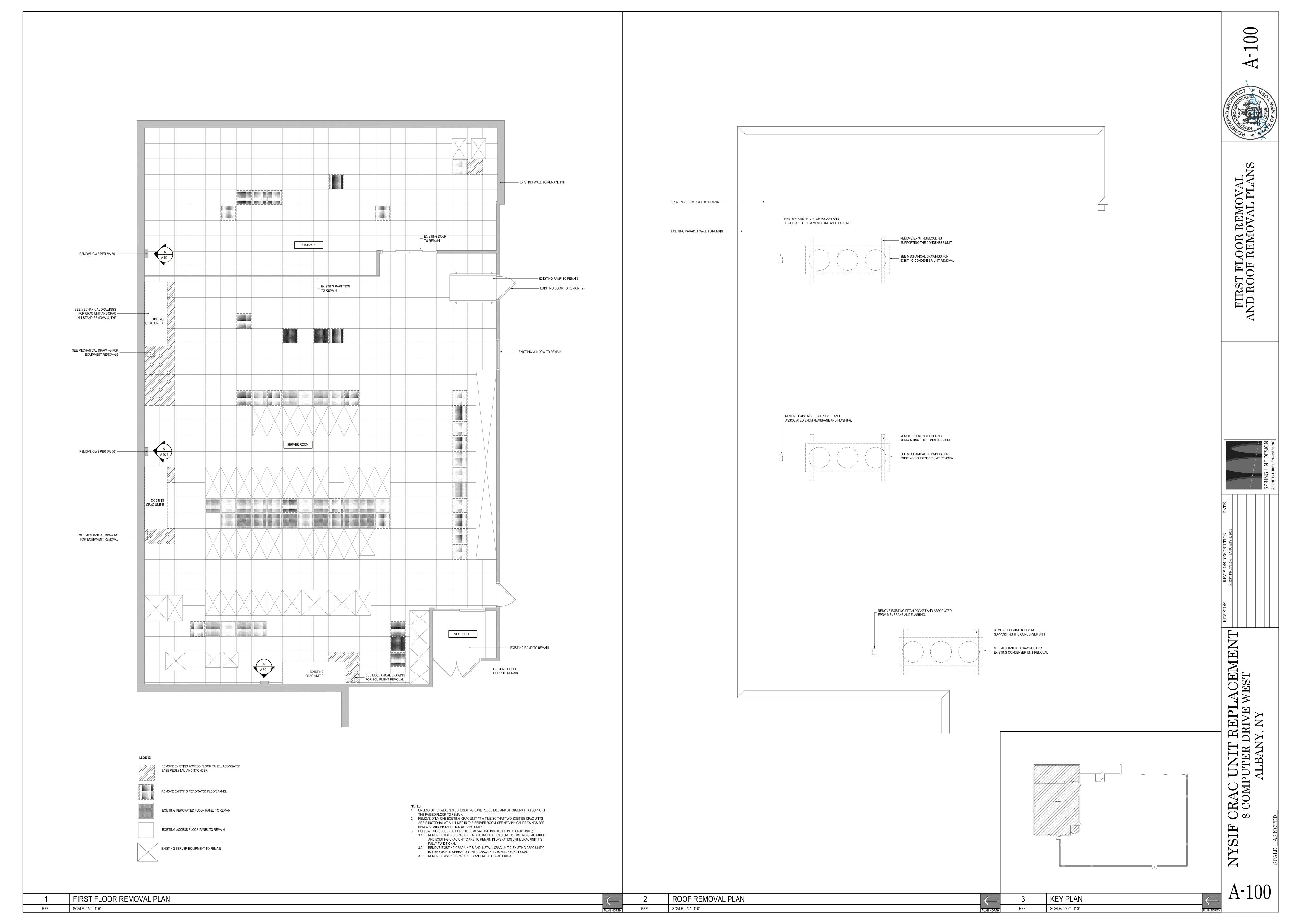
ACTUAL OCCUPANT LOAD: 30 PEOPLE

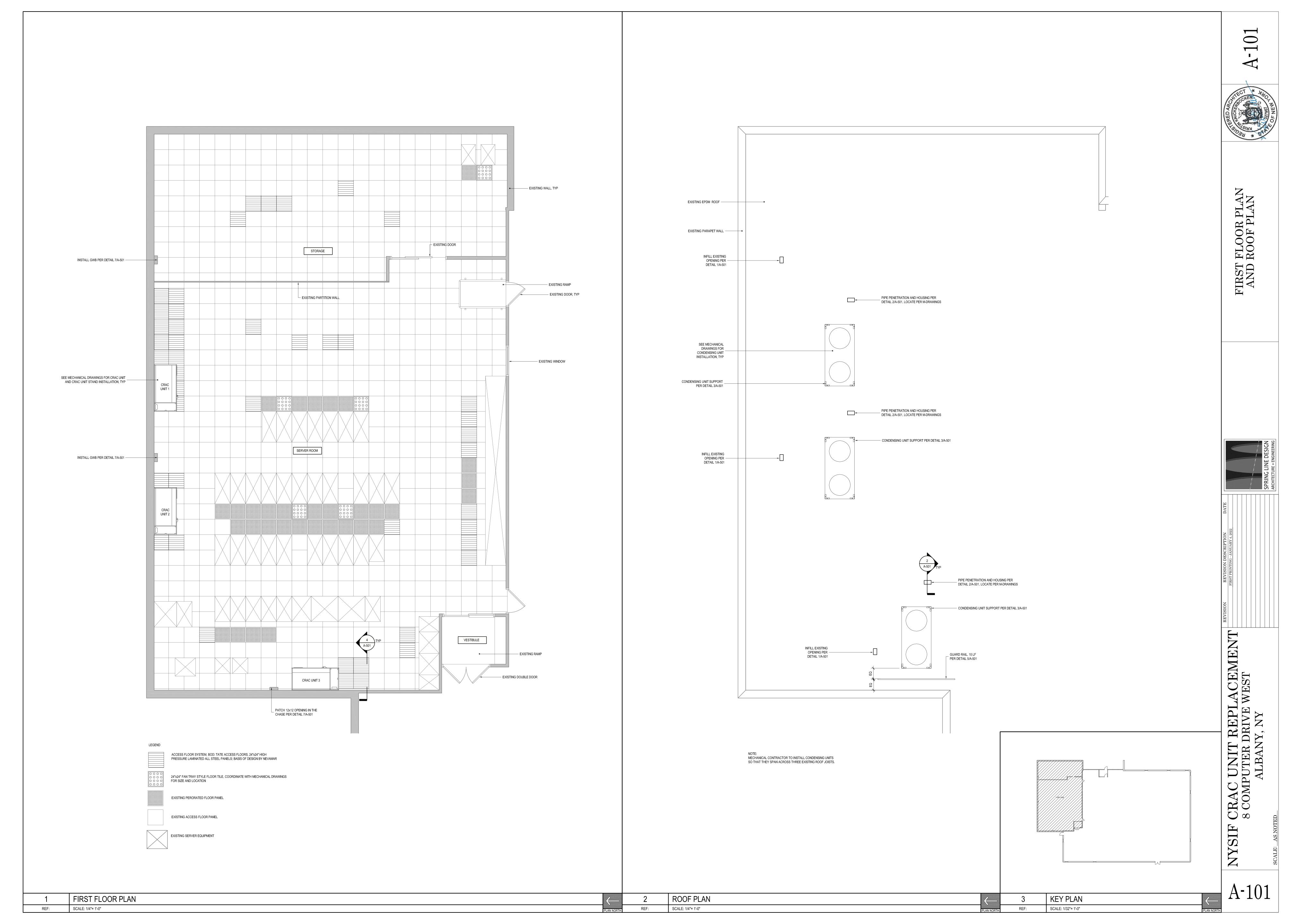
EXIT CAPACITY DOOR: 300 PEOPLE ACTUAL OCCUPANT LOAD: 37 PEOPLE

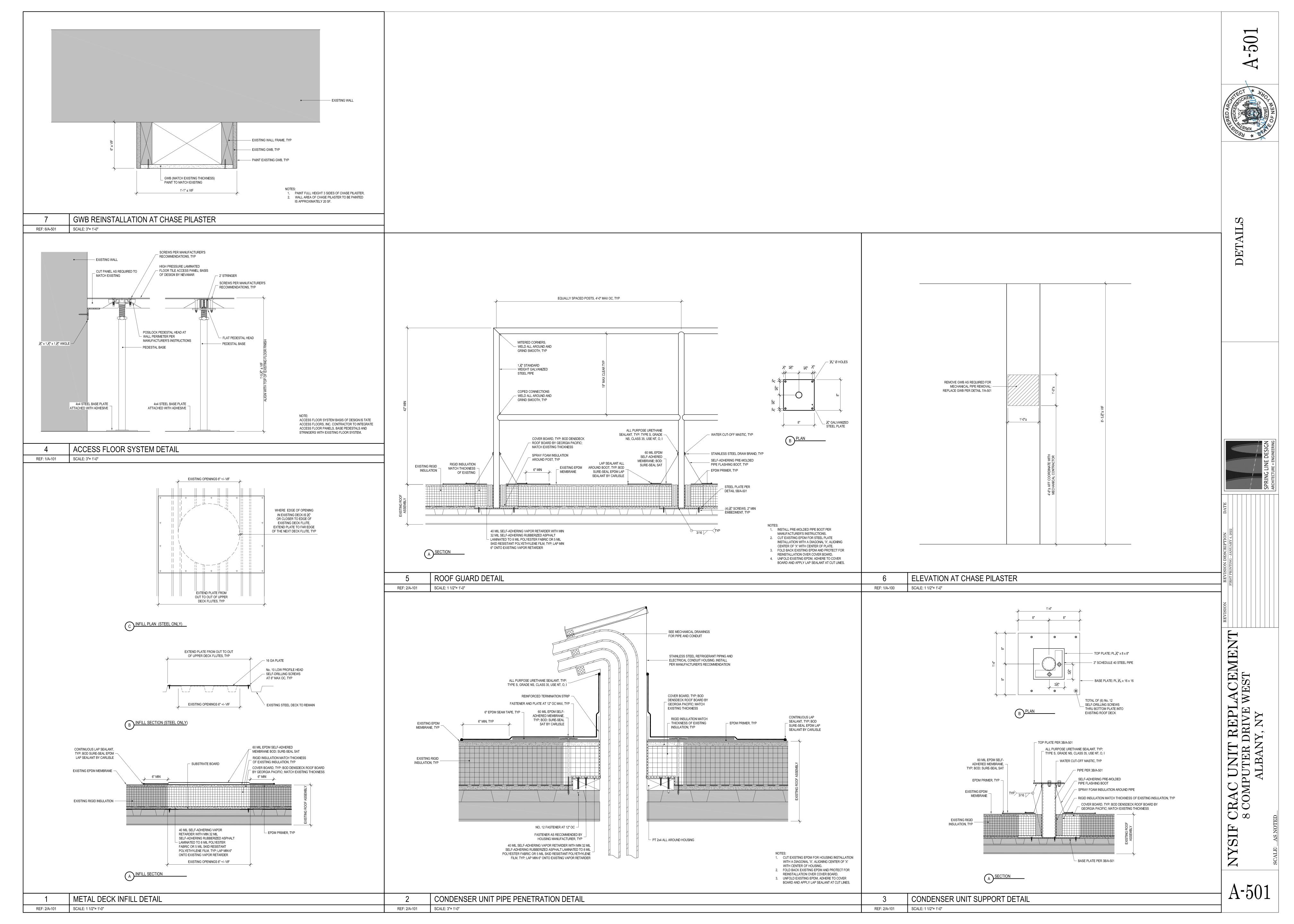
─ AREA: 11,180 SF

OCCUPANTS: 75

150 SF/PER PERSON







		MECH.	ANICAL LEGEND		
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION		ABBREVIATIONS
——3/4" HPR——	NEW HEAT PUMP RETURN PIPING	<u>CD-1</u>	SUPPLY GRILLE WITH TAG	ABBREVIATION	DESCRIPTION
—3/4" HPR-E—	EXISTING HEAT PUMP RETURN PIPING TO REMAIN		AND CFM INDICATED	AD	ACCESS DOOR
3/4" HPR-D	EXISTING HEAT PUMP RETURN PIPING TO BE REMOVED	R=1	RETURN / EXHAUST GRILLE WITH TAG AND CFM INDICATED	AFC	ABOVE FINISHED CEILING
—3/4" HPS—	NEW HEAT PUMP SUPPLY PIPING		LINEAR SLOT DIFFUSER	AFF	ABOVE FINISHED FLOOR
—3/4" HPS-E—	EXISTING HEAT PUMP SUPPLY PIPING TO REMAIN		LINEAR SLOT RETURN	AFG	ABOVE FINISHED GRADE
3/4" HPS-D	EXISTING HEAT PUMP SUPPLY PIPING TO BE REMOVED		SUPPLY DUCT UP	AHU	AIR HANDLING UNIT
3/4" CND	NEW CONDENSATE PIPING		3011 21 2001 01	AS	AIR SEPARATOR
—3/4" CND-E—	EXISTING CONDENSATE PIPING TO REMAIN		SUPPLY DUCT DOWN	ATC	AUTOMATIC TEMPERATURE CONTROL
3/4" CND-D	EXISTING CONDENSATE PIPING TO BE REMOVED			BOD	BOTTOM OF DUCT
8×8 SA	NEW SUPPLY AIR DUCT (WITH 2" INSULATION)		RETURN / EXHAUST DUCT UP	BMS	BUILDING MANAGEMENT SYSTEM
8x8 SA-E	EXISTING SUPPLY AIR DUCT TO REMAIN		RETURN / EXHAUST DUCT DOWN	CFM	CUBIC FEET PER MINUTE
Z:8x8 SA-D:Z]	EXISTING SUPPLY AIR DUCT TO REMOVED			CND	CONDENSATE DRAIN
8×8 RA	NEW RETURN AIR DUCT		MOTOR STARTER	CO	CLEANOUT
8×8 RA-E	EXISTING SUPPLY AIR DUCT TO REMAIN	(T)	WALL MOUNTED THERMOSTAT (54" AFF)	DCV	DEMAND CONTROLLED VENTILATION
228×8 RA-D223			,	DDC FD	DIRECT DIGITAL CONTROL FIRE DAMPER
8x8 EXH	NEW EXHAUST AIR DUCT	©	CARBON DIOXIDE SENSOR/CONTROLLER (54" AFF)	GPM	GALLONS PER MINUTE
8×8 EXH-E	EXISTING EXHAUST AIR DUCT TO REMAIN	. FD	FIDE DAMPED WITH ACCESS DOOD	HPR	HEAT PUMP RETURN
			FIRE DAMPER WITH ACCESS DOOR (TYPE "B" IN DUCT, TYPE "A" IN WALL SLEEVE)	HPS	HEAT PUMP SUPPLY
2		TD	TRANSFER DUCT (SIZED PER PLANS)	MBH	THOUSAND BTU PER HOUR
	SHUT-OFF VALVE		(OA	OUTDOOR AIR
	STRAINER		DUCTHODIC (INCLIPATED DED ODEOIEICATIONIC)	OED	OPEN ENDED DUCT
	AUTOMATIC FLOW CONTROL VALVE	-OR-	DUCTWORK (INSULATED PER SPECIFICATIONS)	SD	SMOKE DETECTOR
	DALANONO MALVE	, ,		TD	TRANSFER DUCT
<u></u> Г	BALANCING VALVE		LINED DUCTWORK		
 5	BALL VALVE	-OR-	LINED DUCTWORK		
 5 	DRAIN VALVE WITH CAP				
	PIPE CAP		VOLUME DAMPER		
$-\!$	DRAIN VALVE WITH HOSE THREADS	-OR-	VOLUME DAMPER		
	UNION	<u>'</u>	DUCT TAP WITH DAMPER		
\sim	FLEXIBLE CONNECTION		FLEXIBLE DUCTWORK		
	FLANGE	#	DRAWING REFERENCED NOTE		
坄	MANUAL AIR VENT	M F	MOTORIZED DAMPER		
0	PIPING — UPWARD		CONNECTION OF NEW TO EVICTOR		
ዋ	PIPING — DOWNWARD		CONNECTION OF NEW TO EXISTING		
	TEE - TOP RUN OUT				
	TEE - BOTTOM RUN OUT				
→	PIPE REDUCER	1			
7-	DRAIN				

MECHANICAL NOTES

- 1. ALL WORK SHALL BE IN ACCORDANCE WITH NEW YORK STATE BUILDING CODE, ENERGY CODE AND ALL APPLICABLE REFERENCED
- 2. THE JOB SITE SHALL BE KEPT FREE OF DEBRIS. ALL UNWANTED MATERIAL AND TRASH SHALL BE REMOVED FROM THE SITE DAILY. CONTRACTOR SHALL BE RESPONSIBLE FOR OFF SITE DISPOSAL OF ALL EXCESS UNWANTED MATERIAL, DEMOLITION DEBRIS, AND CONSTRUCTION DEBRIS DUE TO THE WORK OF THE APPLICABLE CONTRACT. SUCH MATERIAL SHALL BECOME PROPERTY OF THE
- CONTRACTOR. 3. ALL OPENINGS THROUGH FIRE RATED WALLS, FLOORS AND CEILINGS FOR PIPING, WIRING AND HANGERS MUST BE SEALED FIRE TIGHT. PROVIDE FINISHED APPEARANCE FOR EXPOSED PENETRATIONS. REFER TO ARCHITECTURAL DRAWINGS AND ORIGINAL CONSTRUCTION
- 4. FULLY COORDINATE ALL PIPE, DUCT, CONDUIT AND CONTROL WIRING RUNS BEFORE FABRICATION AND INSTALLATION. NO EXTRAS SHALL BE PERMITTED FOR REROUTING OR REMOVAL OF INSTALLED WORK DUE TO COORDINATION WITH BUILDING STRUCTURE, WORK OF OTHER TRADES, OR BUILDING COMPONENTS. DUCTWORK AND PIPING PLANS ARE TWO-DIMENSIONAL AND ALL DUCTWORK AND PIPING RUNS DO
- NOT SHOW ALL NECESSARY CHANGES IN ELEVATION OR OFFSETS REQUIRED FOR A COMPLETE INSTALLATION. PROVIDE DUCT AND PIPE OFFSETS AS REQUIRED FOR THE INSTALLATION OF THE DUCT AND PIPE RUNS SHOWN ON PLANS.

5. OFFSET ALL PIPING, DRAINS AND CONTROL WIRING AS REQUIRED SO THAT IT IS NOT RUN ACROSS LIGHTS, SPEAKERS, FIRE ALARM

DRAWINGS FOR LOCATIONS AND DETAILS FOR FIRE RATED CONSTRUCTION. REFER TO DETAIL DRAWINGS FOR PENETRATION DETAILS.

- 6. ALL NEW DUCTWORK SHALL BE GALVANIZED STEEL AND BE CONSTRUCTED PER SMACNA STANDARDS TO 2" PRESSURE CLASS AND SEAL
- 7. ALL AIR SYSTEMS, SERVING THE AREAS OF WORK, SHALL BE BALANCED BY AN INDEPENDENT BALANCING CONTRACTOR IN ACCORDANCE
- WITH AABC AND TAB INDUSTRY STANDARDS. 8. ALL EQUIPMENT PROPOSED TO BE USED ON THE PROJECT SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO
- 9. ALL EXISTING REUSED PIPING, WITHIN AREA OF WORK, SHALL BE CAPPED AT LOCATIONS OF REMOVED PIPING AS REQUIRED TO PROVIDE
- 10. ALL WORK SHALL BE IN ACCORDANCE WITH SMACNA IAQ GUIDELINES FOR OCCUPIED BUILDINGS UNDER CONSTRUCTION. PRIOR TO CONSTRUCTION, ALL OPEN ENDED DUCTS SHALL BE PROTECTED FROM CONSTRUCTION DUST AND DEBRIS IN ACCORDANCE WITH IAQ
- GUIDELINES. 11. PROVIDE PIPING SUPPORTS AT 5' INTERVALS OR LESS.

COMPLETE PIPING SYSTEM.

12. ALL CONTROL WIRING SHALL BE LOCATED IN 3/4" EMT CONDUIT.

CONTROLS, AND OTHER CEILING OR STRUCTURE MOUNTED DEVICES.

- 13. ALL REFRIGERANT PIPING SHALL BE TYPE ACR COPPER TUBE CONFORMING TO ASTM B88 WITH WROUGHT COPPER BRAZED FITTINGS CONFORMING TO ASME B16.22 RATED AT 300 PSI AND SUITABLE FOR R-410A. INSTALL PIPING IN ACCORDANCE WITH NYS CODE AND ASHRAE 15. PROVIDE 1" THICK ARMAFLEX INSULATION ON SUCTION LINES. PROVIDE 1" THICK INSULATION ON LIQUID LINES FROM CONDENSERS TO INSIDE. PROVIDE UV RESISTANT INSULATION FOR EXTERIOR PIPING WITH PVC COVER. TEST WITH NITROGEN TO 300 PSI FOR 4 HOURS WITH NO LEAKS. EVACUATE SYSTEM TO 500 MICROMETERS FOR 12 HOURS PRIOR TO CHARGING.
- 14. THE CRAC UNIT SYSTEMS SHALL BE COMMISSIONED BY AN OWNER HIRED THIRD PARTY COMMISSIONING AGENT. THE CONTRACTOR AND THEIR SUB-CONTRACTORS (AS NEEDED) SHALL PARTICIPATE IN THE COMMISSIONING PROCESS.
- 15. ALL REGULATED REFRIGERANTS SHALL BE RECOVERED IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.
- 16. THE FACILITY WILL BE OCCUPIED AND FULLY OPERATIONAL DURING CONSTRUCTION. THERE SHALL BE NO INTERRUPTION OF HVAC SYSTEM OPERATION WITHOUT WRITTEN APPROVAL BY THE OWNER.

PROJECT PHASING NOTES

- 1. INSTALL NEW CRAC-3/ACC-3. POWER EQUIPMENT WITH TEMPORARY FEEDS. 2. COMMISSION AND START-UP NEW CRAC-3/ACC-3. EXISTING CRAC-3/ACC-3 TO REMAIN OPERATIONAL AT THIS POINT. 3. DECOMMISSION AND REMOVE EXISTING CRAC-1/ACC-1.
- 4. INSTALL NEW CRAC-1/ACC-1. 5. COMMISSION AND START-UP NEW CRAC-1/ACC-1.
- 6. DECOMMISSION AND REMOVE EXISTING CRAC-2/ACC-2.
- 7. INSTALL NEW CRAC-2/ACC-2. 8. COMMISION AND START-UP NEW CRAC-2/ACC-2.
- 9. DECOMMISSION AND REMOVE EXISTING CRAC-3/ACC-3. 10. PROVIDE PERMANENT POWER TO NEW CRAC-3/ACC-3.

CONFIGURATION CFM ESP FA								TOTAL		COOLING CAPACITY		HUMIDIFIER		RE	HEAT	FI	LTER	ELE	CTRICAL	DATA		DETUDN		BASIS OF	
	FAN EAT (°F)	TOTAL MBH (KW)	SENS MBH (KW)	#/HR	KW	PAN	KW	STAGES	DEPTH	EFF	MCA	MOCP	VOLTS	STAND HEIGHT	PLENUM HEIGHT	DIMENSIONS LxWxH	LIEBERT DS	OPTIONS							
DOWNFLOW	5,200	0.2	1.9	72°/50%	121,916 (35.7)	100,060 (29.3)	11.0	-	_	NONE	NONE	2"	MERV 13	68.3	80A	208/3φ	18"	N/A	73"x35"x76"	DS035AD	1				
DOWNFLOW	5,200	0.2	1.9	72°/50%	121,916 (35.7)	100,060 (29.3)	11.0	_	_	NONE	NONE	2"	MERV 13	68.3	80A	208/3φ	18"	N/A	73"x35"x76"	DS035AD	1				
DOWNFLOW	5,200	0.2	1.9	72°/50%	121,916 (35.7)	100,060 (29.3)	11.0	_	_	NONE	NONE	2"	MERV 13	68.3	80A	208/3ф	18"	N/A	73"x35"x76"	DS035AD	1				
	DOWNFLOW	DOWNFLOW 5,200 DOWNFLOW 5,200	DOWNFLOW 5,200 0.2 DOWNFLOW 5,200 0.2	CONFIGURATIONCFMESPFAN KWDOWNFLOW5,2000.21.9DOWNFLOW5,2000.21.9	DOWNFLOW 5,200 0.2 1.9 72°/50% DOWNFLOW 5,200 0.2 1.9 72°/50%	CONFIGURATION CFM ESP IOTAL FAN KW EAT (°F) TOTAL MBH (KW) DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7)	CONFIGURATION CFM ESP IOTAL FAN KW EAT (*F) TOTAL MBH (KW) SENS MBH (KW) DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3)	CONFIGURATION CFM ESP IOTAL FAN KW EAT (*F) TOTAL MBH (KW) SENS MBH (KW) #/HR DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0	CONFIGURATION CFM ESP TOTAL MBH (KW) SENS MBH (KW) #/HR KW DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 —	CONFIGURATION CFM ESP TOTAL MBH (KW) SENS MBH (KW) #/HR KW PAN DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — — DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — —	CONFIGURATION CFM ESP TOTAL MBH (KW) SENS MBH (KW) #/HR KW PAN KW DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — — NONE DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — — NONE DOWNFLOW 5,200 0.2 1.0 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 — — NONE	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH (KW) #/HR KW PAN KW STAGES DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH (KW) #/HR KW PAN KW STAGES DEPTH DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) (29.3) 11.0 NONE NONE 2"	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH SENS MBH (KW) #/HR KW PAN KW STAGES DEPTH EFF DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) (29.3) 11.0 - NONE NONE 2" MERV 13	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH SENS MBH (KW) #/HR KW PAN KW STAGES DEPTH EFF MCA DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3 DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH SENS MBH (KW) #/HR KW PAN KW STAGES DEPTH EFF MCA MOCP DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" MERV 13 68.3 80A DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" MERV 13 68.3 80A	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH SENS MBH (KW) #/HR KW PAN KW STAGES DEPTH EFF MCA MOCP VOLTS DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3 80A 208/3¢ DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3 80A 208/3¢	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH (KW) FINAL KW PAN KW STAGES DEPTH EFF MCA MOCP VOLTS STAND HEIGHT DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" MERV 13 68.3 80A 208/3¢ 18" DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" MERV 13 68.3 80A 208/3¢ 18" DOWNFLOW 5,200 0.2 1.9 72*/50% 121,916 (35.7) 100,060 (29.3) 11.0 NONE NONE 2" MERV 13 68.3 80A 208/3¢ 18"	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH (KW) FAN KW PAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOWN PLENUM HEIGHT DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3 80A 208/3¢ 18" N/A DOWNFLOW 5,200 0.2 1.9 72°/50% 121,916 (35.7) 100,060 (29.3) 11.0 - NONE NONE 2" MERV 13 68.3 80A 208/3¢ 18" N/A	CONFIGURATION CFM ESP FAN KW EAT (*F) TOTAL MBH (KW) FAN KW PAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR STAND PLENUM HEIGHT CAN A CONTROL OF TOTAL MBH (KW) FAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR STAND PLENUM HEIGHT CAN A CONTROL OF TOTAL MBH (KW) FAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR STAND PLENUM HEIGHT CAN A CONTROL OF TOTAL MBH (KW) FAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR STAND PLENUM HEIGHT CAN A CONTROL OF TOTAL MBH (KW) FAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR STAND PLENUM HEIGHT CAN A CONTROL OF TOTAL MBH (KW) FAN KW STAGES DEPTH EFF MCA MOCP VOLTS FLOOR FLOO	CONFIGURATION CFM ESP TOTAL FAN KW EAT (*F) TOTAL MBH (KW) #/HR KW PAN KW STAGES DEPTH EFF MCA MOCP VOLTS STAND HEIGHT HEIGHT DS DIMENSIONS LXWXH LIEBERT DS DESIGN DEPTH EFF MCA MOCP VOLTS STAND HEIGHT DS DIMENSIONS LXWXH LIEBERT DS DESIGN DEPTH EFF MCA MOCP VOLTS STAND HEIGHT DS DIMENSIONS LXWXH LIEBERT DS DESIGN DEPTH EFF MCA MOCP VOLTS STAND HEIGHT DS DIMENSIONS LXWXH DIMENSIONS LXXXXII DIMENSION				

1. REFER TO SPECIFICATION SECTION 238124 - COMPUTER ROOM AIR-CONTIONERS - FLOOR MOUNTED

NOTES:

- 1. CONTRACTOR TO FIELD INSTALL TOP PLENUM SECTION.
- 2. CONTRACTOR TO FIELD INSTALL EC FAN HOUSING BELOW RAISED ACCESS FLOOR.
- 3. CONTRACTOR TO FIELD INSTALL LEAK DETECTORS

			AIR	-COOL	ED COI	NDENSI	ER SCH	IEDUI	LE	
	COUPLED	DB TEMP	HOT GAS	LIQUID		ELECTRICAL		UNIT WT		BASIS OF DESIGN
TAG	A/C UNIT	(°F)	(2) EA	(2) EA	MCA	MOCP	VOLTS	(LBS)	DIMENSIONS L"xW"xH"	LIEBERT
ACC-1	CRAC-1	105	7/8"	5/8"	5.2	15	208/3ø	441	105.3"x46"x43.7"	MCM080
ACC-2	CRAC-2	105	7/8"	5/8"	5.2	15	208/3ø	441	105.3"x46"x43.7"	MCM080
ACC-3	CRAC-3	105	7/8"	5/8"	5.2	15	208/3ø	441	105.3"x46"x43.7"	MCM080

OPTIONS:

- 1. DISCONNECT SWITCH
- 2. R410A REFRIGERATION
- 3. FAN SPEED CONTROL TO -20°F

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1.03 SUBMITTALS

A. DISCARD ALL PACKING MATERIALS AND VERIFY THAT VALVE INTERIOR, INCLUDING THREADS AND FLANGES, ARE COMPLETELY CLEAN WITHOUT SIGNS OF DAMAGE OR DEGRADATION THAT COULD RESULT IN LEAKAGE B. VERIFY VALVE PARTS TO BE FULLY OPERATIONAL IN ALL POSITIONS FROM CLOSED TO FULLY OPEN.

D. SHOULD VALVE IS DETERMINED TO BE DEFECTIVE, REPLACE WITH NEW VALVE

3.02 INSTALLATION

FULL ACCESSIBILITY FOR SERVICING. B. PROVIDE SEPARATE VALVE SUPPORT AS REQUIRED AND LOCATE VALVE WITH STEM AT OR ABOVE CENTER OF PIPING, MAINTAINING UNIMPEDED STEM MOVEMENT.

1.01 RELATED REQUIREMENTS

A. SECTION 033000 - CAST-IN-PLACE CONCRETE: CONCRETE EQUIPMENT PADS.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - STANDARD SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS 2017

B. ASTM A153/A153M - STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE 2016A. C. ASTM A36/A36M - STANDARD SPECIFICATION FOR CARBON STRUCTURAL STEEL 2019

D. ASTM A47/A47M - STANDARD SPECIFICATION FOR FERRITIC MALLEABLE IRON CASTINGS 1999, WITH EDITORIAL REVISION (2018). E. ASTM B633 — STANDARD SPECIFICATION FOR ELECTRODEPOSITED COATINGS OF ZINC ON IRON AND STEEL 2019.

F. ASTM E84 - STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS 2021A.

G. ASTM E96/E96M - STANDARD TEST METHODS FOR WATER VAPOR TRANSMISSION OF MATERIALS 2016

H. MFMA-4 - METAL FRAMING STANDARDS PUBLICATION 2004.

I. MSS SP-58 - PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN, MANUFACTURE, SELECTION, APPLICATION, AND INSTALLATION 2018.

J. UL 723 — STANDARD FOR TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS CURRENT EDITION, INCLUDING ALL REVISIONS. 1.03 ADMINISTRATIVE REQUIREMENTS 1. COORDINATE SIZES AND ARRANGEMENT OF SUPPORTS AND BASES WITH THE ACTUAL EQUIPMENT AND COMPONENTS TO BE INSTALLED.

2. COORDINATE THE WORK WITH OTHER TRADES TO PROVIDE ADDITIONAL FRAMING AND MATERIALS REQUIRED FOR INSTALLATION. 3. COORDINATE COMPATIBILITY OF SUPPORT AND ATTACHMENT COMPONENTS WITH MOUNTING SURFACES AT THE INSTALLED LOCATIONS. 4. COORDINATE THE ARRANGEMENT OF SUPPORTS WITH DUCTWORK, PIPING, EQUIPMENT AND OTHER POTENTIAL CONFLICTS INSTALLED UNDER

OTHER SECTIONS OR BY OTHERS. 5. NOTIFY ARCHITECT OF ANY CONFLICTS WITH OR DEVIATIONS FROM CONTRACT DOCUMENTS. OBTAIN DIRECTION BEFORE PROCEEDING WITH WORK.

1. DO NOT INSTALL PRODUCTS ON OR PROVIDE ATTACHMENT TO CONCRETE SURFACES UNTIL CONCRETE HAS FULLY CURED IN ACCORDANCE WITH SECTION 033000. 1.04 SUBMITTALS

A. SEE SECTION 013000 - ADMINISTRATIVE REQUIREMENTS, FOR SUBMITTAL PROCEDURES.

B. PRODUCT DATA: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR CHANNEL (STRUT) FRAMING SYSTEMS. NONPENETRATING ROOFTOP SUPPORTS, POST-INSTALLED CONCRETE AND MASONRY ANCHORS, AND THERMAL INSULATED PIPE SUPPORTS. C. INSTALLER'S QUALIFICATIONS: INCLUDE EVIDENCE OF COMPLIANCE WITH SPECIFIED REQUIREMENTS D. MANUFACTURER'S INSTRUCTIONS: INDICATE APPLICATION CONDITIONS AND LIMITATIONS OF USE STIPULATED BY PRODUCT TESTING AGENCY.

INCLUDE INSTRUCTIONS FOR STORAGE, HANDLING, PROTECTION, EXAMINATION, PREPARATION, AND INSTALLATION OF PRODUCT. 1.05 QUALITY ASSURANCE A. COMPLY WITH APPLICABLE BUILDING CODE.

B. PRODUCT LISTING ORGANIZATION QUALIFICATIONS: AN ORGANIZATION RECOGNIZED BY OSHA AS A NATIONALLY RECOGNIZED TESTING LABORATORY

(NRTL) AND ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. 1.06 DELIVERY, STORAGE, AND HANDLING A. RECEIVE, INSPECT, HANDLE, AND STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. GENERAL REQUIREMENTS: 1. PROVIDE ALL REQUIRED HANGERS, SUPPORTS, ANCHORS, FASTENERS, FITTINGS, ACCESSORIES, AND HARDWARE AS NECESSARY FOR THE COMPLETE INSTALLATION OF PLUMBING WORK.

2. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED, WHERE APPLICABLE. 3. WHERE SUPPORT AND ATTACHMENT COMPONENT TYPES AND SIZES ARE NOT INDICATED, SELECT IN ACCORDANCE WITH MANUFACTURER'S

APPLICATION CRITERIA AS REQUIRED FOR THE LOAD TO BE SUPPORTEDI WITH A MINIMUM SAFETY FACTOR OF 51. INCLUDE CONSIDERATION FOR VIBRATION, EQUIPMENT OPERATION, AND SHOCK LOADS WHERE APPLICABLE. 4. DO NOT USE WIRE, CHAIN, PERFORATED PIPE STRAP, OR WOOD FOR PERMANENT SUPPORTS UNLESS SPECIFICALLY INDICATED OR PERMITTED. 5. STEEL COMPONENTS: USE CORROSION RESISTANT MATERIALS SUITABLE FOR THE ENVIRONMENT WHERE INSTALLED.

b. OUTDOOR AND DAMP OR WET INDOOR LOCATIONS: USE ISTAINLESS STEELI UNLESS OTHERWISE INDICATED. c. ZINC-PLATED STEEL: ELECTROPLATED IN ACCORDANCE WITH ASTM B633. d. GALVANIZED STEEL: HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123/A123M OR ASTM A153/A153M.

a. INDOOR DRY LOCATIONS: USE ZINC-PLATED STEEL OR APPROVED EQUIVALENT UNLESS OTHERWISE INDICATED.

B. METAL CHANNEL (STRUT) FRAMING SYSTEMS: FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF SUPPORTS. 1. MANUFACTURERS: a. COOPER B-LINE, A DIVISION OF EATON CORPORATION: WWW.COOPERINDUSTRIES.COM/#SLE.

b. FERGUSON ENTERPRISES INC: WWW.FNW.COM/#SLE c. THOMAS & BETTS CORPORATION: WWW.TNB.COM/#SLE. d. UNISTRUT, A BRAND OF ATKORE INTERNATIONAL INC: WWW.UNISTRUT.COM/#SLE.

e. SOURCE LIMITATIONS: FURNISH CHANNELS (STRUTS) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE PRODUCED BY A SINGLE MANUFACTURER. 2. COMPLY WITH MFMA-4.

MINIMUM 1-1/2 INCH DIAMETER.

B. LETTER COLOR: WHITE.

A. MANUFACTURERS:

2.04 PIPE MARKERS

A. MANUFACTURERS:

2.03 TAGS

C. LETTER HEIGHT: 1/4 INCH.

D. BACKGROUND COLOR: BLACK

E. PLASTIC: COMPLY WITH ASTM D709.

2. BRIMAR INDUSTRIES, INC: WWW.PIPEMARKER.COM/#SLE. 3. CRAFTMARK PIPE MARKERSI: WWW.CRAFTMARKID.COM/#SLE 4. KOLBI PIPE MARKER COI: WWW.KOLBIPIPEMARKERS.COM/#SLE.

BRADY CORPORATION: WWW.BRADYCORP.COM/#SLE

2. BRADY CORPORATION: WWW.BRADYCORP.COM/#SLE

3. BRIMAR INDUSTRIES, INC: WWW.PIPEMARKER.COM/#SLE.

4. CRAFTMARK PIPE MARKERS: WWW.CRAFTMARKID.COM/#SLE

5. KOLBI PIPE MARKER CO: WWW.KOLBIPIPEMARKERS.COM/#SLE.

3. CRAFTMARK PIPE MARKERSI: WWW.CRAFTMARKID.COM/#SLE

4. KOLBI PIPE MARKER COI: WWW.KOLBIPIPEMARKERS.COM/#SLE.

5. SETON IDENTIFICATION PRODUCTS, A TRICOR DIRECT COMPANY: WWW.SETON.COM/#SLE.

1. ADVANCED GRAPHIC ENGRAVING: WWW.ADVANCEDGRAPHICENGRAVING.COM/#SLE

D. VALVE TAG CHART: TYPEWRITTEN LETTER SIZE LIST IN ANODIZED ALUMINUM FRAME.

5. SETON IDENTIFICATION PRODUCTS, A TRICOR COMPANY: WWW.SETON.COM/#SLE. B. COLOR: COMPLY WITH ASME A13.1

C. METAL TAGS: BRASS WITH STAMPED LETTERS; TAG SIZE MINIMUM 1-1/2 INCH DIAMETER WITH SMOOTH EDGES.

C. PLASTIC PIPE MARKERS: FACTORY FABRICATED, FLEXIBLE, SEMI- RIGID PLASTIC, PREFORMED TO FIT AROUND PIPE OR PIPE COVERING; MINIMUM INFORMATION INDICATING FLOW DIRECTION ARROW AND IDENTIFICATION OF FLUID BEING CONVEYED.

B. PLASTIC TAGS: LAMINATED THREE-LAYER PLASTIC WITH ENGRAVED BLACK LETTERS ON LIGHT CONTRASTING BACKGROUND COLOR. TAG SIZE

D. PLASTIC TAPE PIPE MARKERS: FLEXIBLE, VINYL FILM TAPE WITH PRESSURE SENSITIVE ADHESIVE BACKING AND PRINTED MARKINGS. 2.05 CEILING TACKS A. MANUFACTURERS: 1. CRAFTMARK PIPE MARKERS: WWW.CRAFTMARKID.COM/#SLE

B. DESCRIPTION: STEEL WITH 3/4 INCH DIAMETER COLOR CODED HEAD. C. COLOR CODE AS FOLLOWS:

1. HEATING/COOLING VALVES: BLUE

PART 3 EXECUTION

3.01 PREPARATION

A. DEGREASE AND CLEAN SURFACES TO RECEIVE ADHESIVE FOR IDENTIFICATION MATERIALS. 3.02 INSTALLATION

A. INSTALL NAMEPLATES WITH CORROSIVE-RESISTANT MECHANICAL FASTENERS, OR ADHESIVE. APPLY WITH SUFFICIENT ADHESIVE TO ENSURE PERMANENT ADHESION AND SEAL WITH CLEAR LACQUER.

B. INSTALL PLASTIC PIPE MARKERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. C. INSTALL PLASTIC TAPE PIPE MARKERS COMPLETE AROUND PIPE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

D. USE TAGS ON PIPING 3/4 INCH DIAMETER AND SMALLER. E. LOCATE CEILING TACKS TO LOCATE VALVES OR DAMPERS ABOVE LAY-IN PANEL CEILINGS. LOCATE IN CORNER OF PANEL CLOSEST TO EQUIPMENT. END OF SECTION

PART 1 GENERAL 1.01 RELATED REQUIREMENTS

1.02 REFERENCE STANDARDS A. ASTM C177 — STANDARD TEST METHOD FOR STEADY—STATE HEAT FLUX MEASUREMENTS AND THERMAL TRANSMISSION PROPERTIES BY MEANS OF THE GUARDED-HOT-PLATE APPARATUS 2019. B. ASTM C195 - STANDARD SPECIFICATION FOR MINERAL FIBER THERMAL INSULATING CEMENT 2007 (REAPPROVED 2019).

C. ASTM C547 - STANDARD SPECIFICATION FOR MINERAL FIBER PIPE INSULATION 2019. D. ASTM C795 — STANDARD SPECIFICATION FOR THERMAL INSULATION FOR USE IN CONTACT WITH AUSTENITIC STAINLESS STEEL 2008 (REAPPROVED

E. ASTM D610 - STANDARD PRACTICE FOR EVALUATING DEGREE OF RUSTING ON PAINTED STEEL SURFACES 2008 (REAPPROVED 2019). F. ASTM E84 - STANDARD TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS 2021A. G. ASTM E96/E96M - STANDARD TEST METHODS FOR WATER VAPOR TRANSMISSION OF MATERIALS 2016

H.UL 723 — STANDARD FOR TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS CURRENT EDITION, INCLUDING ALL REVISIONS.

1.03 SUBMITTALS A. PRODUCT DATA: PROVIDE PRODUCT DESCRIPTION, THERMAL CHARACTERISTICS, LIST OF MATERIALS AND THICKNESS FOR EACH SERVICE, AND B. MANUFACTURER'S INSTRUCTIONS: INDICATE INSTALLATION PROCEDURES THAT ENSURE ACCEPTABLE WORKMANSHIP AND INSTALLATION STANDARDS

WILL BE ACHIEVED. 1.04 QUALITY ASSURANCE A. MANUFACTURER QUALIFICATIONS: COMPANY SPECIALIZING IN MANUFACTURING THE PRODUCTS SPECIFIED IN THIS SECTION WITH NOT LESS THAN

THREE YEARS OF DOCUMENTED EXPERIENCE. B. APPLICATOR QUALIFICATIONS: COMPANY SPECIALIZING IN PERFORMING THE TYPE OF WORK SPECIFIED IN THIS SECTION WITH MINIMUM THREE YEARS

1.05 DELIVERY, STORAGE, AND HANDLING A. ACCEPT MATERIALS ON SITE, LABELED WITH MANUFACTURER'S IDENTIFICATION, PRODUCT DENSITY, AND THICKNESS.

1.06 FIELD CONDITIONS A. MAINTAIN AMBIENT CONDITIONS REQUIRED BY MANUFACTURERS OF EACH PRODUCT

B. MAINTAIN TEMPERATURE BEFORE, DURING, AND AFTER INSTALLATION FOR MINIMUM OF 24 HOURS.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723. 2.02 GLASS FIBER, RIGID A. INSULATION: ASTM C547 AND ASTM C795; RIGID MOLDED, NONCOMBUSTIBLE.

1. K VALUE: ASTM C177, 0.24 AT 75 DEGREES F.

2. MAXIMUM SERVICE TEMPERATURE: 850 DEGREES 3. MAXIMUM MOISTURE ABSORPTION: 0.2 PERCENT BY VOLUME. B. VAPOR BARRIER JACKET: WHITE KRAFT PAPER WITH GLASS FIBER YARN, BONDED TO ALUMINIZED FILM; MOISTURE VAPOR TRANSMISSION WHEN

C. VAPOR BARRIER LAP ADHESIVE: COMPATIBLE WITH INSULATION. D. INSULATING CEMENT/MASTIC: ASTM C195; HYDRAULIC SETTING ON MINERAL WOOL. E. INDOOR VAPOR BARRIER FINISH:

TESTED IN ACCORDANCE WITH ASTM E96/E96M OF 0.02 PERM—INCHES

1. CLOTH: UNTREATED; 9 OZ/SQ YD WEIGHT. 2. VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, BLACK COLOR.

F. OUTDOOR VAPOR BARRIER MASTIC: VINYL EMULSION TYPE ACRYLIC OR MASTIC, COMPATIBLE WITH INSULATION, BLACK COLOR. 2.03 ACCESSORIES A. GENERAL REQUIREMENTS:

1. PROVIDE REQUIRED ACCESSORIES IN ACCORDANCE WITH AND SUBJECT TO THE RECOMMENDATIONS OF THE INSULATION MANUFACTURER. 2. FURNISH COMPATIBLE MATERIALS WHICH DO NOT CONTRIBUTE TO CORROSION, SOFTEN, OR OTHERWISE ATTACK SURFACES TO WHICH APPLIED, IN EITHER THE WET OR DRY STATE. 3. COMPLY WITH ASTM C795 REQUIREMENTS FOR MATERIALS TO BE USED ON STAINLESS STEEL SURFACES.

4. SUPPLY MATERIALS THAT ARE ASBESTOS FREE. B. CORROSION INHIBITORS: 1. CORROSION CONTROL GEL:

a. CORROSION PROTECTION: COMPLY WITH ASTM B117 AND ASTM D610.

a. 1/2 TO 1 INCHES: BRASS SOLDER TO GALVANIZED FPT. b. 1/2 TO 2 INCHES: BRASS SOLDER TO GALVANIZED FPT. c. 1/2 TO 1 INCHES: BRASS TO GALVANIZED FPT OR FIP (FEMALE IRON PIPE).

d. 3/4 TO 1/2 INCH REDUCER: BRASS SOLDER TO GALVANIZED FPT. e. SERVICE: 250 PSI, MINUS 20 TO 180 DEG F.

2.05 BALL VALVES A. UP TO AND INCLUDING 2 INCHES:

1. BRONZEITWOI PIECE BODY, ISTAINLESS STEELI BALL, TEFLON SEATS AND STUFFING BOX RING, LEVER HANDLE, ISOLDER OR THREADEDI ENDSI.

PART 3 EXECUTION

A. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE. B. REMOVE SCALE AND DIRT ON INSIDE AND OUTSIDE BEFORE ASSEMBLY C. PREPARE PIPING CONNECTIONS TO EQUIPMENT USING JOINTING SYSTEM SPECIFIED

D. KEEP OPEN ENDS OF PIPE FREE FROM SCALE AND DIRT. PROTECT OPEN ENDS WITH TEMPORARY PLUGS OR CAPS. E. AFTER COMPLETION, FILL, CLEAN, AND TREAT SYSTEMS. SEE SECTION 232500 FOR ADDITIONAL REQUIREMENTS. 3.02 INSTALLATION

A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. B. ROUTE PIPING IN ORDERLY MANNER, PARALLEL TO BUILDING STRUCTURE, AND MAINTAIN GRADIENT.

C. INSTALL PIPING TO CONSERVE BUILDING SPACE AND TO AVOID INTERFERENCE WITH USE OF SPACE. D. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS. E. SLOPE PIPING AND ARRANGE TO DRAIN AT LOW POINTS.

F. PIPE HANGERS AND SUPPORTS: 1. INSTALL IN ACCORDANCE WITH ASME B31.9, ASTM F708, OR MSS SP-58. SUPPORT HORIZONTAL PIPING AS SCHEDULED.

3. INSTALL HANGERS TO PROVIDE MINIMUM 1/2-INCH SPACE BETWEEN FINISHED COVERING AND ADJACENT WORK 4. PLACE HANGERS WITHIN 12 INCHES OF EACH HORIZONTAL ELBOW.

5. USE HANGERS WITH 1-1/2 INCHES MINIMUM VERTICAL ADJUSTMENT. DESIGN HANGERS FOR PIPE MOVEMENT WITHOUT DISENGAGEMENT OF SUPPORTED PIPE. 6. SUPPORT VERTICAL PIPING AT EVERYI FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING. 7. PROVIDE COPPER PLATED HANGERS AND SUPPORTS FOR COPPER PIPING.

G. PROVIDE CLEARANCE IN HANGERS AND FROM STRUCTURE AND OTHER EQUIPMENT FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS. SEE SECTION 230719.

2.35 COMPRESSOR RUN TIME MONITORING A. THE CONTROL SHALL LOG THESE COMPRESSOR STATISTICS:

A. ALL UNIT ALARMS SHALL BE ANNUNCIATED THROUGH BOTH AUDIO AND VISUAL CUES, CLEARLY DISPLAYED ON THE SCREEN, AUTOMATICALLY RECORDED IN THE EVENT LOG AND COMMUNICATED TO THE CUSTOMER'S BUILDING MANAGEMENT SYSTEM/BUILDING AUTOMATION SYSTEM. THE

1. NUMBER OF COMPRESSOR STARTS

2. RUN HOURS 3. AVERAGE RUN TIME

4. STARTS PER DAY 5. STARTS PER DAY WORST

7. OPERATING PHASE IN WHICH THE HIGH-PRESSURE ALARM OCCURRED 8. NUMBER OF LOW-PRESSURE ALARMS 9. OPERATING PHASE IN WHICH THE LOW-PRESSURE ALARM OCCURRED

a. THE USER SHALL HAVE THE ABILITY TO MONITOR COMPRESSOR OPERATING TEMPERATURE AND PRESSURE FROM THE LOCAL DISPLAY TO BE USED AS A DIAGNOSTIC TOOL. 2.36 MANUAL COMPRESSOR DISABLEMENT

COMPRESSOR DOWN IF NEEDED TO PREVENT ELECTRICAL OR MECHANICAL DAMAGE. 2.38 SMOKE SENSOR

IS NOT INTENDED TO FUNCTION AS OR REPLACE ANY ROOM SMOKE DETECTION SYSTEM THAT MAY BE REQUIRED BY LOCAL OR NATIONAL CODES. THE SMOKE SENSOR SHALL INCLUDE A SUPERVISION CONTACT CLOSURE. 2.39 CONDENSATE PUMP, DUAL FLOAT A. THE CONDENSATE PUMP SHALL HAVE A MINIMUM CAPACITY OF 145 GPH AT 20 FT HEAD. IT SHALL BE COMPLETE WITH INTEGRAL DUAL-FLOAT

1. REMOTE SHUTDOWN TERMINALS - 2 ADDITIONAL PAIRS OF TERMINALS PROVIDE THE CUSTOMER WITH ADDITIONAL LOCATIONS TO REMOTELY SHUT-DOWN THE UNIT BY FIELD-INSTALLED DEVICES OR CONTROLS.

3. MAIN-FAN AUXILIARY SWITCH - 1 SET OF NORMALLY-OPEN CONTACTS WIRED TO THE EC-FAN MOTOR CONTACTOR WILL CLOSE WHEN EC-FAN OPERATION IS REQUIRED. THIS SET OF DRY CONTACTS COULD ALSO BE USED TO INITIATE AIR ECONOMIZER OPERATION. AIR ECONOMIZER AND ASSOCIATED DEVICES BY OTHERS.

2.41 EC FAN OVERLOAD A. AN EC FAN FAULT SHALL BE STANDARD ON ALL MODELS.

2.42 WIRED SUPPLY SENSOR(S) A. EACH LIEBERT ICOM SHALL HAVE 2 ADDITIONAL SUPPLY-AIR SENSORS CONNECTED AND USED AS CONTROLLING SENSORS. THIS SHALL BE IN ADDITION TO THE STANDARD FACTORY-SUPPLIED SUPPLY-AIR SENSOR. WHEN MULTIPLE SENSORS ARE APPLIED FOR CONTROL PURPOSES, THE

A. EACH LIEBERT ICOM SHALL HAVE TWO (2) FACTORY-INSTALLED AND FACTORY-PROGRAMMED STATIC PRESSURE TRANSDUCER(S) USED FOR CONTROL. THE LIEBERT ICOM SHALL BE CAPABLE OF:

TRANSDUCER SHALL BE REQUIRED FOR A GROUP OF UNITS, HOWEVER, MULTIPLE TRANSDUCERS MAY BE APPLIED PER GROUP AND AGGREGATED FOR REDUNDANCY A. LIEBERT ICOM SHALL MONITOR EVAPORATOR FAN AIRFLOW FOR MONITORING PURPOSES.

A. A FACTORY—INSTALLED COMMUNICATION CARD SHALL BE PROVIDED FOR MONITORING AND/OR CONTROL. THE COMMUNICATIONS CARD SHALL BE

A. ONE (1) 45 FOOT LONG ROPE—TYPE SOLID STATE WATER SENSOR SHALL BE PROVIDED FOR INSTALLATION UNDER THE RAISED FLOOR.

LOADING AND OUTDOOR AMBIENT CONDITIONS CHANGE STANDARD 60-HZ UNITS ARE CSA-CERTIFIED TO THE HARMONIZED U. S. AND CANADIAN PRODUCT SAFETY STANDARD CSA C22.2 NO 236/UL 1995

INSTALLATION. THE CONDENSER SHALL BE A DRAW-THROUGH DESIGN.

1. CONDENSER SHALL CONSIST OF MICROCHANNEL CONDENSER COIL(S), PROPELLER FAN(S) DIRECT-DRIVEN BY INDIVIDUAL FAN MOTOR(S

ELECTRICAL CONTROLS, HOUSING AND MOUNTING LEGS. THE LIEBERT AIR-COOLED CONDENSER SHALL PROVIDE POSITIVE REFRIGERANT HEAD PRESSURE CONTROL TO THE INDOOR COOLING UNIT BY ADJUSTING HEAT REJECTION CAPACITY. MICROCHANNEL COILS SHALL PROVIDE SUPERIOR HEAT TRANSFER. REDUCE AIR-SIDE PRESSURE DROP. INCREASE ENERGY EFFICIENCY AND SIGNIFICANTLY REDUCE THE SYSTEM REFRIGERANT VOLUME REQUIRED. EC FANS AND FAN OPERATING TECHNIQUES SHALL PROVIDE REDUCED MAXIMUM SOUND LEVELS. COMPONENTS SHALL BE MATCHED MAXIMIZE PERFORMANCE OF INDOOR UNIT, AT THE MAXIMUM OUTDOOR DESIGN AMBIENT AND MAXIMUM SOUND REQUIREMENTS. E. LIEBERT MC CONDENSER COIL

a. LIEBERT MICROCHANNEL COILS SHALL BE CONSTRUCTED OF ALUMINUM MICROCHANNEL TUBES, FINS AND MANIFOLDS. TUBES SHALL BE FLAT AND CONTAIN MULTIPLE, PARALLEL FLOW MICROCHANNELS AND SPAN BETWEEN ALUMINUM HEADERS. FULL-DEPTH LOUVERED ALUMINUM FINS SHALL FILL SPACES BETWEEN THE TUBES. TUBES, FINS AND ALUMINUM HEADERS SHALL BE OVEN BRAZED TO FORM A COMPLETE REFRIGERANT-TO-AIR HEAT EXCHANGER COIL. COPPER STUB PIPES SHALL BE ELECTRIC RESISTANCE WELDED TO ALUMINUM COILS AND JOINTS PROTECTED WITH POLYOLEFIN TO SEAL JOINTS FROM CORROSIVE ENVIRONMENTAL ELEMENTS. COIL ASSEMBLIES SHALL BE FACTORY LEAK-TESTED AT A MINIMUM OF 300 PSIG (2068KPAG). HOT GAS AND LIQUID LINES SHALL BE COPPER AND SHALL BE BRAZED USING NITROGEN GAS FLOW TO THE STUB PIPES WITH SPUN CLOSED ENDS FOR CUSTOMER PIPING CONNECTIONS. COMPLETE COIL/PIPING ASSEMBLY SHALL BE THEN FILLED AND SEALED WITH AN INERT GAS HOLDING CHARGE FOR SHIPMENT. F. CONDENSER FAN MOTOR/BLADE ASSEMBLY

1. THE FAN MOTOR/BLADE ASSEMBLY SHALL HAVE AN EXTERNAL ROTOR MOTOR, FAN BLADES AND FAN/FINGER GUARD. FAN BLADES SHALL B CONSTRUCTED ÓF CAST ALUMINUM OR GLASS-REINFORCED POLYMERIC MATERIAL. FAN GUARDS SHÁLL BE HEAVY GAUGE, CLOSE MESHED STEEL WIRE. COATED WITH A BLACK CORROSION RESISTANT FINISH. FAN TERMINAL BLOCKS SHALL BE LOCATED IN AN IP54 ENCLOSURE LOCATED ON THE TOP OF THE FAN MOTOR. FAN ASSEMBLIES SHALL BE FACTORY-BALANCED, TESTED BEFORE SHIPMENT AND MOUNTED SECURELY TO THE CONDENSER STRUCTURE.

2. EC FAN MOTOR SHALL PROVIDE INTERNAL OVERLOAD PROTECTION THROUGH BUILT-IN ELECTRONICS. EACH EC FAN MOTOR SHALL HAVE A BUILT-IN

a. THE EC FAN MOTORS SHALL BE ELECTRONICALLY COMMUTATED FOR VARIABLE SPEED OPERATION AND SHALL HAVE BALL BEARINGS. THE EC FANS CONTROLLER AND COMMUNICATION MODULE, LINKED VIA RS485 COMMUNICATION WIRE TO EACH FAN AND THE PREMIUM CONTROL BOARD, ALLOWING EACH FAN TO RECEIVE AND RESPOND TO PRECISE FAN SPEED INPUTS FROM THE PREMIUM CONTROL BOARD. G. CONDENSER ELECTRICAL CONTROLS 1. ELECTRICAL CONTROLS AND SERVICE CONNECTION TERMINALS SHALL BE PROVIDED AND FACTORY WIRED INSIDE THE ATTACHED CONTROL PANEL

EXTERNALLY MOUNTED LOCKING AND LOCKABLE DOOR HANDLE. ONLY HIGH-VOLTAGE SUPPLY WIRING AND LOW VOLTAGE INDOOR UNIT COMMUNICATION/INTERLOCK WIRING ARE REQUIRED AT CONDENSER INSTALLATION. H. LOCKING DISCONNECT 1. A LOCKING-TYPE DISCONNECT SWITCH SHALL BE FACTORY-MOUNTED AND WIRED TO THE ELECTRICAL PANEL. THE SWITCH SHALL BE ACCESSIBLE FROM THE OUTSIDE OF THE UNIT WITH THE DOOR CLOSED, AND SHALL PREVENT ACCESS TO THE HIGH-VOLTAGE ELECTRICAL COMPONENTS UNTIL

a. THE ELECTRICAL PANEL SHALL PROVIDE AT LEAST 65,000A SCCR. . CABINET 1. THE CONDENSER CABINET SHALL BE CONSTRUCTED OF BRIGHT ALUMINUM SHEET AND DIVIDED INTO INDIVIDUAL FAN SECTIONS BY FULL WIDTH BAFFLES, INTERNAL STRUCTURAL SUPPORT MEMBERS, INCLUDING COIL SUPPORT FRAME, SHALL BE GALVANIZED STEEL FOR STRENGTH AND CORROSION RESISTANCE. PANEL DOORS SHALL BE PROVIDED ON TWO SIDES OF EACH COIL/FAN SECTION TO PERMIT COIL CLEANING. AN

ELECTRICAL PANEL SHALL BE CONTAINED INSIDE A FACTORY MOUNTED, NEMA 3R WEATHERPROOF ELECTRICAL ENCLOSURE. J. MOUNTING LEGS 1. STANDARD 60-IN. HEIGHT GALVANIZED LEGS WITH BRACING

a. CONDENSER SHALL BE SHIPPED WITH 60IN. MOUNTING LEGS WITH STABILIZATION BRACING. LEGS, BRACING AND HARDWARE SHALL BE GALVANIZED STEEL AND SHALL BE FIELD INSTALLED AND ANCHORED TO THE MOUNTING SURFACE.

3.01 INSTALLATION OF THERMAL MANAGEMENT UNITS A. THE CUSTOMER OR THE CUSTOMER'S REPRESENTATIVE SHALL BE RESPONSIBLE FOR THE FOLLOWING:

1. INSTALL THERMAL MANAGEMENT UNITS IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS. INSTALL SAFE OPERATING TEMPERATURE IS REACHED AND THE 30 MINUTES HAS ELAPSED. THE CONTROL SHALL STORE THE NUMBER OF HIGH-TEMPERATURE UNITS PLUMB AND LEVEL, FIRMLY ANCHORED IN LOCATIONS INDICATED AND MAINTAIN THE MANUFACTURER'S RECOMMENDED CLEARANCES.

> FACTORY-MOUNTED. FURNISH COPY OF THE MANUFACTURER'S ELECTRICAL CONNECTION DIAGRAM SUBMITTAL TO ELECTRICAL CONTRACTOR. A. INSTALL AND CONNECT DEVICES FURNISHED BY MANUFACTURER BUT NOT SPECIFIED TO BE FACTORY-MOUNTED. FURNISH COPY

> OF THE MANUFACTURER'S PIPING CONNECTION DIAGRAM SUBMITTAL TO PIPING CONTRACTOR. B. SUPPLY AND DRAIN WATER PIPING

1. CONNECT WATER—SUPPLY AND DRAINS TO AIR—CONDITIONING UNIT. PROVIDE PITCH AND TRAP AS MANUFACTURER'S INSTRUCTIONS AND LOCAL CODES REQUIRE. 3.03 FIELD QUALITY CONTROL

A. START COOLING UNITS IN ACCORDANCE WITH THE MANUFACTURER'S STARTUP INSTRUCTIONS. TEST CONTROLS AND DEMONSTRATE COMPLIANCE WITH REQUIREMENTS, THESE SPECIFICATIONS DESCRIBE REQUIREMENTS FOR A COMPUTER ROOM ENVIRONMENTAL

CONTROL SYSTEM. THE SYSTEM SHALL BE DESIGNED TO MAINTAIN TEMPERATURE AND HUMIDITY CONDITIONS IN THE ROOMS CONTAINING ELECTRONIC EQUIPMENT. B. THE MANUFACTURER SHALL DESIGN AND FURNISH ALL EQUIPMENT TO BE FULLY COMPATIBLE WITH HEAT DISSIPATION

REQUIREMENTS. 3.04 WARRANTY START-UP AND CONTROL PROGRAMMING

B. ENGAGE MANUFACTURER'S FIELD SERVICE TECHNICIAN TO PROVIDE WARRANTY START-UP SUPERVISION AND ASSIST IN PROGRAMMING OF UNIT(S) CONTROLS AND ANCILLARY PANELS SUPPLIED BY THEM.

SECTION 238124 - COMPUTER ROOM AIR CONDITIONERS - FLOOR MOUNTED

6. NUMBER OF HIGH-PRESSURE ALARMS

10. NUMBER OF COMPRESSOR OVERLOADS 11. NUMBER OF HIGH-TEMPERATURE ALARMS (SCROLL COMPRESSORS)

A. THE USER SHALL HAVE THE ABILITY TO DISABLE COMPRESSOR OPERATION USING A SET OF EITHER NORMALLY-OPEN OR NORMALLY-CLOSED DRY a. CUSTOM ALARM INPUTS SHALL BE PROVIDED TO INDICATE FACILITY—SPECIFIC EVENTS. CUSTOM ALARMS CAN BE IDENTIFIED WITH PROGRAMMABLE CONTACTS TIED DIRECTLY TO THE CONTROL OR THROUGH REMOTE MONITORING. AN ADDITIONAL ENABLE/DISABLE FEATURE SHALL BE PROVIDED TO ALLOW THE USER TO PERMANENTLY DISABLE AN INDIVIDUAL COMPRESSOR CIRCUIT FOR MAINTENANCE USING THE LOCAL DISPLAY.

A. THE USER SHALL BE ABLE TO OPERATE EACH COMPRESSOR MANUALLY FROM THE LOCAL DISPLAY. THE USER SHALL BE ABLE TO ENERGIZE REFRIGERATION COMPONENTS INCLUDING LIQUID-LINE SOLENOID VALVES, COMPRESSOR CONTACTORS, ELECTRONIC EXPANSION VALVES AND ADJUST CAPACITY FOR TROUBLESHOOTING OR REPAIR. THE CONTROL SHALL MONITOR THE COMPRESSOR DURING MANUAL OPERATION AND SHALL SHUT THE

A. THE SMOKE SENSOR SHALL IMMEDIATELY SHUT DOWN THE THERMAL MANAGEMENT SYSTEM AND ACTIVATE THE ALARM SYSTEM WHEN ACTIVATED. THE A. THE LIEBERT ICOM SHALL BE FACTORY—SET TO ALLOW PRECISE MONITORING AND CONTROL OF THE CONDITION OF THE AIR ENTERING AND LEAVING SMOKE SENSOR SHALL BE MOUNTED IN THE ELECTRICAL PANEL WITH THE SENSING ELEMENT IN THE RETURN AIR COMPARTMENT. THE SMOKE SENSOR

SWITCHES, PUMP-AND-MOTOR ASSEMBLY AND RESERVOIR. THE SECONDARY FLOAT SHALL SEND A SIGNAL TO THE LOCAL ALARM AND SHUT DOWN THE UNIT UPON HIGH WATER CONDITION. 2.40 LOW VOLTAGE TERMINAL PACKAGE

A. FACTORY-INSTALLED AND FACTORY-WIRED TERMINALS SHALL BE PROVIDED

2. EXTRA COMMON-ALARM CONTACTS - 2 ADDITIONAL PAIRS OF TERMINALS PROVIDE THE CUSTOMER WITH NORMALLY-OPEN CONTACTS FOR REMOTE

4. LIQUI-TECT SHUTDOWN - 1 PAIR OF DRY CONTACTS FOR THE LIQUI-TECT SENSOR SIGNAL WILL PROVIDE UNIT SHUT DOWN.

1. DEW POINT AND RELATIVE HUMIDITY CONTROL METHODS SHALL BE AVAILABLE (BASED ON USER PREFERENCE) FOR HUMIDITY CONTROL WITHIN THE USER SHALL BE ABLE TO CONTROL BASED ON A MAXIMUM OR AVERAGE TEMPERATURE READING 2.43 WIRED REMOTE SENSOR(S) A. EACH LIEBERT ICOM® SHALL HAVE UP TO FIVE (5) 2T SENSORS FOR CONTROL OR REFERENCE. AS PART OF THE U2U NETWORK, THE SENSORS SHALL BE SHARED AND USED TO CONTROL THE COOLING UNITS AND PROVIDE GREATER FLEXIBILITY, VISIBILITY AND CONTROL TO RESPOND TO

CHANGES IN THE CONDITIONED SPACE. WHEN THE SENSORS ARE USED FOR CONTROL, THE USER MAY SET THE CONTROL TO BE BASED OFF A MAXIMUM OR AVERAGE OF A SELECTED HIGHEST TEMPERATURE READING. 2.44 STATIC PRESSURE TRANSDUCER(S)

1. SHARING SENSOR DATA ACROSS MULTIPLE UNITS IN THE U2U NETWORK TO PROVIDE GREATER FLEXIBILITY, VISIBILITY AND CONTROL. ONLY ONE

2.45 AIRFLOW MONITORING AVERAGE OR WORST-CASE SENSOR READING (USER-SELECTABLE) FOR HEATING, COOLING HUMIDIFICATION AND DEHUMIDIFICATION. BASED ON THE

CAPABLE OF CONNECTING TO A BUILDING MANAGEMENT SYSTEM/BUILDING AUTOMATION SYSTEM USING THE FOLLOWING PROTOCOLS: 1. BACNET IP-BACNET OVER INTERNET PROTOCOL 2.47 LIEBERT LIQUI-TECT® SENSORS

A. THE FLOOR STAND SHALL BE CONSTRUCTED OF A WELDED STEEL FRAME. THE FLOOR STAND SHALL HAVE ADJUSTABLE LEGS WITH VIBRATION ISOLATION PADS. THE FLOOR STAND SHALL BE 18 IN. HIGH.

2.49 LIEBERT MC CONDENSER A. THESE SPECIFICATIONS DESCRIBE REQUIREMENTS FOR A LIEBERT AIR-COOLED CONDENSER FOR A LIEBERT THERMAL MANAGEMENT SYSTEM. THE CONDENSER SHALL BE DESIGNED TO REJECT WASTE HEAT TO OUTDOOR AIR AND TO CONTROL REFRIGERANT HEAD PRESSURE AS INDOOR EQUIPMENT B. THE MANUFACTURER SHALL DESIGN AND FURNISH ALL EQUIPMENT IN THE QUANTITIES AND CONFIGURATIONS SHOWN ON THE PROJECT DRAWINGS.

FOR "HEATING AND COOLING EQUIPMENT" AND ARE MARKED WITH THE CSA C-US LOGO. C.LIEBERT MC CONDENSER DESIGN REQUIREMENTS

1. THE AIR-COOLED CONDENSER SHALL BE A FACTORY-ASSEMBLED UNIT, COMPLETE WITH INTEGRAL ELECTRICAL PANEL, DESIGNED FOR OUTDOOR 2. THE UNIT IS TO BE SUPPLIED FOR OPERATION USING A 480 VOLT 3-PHASE, 60 HZ POWER SUPPLY

D. LIEBERT MC CONDENSER STANDARD FEATURES

A. EACH LIEBERT ICOM SHALL HAVE ONE FACTORY—SUPPLIED AND CONNECTED SUPPLY AIR SENSOR THAT MAY BE USED AS A CONTROLLING SENSOR OR

SECTION. A LOCKING DISCONNECT SWITCH SHALL BE FACTORY-MOUNTED AND WIRED TO THE ELECTRICAL PANEL AND CONTROLLED VIA AN

ABILITY TO PREDICT FREEZE CONDITIONS AND CORRECT THIS CONDITION AUTOMATICALLY BY ADJUSTING FAN SPEED AND COMPRESSOR CAPACITY. IF A

SWITCHED TO THE OFF POSITION. THE LOCKING DISCONNECT SHALL BE LOCKABLE IN SUPPORT OF LOCKOUT/TAG-OUT SAFETY PROGRAMS. 2. SHORT CIRCUIT CURRENT RATING

TRANSDUCER HAS FAILED, HAS BEEN DISCONNECTED, SHORTED OR THE READING HAS GONE OUT OF RANGE, THE USER SHALL BE NOTIFIED THROUGH THE LOCAL DISPLAY AND REMOTE MONITORING. THE CORRESPONDING CIRCUIT THAT THE FAILURE HAS OCCURRED ON SHALL BE DISABLED TO

1. INSTALL AND CONNECT ELECTRICAL DEVICES FURNISHED BY THE MANUFACTURER BUT NOT SPECIFIED TO BE

A. INSTALL THE INDOOR UNIT IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS PROVIDED WITH SEISMIC OPTION. FIRMLY ANCHOR MAINTAINING MANUFACTURER'S RECOMMENDED CLEARANCES. MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING. CONCRETE STRENGTH. SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECTION OR BUILDING. ELECTRICAL, PIPE AND DUCT CONNECTIONS MUST PERMIT MOVEMENT IN THREE DIMENSIONS AND ISOLATE THE UNIT FROM FIELD CONNECTIONS. ELECTRICAL CONDUIT SHALL BE FLEXIBLE. HAVING AT LEAST ONE BEND BETWEEN THE RIGID CONNECTION AT THE UNIT CABINET AND THE CONNECTION TO RIGID CONDUIT OR FOUNDATION. THE PIPING FLEXIBLE CONNECTION OR LOOP MUST BE SUITABLE FOR THE OPERATION PRESSURE AND TEMPERATURE OF THE SYSTEM. FURNISH COPY OF MANUFACTURER'S PIPING CONNECTION DIAGRAM SUBMITTAL TO PIPING CONTRACTOR.

END OF SECTION

I. ASTM B88 - STANDARD SPECIFICATION FOR SEAMLESS COPPER WATER TUBE 2020 J. ASTM B88M - STANDARD SPECIFICATION FOR SEAMLESS COPPER WATER TUBE (METRIC) 2020.

D. ASME B16.22 - WROUGHT COPPER AND COPPER ALLOY SOLDER-JOINT PRESSURE FITTINGS 2018.

B. ASHRAE STD 15 - SAFETY STANDARD FOR REFRIGERATION SYSTEMS 2019, WITH ALL AMENDMENTS AND ERRATA.

K. ASTM B280 — STANDARD SPECIFICATION FOR SEAMLESS COPPER TUBE FOR AIR CONDITIONING AND REFRIGERATION FIELD SERVICE 2020. L. AWS A5.8M/A5.8 - SPECIFICATION FOR FILLER METALS FOR BRAZING AND BRAZE WELDING 2019 M.MSS SP-58 - PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN, MANUFACTURE, SELECTION, APPLICATION, AND INSTALLATION 2018.

H. ASTM A123/A123M - STANDARD SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS 2017

C. ASME BPVC-IX - QUALIFICATION STANDARD FOR WELDING, BRAZING, AND FUZING PROCEDURES; WELDERS; BRAZERS; AND WELDING, BRAZING,

A. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED ENSURE SYSTEM COMPONENTS ARE COMPATIBLE AND JOINED TO ENSURE THE INTEGRITY OF THE SYSTEM IS NOT JEOPARDIZED. PROVIDE NECESSARY JOINING FITTINGS. ENSURE FLANGES, UNION, AND COUPLINGS FOR

SERVICING ARE CONSISTENTLY PROVIDED.

B. PROVIDE PIPE HANGERS AND SUPPORTS IN ACCORDANCE WITH ASME B31.5 UNLESS INDICATED OTHERWISE. C. LIQUID INDICATORS:

1. USE LINE SIZE LIQUID INDICATORS IN MAIN LIQUID LINE LEAVING CONDENSER. 2. IF RECEIVER IS PROVIDED, INSTALL IN LIQUID LINE LEAVING RECEIVER.

3. USE LINE SIZE ON LEAVING SIDE OF LIQUID SOLENOID VALVES. D. VALVES: USE SERVICE VALVES ON SUCTION AND DISCHARGE OF COMPRESSORS.

3. USE GAUGE TAPS AT HOT GAS BYPASS REGULATORS, INLET AND OUTLET

USE GAUGE TAPS AT COMPRESSOR INLET AND OUTLET.

SECTION 232300 - REFRIGERANT PIPING

A. AHRI 710 - PERFORMANCE RATING OF LIQUID-LINE DRIERS 2009.

G. ASME B31.9 — BUILDING SERVICES PIPING 2020.

AND FUSING OPERATORS - WELDING BRAZING AND FUSING QUALIFICATIONS 2019.

E. ASME B16.26 - CAST COPPER ALLOY FITTINGS FOR FLARED COPPER TUBES 2018.

F. ASME B31.5 - REFRIGERATION PIPING AND HEAT TRANSFER COMPONENTS 2020.

PART 1 GENERAL

1.01 REFERENCE STANDARDS

4. USE CHECK VALVES ON COMPRESSOR DISCHARGE. 5. USE CHECK VALVES ON CONDENSER LIQUID LINES ON MULTIPLE CONDENSER SYSTEMS. E. REFRIGERANT CHARGING (PACKED ANGLE) VALVE: USE IN LIQUID LINE BETWEEN RECEIVER SHUT-OFF VALVE AND EXPANSION VALVE.

F. STRAINERS: 1. USE LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE. 2. WHERE MULTIPLE EXPANSION VALVES WITH INTEGRAL STRAINERS ARE USED, USE SINGLE MAIN LIQUID LINE STRAINER.

3. ON STEEL PIPING SYSTEMS, USE STRAINER IN SUCTION LINE 4. USE SHUT-OFF VALVE ON EACH SIDE OF STRAINER. G. FILTER-DRIERS:

1. USE A FILTER-DRIER IMMEDIATELY AHEAD OF LIQUID-LINE CONTROLS, SUCH AS THERMOSTATIC EXPANSION VALVES, SOLENOID VALVES, AND MOISTURE INDICATORS. A. PRODUCT DATA: PROVIDE GENERAL ASSEMBLY OF SPECIALTIES, INCLUDING MANUFACTURERS CATALOGUE INFORMATION. PROVIDE

MANUFACTURERS CATALOG DATA INCLUDING LOAD CAPACITY. B. TEST REPORTS: INDICATE RESULTS OF LEAK TEST, ACID TEST C. MANUFACTURER'S INSTALLATION INSTRUCTIONS: INDICATE SUPPORT, CONNECTION REQUIREMENTS, AND ISOLATION FOR SERVICING. D. PROJECT RECORD DOCUMENTS: RECORD EXACT LOCATIONS OF EQUIPMENT AND REFRIGERATION ACCESSORIES ON RECORD DRAWINGS.

1.04 DELIVERY, STORAGE, AND HANDLING A. DELIVER AND STORE PIPING AND SPECIALTIES IN SHIPPING CONTAINERS WITH LABELING IN PLACE. B. PROTECT PIPING AND SPECIALTIES FROM ENTRY OF CONTAMINATING MATERIAL BY LEAVING END CAPS AND PLUGS IN PLACE UNTIL INSTALLATION.

C. DEHYDRATE AND CHARGE COMPONENTS SUCH AS PIPING AND RECEIVERS, SEAL PRIOR TO SHIPMENT, UNTIL CONNECTED INTO SYSTEM PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS A. COMPLY WITH ASME B31.9 FOR INSTALLATION OF PIPING SYSTEM. B. WELDING MATERIALS AND PROCEDURES: COMPLY WITH ASME BPVC-IX AND APPLICABLE STATE LABOR REGULATIONS. C. WELDERS CERTIFICATION: IN ACCORDANCE WITH ASME BPVC-IX.

D. PRODUCTS REQUIRING ELECTRICAL CONNECTION: LISTED AND CLASSIFIED BY UL, AS SUITABLE FOR THE PURPOSE INDICATED. A. COPPER TUBE: ASTM B280, H58 HARD DRAWN OR O60 SOFT ANNEALED. 1. FITTINGS: ASME B16.22 WROUGHT COPPER. 2. JOINTS: BRAZE, AWS A5.8M/A5.8 BCUP SILVER/PHOSPHORUS/COPPER ALLOY

B. COPPER TUBE TO 7/8 INCH OD: ASTM B88 (ASTM B88M), TYPE K (A), ANNEALED. 1. FITTINGS: ASME B16.26 CAST COPPER. 2. JOINTS: FLARED. C. PIPE SUPPORTS AND ANCHORS: 1. PROVIDE HANGERS AND SUPPORTS THAT COMPLY WITH MSS SP-58.

a. IF TYPE OF HANGER OR SUPPORT FOR A PARTICULAR SITUATION IS NOT INDICATED, SELECT APPROPRIATE TYPE USING MSS SP-58 2. HANGERS FOR PIPE SIZES 1/2 TO 1-1/2 INCH: MALLEABLE IRON ADJUSTABLE SWIVEL, SPLIT RING. 3. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS. 4. VERTICAL SUPPORT: STEEL RISER CLAMP

5. COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED. 6. HANGER RODS: MILD STEEL THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUS THREADED 7. INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER RODS. 8. ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS: STEEL PEDESTALS WITH BASES THAT REST ON TOP OF ROOFING MEMBRANE, NOT REQUIRING

FOLLOWS: a. BASES: HIGH DENSITY, UV TOLERANT, POLYPROPYLENE OR REINFORCED PVC. b. BASE SIZES: AS REQUIRED TO DISTRIBUTE LOAD SUFFICIENTLY TO PREVENT INDENTATION OF ROOFING ASSEMBLY c. STEEL COMPONENTS: STAINLESS STEEL, OR CARBON STEEL HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123/A123M

ANY ATTACHMENT TO THE ROOF STRUCTURE AND NOT PENETRATING THE ROOFING ASSEMBLY, WITH SUPPORT FIXTURES AS SPECIFIED; AND AS

d. ATTACHMENT/SUPPORT FIXTURES: AS RECOMMENDED BY MANUFACTURER, SAME TYPE AS INDICATED FOR EQUIVALENT INDOOR HANGERS AND SUPPORTS; CORROSION RESISTANT MATERIAL. e. HEIGHT: PROVIDE MINIMUM CLEARANCE OF 6 INCHES UNDER PIPE TO TOP OF ROOFING. 2.03 MOISTURE AND LIQUID INDICATORS A. INDICATORS: SINGLE PORT TYPE, UL LISTED, WITH COPPER OR BRASS BODY, FLARED OR SOLDER ENDS, SIGHT GLASS, COLOR CODED PAPER

MOISTURE INDICATOR WITH REMOVABLE ELEMENT CARTRIDGE AND PLASTIC CAP; FOR MAXIMUM TEMPERATURE OF 200 DEGREES F AND MAXIMUM

A. SERVICE VALVES: 1. FORGED BRASS BODY WITH COPPER STUBS, BRASS CAPS, REMOVABLE VALVE CORE, INTEGRAL BALL CHECK VALVE, FLARED OR SOLDER ENDS, FOR MAXIMUM PRESSURE OF 500 PSI. A. STRAIGHT LINE OR ANGLE LINE TYPE:

REINFORCED WITH BRASS; FOR MAXIMUM WORKING PRESSURE OF 430 PSI. 2.06 FILTER-DRIERS 1. FLOW CAPACITY - LIQUID LINE: [____] TON, MINIMUM, RATED IN ACCORDANCE WITH AHRI 710.

1. BRASS OR STEEL SHELL, STEEL CAP AND FLANGE, AND REPLACEABLE CARTRIDGE, WITH SCREEN OF STAINLESS STEEL WIRE OR MONEL

2. PRESSURE DROP: 2 PSI, MAXIMUM, WHEN OPERATING AT FULL CONNECTED EVAPORATOR CAPACITY. 3. DESIGN WORKING PRESSURE: 350 PSI, MINIMUM. B. CORES: MOLDED OR LOOSE-FILL MOLECULAR SIEVE DESICCANT COMPATIBLE WITH REFRIGERANT, ACTIVATED ALUMINA, ACTIVATED CHARCOAL AND FILTRATION TO 40 MICRONS, WITH SECONDARY FILTRATION TO 20 MICRONS; OF CONSTRUCTION THAT WILL NOT PASS INTO REFRIGERANT

1. CONNECTIONS: AS SPECIFIED FOR APPLICABLE PIPE TYPE. 3.01 PREPARATION A. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE.

WORKING PRESSURE OF 500 PSI.

C. CONSTRUCTION: UL LISTED.

2.04 VALVES

B. REMOVE SCALE AND DIRT ON INSIDE AND OUTSIDE BEFORE ASSEMBLY C. PREPARE PIPING CONNECTIONS TO EQUIPMENT WITH FLANGES OR UNIONS. 3.02 INSTALLATION A. INSTALL REFRIGERATION SPECIALTIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

B. ROUTE PIPING IN ORDERLY MANNER, WITH PLUMBING PARALLEL TO BUILDING STRUCTURE, AND MAINTAIN GRADIENT. C. INSTALL PIPING TO CONSERVE BUILDING SPACE AND AVOID INTERFERENCE WITH USE OF SPACE D. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS AND LOCATIONS. SLOPE PIPING ONE PERCENT IN DIRECTION OF OIL RETURN. E. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT. F. PIPE HANGERS AND SUPPORTS:

6. PROVIDE COPPER PLATED HANGERS AND SUPPORTS FOR COPPER PIPING.

HORIZONTAL PIPING 0.40 PERCENT IN DIRECTION OF FLOW. H. PROVIDE CLEARANCE FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS. I. FLOOD PIPING SYSTEM WITH NITROGEN WHEN BRAZING.

L. PROVIDE REPLACEABLE CARTRIDGE FILTER-DRIERS, WITH ISOLATION VALVES AND VALVED BYPASS. 3.03 FIELD QUALITY CONTROL A. TEST REFRIGERATION SYSTEM IN ACCORDANCE WITH ASME B31.5.

 INSTALL IN ACCORDANCE WITH ASME B31.5. 2. INSTALL HANGERS TO PROVIDE MINIMUM 1/2 INCH SPACE BETWEEN FINISHED COVERING AND ADJACENT WORK. 3. PLACE HANGERS WITHIN 12 INCHES OF EACH HORIZONTAL ELBOW.

4. SUPPORT VERTICAL PIPING AT EVERYI FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING 5. WHERE SEVERAL PIPES CAN BE INSTALLED IN PARALLEL AND AT SAME ELEVATION, PROVIDE MULTIPLE OR TRAPEZE HANGERS

J. INSULATE PIPING; REFER TO SECTION AND SECTION 230716. K. FOLLOW ASHRAE STD 15 PROCEDURES FOR CHARGING AND PURGING OF SYSTEMS AND FOR DISPOSAL OF REFRIGERANT.

G. ARRANGE PIPING TO RETURN OIL TO COMPRESSOR. PROVIDE TRAPS AND LOOPS IN PIPING, AND PROVIDE DOUBLE RISERS AS REQUIRED. SLOPE

B. PRESSURE TEST SYSTEM WITH DRY NITROGEN TO 200 PSI. PERFORM FINAL TESTS AT 27 INCHES VACUUM AND 200 PSI USING HALIDE TORCH. END OF SECTION

19. VARIOUS SENSORS—THE MENUS SHALL ALLOW SETUP AND DISPLAY OF OPTIONAL CUSTOM SENSORS. THE CONTROL SHALL INCLUDE FOUR CUSTOMER-ACCESSIBLE ANALOG INPUTS FOR FIELD-PROVIDED SENSORS. THE ANALOG INPUTS SHALL ACCEPT A 4 TO 20MA SIGNAL. THE USER SERVICE TERMINAL. EACH CONTROL OUTPUT SHALL BE INDICATED BY AN LED ON A CIRCUIT BOARD.

HAVE THE CAPACITY FOR THE USER TO AUTOMATICALLY BACKUP UNIT CONFIGURATION SETTINGS TO INTERNAL MEMORY OR USB STORAGE DRIVE. CONFIGURATION SETTINGS MAY BE TRANSFERRED TO ANOTHER UNIT FOR A MORE STREAMLINED UNIT STARTUP. 3. PARAMETER DOWNLOAD-THE LIEBERT ICOM SHALL ENABLE THE USER TO DOWNLOAD A REPORT THAT LISTS PARAMETER NAMES, FACTORY DEFAULT SETTINGS AND USER-PROGRAMMED SETTINGS IN .CSV FORMAT FOR REMOTE REFERENCE. 4. PARAMETER SEARCH-THE LIEBERT ICOM SHALL HAVE SEARCH FIELDS FOR EFFICIENT NAVIGATION AND PARAMETER LOOKUP. 5. SETUP WIZARDS-THE LIEBERT ICOM SHALL CONTAIN STEP-BY-STEP TUTORIALS OR WIZARDS TO PROVIDE EASY SETUP OF THE CONTROL.

6. CONTEXT-SENSITIVE HELP-THE LIEBERT ICOM SHALL HAVE AN ON-BOARD HELP DATABASE. THE DATABASE SHALL PROVIDE CONTEXT SENSITIVE HELP TO ASSIST WITH SETUP AND NAVIGATION OF THE MENUS. 7. DISPLAY SETUP-THE USER SHALL HAVE THE ABILITY TO CONFIGURE THE LIEBERT ICOM INFORMATION BASED ON THE SPECIFIC USER'S PREFERENCE. LANGUAGE, UNITS OF MEASURE, SCREEN CONTRAST, HOME SCREEN LAYOUT, BACK-LIGHT TIMER AND THE HIDE/SHOW OF CERTAIN READOUTS SHALL BE CONFIGURABLE THROUGH THE DISPLAY. 8. ADDITIONAL READOUTS-THE LIEBERT ICOM SHALL PERMIT THE USER TO CONFIGURE CUSTOM WIDGETS ON THE MAIN SCREEN. WIDGET OPTIONS

17. OPTIONS SETUP-THE MENUS SHALL PROVIDE OPERATION SETTINGS FOR THE INSTALLED COMPONENTS.

18. AUXILIARY BOARDS—THE MENUS SHALL ALLOW SETUP OF OPTIONAL EXPANSION BOARDS.

SECTION 238124 - COMPUTER ROOM AIR CONDITIONERS - FLOOR MOUNTED

EQUIPMENT TO BE FULLY COMPATIBLE WITH HEAT DISSIPATION REQUIREMENTS OF THE ROOM.

CONDITIONS FOR LATENT COOLING WHILE SATISFYING THE ROOM TEMPERATURE SET POINTS.

1995 FOR HEATING AND COOLING EQUIPMENT" AND ARE MARKED WITH THE CSA C-US LOGO.

B. REFER ALSO TO THE PRE-PURCHASE BID DOCUMENTS FOR SUBMITTALS TO BE INCLUDE WITH THE PROPOSALS

A. THESE SPECIFICATIONS DESCRIBE REQUIREMENTS FOR A THERMAL MANAGEMENT SYSTEM. THE SYSTEM SHALL BE DESIGNED TO CONTROL

D. DEHUMIDIFICATION WITH REHEAT CONTROL IS NOT A REQUIREMENT FOR THIS PROJECT. REHEAT COILS SHALL NOT BE PROVIDED.

TEMPERATURE AND HUMIDITY CONDITIONS IN ROOMS CONTAINING ELECTRONIC EQUIPMENT. THE MANUFACTURER SHALL DESIGN AND FURNISH ALL

C. THE UNITS SHALL BE DESIGNED TO PROVIDE HIGH SENSIBLE COOLING WITH LITTLE IF ANY LATENT COOLING, HOWEVER THEY SHALL BE FULLY CAPABLE

OF HANDLING COLD CONDENSATE IN ALL RESPECTS. THE CONTROL SYSTEM SHALL CONTROL THE DISCHARGE AIR CONDITIONS TO MINIMIZE THE

A. STANDARD 60 HZ UNITS SHALL BE CSA-CERTIFIED TO THE HARMONIZED U.S. AND CANADIAN PRODUCT SAFETY STANDARD, "CSA C22.2 NO 236/UL

B. THE SYSTEM SHALL BE AHRI CERTIFIED™, THE TRUSTED MARK OF PERFORMANCE ASSURANCE FOR HEATING, VENTILATION, AIR CONDITIONING AND

A. SUBMITTALS SHALL BE PROVIDED AFTER AWARD AND SHALL INCLUDE: SINGLE-LINE DIAGRAMS; DIMENSIONAL, ELECTRICAL AND CAPACITY DATA;

B. ACCEPTABLE ALTERNATIVES SHALL BE PERMITTED WITH ENGINEER'S PRIOR APPROVAL ONLY. BIDDER SHALL SUBMIT A DETAILED SUMMARY FORM

A. THE CABINET SHALL BE DESIGNED SO THAT ALL COMPONENTS ARE EASILY ACCESSIBLE FOR SERVICE AND MAINTENANCE THROUGH THE UNIT'S FRONT.

LISTING ALL VARIATIONS TO INCLUDE SIZE DEVIATIONS, ELECTRICAL LOAD DIFFERENCES, FUNCTIONAL AND COMPONENT CHANGES AND SAVINGS TO

A. THE SPECIFIED SYSTEM SHALL BE FACTORY-TESTED BEFORE SHIPMENT. TESTING SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO: QUALITY CONTRO

A. THE FRAME SHALL BE WELDED, FORMED SHEET METAL. IT SHALL BE PROTECTED AGAINST CORROSION USING THE AUTOPHORETIC COATING PROCESS

a. THE EXTERIOR PANELS SHALL BE INTERNALLY LINED WITH 20-GAUGE SHEET METAL, SANDWICHING THE INSULATION BETWEEN THE PANELS, FOR

A. FOR DOWNFLOW UNITS, THE FILTER CHAMBER SHALL BE LOCATED WITHIN THE CABINET, AND FILTERS SHALL BE REMOVABLE FROM ACCESS DOORS IN

1. FILTERS SHALL 2 IN. 3M COMMERCIAL HVAC FILTER, MINI-PLEAT WITH GASKET, HAVING AN ASHRAE 52.2-2012 MERV A13 RATING.

A. THE MANUAL DISCONNECT SWITCH SHALL BE MOUNTED IN THE HIGH-VOLTAGE SECTION OF THE ELECTRICAL PANEL. THE SWITCH SHALL BE

ACCESSIBLE FROM THE OUTSIDE OF THE UNIT WITH THE DOOR CLOSED AND SHALL PREVENT ACCESS TO THE HIGH-VOLTAGE ELECTRICAL

B. SHORT-CIRCUIT CURRENT RATING (SCCR) IS THE MAXIMUM SHORT-CIRCUIT CURRENT A COMPONENT OR ASSEMBLY CAN SAFELY WITHSTAND WHEN

1. THE FANS SHALL BE PLUG/PLENUM TYPE, MOTORIZED IMPELLERS, SINGLE INLET AND DYNAMICALLY BALANCED. THE DRIVE PACKAGE SHALL BE

A. THE HUMIDIFIER SHALL BE OF THE INFRARED TYPE INSTALLED INSIDE THE UNIT, CONSISTING OF HIGH-INTENSITY QUARTZ LAMPS MOUNTED ABOVE

HIGH-VOLTAGE ELECTRICAL CONNECTIONS. THE COMPLETE HUMIDIFIER SECTION SHALL BE PRE-PIPED. READY FOR FIELD CONNECTION TO THE

FACTORY PROVIDED 1-IN. AIR-GAP SHALL PREVENT BACK-FLOW OF THE HUMIDIFIER SUPPLY WATER. THE HUMIDIFIER CAPACITY SHALL BE 11

1. EACH UNIT SHALL INCLUDE TWO (2) INDEPENDENT REFRIGERATION CIRCUITS AND EACH CIRCUIT SHALL INCLUDE LIQUID LINE FILTER DRIERS.

1. THE COMPRESSORS SHALL BE SCROLL—TYPE WITH A VARIABLE CAPACITY OPERATION CAPABILITY. COMPRESSOR SOLENOID VALVE SHALL UNLOAD

THE COMPRESSOR AND ALLOW FOR VARIABLE CAPACITY OPERATION. THE COMPRESSOR SHALL HAVE VIBRATION ISOLATORS, THERMAL OVERLOADS

AUTOMATIC RESET HIGH-PRESSURE SWITCH WITH LOCKOUT AFTER THREE FAILURES, ROTALOCK SERVICE VALVES, SUCTION LINE STRAINER AND A

B. THE EVAPORATOR COIL SHALL HAVE 24.65 SQ. FT. FACE AREA, 6 ROWS DEEP. IT SHALL BE CONSTRUCTED OF RIFLED COPPER TUBES AND ALUMINUM

FINS WITH A MAXIMUM FACE VELOCITY OF 421.9 FT. PER MINUTE AT 10,400 CFM. A STAINLESS STEEL CONDENSATE DRAIN PAN SHALL BE PROVIDED.

1. THE SYSTEM SHALL BE DESIGNED FOR USE WITH R-410A REFRIGERANT, WHICH MEETS THE U.S. CLEAN AIR ACT FOR PHASE-OUT OF HCFC

A. THE INDOOR EVAPORATOR UNIT SHALL INCLUDE REFRIGERANT PIPING AND SHALL HAVE A FACTORY HOLDING CHARGE OF NITROGEN. THE HOT-GAS

AND LIQUID LINES SHALL BE SPUN SHUT AND EACH SHALL INCLUDE A FACTORY—INSTALLED SCHRADER VALVE. FIELD—RELIEF OF THE SCHRADER

A. THE LIEBERT ICOM SHALL BE MICROPROCESSOR-BASED WITH A 9-IN. COLOR TOUCHSCREEN DISPLAY AND SHALL BE MOUNTED IN AN ERGONOMIC,

INCLUDE SETPOINTS, STANDBY SETTINGS (LEAD/LAG), TIMERS/SLEEP MODE, ALARM SETUP, SENSOR CALIBRATION, MAINTENANCE/WELLNESS

AESTHETICALLY PLEASING HOUSING. THE DISPLAY AND HOUSING SHALL BE VIEWABLE WHILE THE FRONT PANEL IS OPEN OR CLOSED. THE CONTROLS

SHALL BE MENU-DRIVEN. THE SYSTEM SHALL DISPLAY USER MENUS FOR ACTIVE ALARMS, EVENT LOG, GRAPHIC DATA, UNIT VIEW/STATUS OVERVIEW

(INCLUDING THE MONITORING OF ROOM CONDITIONS, OPERATIONAL STATUS IN PERCENTAGE OF EACH FUNCTION, DATE AND TIME), TOTAL RUN HOURS,

VARIOUS SENSORS, DISPLAY SETUP AND SERVICE CONTACTS. A PASSWORD SHALL BE REQUIRED TO MAKE SYSTEM CHANGES. SERVICE MENUS SHALL

1. PASSWORD PROTECTION—THE LIEBERT ICOM SHALL CONTAIN TWO UNIQUE PASSWORDS TO PROTECT AGAINST UNAUTHORIZED CHANGES. AN AUTO

2. UNIT BACKUP AND RESTORE-THE USER SHALL BE ABLE TO CREATE SAFE COPIES OF IMPORTANT CONTROL PARAMETERS. THE LIEBERT ICOM SHALL

VALVE SHALL INDICATE A LEAK-FREE SYSTEM FROM THE FACTORY. INSTALLING CONTRACTOR SHALL CUT THE EVAPORATOR PIPING AND SHALL

WATER SUPPLY. THE HUMIDIFIER SHALL BE EQUIPPED WITH AN AUTOMATIC WATER SUPPLY SYSTEM AND SHALL HAVE AN ADJUSTABLE

AND OUT-OF THE WATER SUPPLY. THE HUMIDIFIER PAN SHALL BE STAINLESS STEEL AND ARRANGED TO BE REMOVABLE WITHOUT DISCONNECTING

WATER-OVERFEED TO PREVENT MINERAL PRECIPITATION. A HIGH-WATER DETECTOR SHALL SHUT DOWN THE HUMIDIFIER TO PREVENT OVERFLOWING. A

LB./HR. THE HUMIDIFIER SHALL BE REMOVABLE FROM THE FRONT OF THE CABINET. BYPASS AIR SLOTS SHALL BE INCLUDED TO ENABLE MOISTURE TO

REFRIGERANT SIGHT GLASS WITH MOISTURE INDICATOR AND ELECTRONIC EXPANSION VALVES. COMPRESSORS SHALL BE LOCATED OUTSIDE THE AIR

STREAM AND SHALL BE REMOVABLE AND SERVICEABLE FROM THE FRONT OF THE UNIT. EACH COMPRESSOR CIRCUIT SHALL BE CONNECTED TO THE

DIRECT DRIVE, ELECTRONICALLY COMMUTATED AND VARIABLE SPEED. THE FANS SHALL BE LOCATED TO DRAW AIR OVER THE A-FRAME COIL TO

ENSURE EVEN AIR DISTRIBUTION AND MAXIMUM COIL PERFORMANCE. EC FANS SHALL BE CAPABLE OF BEING LOWERED INTO A RAISED FLOOR

EASY CLEANING. THE MAIN FRONT PANEL SHALL HAVE CAPTIVE 1/4-TURN FASTENERS. THE MAIN UNIT COLOR SHALL BE SELECTED BY OWNER

THE FRAME SHALL BE CAPABLE OF BEING SEPARATED INTO THREE PARTS IN THE FIELD TO ACCOMMODATE RIGGING THROUGH SMALL SPACES.

CHECKS, "HI-POT." THE SYSTEM SHALL BE DESIGNED AND MANUFACTURED ACCORDING TO WORLD-CLASS QUALITY STANDARDS. THE MANUFACTURER

COMMERCIAL REFRIGERATION EQUIPMENT, USING AHRI STANDARD 1360. THE SYSTEM SENSIBLE COEFFICIENT OF PERFORMANCE (SCOP) SHALL MEET

B. THE EQUIPMENT SELECTION ASSUMES THE ROOM'S ENVELOPE PROVIDES AN INDUSTRY STANDARD LEVEL OF VAPOR RETARDER IN THE WALLS AND

CEILING AND THE PERIMETER HAS AN FIRE RATING AND IS SEALED AGAINST AIR INFILTRATION TO THE EXTERIOR AND ADJACENT INTERIOR SPACES.

PART 1 GENERAL

1.02 DESIGN REQUIREMENTS

ASHRAE 90.1

1.04 SERVICEABILITY/ACCESS

1.06 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 FRAME

SHALL BE ISO 9001 CERTIFIED

B. DOWNFLOW AIR-SUPPLY CONFIGURATIONS

DOWNFLOW AIR BOTTOM DISCHARGE

C. DOWNFLOW AIR RETURN

1. DOUBLE-SKIN PANELS

2.02 FILTERS - DA050, DA080, DA085

B. FILTERS, 2-IN. MERV A13

2.03 LOCKING DISCONNECT SWITCH

2.05 FAN SECTION

2.04 SHORT-CIRCUIT CURRENT RATING (SCCR)

A. ELECTRONICALLY COMMUTATED (EC) FANS

BE ABSORBED INTO THE AIR STREAM

2.09 CRANK-CASE HEATERS

2.10 EVAPORATOR COIL

A. DUAL CIRCUIT — DA080, DA085, DA125—165

FULL-FACE AREA OF THE EVAPORATOR COIL

A. DIGITAL SCROLL COMPRESSORS — DA050, DA080, DA085

A. THE EVAPORATOR COIL SHALL BE A-FRAME DESIGN FOR DOWNFLOW UNITS.

2.12 LIEBERT ICOM® MICROPROCESSOR CONTROL WITH 9-IN COLOR TOUCHSCREE

THE FACE OF THE RETURN AIR PLENUMS.

D. EXTERIOR PANELS

PIPING; AND ELECTRICAL CONNECTION DRAWINGS.

A. BASIS OF DESIGN: LIEBERT SELF-CONTAINED, FACTORY-ASSEMBLED UNIT.

a. THE SUPPLY AIR SHALL EXIT FROM THE BOTTOM OF THE UNIT.

1. THE RETURN AIR SHALL ENTER THE UNIT FROM THE TOP.

FROM MANUFACTURER'S STANDARD COLOR PALETTE.

1. TWO (2) EXTRA SET(S) OF FILTERS SHALL BE PROVIDED PER SYSTEM.

PROTECTED BY A SPECIFIC OVERCURRENT PROTECTIVE DEVICE(S) OR FOR A SPECIFIED TIME.

(DURING FIELD INSTALLATION WITH EC-FAN LOWERING JACK) WITH MINIMUM HEIGHT OF 24 IN.

MAXIMUM OPERATING SPEED OF 3500 RPM. THE COMPRESSOR MOTOR SHALL BE SUCTION GAS COOLED.

A. THE COMPRESSORS SHALL INCLUDE CRANKCASE HEATERS, POWERED FROM THE INDOOR UNIT ELECTRIC PANEL

EVACUATE AND CHARGE THE SYSTEM. REFRIGERANT SHALL BE SUPPLIED BY THE INSTALLING CONTRACTOR.

SETTINGS, OPTIONS SETUP, SYSTEM/NETWORK SETUP, AUXILIARY BOARDS AND DIAGNOSTICS/SERVICE MODE

HIDE/SHOW FEATURE ALLOWS THE USER TO SEE APPLICABLE INFORMATION BASED ON THE LOGIN USED

REFRIGERANTS. REFRIGERANT SHALL BE FIELD SUPPLIED AND FIELD CHARGED BY THE INSTALLING CONTRACTOR

COMPONENTS UNTIL SWITCHED TO THE "OFF" POSITION.

A. THE ELECTRICAL PANEL SHALL PROVIDE AT LEAST 65,000A SCCR.

1.05 BASIS OF DESIGN / ACCEPTABLE ALTERNATIVES

1.03 SUBMITTALS

1.01 SUMMARY

SHALL INCLUDE ITEMS SUCH AS FAN SPEED, CALL FOR COOLING, CALL FOR FREE-COOLING, MAINTENANCE STATUS, CALL FOR HOT WATER REHEAT, CALL FOR ELECTRIC REHEAT, CALL FOR DEHUMIDIFICATION, CALL FOR HUMIDIFICATION, AIRFLOW, STATIC PRESSURE, FLUID FLOW RATE AND 9. STATUS LED'S-THE LIEBERT ICOM SHALL PROVIDE THE USER WITH THE UNIT'S OPERATING STATUS USING AN INTEGRATED LED. THE LED SHALL INDICATE IF THE UNIT HAS AN ACTIVE ALARM; IF THE UNIT HAS AN ACTIVE ALARM THAT HAS BEEN ACKNOWLEDGED; OR IF THE UNIT IS ON, OFF OR IN

10. EVENT LOG-THE LIEBERT ICOM SHALL AUTOMATICALLY STORE THE LAST 400 UNIT-ONLY EVENTS (MESSAGES, WARNINGS, AND ALARMS). 11. SERVICE CONTACT INFORMATION-THE LIEBERT ICOM SHALL HAVE THE ABILITY TO STORE THE LOCAL SERVICE OR SALES CONTACT INFORMATION. 12. UPGRADEABLE-LIEBERT ICOM UPGRADES SHALL BE PERFORMED THROUGH A USB CONNECTION. 13. TIMERS/SLEEP MODE-THE MENU SHALL ALLOW VARIOUS CUSTOMER SETTINGS FOR TURNING ON/OFF UNIT.

14. MENU LAYOUT-THE MENUS SHALL BE DIVIDED INTO TWO MAIN MENU SCREENS: USER AND SERVICE. THE USER SCREEN SHALL CONTAIN THE MENUS TO ACCESS PARAMETERS REQUIRED FOR BASIC UNIT CONTROL AND SETUP. THE SERVICE SCREEN SHALL BE DESIGNED FOR SERVICE PERSONAL AND PROVIDES ACCESS TO ADVANCED CONTROL SETUP FEATURES AND DIAGNOSTIC INFORMATION 15. SENSOR CALIBRATION—THE MENUS SHALL ALLOW UNIT SENSORS TO BE CALIBRATED WITH EXTERNAL SENSORS 16. MAINTENANCE/WELLNESS SETTINGS - THE MENUS SHALL ALLOW REPORTING OF POTENTIAL COMPONENT PROBLEMS BEFORE THEY OCCUR.

SHALL BE ABLE TO CHANGE THE INPUT TO 0 TO 5VDC OR 0 TO 10VDC. THE GAINS FOR EACH ANALOG INPUT SHALL BE PROGRAMMABLE FROM THE FRONT DISPLAY. THE ANALOG INPUTS SHALL BE ABLE TO BE MONITORED FROM THE FRONT DISPLAY. 20. DIAGNOSTICS/SERVICE MODE-THE LIEBERT ICOM® SHALL BE PROVIDED WITH SELF-DIAGNOSTICS TO AID IN TROUBLESHOOTING. THE MICROCONTROLLER BOARD SHALL BE DIAGNOSED AND REPORTED AS PASS/NOT PASS. CONTROL INPUTS SHALL BE INDICATED AS ON OR OFF AT THE FRONT DISPLAY. CONTROL OUTPUTS SHALL BE ABLE TO BE TURNED ON OR OFF FROM THE FRONT DISPLAY WITHOUT USING JUMPERS OR A

c. THIRD PRIORITY: IF BOTH COMPRESSORS ARE IN OPERATION, THE ONE THAT HAS BEEN OPERATING LONGER SINCE THE LAST START SHALL BE THE NEXT TO BE STOPPED. 2.34 COMPRESSOR HIGH- AND LOW-TEMPERATURE LIMIT PROTECTION A. THE CONTROL SHALL MONITOR THE RETURN AIR TO ENSURE THAT THE COMPRESSOR(S) ARE OPERATED WITHIN THE MANUFACTURER'S DEFINED

WINDOW OF OPERATION. IF THE RETURN AIR TEMPERATURE DEVIATES FROM THE MANUFACTURER'S WINDOW OF OPERATION, THE LIEBERT ICOM SHALL AUTOMATICALLY ADJUST TO PREVENT DAMAGE TO THE COOLING UNIT OR REDUCTION IN ITS RELIABILITY.

b. SECOND PRIORITY: IF BOTH COMPRESSORS ARE OFF, THE ONE WITH FEWER WORKING HOURS SHALL BE THE NEXT TO START.

SECTION 238124 - COMPUTER ROOM AIR CONDITIONERS - FLOOR MOUNTED

LABELS. FREQUENTLY USED ALARM INPUTS SHALL INCLUDE

INSTALLED. PROPORTIONAL AND TUNABLE PID SHALL ALSO BE USER-SELECTABLE OPTIONS.

PROGRAMMED FOR A DELAY OF 0 TO 255 SECONDS.

SENSOR SELECTIONS. THE SENSOR SELECTIONS SHALL BE:

MEET SLA GUIDELINES WHILE OPERATING TO HIGHEST EFFICIENCY.

FORM OF CONTROL FOR A ROOM WITH AN UNBALANCED LOAD.

SHALL BE TWO MODES OF TEAMWORK OPERATION:

LIEBERT ICOM SHALL ACTIVATE AN AUDIBLE AND VISUAL ALARM IN THE EVENT OF ANY OF THE FOLLOWING CONDITIONS:

b. EACH ALARM (UNIT AND CUSTOM) SHALL BE SEPARATELY ENABLED OR DISABLED, SELECTED TO ACTIVATE THE COMMON ALARM AND

THE UNIT. THIS CONTROL SHALL INCLUDE PREDICTIVE METHODS TO CONTROL AIR FLOW AND COOLING CAPACITY BASED CONTROL SENSORS

1. THE LIEBERT ICOM SHALL BE FLEXIBLE IN THE SENSE THAT IT SHALL ALLOW CONTROLLING THE CAPACITY AND FAN FROM MULTIPLE DIFFERENT

4) MANUAL (FOR DIAGNOSTICS OR TO RECEIVE A SIGNAL FROM THE BMS THROUGH LIEBERT REMOTE MONITORING DEVICES OR ANALOG INPUT)

1. THE LIEBERT ICOM® SHALL HAVE THE ABILITY TO ADJUST THE CAPACITY OUTPUT BASED ON SUPPLY AND RETURN TEMPERATURE CONDITIONS TO

A. LIEBERT ICOM TEAMWORK SHALL SAVE ENERGY BY PREVENTING MULTIPLE UNITS IN AN AREA FROM OPERATING IN OPPOSING MODES. TEAMWORK

ALLOWS THE CONTROL TO OPTIMIZE A GROUP OF CONNECTED EQUIPPED WITH LIEBERT ICOM USING THE U2U (UNIT-TO-UNIT) NETWORK. THERE

1. TEAMWORK MODE 2 (INDEPENDENT): THE LIEBERT ICOM CALCULATES THE WORSE—CASE DEMAND FOR HEATING, COOLING HUMIDIFICATION AND

DEHUMIDIFICATION. BASED ON THE GREATEST DEMAND WITHIN THE GROUP, EACH UNIT OPERATES INDEPENDENTLY, MEANING THAT THE UNIT MAY

2. TEAMWORK MODE 3 - OPTIMIZED AISLE (OPTIMIZED AISLE): MAY BE APPLIED IN LARGE AND SMALL ROOMS WITH VARYING HEAT LOADS. OPTIMIZEI AISLE IS THE MOST EFFICIENT TEAMWORK MODE THAT ALLOWS THE UNIT TO MATCH COOLING CAPACITY WITH HEAT LOAD. IN THE OPTIMIZED AISLE

SECONDARY REMOTE TEMPERATURE SENSOR(S) AS AN OVERRIDE TO ENSURE THAT THE INLET RACK TEMPERATURE IS BEING MET. COOLING

(COMPRESSORS, ECONOMIZER OR ECONOPHASE) IS CONTROLLED OFF UNIT SUPPLY AIR CONDITIONS. THE LIEBERT ICOM CALCULATES THE

A. THE LIEBERT ICOM SHALL ALLOW PLANNED ROTATION TO KEEP EQUAL RUN TIME ON UNITS AND PROVIDE AUTOMATED EMERGENCY ROTATION OF

A. THE LIEBERT ICOM CASCADE OPTION SHALL ALLOW THE UNITS TO TURN ON AND OFF BASED ON HEAT LOAD WHEN UTILIZING TEAMWORK MODE

-OPTIMIZED AISLE MODE WITH REMOTE TEMPERATURE SENSORS. IN TEAMWORK MODE 3. CASCADE MODE WILL STAGE UNITS ON BASED ON

ENERGY AND TO MEET COOLING DEMANDS. FOR INSTANCE, WITH A LIEBERT ICOM GROUP OF SIX UNITS AND ONLY 50% OF THE HEAT LOAD, THE

RESPOND TO THE THERMAL LOAD AND HUMIDITY CONDITIONS BASED ON THE UNITS CONTROLLING SENSORS. ALL SENSOR READINGS ARE SHARED.

MODE, THE FANS OPERATE IN PARALLEL. FANS CAN BE CONTROLLED EXCLUSIVELY BY REMOTE TEMPERATURE OR USING STATIC PRESSURE WITH A

DEMAND WITHIN THE GROUP, UNITS WILL BE ALLOWED TO OPERATE WITHIN THAT MODE UNTIL ROOM CONDITIONS ARE SATISFIED. THIS IS THE BEST

EMPERATURE AND HUMIDITY READINGS AND THEIR DEVIATION FROM SETPOINT. CASCADE MODE COORDINATES THE FAN SPEED DYNAMICALLY TO SAVE

THE LIEBERT ICOM SHALL AUTOMATICALLY RESPOND TO THE NEW LOAD AND BRING ON ANOTHER UNIT. INCREASING THE UNITS IN OPERATION TO FIVE.

THE VIRTUAL MASTER FUNCTION SHALL PROVIDE SMOOTH CONTROL OPERATION IF THE GROUP'S COMMUNICATION IS COMPROMISED. WHEN THE LEAD

NETWORK, THE LIEBERT ICOM AUTOMATICALLY ASSIGNS A VIRTUAL MASTER. THE VIRTUAL MASTER SHALL ASSUME THE SAME RESPONSIBILITIES AS THE

LIEBERT ICOM SHALL OPERATE ONLY FOUR UNITS AT 80% FAN SPEED AND LEAVE THE OTHER TWO UNITS IN STANDBY. AS THE HEAT LOAD INCREASES

AS THE HEAT LOAD SHIFTS UP OR DOWN, THE CONTROL SHALL MEET THE NEEDS BY CASCADING UNITS ON OR PUTTING THEM BACK INTO STANDBY.

A. AS PART OF THE ROBUST ARCHITECTURE OF THE LIEBERT ICOM CONTROL, IT SHALL ALLOW FOR A VIRTUAL MASTER THAT COORDINATES OPERATION.

UNIT, WHICH IS IN CHARGE OF COMPONENT STAGING IN TEAMWORK, UNIT STAGING AND STANDBY ROTATION, BECOMES DISCONNECTED FROM THE

A. THE LIEBERT ICOM SHALL ALLOW THE USE OF A VIRTUAL BACK-DRAFT DAMPER, ELIMINATING THE NEED FOR A MECHANICAL DAMPER. THIS SHALL

A. COMPRESSOR SHORT CYCLE CONTROL SHALL BE AVAILABLE TO PREVENT COMPRESSOR SHORT—CYCLING AND NEEDLESS COMPRESSOR WEAR.

A. UNITS SHALL BE MATCHED WITH LIEBERT MC PREMIUM CONDENSERS AND LIEBERT ECONOPHASE UNIT AND SHALL COMMUNICATE WITH THEM VIA

FIELD-SUPPLIED CANBUS WIRES. THIS COMMUNICATION SHALL ALLOW LIEBERT ICOM TO CONTROL LIEBERT MC CONDENSER/ECONOPHASE MODES

REFERENCE. WHEN MULTIPLE SENSORS ARE APPLIED FOR CONTROL PURPOSES, THE USER SHALL BE ABLE TO CONTROL BASED ON A MAXIMUM OR

AVERAGE TEMPERATURE READING. THE UNITS SHALL BE DESIGNED TO PROVIDE HIGH SENSIBLE COOLING WITH LITTLE IF ANY LATENT COOLING,

A. THE AUTO RESTART FEATURE SHALL AUTOMATICALLY RESTART THE SYSTEM AFTER A POWER FAILURE. TIME DELAY SHALL BE PROGRAMMABLE. AN

A. ON INITIAL STARTUP OR RESTART AFTER POWER FAILURE, EACH OPERATIONAL LOAD SHALL BE SEQUENCED WITH A MINIMUM OF ONE SECOND DELAY

EQUIPMENT DAMAGE. THE USER SHALL BE NOTIFIED OF THE LOW-PRESSURE CONDITION THROUGH THE LOCAL DISPLAY AND REMOTE MONITORING.

A. AN ADJUSTABLE SOFTWARE TIMER SHALL BE PROVIDED TO ASSIST WITH COMPRESSOR STARTING DURING COLD WEATHER. WHEN THE COMPRESSOR

STARTS, THE LOW-PRESSURE INPUT SHALL BE IGNORED FOR THE PERIOD SET IN THE USER-ADJUSTABLE TIMER. ONCE THE DELAY AFTER THE

COMPRESSOR START HAS ELAPSED, THE LOW-PRESSURE INPUT SHOULD REMAIN IN THE NORMAL STATE. IF THE LOW PRESSURE INPUT DOES NOT

REMAIN IN THE NORMAL STATE AFTER THE DELAY HAS ELAPSED, THE CIRCUIT SHALL LOCK OUT ON LOW PRESSURE. THE LOW-PRESSURE ALARM

A. UNITS SHALL SHIP STANDARD WITH ADVANCED FREEZE PROTECTION ENABLED. THE ADVANCED FREEZE PROTECTION SHALL MONITOR THE PRESSURE

CONDENSATE ON THE COIL WHEN THE UNIT OPERATES BELOW 100% FAN SPEED. LIEBERT ICOM'S ADVANCED FREEZE PROTECTION PROVIDES THE

A. WHEN THE COMPRESSOR IS INITIALLY ACTIVATED, THE SYSTEM SHALL BE MONITORED FOR A HIGH PRESSURE. WHEN HIGH PRESSURE IS DETECTED,

THE CONTROL SHALL REDUCE THE SYSTEM DISCHARGE PRESSURE BY ALTERING THE COMPRESSOR LOADING AND THE CONDENSER FAN SPEED,

PREVENTING CIRCUIT SHUT DOWN. IF THE UNIT IS UNSUCCESSFUL IN CORRECTING THE PROBLEM THROUGH THIS INTERACTION, AN ALARM SHALL

A. THE CONTROL SHALL MONITOR THE HIGH-SIDE AND LOW-SIDE REFRIGERANT PRESSURE TRANSDUCERS. IF THE CONTROL SENSES THAT THE

A. THE CONTROL SHALL MONITOR COMPRESSOR OPERATION AND STAGING TO ENSURE THAT LIQUID AND HOT GAS VELOCITY ARE MAINTAINED FOR

A. THE CONTROL SHALL MONITOR DIGITAL SCROLL TEMPERATURE DURING UNIT OPERATION. A COMPRESSOR TEMPERATURE LIMIT SHALL BE IMPOSED TO

LOCKOUT. THE CONTROL SHALL CONTINUE TO MONITOR COMPRESSOR TEMPERATURE DURING THE OFF-CYCLE AND RE ENABLE THE CIRCUIT ONCE A

HELP PREVENT DAMAGE TO THE COMPRESSOR. IF THE TEMPERATURE REACHES THE MAXIMUM TEMPERATURE LIMIT, THE COMPRESSOR SHALL BE

DISCONNECTED, SHORTED OR THE READING GOES OUT OF RANGE, THE USER WILL BE NOTIFIED THROUGH AN EVENT ON THE LOCAL DISPLAY AND

A. A USER-SELECTABLE COMPRESSOR SEQUENCING PARAMETER SHALL BE PROVIDED AND ACCESS THROUGH THE LOCAL CONTROL. THIS SEQUENCING

3. AUTO: THE UNIT SHALL AUTOMATICALLY STAGE COMPRESSORS TO KEEP EACH UNIT'S RUN TIME WITHIN 8 HOURS OF THE OTHER UNIT'S RUN TIME.

a. FIRST PRIORITY: IF THE SAFETY TIMINGS ARE ACCEPTABLE FOR ONLY ONE COMPRESSOR, THAT COMPRESSOR SHALL BE THE NEXT TO BE

NOTE: THE AUTO SETTING ATTEMPTS TO MAINTAIN EQUAL RUN TIMES BETWEEN COMPRESSORS. HOWEVER, THE CONTROL WILL NOT TURN OFF A

LOCKED OUT FOR 30 MINUTES AND AN ALARM SHALL BE ANNUNCIATED ON THE LOCAL DISPLAY AND THROUGH MONITORING. AFTER THE INITIAL

A. THE CONTROL SHALL MONITOR THE STATUS OF THE DIGITAL SCROLL SENSOR(S). IF THE CONTROL SENSES THE THERMISTOR BECOMES

OCCUR AND THE AFFECTED COMPRESSOR SHALL BE IMMEDIATELY LOCKED OFF. THE CONTROL SHALL AUTOMATICALLY RE-ENABLE THE COMPRESSOR

FREEZING IF CIRCUIT SUCTION PRESSURE DROPS. APPLYING FAN SPEED TO DIRECT EXPANSION SYSTEMS REQUIRES LIMITATIONS TO AVOID FREEZING

OF EACH CIRCUIT USING A TRANSDUCER. THE CONTROL SHALL INTERACT WITH THE FAN AND COMPRESSOR TO PREVENT THE UNIT COIL FROM

FREEZE CONDITION IS DETECTED, THE USER SHALL BE NOTIFIED THROUGH THE LOCAL DISPLAY AND REMOTE MONITORING SYSTEMS.

HOWEVER THEY SHALL BE FULLY CAPABLE OF HANDLING COLD CONDENSATE IN ALL RESPECTS. THE CONTROL SYSTEM SHALL CONTROL THE

DISCHARGE AIR CONDITIONS TO MINIMIZE THE CONDITIONS FOR LATENT COOLING WHILE SATISFYING THE ROOM TEMPERATURE SET POINTS.

A. UNITS SHALL SHIP STANDARD WITH LOW-PRESSURE TRANSDUCERS FOR MONITORING INDIVIDUAL COMPRESSOR SUCTION PRESSURE. IF THE

PRESSURE FALLS DUE TO LOSS OF CHARGE OR OTHER MECHANICAL CAUSE, THE CORRESPONDING CIRCUIT SHALL SHUT DOWN TO PREVENT

ALLOW THE FANS OF A STAND-BY UNIT TO SPIN IN REVERSE AT A LOW SPEED (15% OR LESS) TO ACT AS A DAMPER.

OPTIONAL CAPACITIVE BUFFER MAY BE PROVIDED FOR CONTINUOUS CONTROL OPERATION THROUGH A POWER OUTAGE.

SHALL BE ANNOUNCED ON THE LOCAL DISPLAY AND COMMUNICATED TO REMOTE MONITORING SYSTEMS.

2.13 ALARMS

1. HIGH TEMPERATURE

2. LOW TEMPERATURE

3. HIGH HUMIDITY

4. LOW HUMIDITY

5. EC FAN FAULT

6. CHANGE FILTERS

8. LOSS OF POWER

7. LOSS OF AIR FLOW

9. COMPRESSOR OVERLOAD

HUMIDIFIER PROBLEM

11. HIGH HEAD PRESSURE

13. CUSTOM ALARMS

12. LOW SUCTION PRESSURE

1) LEAK UNDER FLOOR

2) SMOKE DETECTED

3) STANDBY UNIT ON

B. CONTROLLING SENSOR OPTIONS

a. COOLING CAPACITY

1) SUPPLY

2) REMOTE

3) RETURN

b. FAN SPEED

1) SUPPLY

2) REMOTE

3) RETURN

D. HUMIDITY CONTROL

2.16 STANDBY/LEAD-LAG

2.18 VIRTUAL MASTER

2.17 STANDBY UNIT CASCADING

2.19 VIRTUAL BACK-DRAFT DAMPER

2.22 WIRED SUPPLY SENSOR

2.23 SYSTEM AUTO RESTART

2.24 SEQUENTIAL LOAD ACTIVATION

2.25 LOW-PRESSURE MONITORING

2.26 WINTER START TIME DELAY

2.27 ADVANCED FREEZE PROTECTION

PREVENT UNIT DAMAGE.

2.32 DIGITAL SCROLL SENSOR FAILURE

STARTED/STOPPED.

REMOTE MONITORING

2.33 COMPRESSOR SEQUENCING

2.30 OIL RETURN PROTECTION

2.28 ADVANCED HIGH-PRESSURE PROTECTION

WHEN PRESSURE RETURNS TO A SAFE LEVEL.

2.29 REFRIGERANT PRESSURE TRANSDUCER FAILURE

PROPER OIL RETURN TO THE COMPRESSOR.

2.31 DIGITAL SCROLL HIGH-TEMPERATURE PROTECTION

1. ALWAYS USE COMPRESSOR 1 AS LEAD COMPRESSOR

2. ALWAYS USE COMPRESSOR 2 AS LEAD COMPRESSOR

TRIPS. THE NUMBER OF TRIPS SHALL BE ACCESSIBLE THROUGH THE LOCAL DISPLAY

COMPRESSOR TO EQUALIZE RUN TIME WHEN IT IS NEEDED TO CONTROL THE SPACE.

TO MINIMIZE TOTAL INRUSH CURRENT.

2.20 COMPRESSOR SHORT CYCLE CONTROL

OPERATING AND STANDBY UNITS.

MASTER UNTIL COMMUNICATION IS RESTORED.

2.21 LIEBERT MC™AND ECONOPHASE COMMUNICATION

AND OPERATION AND TO MONITOR THEIR HEALTH AND ALARM STATUS.

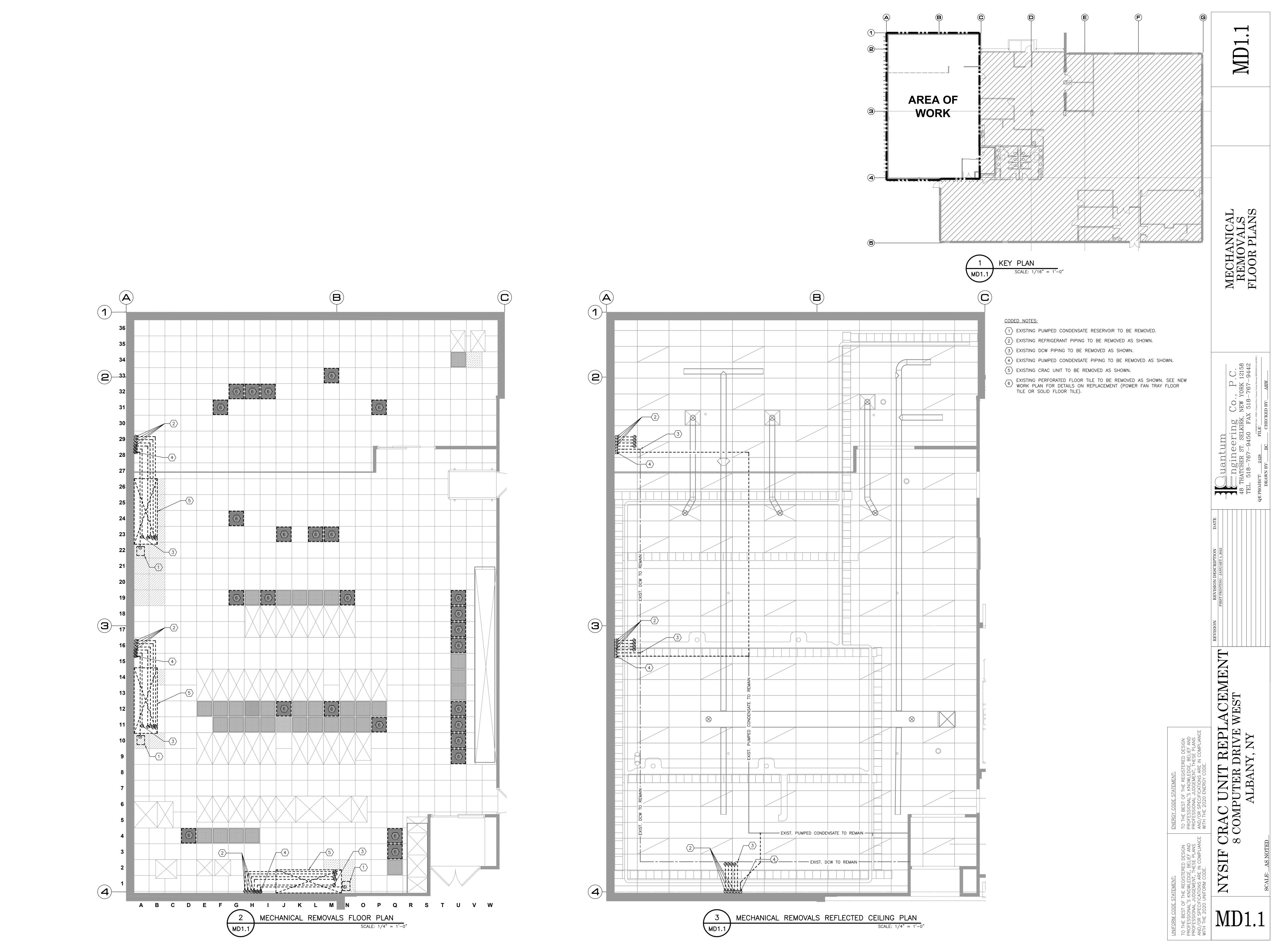
2.15 MULTI-UNIT COORDINATION

SPACE.

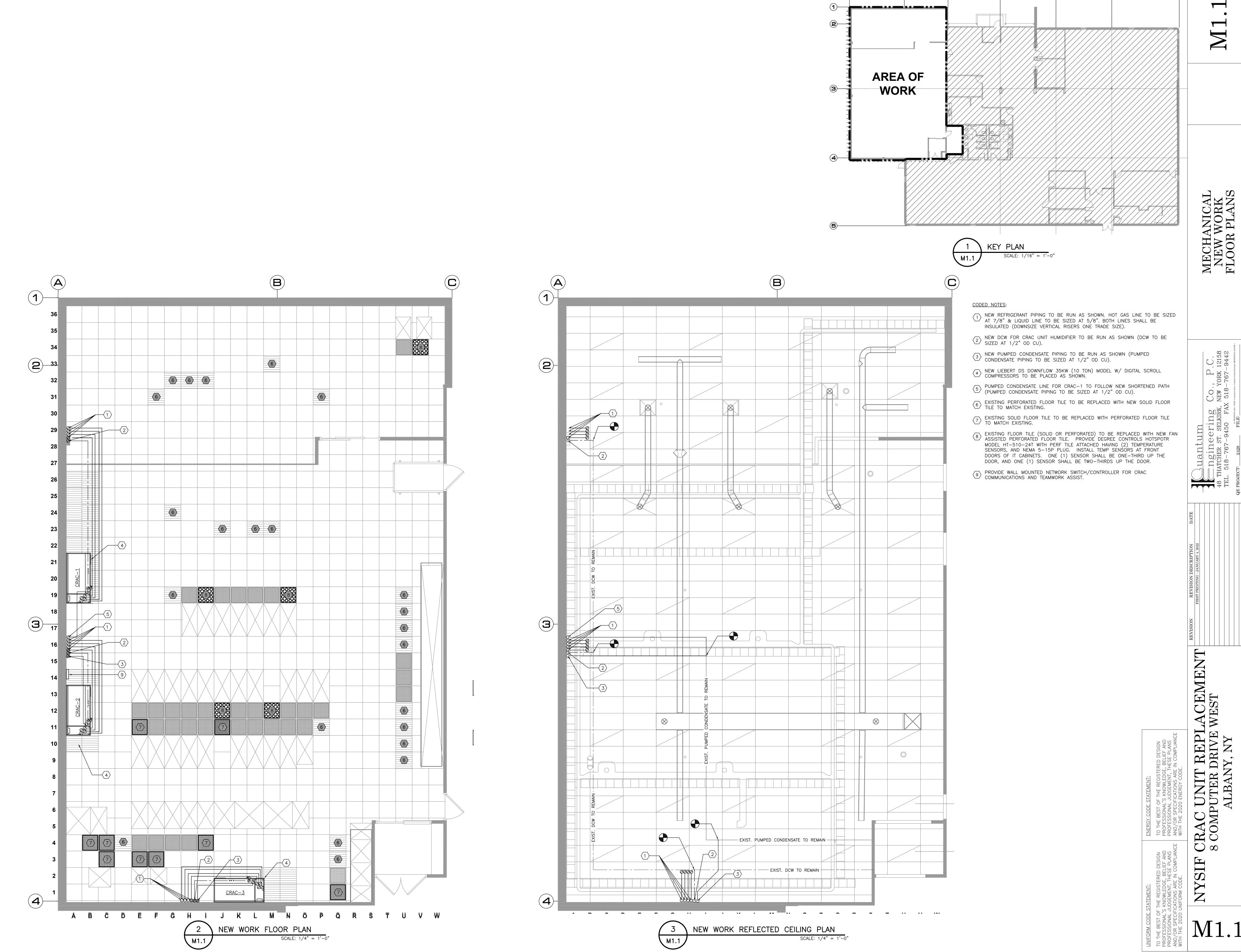
5) STATIC PRESSURE

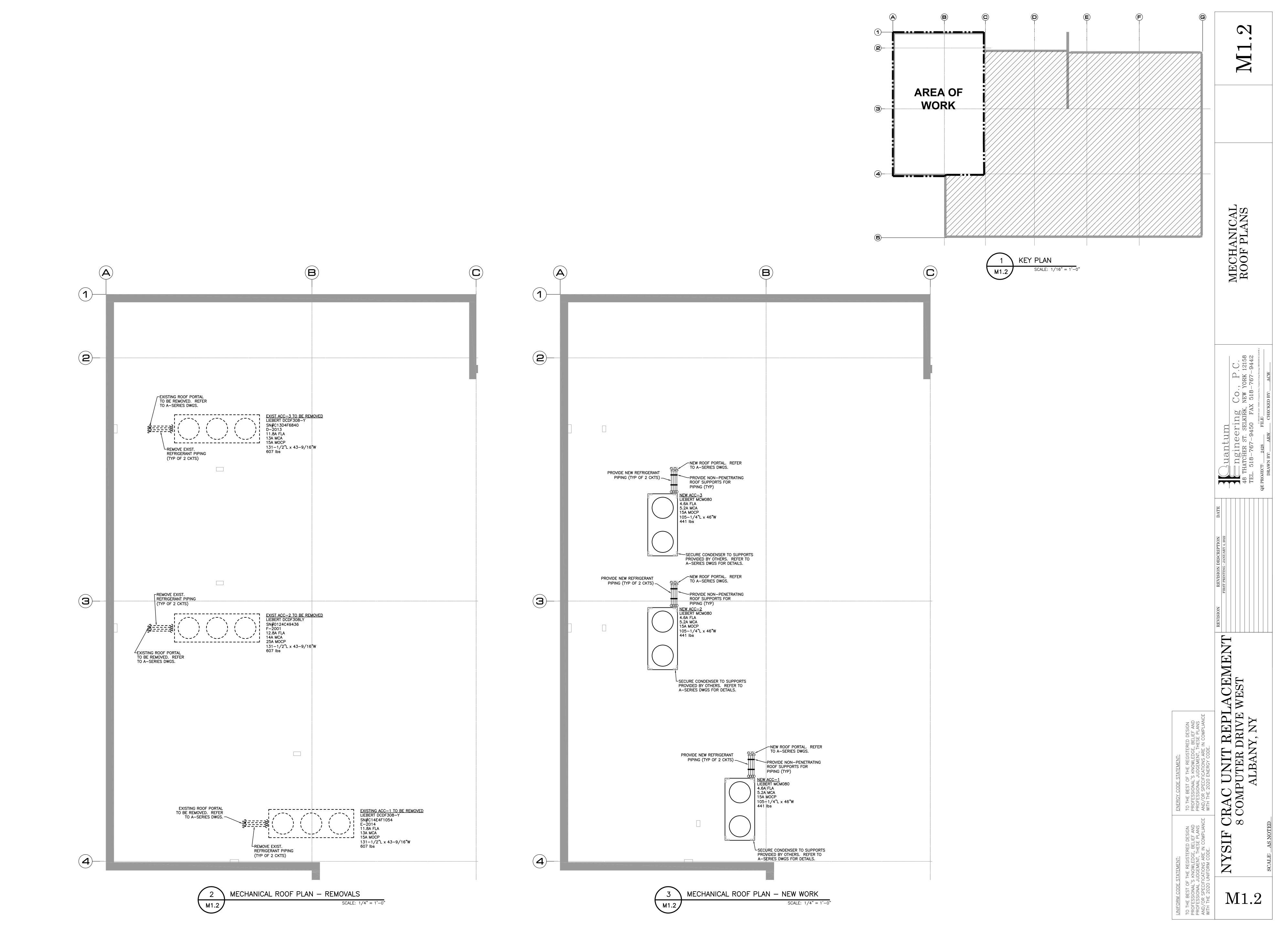
C. TEMPERATURE COMPENSATION

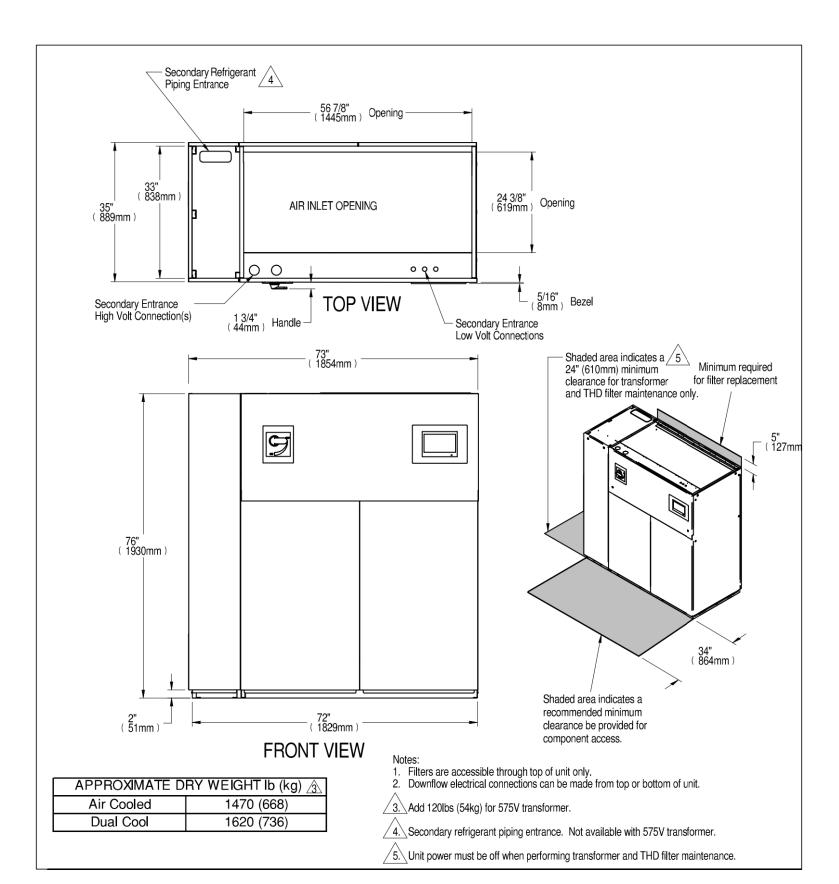
2.14 LIEBERT ICOM® CONTROL METHODS AND OPTIONS



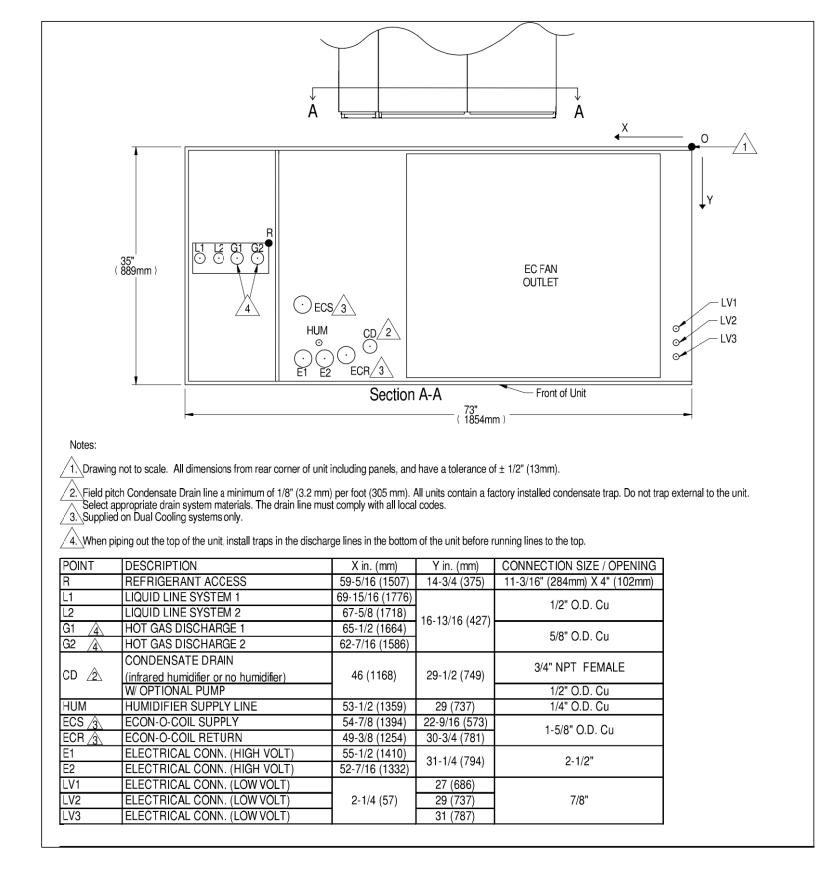
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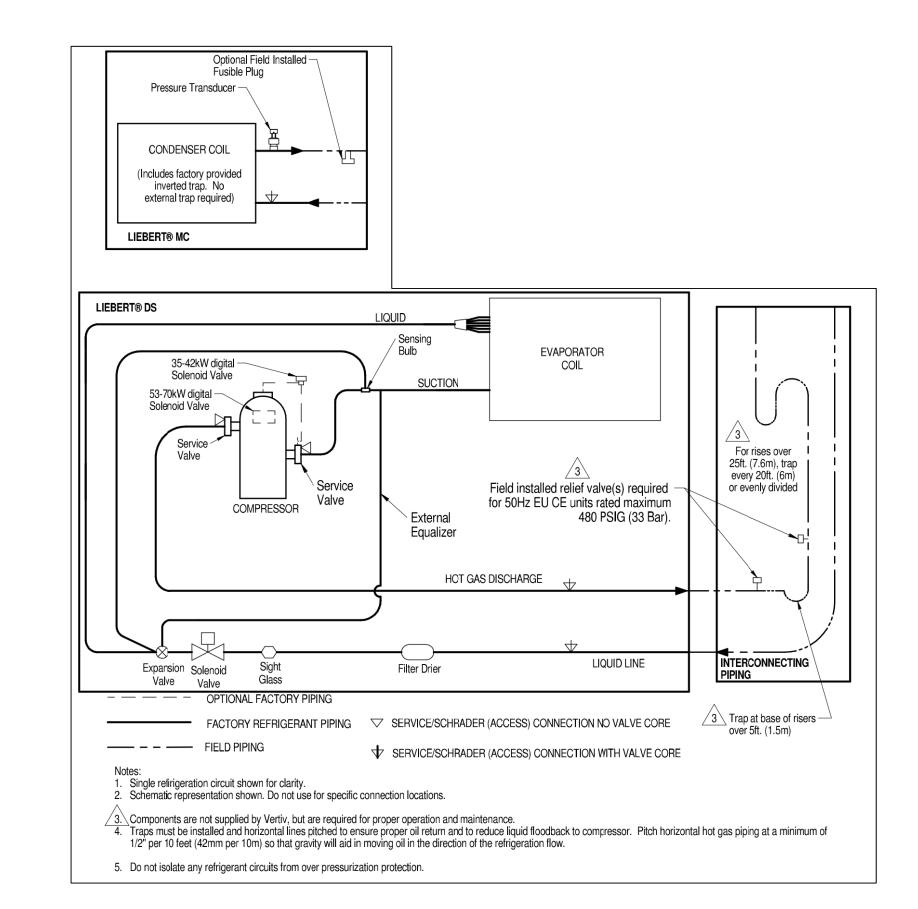




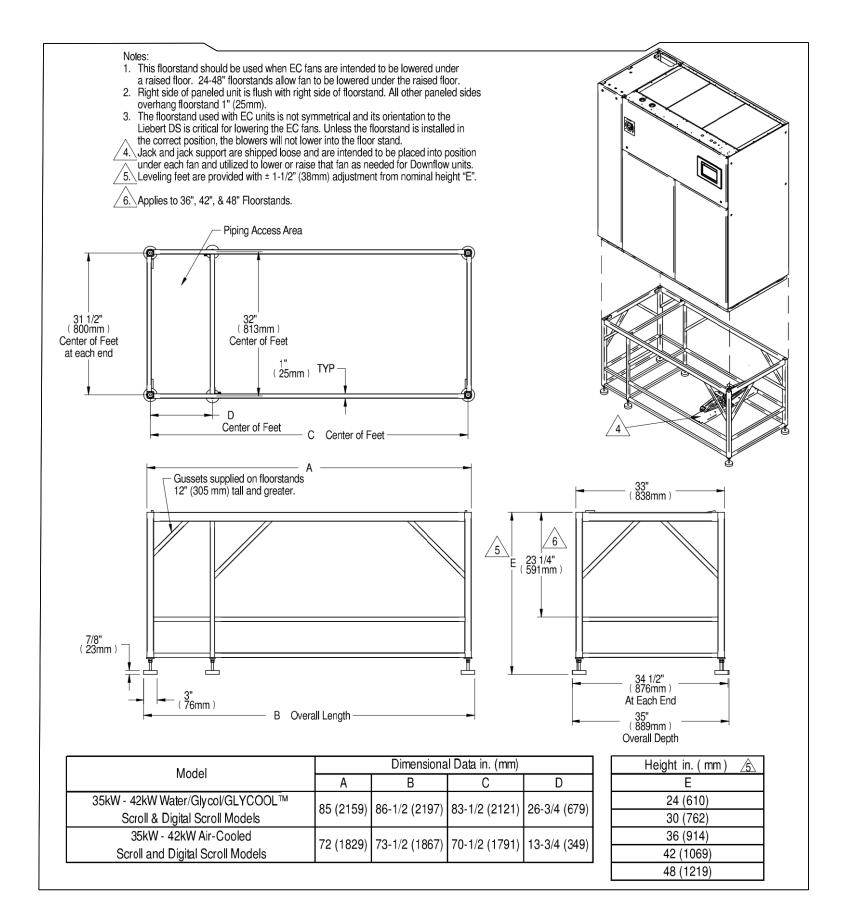




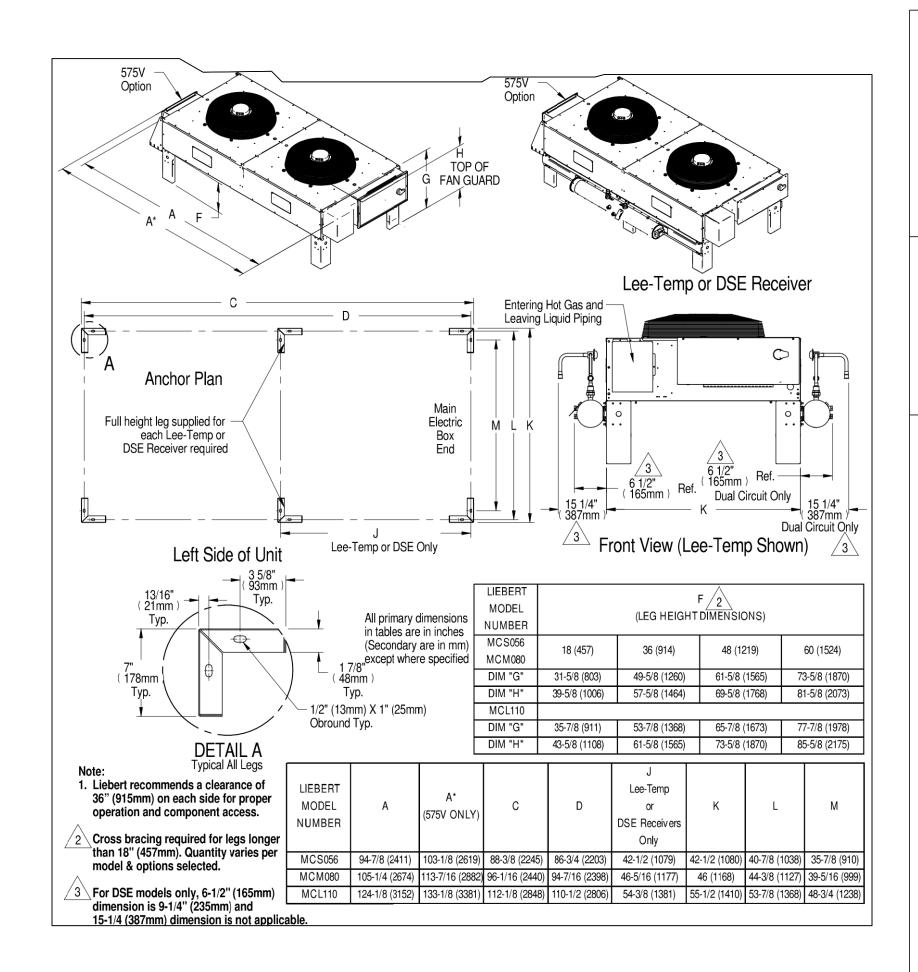


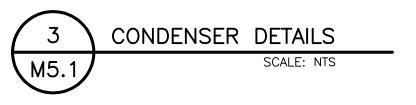












REVISION DESCRIPTION
FIRST PRINTING - JANUARY 4, 2022

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MECHANICAL DETAILS

NERGY CODE STATEMENT:

O THE BEST OF THE REGISTERED DESIGN
ROFESSIONAL'S KNOWLEDGE, BELIEF AND
ROFESSIONAL JUDGEMENT, THESE PLANS
ND/OR SPECIFICATIONS ARE IN COMPLIANCE
ITH THE 2020 ENERGY CODE.

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DEBRIS. IF ITEMS ARE DAMAGED, THEY SHALL NOT BE INSTALLED. THE CONTRACTOR SHALL TAKE IMMEDIATE MEASURE TO OBTAIN REPLACEMENT OR REPAIR IN ORDER TO MAINTAIN THE SCHEDULE.

8. CONTRACTOR SHALL VERIFY THAT ALL MATERIALS HE OR HIS SUPPLIERS SELECT CONFORM TO THE REQUIREMENTS OF THE DRAWINGS. TRANSMITTAL OF DRAWING INFORMATION TO MANUFACTURERS SUPPLYING MATERIALS, AND ADHERENCE TO THESE REQUIREMENTS IS THE CONTRACTOR'S RESPONSIBILITY. APPROVAL OF MANUFACTURER'S NAME BY THE ENGINEER DOES NOT RELEASE THE CONTRACTOR OF THE RESPONSIBILITY FOR PROVIDING MATERIALS WHICH COMPLY IN ALL RESPECTS WITH THE REQUIREMENTS IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUBMIT PRODUCT INFORMATION AND SHOP DRAWINGS FOR ALL MATERIALS USED ON THE PROJECT.

CONTRACTOR SHALL MINIMIZE INTERFERENCE WITH THE WORKING ROUTINE OF OCCUPIED AREAS, BY COORDINATING THE PERFORMANCE OF THE WORK IN A MANNER ACCEPTABLE TO ALL GROUPS INVOLVED.
 CONTRACTOR SHALL NOT INTERRUPT ANY OF THE BUILDING'S ELECTRICAL SERVICES IN ANY WAY WITHOUT EXPRESSED PERMISSION OF THE OWNER. AMPLE WRITTEN NOTICE OF SHUTDOWNS SHALL BE GIVEN WELL IN ADVANCE TO THE OWNER. INTERRUPTIONS AND INTERFERENCE SHALL BE MADE AS BRIEF AS POSSIBLE AND ONLY AT TIMES AS STATED BY THE OWNER. WHEN TEMPORARY LOSS OF SERVICES IS LIMITATION.

SERVICES IS UNAVOIDABLE, IT SHALL BE MADE AT TIMES AS SHALL CAUSE THE LEAST INTERFERENCE WITH THE ESTABLISHED ROUTINE.

11. CONTRACTOR SHALL LAYOUT AND INSTALL THEIR WORK IN ADVANCE OF FINISH CONSTRUCTION.

12. ALL WORK DESCRIBED ON THE DRAWINGS AND ALL WORK REQUIRED

BY THIS CONTRACT SHALL BE EXECUTED IN A THOROUGHLY
SUBSTANTIAL AND WORKMANLIKE MANNER BY SKILLED MECHANICS IN
THE VARIOUS TRADES INVOLVED. FOLLOW MANUFACTURER'S
INSTRUCTIONS FOR INSTALLING, CONNECTING AND ADJUSTING ALL
EQUIPMENT.

13. ALL CONDUCTORS AND BUSBARS SHALL BE COPPER, UNLESS
OTHERWISE NOTED. ALL CONDUCTORS SHALL BE AT LEAST #12 AWG
COPPER UNLESS OTHERWISE NOTED.

14. WIRE SIZES ARE BASED ON THE 60 DEGREE CELSIUS AMPACITIES FOR WIRE SIZES #12 THRU #1 AWG AND 75 DEGREE CELSIUS AMPACITIES FOR WIRE SIZES LARGER THAN #1/0 AWG PER NEC 110.14(C).
15. ALL DEVICES, EQUIPMENT, FIXTURES, AND THE LIKE MUST BE GROUNDED BY USE OF A PROPERLY SIZED GROUNDING CONDUCTOR. MECHANICAL/ELECTRICAL BONDS OF THE METALLIC RACEWAY SYSTEM SHALL BE MAINTAINED.

PROJECT NOTES

CLOSE—OUT NOTES:

1. THE EC SHALL PROVIDE THE OWNER WITH ALL SPECIAL TOOLS NEEDED FOR PROPER OPERATION, ADJUSTMENT AND MAINTENANCE OF EQUIPMENT.

WORK ENVIRONMENT:

1. THE EC SHALL CLEAN UP AND REMOVE FROM THE SITE ALL RUBBISH, DEBRIS AND TRASH ACCUMULATED DURING THE DAY AS A RESULT OF EC'S WORK OR HIS PRESENCE ON THE JOB.

MECHANICAL RELATED NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS OF MECHANICAL EQUIPMENT. LOCATE DISCONNECT SWITCHES IN ACCORDANCE WITH THE NEC.

PROJECT PHASING NOTES

- INSTALL NEW CRAC-3/ACC-3. POWER EQUIPMENT WITH TEMPORARY FEEDS.
 COMMISSION AND START-UP NEW CRAC-3/ACC-3. EXISTING
- CRAC-3/ACC-3 TO REMAIN OPERATIONAL AT THIS POINT.

 DECOMMISSION AND REMOVE EXISTING CRAC-1/ACC-1.

 INSTALL NEW CRAC-1/ACC-1.
- 5. COMMISSION AND START-UP NEW CRAC-1/ACC-1.6. DECOMMISSION AND REMOVE EXISTING CRAC-2/ACC-2.
- INSTALL NEW CRAC-2/ACC-2.
 COMMISION AND START-UP NEW CRAC-2/ACC-2.
 DECOMMISSION AND REMOVE EXISTING CRAC-3/ACC-3.
 PROVIDE PERMANENT POWER TO NEW CRAC-3/ACC-3.

ABBREVIATIONS ABBREVIATION DESCRIPTION ABANDON IN PLACE Α ABOVE FINISHED CEILING AFC AFF ABOVE FINISHED FLOOR ARC FAULT CIRCUIT INTERRUPT AFI OR AFCI BMS/BAS/ATC BUILDING MGT/AUTOMATIC TEMP CTRL SYSTEM MOUNTED ON OR ABOVE CEILING CENTER LINE CLG CEILING DEDICATED CIRCUIT EXISTING TO REMAIN IN PLACE ELECTRICAL CONTRACTOR EL ELEVATOR EMERGENCY EM ELEVATOR RECALL ER EXHAUST EXH GFI OR GFCI GROUND FAULT CIRCUIT INTERRUPT LIGHTNING ARRESTOR LGT/LGTS LIGHT/LIGHTS MECHANICAL CONTRACTOR MOTOR CONTROL CENTER NOT APPLICABLE N/A

NOT IN CONTRACT NIC NIGHT LIGHT N/R NOT REQUIRED NOT TO SCALE NTS ON CENTER OC PLUMBING CONTRACTOR PWR POWER REMOVED COMPLETE AND RELOCATED RAF RAISED ACCESS FLOOR RCPT/RCPTS RECEPTACLE/RECEPTACLES REMOVE AND TURN OVER TO OWNER SURFACE MOUNTED SM SURGE PROTECTIVE DEVICE SPD SURGE SUPPRESSOR SS STAINLESS STEEL s/s TO BE DETERMINED TBD TAMPER RESISTANT UNLESS OTHERWISE NOTED VERIFY IN FIELD VANDAL RESISTANT WIRE GUARD

	DEFINITIONS
CONCEALED:	EMBEDDED IN MASONRY OR OTHER CONSTRUCTION, INSTALLED BEHIND WALL FURRING, WITHIN PARTITIONS, OR HUNG CEILINGS (PERMANENT OR REMOVABLE), IN TRENCHES, OR IN CRAWL SPACES.
EXPOSED:	NOT INSTALLED UNDERGROUND OR CONCEALED.
NOTED:	AS INDICATED ON THE DRAWINGS AND/OR SPECIFIED.
INDICATED:	AS INDICATED ON THE DRAWINGS.
SHOWN:	AS SHOWN ON THE DRAWINGS.
WIRING:	CONDUITS, FITTINGS, WIRES, JUNCTION AND OUTLET BOXES, SWITCHES, CUTOUTS, RECEPTACLES, AND ITEMS NECESSARY OR REQUIRED IN CONNECTION WITH OR RELATING THERETO.
PROVIDE:	FURNISH AND INSTALL.
FURNISH:	SUPPLY/OBTAIN/PURCHASE AN ITEM.

TO PUT IN PLACE, CONNECT, MAKE READY TO USE.

WIREMOLD

WEATHER PROOF

TO BE REMOVED

TRANSFORMER

WM

XFMR

			EQL	JIPMENT D	ISCONNECT	SCHE	DULE			
TAG	DESCRIPTION	LOCATION	FED FROM	VOLTS-PH	kW-HP-MCA	MOCP	FEEDER	DISCONNECT	UNIT CONTROL	NOTES
CRAC-1	COMPUTER ROOM AIR-CONDITIONER	SERVER ROOM	EXIST.	208/3ø	63.1 FLA	80A	(3) #3 + (1) #8G IN 1-1/4°C	N1/200/80	INTEGRAL TO UNIT	1
CRAC-2	COMPUTER ROOM AIR-CONDITIONER	SERVER ROOM	EXIST.	208/3ø	63.1 FLA	80A	(3) #3 + (1) #8G IN 1-1/4°C	N1/200/80	INTEGRAL TO UNIT	1
CRAC-3	COMPUTER ROOM AIR-CONDITIONER	SERVER ROOM	EXIST.	208/3ø	63.1 FLA	80A	(3) #3 + (1) #8G IN 1-1/4°C	N1/200/80	INTEGRAL TO UNIT	1
ACC-1	AIR-COOLED CONDENSER	ROOF	EXIST.	208/3ø	4.6 FLA	15A	(3) #12 + (1) #12G IN 3/4"C	INTEGRAL TO UNIT	INTEGRAL TO UNIT	_
ACC-2	AIR-COOLED CONDENSER	ROOF	EXIST.	208/3ø	4.6 FLA	15A	(3) #12 + (1) #12G IN 3/4"C	INTEGRAL TO UNIT	INTEGRAL TO UNIT	_
ACC-3	AIR-COOLED CONDENSER	ROOF	EXIST.	208/3ø	4.6 FLA	15A	(3) #12 + (1) #12G IN 3/4"C	INTEGRAL TO UNIT	INTEGRAL TO UNIT	_

1. EC TO PROVIDE DISC SW TO INTERCEPT EXISTING 175A FEEDER AND PROVIDE NEW LOAD SIDE FEEDER TO NEW
CRAC UNIT. REFER TO DETAIL 1 ON THIS SHEET.

2. NOT USED
4. NOT USED

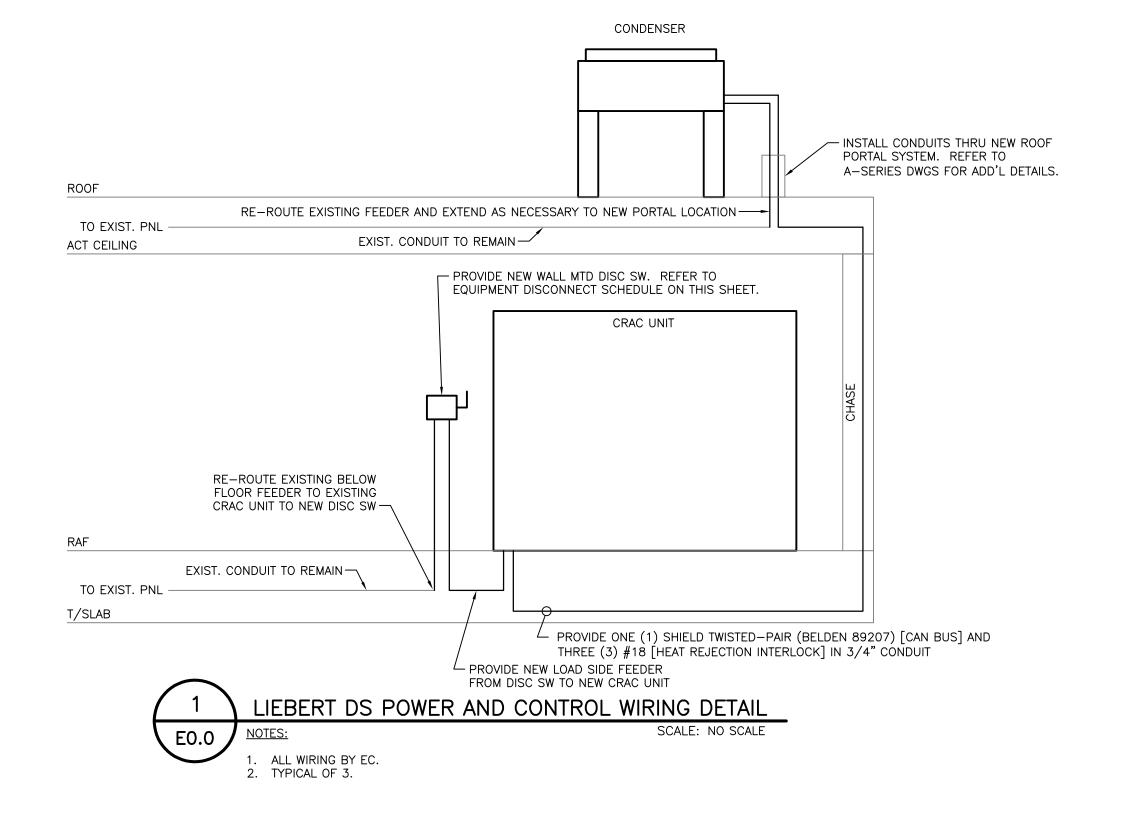
	DISCONNECT LEGEND
N/R	NOT REQUIRED
NIC	NOT IN CONTRACT
DISCONNECT	KEY
N1 / 30 / 20	
	#: FUSE SIZE NF: NON—FUSED DISCONNECT
L	DISCONNECT AMPACITY
	NEMA ENCLOSURE RATING
TOGGLE	HEAVY DUTY TOGGLE SWITCH
UNIT CONTR	OL KEY
C / N1 / PB	
	· Hoa: Hand-Off-Auto PB: Push Button
<u> </u>	NEMA ENCLOSURE RATING
	C: COMBINATION MAGNETIC M: MANUAL
VFD	VARIABLE FREQUENCY DRIVE
ATC	AUTOMATIC TEMPERATURE CONTROL

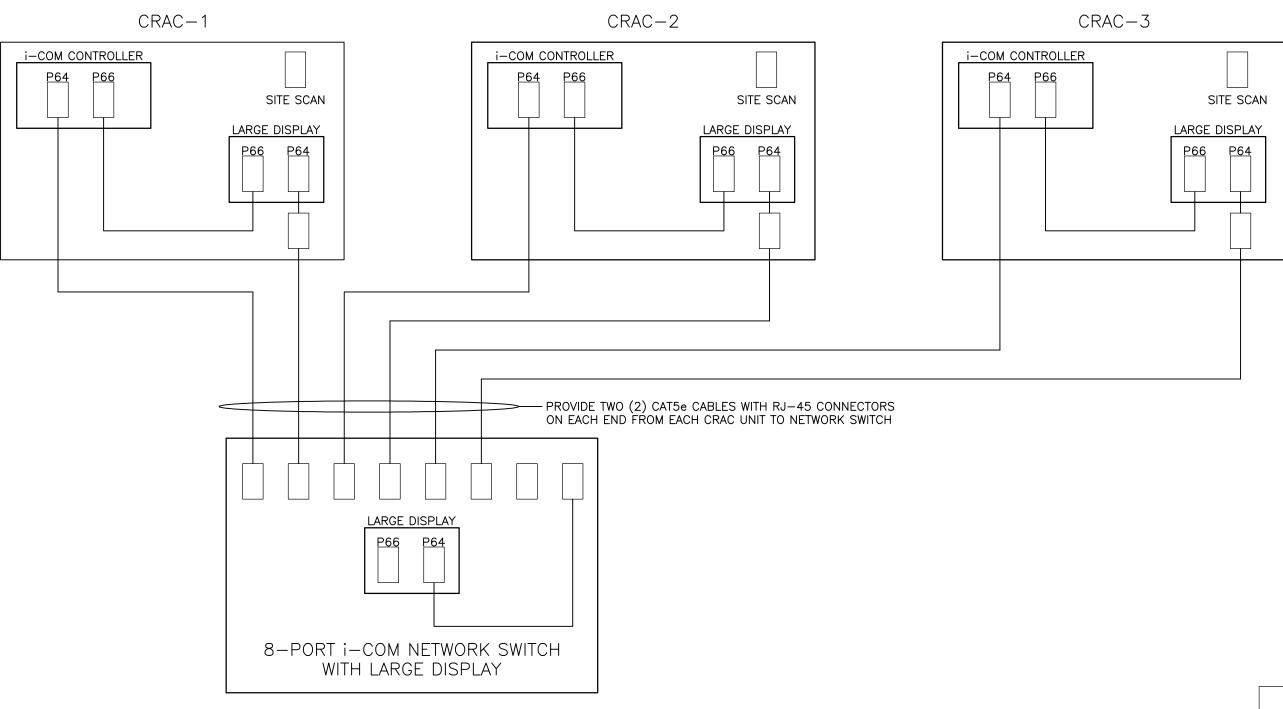
Р	OWER SYMBOLS LEGEND
SYMBOL	DESCRIPTION
Фхх	DUPLEX RECEPTACLE, 20A, 120VAC GFI — GROUND FAULT INTERRUPTER GFP — GROUND FAULT PROTECTED ##" — MOUNTING HEIGHT DC — DROP CORD USB — INTEGRAL USB PORTS
‡ xx	QUADRUPLEX RECEPTACLE, 20A, 120VAC GFI – GROUND FAULT INTERRUPTER GFP – GROUND FAULT PROTECTED ##" – MOUNTING HEIGHT USB – INTEGRAL USB PORTS
igorplus	SPECIALTY RECEPTACLE TO MATCH EQUIPMENT REQUIREMENTS. REFER TO MANUFACTURERS INSTALLATION INFORMATION.
Jxx	JUNCTION BOX SM — SURFACE MOUNT
∕	MOTOR
2	MOTOR WITH NON-FUSED DISCONNECT SWITCH
7	NON-FUSED DISCONNECT SWITCH

	PANEL LE-M		E	EXIS	TING	ТО	RE	IIAM	\	12	20/208	VOLTS
S	MAINS 225A MAII	N BKR _	22	25					3	Ph	HASE4	WIR
9	OPTIONS: TOP FEED ⊠ SUBFEED LUG BOTTOM FEED □ FEEDTHRU LU					φ	SL RE	JRFAC CESS	E MTD ED MTD)	100% NEUTRAL BREAKER AIC MINIMUI	M _100k
Í	DESCRIPTION	WATTS	TRIP						TRIP	WATTS	DESCRIPTION	ON
	RTU-1	_	40	1	-	+	-	2	60	_	RTU-2	
		_		3		+		4		_		
		_		5		+-	 	6		_		
_	RTU-3		25	7	+	+		8	25	_	RTU-4	
_		_		9		+		10		_		
_				11			•	12				
+	RTU-5		40	13				14	20		HOT WATER HE	EATER
_	<u> </u>			15		1		16			RP-1	
+	I EFT-1		20	19				20	20		EFT-1	
-			20	21				22	20			
+	ECH-1	_	20	23				24	20	_	EF-1 / EF-2 /	/ FF-3
+		_		25			<u> </u>	26	20	_	UH-1 IN LOADIN	
1	TEMP CRAC FEED	_	80	27		-	-	28	20	_	SPARE	
\top		_		29		_	<u> </u>	30	20	_	SPARE	
		T -	İ	31	-		-	32	20	_	SPARE	
1	TEMP ACC FEED	_	15	33		-	-	34	20	_	SPARE	
		_		35		+	 	36	20	_	SPARE	
		_		37	-	_		38	20	_	ATC	
_	SPARE		20	39		-		40	20		ATC	
_	SPARE		20	41				42	20	_	ATC	
_		_	TOT	AL				l TC	TAL	_		
	MANUFACTURERSQU	ARE D			M	ODEL		NQ	OD		NEV	1 1

PANEL SCHEDULE NOTES:

1. PROVIDE BREAKER TO TEMPORARILY FEED NEW CRAC-3/ACC-3 WHILE THE EXISTING CRAC-3/ACC-3 ARE STILL OPERATIONAL. REMOVE BREAKER AND ASSOCIATED TEMPORARY WIRING ONCE PERMANENT WIRING TO CRAC-3/ACC-3 IS INSTALLED.





2 LIEBERT ICOM CONTROL WIRING DETAIL

80.0 NOTES: SCALE: NO SCALE

1. ALL WIRING BY EC.

TO THE BEST OF THE REGISTERED DESIGN
ND
PROFESSIONAL'S KNOWLEDGE, BELIEF AND
NS
IANCE
AND/OR SPECIFICATIONS ARE IN COMPLIANCE
WITH THE 2020 ENERGY CODE.

CRAC UNIT REPLACE

8 COMPUTER DRIVE WEST
ALBANY, NY

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IE BEST OF THE REGISTERED DESIGN TO ESSIONAL'S KNOWLEDGE, BELIEF AND PRESSIONAL JUDGEMENT, THESE PLANS PROR SPECIFICATIONS ARE IN COMPLIANCE AN THE 2020 UNIFORM CODE.

E0.0

ELECTRICAL CONDUCTORS/EQUIPMENT OR LIKELY TO BECOME ENERGIZED AS INDICATED AND IN ACCORDANCE WITH NFPA 70. 2. PROVIDE INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH FEEDER AND BRANCH CIRCUIT RACEWAY. DO NOT USE RACEWAYS AS SOLE EQUIPMENT GROUNDING CONDUCTOR. 3. WHERE CIRCUIT CONDUCTOR SIZES ARE INCREASED FOR VOLTAGE DROP, INCREASE SIZE OF EQUIPMENT GROUNDING CONDUCTOR

PROPORTIONALLY IN ACCORDANCE WITH NFPA 70. 4. UNLESS OTHERWISE INDICATED, CONNECT WIRING DEVICE GROUNDING TERMINAL TO BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTOR AND TO OUTLET BOX WITH BONDING JUMPER. 5. TERMINATE BRANCH CIRCUIT EQUIPMENT GROUNDING CONDUCTORS ON SOLIDLY BONDED EQUIPMENT GROUND BUS ONLY. DO NOT TERMINATE ON NEUTRAL (GROUNDED) OR ISOLATED/INSULATED GROUND BUS.

6. PROVIDE BONDING JUMPER ACROSS EXPANSION OR EXPANSION/DEFLECTION FITTINGS PROVIDED TO ACCOMMODATE CONDUIT MOVEMENT 2.02 GROUNDING AND BONDING COMPONENTS A. GENERAL REQUIREMENTS: . PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED.

2. PROVIDE PRODUCTS LISTED AND LABELED AS COMPLYING WITH UL 467 WHERE APPLICABLE. B. CONDUCTORS FOR GROUNDING AND BONDING, IN ADDITION TO REQUIREMENTS OF SECTION 260526: 1. USE INSULATED COPPER CONDUCTORS UNLESS OTHERWISE INDICATED. C. CONNECTORS FOR GROUNDING AND BONDING

1. DESCRIPTION: CONNECTORS APPROPRIATE FOR THE APPLICATION AND SUITABLE FOR THE CONDUCTORS AND ITEMS TO BE CONNECTED; LISTED AND LABELED AS COMPLYING WITH UL 467.

2. UNLESS OTHERWISE INDICATED, USE IMECHANICAL CONNECTORS OR COMPRESSION CONNECTORS FOR ACCESSIBLE CONNECTIONS

PART 3 EXECUTION 3.01 EXAMINATION A. VERIFY THAT WORK LIKELY TO DAMAGE GROUNDING AND BONDING SYSTEM COMPONENTS HAS BEEN COMPLETED.

B. VERIFY THAT FIELD MEASUREMENTS ARE AS INDICATED. C. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK 3.02 INSTALLATION

A. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. d. FOR MODIFICATIONS OR ADDITIONS TO EXISTING WIRING SYSTEMS, COMPLY WITH EXISTING COLOR CODE WHEN EXISTING CODE COMPLIES WITH B. PERFORM WORK IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP)

C. MAKE GROUNDING AND BONDING CONNECTIONS USING SPECIFIED CONNECTORS 1. REMOVE APPROPRIATE AMOUNT OF CONDUCTOR INSULATION FOR MAKING CONNECTIONS WITHOUT CUTTING, NICKING OR DAMAGING CONDUCTORS. DO NOT REMOVE CONDUCTOR STRANDS TO FACILITATE INSERTION INTO CONNECTOR. 2. REMOVE NONCONDUCTIVE PAINT, ENAMEL, OR SIMILAR COATING AT THREADS, CONTACT POINTS, AND CONTACT SURFACES

3. EXOTHERMIC WELDS: MAKE CONNECTIONS USING MOLDS AND WELD MATERIAL SUITABLE FOR THE ITEMS TO BE CONNECTED IN ACCORDANCE WITH 4. MECHANICAL CONNECTORS: SECURE CONNECTIONS ACCORDING TO MANUFACTURER'S RECOMMENDED TORQUE SETTINGS.

5. COMPRESSION CONNECTORS: SECURE CONNECTIONS USING MANUFACTURER'S RECOMMENDED TOOLS AND DIES. D. IDENTIFY GROUNDING AND BONDING SYSTEM COMPONENTS IN ACCORDANCE WITH SECTION 260553.

END OF SECTION

<u> SECTION 260529 — HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS</u>

PART 1 GENERAL 1.01 REFERENCE STANDARDS A. ASTM B633 - STANDARD SPECIFICATION FOR ELECTRODEPOSITED COATINGS OF ZINC ON IRON AND STEEL 2019.

B. MFMA-4 - METAL FRAMING STANDARDS PUBLICATION 2004. C. NECA 1 - STANDARD FOR GOOD WORKMANSHIP IN ELECTRICAL CONSTRUCTION 2015. D. NFPA 70 - NATIONAL ELECTRICAL CODE MOST RECENT EDITION ADOPTED BY AUTHORITY HAVING JURISDICTION, INCLUDING ALL APPLICABLE AMENDMENTS AND SUPPLEMENTS.

1.02 ADMINISTRATIVE REQUIREMENTS 1. COORDINATE SIZES AND ARRANGEMENT OF SUPPORTS AND BASES WITH THE ACTUAL EQUIPMENT AND COMPONENTS TO BE INSTALLED. 2. COORDINATE THE WORK WITH OTHER TRADES TO PROVIDE ADDITIONAL FRAMING AND MATERIALS REQUIRED FOR INSTALLATION.

3. COORDINATE COMPATIBILITY OF SUPPORT AND ATTACHMENT COMPONENTS WITH MOUNTING SURFACES AT THE INSTALLED LOCATIONS. 4. COORDINATE THE ARRANGEMENT OF SUPPORTS WITH DUCTWORK, PIPING, EQUIPMENT AND OTHER POTENTIAL CONFLICTS INSTALLED UNDER OTHER SECTIONS OR BY OTHERS. 5. NOTIFY ARCHITECT OF ANY CONFLICTS WITH OR DEVIATIONS FROM CONTRACT DOCUMENTS. OBTAIN DIRECTION BEFORE PROCEEDING WITH WORK B. SEQUENCING:

1. DO NOT INSTALL PRODUCTS ON OR PROVIDE ATTACHMENT TO CONCRETE SURFACES UNTIL CONCRETE HAS FULLY CURED IN ACCORDANCE WITH SECTION 033000. 1.03 SUBMITTALS

A. PRODUCT DATA: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR CHANNEL (STRUT) FRAMING SYSTEMS, NON-PENETRATING ROOFTOP SUPPORTS, AND POST-INSTALLED CONCRETE AND MASONRY ANCHORS. B. SHOP DRAWINGS: INCLUDE DETAILS FOR FABRICATED HANGERS AND SUPPORTS WHERE MATERIALS OR METHODS OTHER THAN THOSE INDICATED ARE

PROPOSED FOR SUBSTITUTION 1.04 QUALITY ASSURANCE A. COMPLY WITH NFPA 70. C. VERIFY THAT RACEWAYS, BOXES, AND EQUIPMENT ENCLOSURES ARE INSTALLED AND ARE PROPERLY SIZED TO ACCOMMODATE CONDUCTORS AND B. COMPLY WITH APPLICABLE BUILDING CODE.

C. PRODUCT LISTING ORGANIZATION QUALIFICATIONS: AN ORGANIZATION RECOGNIZED BY OSHA AS A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) AND ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. 1.05 DELIVERY, STORAGE, AND HANDLING

A. RECEIVE, INSPECT, HANDLE, AND STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

PART 2 PRODUCTS 2.01 SUPPORT AND ATTACHMENT COMPONENTS A. GENERAL REQUIREMENTS:

1. PROVIDE ALL REQUIRED HANGERS, SUPPORTS, ANCHORS, FASTENERS, FITTINGS, ACCESSORIES, AND HARDWARE AS NECESSARY FOR THE COMPLETE INSTALLATION OF ELECTRICAL WORK. 2. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED, WHERE APPLICABLE 3. WHERE SUPPORT AND ATTACHMENT COMPONENT TYPES AND SIZES ARE NOT INDICATED. SELECT IN ACCORDANCE WITH MANUFACTURER'S

APPLICATION CRITERIA AS REQUIRED FOR THE LOAD TO BE SUPPORTED WITH A MINIMUM SAFETY FACTOR OF 5I. INCLUDE CONSIDERATION FOR VIBRATION, EQUIPMENT OPERATION, AND SHOCK LOADS WHERE APPLICABLE. 4. DO NOT USE PRODUCTS FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70 AND PRODUCT LISTING. 5. DO NOT USE WIRE, CHAIN, PERFORATED PIPE STRAP, OR WOOD FOR PERMANENT SUPPORTS UNLESS SPECIFICALLY INDICATED OR PERMITTED.

6. STEEL COMPONENTS: USE CORROSION RESISTANT MATERIALS SUITABLE FOR THE ENVIRONMENT WHERE INSTALLED. a. INDOOR DRY LOCATIONS: USE ZINC-PLATED STEEL OR APPROVED EQUIVALENT UNLESS OTHERWISE INDICATED. b. OUTDOOR AND DAMP OR WET INDOOR LOCATIONS: USE ISTAINLESS STEEL OR APPROVED EQUIVALENTI UNLESS OTHERWISE INDICATED. c. ZINC-PLATED STEEL: ELECTROPLATED IN ACCORDANCE WITH ASTM B633.

B. COMPONENTS FOR VIBRATION ISOLATION AND/OR SEISMIC CONTROLS: COMPLY WITH SECTION 260548. C. CONDUIT AND CABLE SUPPORTS: STRAPS, CLAMPS, ETC. SUITABLE FOR THE CONDUIT OR CABLE TO BE SUPPORTED. 1. CONDUIT STRAPS: ONE-HOLE OR TWO-HOLE TYPE; ISTEELL.

D. OUTLET BOX SUPPORTS: HANGERS, BRACKETS, ETC. SUITABLE FOR THE BOXES TO BE SUPPORTED. E. METAL CHANNEL (STRUT) FRAMING SYSTEMS: FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF SUPPORTS. COMPLY WITH MFMA-4. 2. CHANNEL MATERIAL:

a. INDOOR DRY LOCATIONS: USE PAINTED STEEL, ZINC-PLATED STEEL, OR GALVANIZED STEEL. b. OUTDOOR AND DAMP OR WET INDOOR LOCATIONS: USE ISTAINLESS STEELL. 3. MINIMUM CHANNEL THICKNESS: STEEL SHEET, 12 GAUGE, 0.1046 INCH. 4. MINIMUM CHANNEL DIMENSIONS: 1-5/8 INCH WIDTH BY 13/16 INCH HEIGHT. F. HANGER RODS: THREADED ZINC-PLATED STEEL UNLESS OTHERWISE INDICATED.

a. SINGLE CONDUIT UP TO 1 INCH (27 MM) TRADE SIZE: 1/4 INCH DIAMETER. b. SINGLE CONDUIT LARGER THAN 1 INCH (27 MM) TRADE SIZE: 3/8 INCH DIAMETER c. TRAPEZE SUPPORT FOR MULTIPLE CONDUITS: 3/8 INCH DIAMETER.

1. MINIMUM SIZE, UNLESS OTHERWISE INDICATED OR REQUIRED:

2. CONDUIT CLAMPS: BOLTED TYPE UNLESS OTHERWISE INDICATED.

F. NECA 101 - STANDARD FOR INSTALLING STEEL CONDUITS (RIGID, IMC, EMT) 2013 G. NECA 102 - STANDARD FOR INSTALLING ALUMINUM RIGID METAL CONDUIT 2004. H. NEMA FB 1 - FITTINGS, CAST METAL BOXES, AND CONDUIT BODIES FOR CONDUIT, ELECTRICAL METALLIC TUBING, AND CABLE 2014

I. NEMA RN 1 - POLYVINYL-CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID STEEL CONDUIT AND INTERMEDIATE METAL CONDUIT 2018. J. NFPA 70 - NATIONAL ELECTRICAL CODE MOST RECENT EDITION ADOPTED BY AUTHORITY HAVING JURISDICTION, INCLUDING ALL APPLICABLE AMENDMENTS AND SUPPLEMENTS. K.UL 1 - FLEXIBLE METAL CONDUIT CURRENT EDITION, INCLUDING ALL REVISIONS. L. UL 6 — ELECTRICAL RIGID METAL CONDUIT—STEEL CURRENT EDITION, INCLUDING ALL REVISIONS.

M.UL 6A - ELECTRICAL RIGID METAL CONDUIT-ALUMINUM, RED BRASS, AND STAINLESS STEEL CURRENT EDITION, INCLUDING ALL REVISIONS. N.UL 360 - LIQUID-TIGHT FLEXIBLE METAL CONDUIT CURRENT EDITION, INCLUDING ALL REVISIONS. O.UL 514A - METALLIC OUTLET BOXES CURRENT EDITION, INCLUDING ALL REVISIONS P. UL 514B — CONDUIT, TUBING, AND CABLE FITTINGS CURRENT EDITION, INCLUDING ALL REVISIONS

Q.UL 797 — ELECTRICAL METALLIC TUBING-STEEL CURRENT EDITION, INCLUDING ALL REVISIONS. R.UL 797A — ELECTRICAL METALLIC TUBING — ALUMINUM AND STAINLESS STEEL CURRENT EDITION, INCLUDING ALL REVISIONS. S. UL 1242 — ELECTRICAL INTERMEDIATE METAL CONDUIT-STEEL CURRENT EDITION, INCLUDING ALL REVISIONS. T. UL 2419 — OUTLINE OF INVESTIGATION FOR ELECTRICALLY CONDUCTIVE CORROSION RESISTANT COMPOUNDS CURRENT EDITION, INCLUDING ALL

1.02 ADMINISTRATIVE REQUIREMENTS A. COORDINATION: 1. COORDINATE MINIMUM SIZES OF CONDUITS WITH ACTUAL TYPE AND QUANTITY OF CONDUCTORS TO BE INSTALLED, INCLUDING ADJUSTMENTS FOR

CONDUCTOR SIZES INCREASED FOR VOLTAGE DROP. 2. COORDINATE ARRANGEMENT OF CONDUITS WITH STRUCTURAL MEMBERS, DUCTWORK, PIPING, EQUIPMENT, AND OTHER POTENTIAL CONFLICTS. 3. VERIFY EXACT CONDUIT TERMINATION LOCATIONS REQUIRED FOR BOXES, ENCLOSURES, AND EQUIPMENT 4. COORDINATE WORK TO PROVIDE ROOF PENETRATIONS THAT PRESERVE INTEGRITY OF ROOFING SYSTEM AND DO NOT VOID ROOF WARRANTY.

5. NOTIFY ARCHITECT OF CONFLICTS WITH OR DEVIATIONS FROM CONTRACT DOCUMENTS. OBTAIN DIRECTION BEFORE PROCEEDING WITH WORK. B. SEQUENCING: 1. DO NOT BEGIN INSTALLATION OF CONDUCTORS AND CABLES UNTIL INSTALLATION OF CONDUIT BETWEEN TERMINATION POINTS IS COMPLETE. 1.03 SUBMITTALS

A. PRODUCT DATA: PROVIDE MANUFACTURER'S STANDARD CATALOG PAGES AND DATA SHEETS FOR CONDUITS AND FITTINGS A. PRODUCT LISTING ORGANIZATION QUALIFICATIONS: ORGANIZATION RECOGNIZED BY OSHA AS NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL)

AND ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. 1.05 DELIVERY, STORAGE, AND HANDLING

A. RECEIVE, INSPECT, HANDLE, AND STORE CONDUIT AND FITTINGS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS

PART 2 PRODUCTS 2.01 CONDUIT APPLICATIONS A. DO NOT USE CONDUIT AND ASSOCIATED FITTINGS FOR APPLICATIONS OTHER THAN AS PERMITTED BY NFPA 70, MANUFACTURER'S INSTRUCTIONS, AND PRODUCT LISTING.

MORE THAN ONE LISTED APPLICATION APPLIES, COMPLY WITH MOST RESTRICTIVE REQUIREMENTS. WHERE CONDUIT TYPE FOR PARTICULAR APPLICATION IS NOT SPECIFIED, USE GALVANIZED STEEL RIGID METAL CONDUIT. C. EXPOSED, INTERIOR, NOT SUBJECT TO PHYSICAL DAMAGE: USE GALVANIZED STEEL RIGID METAL CONDUIT (RMC), ALUMINUM RIGID METAL CONDUIT (RMC), GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC), OR ALUMINUM ELECTRICAL METALLIC TUBING (EMT). D. EXPOSED, INTERIOR, SUBJECT TO PHYSICAL DAMAGE: USE GALVANIZED STEEL RIGID METAL CONDUIT (RMC), ALUMINUM RIGID METAL CONDUIT (RMC),

B. UNLESS OTHERWISE INDICATED AND WHERE NOT OTHERWISE RESTRICTED, USE CONDUIT TYPES INDICATED FOR SPECIFIED APPLICATIONS. WHERE

OR GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC). 1. LOCATIONS SUBJECT TO PHYSICAL DAMAGE INCLUDE, BUT ARE NOT LIMITED TO: a. WHERE EXPOSED BELOW 8 FEET, EXCEPT WITHIN ELECTRICAL AND COMMUNICATION ROOMS OR CLOSETS. E. EXPOSED, EXTERIOR, NOT SUBJECT TO SEVERE PHYSICAL DAMAGE: USE PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC).

F. FLEXIBLE CONNECTIONS TO VIBRATING EQUIPMENT 1. DRY LOCATIONS: USE FLEXIBLE METAL CONDUIT (FMC). 2. DAMP, WET, OR CORROSIVE LOCATIONS: USE LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC).

3. MAXIMUM LENGTH: 6 FEET UNLESS OTHERWISE INDICATED. 4. VIBRATING EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO:

a. TRANSFORMERS. b. MOTORS.

G. FISHED IN EXISTING WALLS, WHERE NECESSARY: USE FLEXIBLE METAL CONDUIT (FMC), GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT), OR STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT). 2.02 CONDUIT - GENERAL REQUIREMENTS

B. EXISTING WORK: WHERE EXISTING CONDUITS ARE INDICATED TO BE REUSED, THEY MAY BE REUSED ONLY WHERE THEY COMPLY WITH SPECIFIED REQUIREMENTS, ARE FREE FROM CORROSION, AND INTEGRITY IS VERIFIED BY PULLING MANDREL THROUGH THEM. C.FITTINGS FOR GROUNDING AND BONDING: SEE SECTION 260526 FOR ADDITIONAL REQUIREMENTS

D. PROVIDE CONDUIT, FITTINGS, SUPPORTS, AND ACCESSORIES REQUIRED FOR COMPLETE RACEWAY SYSTEM. E. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR PURPOSE INTENDED

F. MINIMUM CONDUIT SIZE, UNLESS OTHERWISE INDICATED: 1. BRANCH CIRCUITS: 3/4-INCH TRADE SIZE 2. BRANCH CIRCUIT HOMERUNS: 3/4-INCH TRADE SIZE.

3. CONTROL CIRCUITS: 1/2-INCH TRADE SIZE. G. WHERE CONDUIT SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS SPECIFIED. 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC) A. DESCRIPTION: NFPA 70, TYPE RMC GALVANIZED STEEL RIGID METAL CONDUIT COMPLYING WITH ANSI C80.1 AND LISTED AND LABELED AS COMPLYING

WITH UL 6. B. FITTINGS: 1. NONHAZARDOUS LOCATIONS: USE FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH UL 514B OR UL 6.

2. MATERIAL: USE ISTEEL OR MALLEABLE IRONI. a. DO NOT USE DIE CAST ZINC FITTINGS. 3. CONNECTORS AND COUPLINGS: USE THREADED TYPE FITTINGS ONLY. THREADLESS FITTINGS, INCLUDING SET SCREW AND COMPRESSION/GLAND TYPES, ARE NOT PERMITTED.

2.04 ALUMINUM RIGID METAL CONDUIT (RMC) A. DESCRIPTION: NFPA 70, TYPE RMC ALUMINUM RIGID METAL CONDUIT COMPLYING WITH ANSI C80.5 AND LISTED AND LABELED AS COMPLYING WITH UL B. FITTINGS:

1. NONHAZARDOUS LOCATIONS: USE FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH UL 514B OR UL 6A 2. MATERIAL: USE ALUMINUM. 3. CONNECTORS AND COUPLINGS: USE THREADED TYPE FITTINGS ONLY. THREADLESS FITTINGS, INCLUDING SET SCREW AND COMPRESSION/GLAND TYPES, ARE NOT PERMITTED.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC) A. DESCRIPTION: NFPA 70, TYPE IMC GALVANIZED STEEL INTERMEDIATE METAL CONDUIT COMPLYING WITH ANSI C80.6 AND LISTED AND LABELED AS COMPLYING WITH UL 1242. B. FITTINGS:

1. NONHAZARDOUS LOCATIONS: USE FITTINGS COMPLYING WITH NEMA FB 1 AND LISTED AND LABELED AS COMPLYING WITH UL 514B OR UL 1242. 2. MATERIAL: USE STEEL OR MALLEABLE IRON. a. DO NOT USE DIE CAST ZINC FITTINGS.

3. CONNECTORS AND COUPLINGS: USE THREADED TYPE FITTINGS ONLY. THREADLESS FITTINGS, INCLUDING SET SCREW AND COMPRESSION/GLAND TYPES. ARE NOT PERMITTED.

F. INSTALL PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC) USING ONLY TOOLS APPROVED BY MANUFACTURER. 1. UNLESS DIMENSIONED, CONDUIT ROUTING INDICATED IS DIAGRAMMATIC.

2. WHEN CONDUIT DESTINATION IS INDICATED WITHOUT SPECIFIC ROUTING, DETERMINE EXACT ROUTING REQUIRED.

3. CONCEAL CONDUITS UNLESS SPECIFICALLY INDICATED TO BE EXPOSED. 4. CONDUITS IN THE FOLLOWING AREAS MAY BE EXPOSED, UNLESS OTHERWISE INDICATED: a. ELECTRICAL ROOMS. b. MECHANICAL EQUIPMENT ROOMS. c. WITHIN JOISTS IN AREAS WITH NO CEILING.

a. ACROSS FLOORS b. ACROSS ROOFS. c. ACROSS TOP OF PARAPET WALLS d. ACROSS BUILDING EXTERIOR SURFACES

5. UNLESS OTHERWISE APPROVED, DO NOT ROUTE EXPOSED CONDUITS:

6. ARRANGE CONDUIT TO MAINTAIN ADEQUATE HEADROOM, CLEARANCES, AND ACCESS. 7. ARRANGE CONDUIT TO PROVIDE NO MORE THAN EQUIVALENT OF FOUR 90-DEGREE BENDS BETWEEN PULL POINTS. 8. ARRANGE CONDUIT TO PROVIDE NO MORE THAN 150 FEET BETWEEN PULL POINTS. 9. ROUTE CONDUITS ABOVE WATER AND DRAIN PIPING WHERE POSSIBLE.

10. ARRANGE CONDUIT TO PREVENT MOISTURE TRAPS. PROVIDE DRAIN FITTINGS AT LOW POINTS AND AT SEALING FITTINGS WHERE MOISTURE MAY 11. MAINTAIN MINIMUM CLEARANCE OF 6 INCHES BETWEEN CONDUITS AND PIPING FOR OTHER SYSTEMS.

12. MAINTAIN MINIMUM CLEARANCE OF 12 INCHES BETWEEN CONDUITS AND HOT SURFACES. THIS INCLUDES, BUT IS NOT LIMITED TO:

b. HOT WATER PIPING.

c. FLUES. 13. GROUP PARALLEL CONDUITS IN SAME AREA ON COMMON RACK H. CONDUIT SUPPORT 1. SECURE AND SUPPORT CONDUITS IN ACCORDANCE WITH NFPA 70 USING SUITABLE SUPPORTS AND METHODS APPROVED BY AUTHORITIES HAVING JURISDICTION: SEE SECTION 260529.

2. PROVIDE REQUIRED VIBRATION ISOLATION AND/OR SEISMIC CONTROLS; SEE SECTION 260548 3. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS. 4. INSTALLATION ABOVE SUSPENDED CEILINGS: DO NOT PROVIDE SUPPORT FROM CEILING SUPPORT SYSTEM. DO NOT PROVIDE SUPPORT FROM CEILING GRID OR ALLOW CONDUITS TO LAY ON CEILING TILES

5. USE CONDUIT STRAP TO SUPPORT SINGLE SURFACE-MOUNTED CONDUIT a. USE CLAMP BACK SPACER WITH CONDUIT STRAP FOR DAMP AND WET LOCATIONS TO PROVIDE SPACE BETWEEN CONDUIT AND MOUNTING

6. USE METAL CHANNEL/STRUT WITH ACCESSORY CONDUIT CLAMPS TO SUPPORT MULTIPLE PARALLEL SURFACE-MOUNTED CONDUITS. 7. USE CONDUIT CLAMP TO SUPPORT SINGLE CONDUIT FROM BEAM CLAMP OR THREADED ROD. 8. USE TRAPEZE HANGERS ASSEMBLED FROM THREADED RODS AND METAL CHANNEL/STRUT WITH ACCESSORY CONDUIT CLAMPS TO SUPPORT

MULTIPLE PARALLEL SUSPENDED CONDUITS. 9. USE NONPENETRATING ROOFTOP SUPPORTS TO SUPPORT CONDUITS ROUTED ACROSS ROOFTOPS, WHERE APPROVED. 10. USE OF SPRING STEEL CONDUIT CLIPS FOR SUPPORT OF CONDUITS IS IPERMITTED ONLY AS FOLLOWS: a. SUPPORT OF ELECTRICAL METALLIC TUBING (EMT) UP TO 1—INCH (27 MM) TRADE SIZE CONCEALED ABOVE ACCESSIBLE CEILINGS AND WITHIN HOLLOW STUD WALLS

11. USE OF WIRE FOR SUPPORT OF CONDUITS IS NOT PERMITTED. I. CONNECTIONS AND TERMINATIONS:

1. USE APPROVED ZINC-RICH PAINT OR CONDUIT JOINT COMPOUND ON FIELD-CUT THREADS OF GALVANIZED STEEL CONDUITS PRIOR TO MAKING 2. WHERE TWO THREADED CONDUITS MUST BE JOINED AND NEITHER CAN BE ROTATED, USE THREE-PIECE COUPLINGS OR SPLIT COUPLINGS. DO NOT USE RUNNING THREADS 3. USE SUITABLE ADAPTERS WHERE REQUIRED TO TRANSITION FROM ONE TYPE OF CONDUIT TO ANOTHER.

4. PROVIDE DRIP LOOPS FOR LIQUIDTIGHT FLEXIBLE CONDUIT CONNECTIONS TO PREVENT DRAINAGE OF LIQUID INTO CONNECTORS. 5. TERMINATE THREADED CONDUITS IN BOXES AND ENCLOSURES USING THREADED HUBS OR DOUBLE LOCK NUTS FOR DRY LOCATIONS AND RAINTIGHT HUBS FOR WET LOCATIONS. 6. PROVIDE INSULATING BUSHINGS, INSULATED THROATS, OR LISTED METAL FITTINGS WITH SMOOTH, ROUNDED EDGES AT CONDUIT TERMINATIONS TO PROTECT CONDUCTORS.

7. SECURE JOINTS AND CONNECTIONS TO PROVIDE MECHANICAL STRENGTH AND ELECTRICAL CONTINUITY J. PENETRATIONS: 1. DO NOT PENETRATE OR OTHERWISE NOTCH OR CUT STRUCTURAL MEMBERS, INCLUDING FOOTINGS AND GRADE BEAMS, WITHOUT APPROVAL OF STRUCTURAL ENGINEER.

2. MAKE PENETRATIONS PERPENDICULAR TO SURFACES UNLESS OTHERWISE INDICATED. 3. PROVIDE SLEEVES FOR PENETRATIONS AS INDICATED OR AS REQUIRED TO FACILITATE INSTALLATION. SET SLEEVES FLUSH WITH EXPOSED SURFACES UNLESS OTHERWISE INDICATED OR REQUIRED. 4. CONCEAL BENDS FOR CONDUIT RISERS EMERGING ABOVE GROUND. 5. SEAL INTERIOR OF CONDUITS ENTERING BUILDING FROM UNDERGROUND AT FIRST ACCESSIBLE POINT TO PREVENT ENTRY OF MOISTURE AND GASES.

6. WHERE CONDUITS PENETRATE WATERPROOF MEMBRANE, SEAL AS REQUIRED TO MAINTAIN INTEGRITY OF MEMBRANE. 7. MAKE PENETRATIONS FOR ROOF-MOUNTED EQUIPMENT WITHIN ASSOCIATED EQUIPMENT OPENINGS AND CURBS WHERE POSSIBLE TO MINIMIZE ROOFING SYSTEM PENETRATIONS. WHERE PENETRATIONS ARE NECESSARY, SEAL AS INDICATED OR AS REQUIRED TO PRESERVE INTEGRITY OF ROOFING SYSTEM AND MAINTAIN ROOF WARRANTY.

8. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS; SEE SECTION 078400. K. CONDUIT MOVEMENT PROVISIONS: WHERE CONDUITS ARE SUBJECT TO MOVEMENT, PROVIDE EXPANSION AND EXPANSION/DEFLECTION FITTINGS TO PREVENT DAMAGE TO ENCLOSED CONDUCTORS OR CONNECTED EQUIPMENT. THIS INCLUDES, BUT IS NOT LIMITED TO:

1. WHERE CONDUITS CROSS STRUCTURAL JOINTS INTENDED FOR EXPANSION, CONTRACTION, OR DEFLECTION. 2. WHERE CONDUITS ARE SUBJECT TO EARTH MOVEMENT BY SETTLEMENT OR FROST CONDENSATION PREVENTION: WHERE CONDUITS CROSS BARRIERS BETWEEN AREAS OF POTENTIAL SUBSTANTIAL TEMPERATURE DIFFERENTIAL, PROVIDE SEALING FITTING OR APPROVED SEALING COMPOUND AT ACCESSIBLE POINT NEAR PENETRATION TO PREVENT CONDENSATION. THIS INCLUDES, BUT IS NOT LIMITED TO

1. WHERE CONDUITS PASS FROM OUTDOORS INTO CONDITIONED INTERIOR SPACES. 2. WHERE CONDUITS PASS FROM UNCONDITIONED INTERIOR SPACES INTO CONDITIONED INTERIOR SPACES. M. PROVIDE PULL STRING IN EACH EMPTY CONDUIT AND IN CONDUITS WHERE CONDUCTORS AND CABLES ARE TO BE INSTALLED BY OTHERS. LEAVE MINIMUM SLACK OF 12 INCHES AT EACH END.

N. PROVIDE GROUNDING AND BONDING; SEE SECTION 260526. O. IDENTIFY CONDUITS; SEE SECTION 260553. 3.03 FIELD QUALITY CONTROL A. REPAIR CUTS AND ABRASIONS IN GALVANIZED FINISHES USING ZINC-RICH PAINT RECOMMENDED BY MANUFACTURER. REPLACE

COMPONENTS THAT EXHIBIT SIGNS OF CORROSION. B. WHERE COATING OF PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC) CONTAINS CUTS OR ABRASIONS, REPAIR IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS C. CORRECT DEFICIENCIES AND REPLACE DAMAGED OR DEFECTIVE CONDUITS.

A. CLEAN INTERIOR OF CONDUITS TO REMOVE MOISTURE AND FOREIGN MATTER. 3.05 PROTECTION A. IMMEDIATELY AFTER INSTALLATION OF CONDUIT, USE SUITABLE MANUFACTURED PLUGS TO PROVIDE PROTECTION FROM ENTRY OF

3.04 CLEANING

MOISTURE AND FOREIGN MATERIAL AND DO NOT REMOVE UNTIL READY FOR INSTALLATION OF CONDUCTORS. END OF SECTION

J. CRIMPED TERMINALS: NYLON-INSULATED, WITH INSULATION GRIP AND TERMINAL CONFIGURATION SUITABLE FOR CONNECTION TO BE MADE.

3.01 FXAMINATION A. VERIFY THAT INTERIOR OF BUILDING HAS BEEN PROTECTED FROM WEATHER. B. VERIFY THAT WORK LIKELY TO DAMAGE WIRE AND CABLE HAS BEEN COMPLETED.

J. MINIMUM CONDUCTOR SIZE:

a. EXCEPTIONS:

1. BRANCH CIRCUITS: 12 AWG.

2. CONTROL CIRCUITS: 14 AWG

1) PHASE A: BROWN.

2) PHASE B: ORANGE.

3) PHASE C: YELLOW

1) PHASE A: BLACK.

3) PHASE C: BLUE.

2.03 SINGLE CONDUCTOR BUILDING WIRE

1. FEEDERS AND BRANCH CIRCUITS:

2. CONTROL CIRCUITS: STRANDED

C. INSULATION VOLTAGE RATING: 600 V.

a. SIZE 10 AWG AND SMALLER: SOLID.

b. SIZE 8 AWG AND LARGER: STRANDED.

C. WIRING CONNECTORS FOR SPLICES AND TAPS:

D. WIRING CONNECTORS FOR TERMINATIONS:

CABLES IN ACCORDANCE WITH NFPA 70.

TOGETHER IN A SINGLE RACEWAY IS NOT PERMITTED.

CONDUCTOR FOR EACH INDIVIDUAL BRANCH CIRCUIT.

B. CONDUCTOR STRANDING:

D. INSULATION:

2.04 WIRING CONNECTORS

RFQUIRFD.

2) PHASE B: RED.

COLOR CODING THROUGHOUT PROJECT.

a. 480Y/277 V, 3 PHASE, 4 WIRE SYSTEM:

4) NEUTRAL/GROUNDED: GRAY.

4) NEUTRAL/GROUNDED: WHITE.

c. EQUIPMENT GROUND, ALL SYSTEMS: GREEN.

A. DESCRIPTION: SINGLE CONDUCTOR INSULATED WIRE.

1. COPPER BUILDING WIRE: TYPE ITHHN/THWN OR THHN/THWN-2L

LISTED AS COMPLYING WITH UL 486A-486B OR UL 486C AS APPLICABLE

H. MECHANICAL CONNECTORS: PROVIDE BOLTED TYPE OR SET-SCREW TYPE

B. CONNECTORS FOR GROUNDING AND BONDING: COMPLY WITH SECTION 260526.

NFPA 70 AND IS APPROVED BY THE AUTHORITY HAVING JURISDICTION.

e. FOR CONTROL CIRCUITS, COMPLY WITH MANUFACTURER'S RECOMMENDED COLOR CODE.

1. COPPER CONDUCTORS SIZE 8 AWG AND SMALLER: USE TWIST-ON INSULATED SPRING CONNECTORS.

F. DO NOT USE PUSH-IN WIRE CONNECTORS AS A SUBSTITUTE FOR TWIST-ON INSULATED SPRING CONNECTORS.

I. COMPRESSION CONNECTORS: PROVIDE CIRCUMFERENTIAL TYPE OR HEX TYPE CRIMP CONFIGURATION.

3. CONDUCTORS FOR CONTROL CIRCUITS: USE CRIMPED TERMINALS FOR ALL CONNECTIONS.

2. COPPER CONDUCTORS SIZE 6 AWG AND LARGER: USE MECHANICAL CONNECTORS OR COMPRESSION CONNECTORS

b. 208Y/120 V, 3 PHASE, 4 WIRE SYSTEM:

2. COLOR CODING METHOD: INTEGRALLY COLORED INSULATION.

L. CONDUCTOR COLOR CODING:

3. COLOR CODE:

1) 20 A, 120 V CIRCUITS LONGER THAN 75 FEET: 10 AWG, FOR VOLTAGE DROP.

2) 20 A, 120 V CIRCUITS LONGER THAN 150 FEET: 8 AWG, FOR VOLTAGE DROP.

3) 20 A, 277 V CIRCUITS LONGER THAN 150 FEET: 10 AWG, FOR VOLTAGE DROP

K. WHERE CONDUCTOR SIZE IS NOT INDICATED, SIZE TO COMPLY WITH NFPA 70 BUT NOT LESS THAN APPLICABLE MINIMUM SIZE REQUIREMENTS

1. COLOR CODE CONDUCTORS AS INDICATED UNLESS OTHERWISE REQUIRED BY THE AUTHORITY HAVING JURISDICTION. MAINTAIN CONSISTENT

a. CONDUCTORS SIZE 4 AWG AND LARGER MAY HAVE BLACK INSULATION COLOR CODED USING VINYL COLOR CODING ELECTRICAL TAPE

A. DESCRIPTION: WIRING CONNECTORS APPROPRIATE FOR THE APPLICATION, SUITABLE FOR USE WITH THE CONDUCTORS TO BE CONNECTED, AND

1. PROVIDE TERMINAL LUGS FOR CONNECTING CONDUCTORS TO EQUIPMENT FURNISHED WITH TERMINATIONS DESIGNED FOR TERMINAL LUGS.

E. DO NOT USE INSULATION-PIERCING OR INSULATION-DISPLACEMENT CONNECTORS DESIGNED FOR USE WITH CONDUCTORS WITHOUT STRIPPING

G. TWIST-ON INSULATED SPRING CONNECTORS: RATED 600 V, 221 DEGREES F FOR STANDARD APPLICATIONS AND 302 DEGREES F FOR HIGH

BRANCH CIRCUITS OF DIFFERENT PHASES INSTALLED IN THE SAME RACEWAY IS NOT PERMITTED. PROVIDE DEDICATED NEUTRAL/GROUNDED

3. DO NOT DAMAGE CONDUCTORS AND CABLES OR EXCEED MANUFACTURER'S RECOMMENDED MAXIMUM PULLING TENSION AND SIDEWALL

E. PARALLELED CONDUCTORS: INSTALL CONDUCTORS OF THE SAME LENGTH AND TERMINATE IN THE SAME MANNER.

H. NEATLY TRAIN AND BUNDLE CONDUCTORS INSIDE BOXES, WIREWAYS, PANELBOARDS AND OTHER EQUIPMENT ENCLOSURES.

CEILING GRID OR ALLOW CONDUCTORS AND CABLES TO LAY ON CEILING TILES.

G. INSTALL CONDUCTORS WITH A MINIMUM OF 12 INCHES OF SLACK AT EACH OUTLET

4. USE SUITABLE WIRE PULLING LUBRICANT WHERE NECESSARY, EXCEPT WHEN LUBRICANT IS NOT RECOMMENDED BY THE MANUFACTURER.

F. SECURE AND SUPPORT CONDUCTORS AND CABLES IN ACCORDANCE WITH NFPA 70 USING SUITABLE SUPPORTS AND METHODS APPROVED BY THE

AUTHORITY HAVING JURISDICTION. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM RACEWAYS,

1. INSTALLATION ABOVE SUSPENDED CEILINGS: DO NOT PROVIDE SUPPORT FROM CEILING SUPPORT SYSTEM. DO NOT PROVIDE SUPPORT FROM

I. GROUP OR OTHERWISE IDENTIFY NEUTRAL/GROUNDED CONDUCTORS WITH ASSOCIATED UNGROUNDED CONDUCTORS INSIDE ENCLOSURES IN

TEMPERATURE APPLICATIONS; PRE-FILLED WITH SEALANT AND LISTED AS COMPLYING WITH UL 486D FOR DAMP AND WET LOCATIONS.

2. COPPER CONDUCTORS SIZE 8 AWG AND LARGER: USE MECHANICAL CONNECTORS OR COMPRESSION CONNECTORS WHERE CONNECTORS ARE

D. VERIFY THAT FIELD MEASUREMENTS ARE AS INDICATED. E. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK. A. CLEAN RACEWAYS THOROUGHLY TO REMOVE FOREIGN MATERIALS BEFORE INSTALLING CONDUCTORS AND CABLES.

3.03 INSTALLATION A. CIRCUITING REQUIREMENTS: 1. UNLESS DIMENSIONED, CIRCUIT ROUTING INDICATED IS DIAGRAMMATIC.

WITH NFPA 70.

PRESSURE.

PIPING, DUCTWORK, OR OTHER SYSTEMS.

ACCORDANCE WITH NFPA 70.

2. WHEN CIRCUIT DESTINATION IS INDICATED WITHOUT SPECIFIC ROUTING, DETERMINE EXACT ROUTING REQUIRED. 3. ARRANGE CIRCUITING TO MINIMIZE SPLICES. 4. INCLUDE CIRCUIT LENGTHS REQUIRED TO INSTALL CONNECTED DEVICES WITHIN 10 FT OF LOCATION INDICATED. 5. MAINTAIN SEPARATION OF CLASS 1, CLASS 2, AND CLASS 3 REMOTE-CONTROL, SIGNALING, AND POWER-LIMITED CIRCUITS IN ACCORDANCE

6. MAINTAIN SEPARATION OF WIRING FOR EMERGENCY SYSTEMS IN ACCORDANCE WITH NFPA 70. 7. CIRCUITING ADJUSTMENTS: UNLESS OTHERWISE INDICATED, WHEN BRANCH CIRCUITS ARE INDICATED AS SEPARATE, COMBINING THEM 8. COMMON NEUTRALS: UNLESS OTHERWISE INDICATED, SHARING OF NEUTRAL/GROUNDED CONDUCTORS AMONG UP TO THREE SINGLE PHASE

B. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. C. PERFORM WORK IN ACCORDANCE WITH NECA 1 (GENERAL WORKMANSHIP). D. INSTALLATION IN RACEWAY: 1. TAPE ENDS OF CONDUCTORS AND CABLES TO PREVENT INFILTRATION OF MOISTURE AND OTHER CONTAMINANTS. 2. PULL ALL CONDUCTORS AND CABLES TOGETHER INTO RACEWAY AT SAME TIME.

IP

SELF-ADHESIVE BACKING OR EPOXY CEMENT.

3.03 FIELD QUALITY CONTROL

F. MARK ALL HANDWRITTEN TEXT, WHERE PERMITTED, TO BE NEAT AND LEGIBLE.

1. DO NOT USE ADHESIVES ON EXTERIOR SURFACES EXCEPT WHERE SUBSTRATE CANNOT BE PENETRATED.

E. INSTALL SELF-ADHESIVE LABELS AND MARKERS TO ACHIEVE MAXIMUM ADHESION, WITH NO BUBBLES OR WRINKLES AND EDGES PROPERLY SEALED.

END OF SECTION

A. REPLACE SELF-ADHESIVE LABELS AND MARKERS THAT EXHIBIT BUBBLES, WRINKLES, CURLING OR OTHER SIGNS OF IMPROPER ADHESION.

2.01 BOXES

FINISHED SURFACE.

IN SECTION 078400.

FUTURE USE.

3.03 CLEANING

O. CLOSE UNUSED BOX OPENINGS.

2. INSTALL BOXES IN COMBUSTIBLE MATERIALS SUCH AS WOOD SO THAT FRONT EDGE OF BOX OR ASSOCIATED RAISED COVER IS FLUSH WITH

M.INSTALL PERMANENT BARRIER BETWEEN GANGED WIRING DEVICES WHEN VOLTAGE BETWEEN ADJACENT DEVICES EXCEEDS 300 V.

ARE NO GAPS OR OPEN SPACES GREATER THAN 1/8 INCH AT THE EDGE OF THE BOX.

A. CLEAN INTERIOR OF BOXES TO REMOVE DIRT, DEBRIS, PLASTER AND OTHER FOREIGN MATERIAL

L. INSTALL BOXES AS REQUIRED TO PRESERVE INSULATION INTEGRITY.

R. IDENTIFY BOXES IN ACCORDANCE WITH SECTION 260553.

Q.PROVIDE GROUNDING AND BONDING IN ACCORDANCE WITH SECTION 260526.

3. REPAIR ROUGH OPENINGS AROUND BOXES IN NONCOMBUSTIBLE MATERIALS SUCH AS CONCRETE, TILE, GYPSUM, PLASTER, ETC. SO THAT THERE

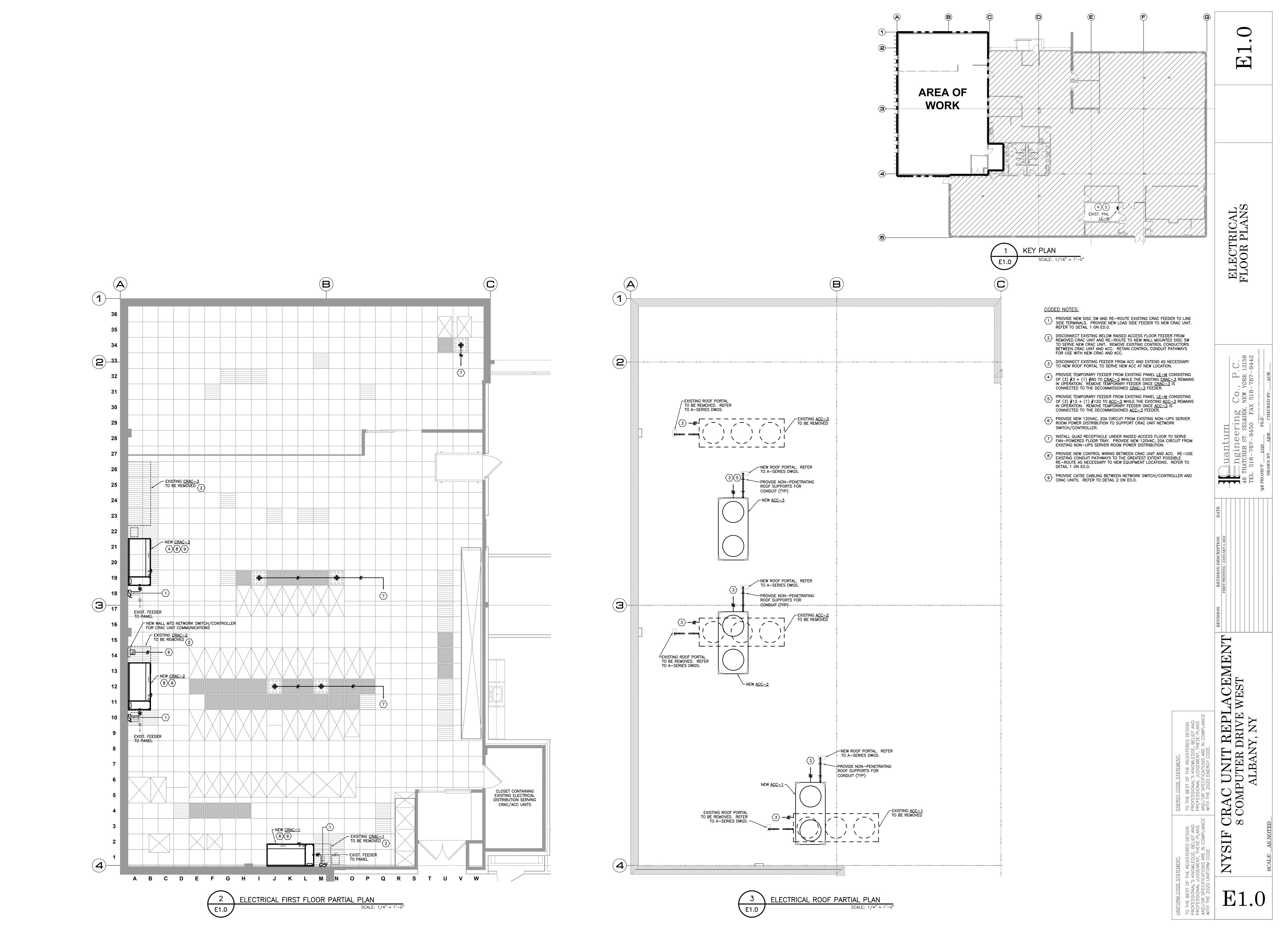
N. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS, USING MATERIALS AND METHODS SPECIFIED

P. INSTALL BLANK WALL PLATES ON JUNCTION BOXES AND ON OUTLET BOXES WITH NO DEVICES OR EQUIPMENT INSTALLED OR DESIGNATED FOR

A. IMMEDIATELY AFTER INSTALLATION, PROTECT BOXES FROM ENTRY OF MOISTURE AND FOREIGN MATERIAL UNTIL READY FOR INSTALLATION OF

END OF SECTION

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Project information.
- 2. Work covered by Contract Documents.
- 3. Phased construction.
- 4. Work performed by Owner.
- 5. Multiple Work Packages.
- 6. Work under Owner's separate contracts.
- 7. Future work not part of this Project.
- 8. Owner's product purchase contracts.
- 9. Owner-furnished/Contractor-installed (OFCI) products.
- 10. Owner-furnished/Owner-installed (OFOI) products.
- 11. Contractor-furnished/Owner-installed (CFOI) products.
- 12. Contractor's use of site and premises.
- 13. Coordination with occupants.
- 14. Work restrictions.
- 15. Specification and Drawing conventions.
- 16. Miscellaneous provisions.

B. Related Requirements:

- 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
- 2. Section 017300 "Execution" for coordination of Owner-installed products.

1.2 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.3 PROJECT INFORMATION

- A. Project Identification: NYSIF CRAC UNIT REPLACEMENT; SD929.
 - 1. Project Location: 8 Computer Drive West Albany, NY.

B. Owner:

1. Owner's Representative: Jessica Alber (jalber@nysif.com) (518-437-4651).

- C. Architect: Spring Line Design Architecture and Engineering; 73 Troy Road; East Greenbush, NY 12061; Tel: 518-487-4755; sld@springlinedesign.com.
- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
 - 1. Mechanical Consultant: Quantum Engineering, Co; P.C.
 - 2. constructor. The terms "design-builder" and "Contractor" are synonymous.
- E. Project Coordinator for Multiple Contracts: Owner shall serve as Project coordinator.
- F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - 1. <The existing building is classified as a Group B occupancy with Type II B construction type. The scope of the work is classified as alteration level 2. The scope of the project involves replacement of three CRAC units in a 3000 sqft server room, replacement of three ACC condenser units at the roof and other Work indicated in the Contract Documents.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: The awarded contractor will have the opportunity to subcontract but will not know what the Contractor will need to sub out until we receive the proposal. The awarded Contractor will perform or coordinate all of the work necessary to complete the project.

1.6 OWNER'S PRODUCT PURCHASE CONTRACTS

A. Owner has negotiated Product Purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Product Purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum unless otherwise indicated.

1. Contractor's responsibilities are same as if Contractor had negotiated Product Purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to Work in areas and areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits on Use of Site: Confine construction operations to areas indicated in the Contract Drawings.
 - 2. Driveways, Walkways and Entrances: Keep driveways **parking garage, loading areas,** and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. A remote area of the parking lot small parking area will be provided to the contractor for materials. The staging area will be identified prior to the start of work. During off hours, the parking lot is available. No parking available on site during normal business hours, however street parking is available. Parking lot is available for the contractor to utilize during off hours.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and **existing** building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
 - 3. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between **Friday 6** p.m. to **Monday 7** a.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: This work will be completed in one weekend.
 - 2. Work in Existing Building: Contractor is to sign in with security upon arrival. Any person working inside the building will be issued a temporary badge.
 - 3. Hours for Utility Shutdowns: The data center must remain fully functional; the AC's must be replaced 1 at a time with no more than 1 AC offline at any time.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify **Owner** not less than **5** days in advance with a project safety plan prior to the commencement of work.
 - 2. Contractor is to replace each roof top unit one at a time so there is no lapse in climate control in the server room.
- D. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building on Project site on Owner's property is not permitted.
- E. Employee Identification: **Owner will provid**e identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- F. Employee Screening: Comply with Owner's requirements for **Covid** screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

- 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
- 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
- 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

END OF SECTION 011000

New York State Insurance Fund CRAC Unit Replacement 8 Computer Dr. West, Albany, NY

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUBSTITUTION PROCEDURES

- A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A provided at the end of this Section.
 - 2. Submit requests within three days after the Notice of Award.
 - 3. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
- C. Architect will review proposed substitutions and notify Contractor of their acceptance or rejection by Change Order. If necessary, Architect will request additional information or documentation for evaluation.
 - 1. Architect will notify Contractor of acceptance or rejection of proposed substitution within five days of receipt of request, or three days of receipt of additional information or documentation, whichever is later.
- D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 CONTRACT MODIFICATION PROCEDURES

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.
- B. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work.
 - 1. Proposal Requests are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time.
- C. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
- D. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor, for all changes to the Contract Sum or the Contract Time.
- E. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Subcontract List: Submit a written summary identifying individuals or firms proposed for each portion of the Work.
- B. Key Personnel Names: Prior to starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. List email addresses and telephone numbers.
- C. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- D. Requests for Interpretation (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use forms included.
- E. Electronic Mail: Use electronic mail for purposes of managing project communication and documentation until Final Completion.

1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 2. Architect will discard submittals received from sources other than the Contractor.
- C. Paper Submittals: Place a permanent label or title block on each submittal for identification. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect. Include the following information on the label:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Contractor.
 - 4. Name and address of subcontractor or supplier.
 - 5. Number and title of appropriate Specification Section.

- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with unique identifier, including project identifier, Specification Section number, and revision identifier.
 - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
- E. Identify options requiring selection by Architect.
- F. Identify deviations from the Contract Documents on submittals.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections.
 - 1. Send electronic submittals as Portable Document Format (PDF) electronic files directly to the electronic mail account specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.2 SUBMITTALS

- A. Submit no less than three, but no more than five, paper copies of each submittal unless otherwise indicated. Architect will retain two copies.
- B. Product Data: Mark each copy to show applicable products and options. Include the following:
 - 1. Manufacturer's written recommendations, product specifications, and installation instructions.
 - 2. Wiring diagrams showing factory-installed wiring.
 - 3. Printed performance curves and operational range diagrams.
 - 4. Testing by recognized testing agency.
 - 5. Compliance with specified standards and requirements.

C. Initial Color Selection Submittals:

1. Color and pattern charts to be submitted in the same manner as paper submittals. Do not submit electronically.

- D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Include the following:
 - 1. Dimensions and identification of products.
 - 2. Fabrication and installation drawings and roughing-in and setting diagrams.
 - 3. Wiring diagrams showing field-installed wiring.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- E. Electronic Shop Drawings: Shop Drawings submitted electronic to be submitted full scale without reduction or enlargement of original shop drawing. All shop drawings to have a written scale or a graphic scale, and the minimum text size is to be 1/8" high.
- F. Samples: Submit three Samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label. Samples will not be returned unless noted otherwise in specification for each product.
- G. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

2.3 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

New York State Insurance Fund CRAC Unit Replacement 8 Computer Dr. West, Albany, NY

PART 3 - EXECUTION

3.1 SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Architect will review each submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp, and will mark stamp appropriately to indicate action.
- C. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.2 ACTION STAMPS

- A. Approved: Products, samples, or other submittals that are marked with an "Approved" stamp are approved as submitted by the Contractor for use in the Work provided it complies with the Contract Documents.
- B. Approved as Noted: Products, samples, or other submittals that are marked with an "Approved as Noted" stamp are approved with comments on the submittals. Such submittals may be used to complete the Work by the Contractor, provided it complies with the Contract Documents, and if the Contractor incorporates changes in the Work due to the reviewer's comments. If the Contractor disagrees with or cannot incorporate the changes then the Contractor must resubmit to the Architect.
- C. Returned for Corrections: Products, samples, or other submittals that are marked with a "Returned for Corrections" stamp are not approved and the reviewer has made comments regarding items that need correction before approval can be granted. The Contractor is to incorporate changes and provide missing items as requested by the reviewer and resubmit to the Architect.
- D. Disapproved: Products, samples, or other submittals that are marked with a "Disapproved" stamp are not approved and are not to be used in the Work. The Contractor will submit another product or information that meets the performance requirements of the specification.
- E. Acknowledged: Products, samples, or other submittals that are marked with an "Acknowledged" stamp are items that do not require the Architect's approval however they are stamped to indicate that the item has been received (for example: SDS sheets). No further submission is required.
- F. No Action Taken: Products, samples, or other submittals that are marked with a "No Action Taken" stamp are neither approved nor disapproved and the information bearing this stamp is not a required submittal.

END OF SECTION 013000

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Architect for a decision.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced.
 - 1. Show compliance with requirements for comparable product requests.
 - 2. Architect will review the proposed product and notify Contractor of its acceptance or rejection.
- C. Basis-of-Design Product Specification Submittal: Show compliance with requirements.
- D. Compatibility of Options: If Contractor is given option of selecting between two or more products, select product compatible with products previously selected.
- E. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 4. Store materials in a manner that will not endanger Project structure.
 - 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- F. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. Provide products that comply with the Contract Documents, are undamaged, and, unless otherwise indicated, are new at the time of installation.
 - 1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
 - 2. Where products are accompanied by the term "as selected," Architect will make selection.
 - 3. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Where the following headings are used to list products or manufacturers, the Contractor's options for product selection are as follows:

1. Products:

- a. Where requirements include "one of the following," provide one of the products listed that complies with requirements.
- b. Where requirements do not include "one of the following," provide one of the products listed that complies with requirements or a comparable product.

2. Manufacturers:

- a. Where requirements include "one of the following," provide a product that complies with requirements by one of the listed manufacturers.
- b. Where requirements do not include "one of the following," provide a product that complies with requirements by one of the listed manufacturers or another manufacturer.
- 3. Basis-of-Design Product: Provide the product named, or indicated on the Drawings, or a comparable product by one of the listed manufacturers.
- C. Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Architect will consider Contractor's request for comparable product when the following conditions are satisfied:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

- 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications.
- 3. List of similar installations for completed projects, if requested.
- 4. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 EXECUTION REQUIREMENTS

A. Cutting and Patching:

- 1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- 2. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.2 CLOSEOUT SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- B. Operation and Maintenance Data: Submit one copy of manual.
- C. PDF Electronic File: Assemble manual into a composite electronically indexed file. Submit on digital media.
- D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

- A. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
- B. Submittals Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other sections, including project record documents, operation and maintenance manuals, property surveys, similar final record information, warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit maintenance material submittals specified in other sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner.

- C. Procedures Prior to Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner.
 - 3. Participate with Owner in conducting inspection and walkthrough with local authorities having jurisdiction.
 - 4. Remove temporary facilities and controls.
 - 5. Complete final cleaning requirements, including touchup painting.
 - 6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will proceed with inspection or advise Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.

1.4 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment.
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare final Certificate for Payment after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

New York State Insurance Fund CRAC Unit Replacement 8 Computer Dr. West, Albany, NY

B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

2.2 OPERATION AND MAINTENANCE DOCUMENTATION

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize manual into separate sections for each system and subsystem, and separate sections for each piece of equipment not part of a system.
- C. Organize data into three-ring binders with identification on front and spine of each binder, and envelopes for folded drawings. Include the following:
 - 1. Manufacturer's operation and maintenance documentation.
 - 2. Maintenance and service schedules.
 - 3. Maintenance service contracts. Include name and telephone number of service agent.
 - 4. Emergency instructions.
 - 5. Spare parts list and local sources of maintenance materials.
 - 6. Wiring diagrams.
 - 7. Copies of warranties. Include procedures to follow and required notifications for warranty claims

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Existing Conditions: The existence and location utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of utilities, mechanical and electrical systems, and other construction affecting the Work.
- B. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Verify compatibility with and suitability of substrates.
 - 2. Examine roughing-in for mechanical and electrical systems.
 - 3. Examine walls, floors, and roofs for suitable conditions.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

E. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.2 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations.
- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.
- E. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
- F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Use products, cleaners, and installation materials that are not considered hazardous.

3.3 CUTTING AND PATCHING

- A. Provide temporary support of work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Cutting: Cut in-place construction using methods least likely to damage elements retained or adjoining construction.
 - 1. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- D. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.

- 2. Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance.
- 3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

3.4 CLEANING

- A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
 - 3. Remove debris from concealed spaces before enclosing the space.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
 - 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 - 3. Remove labels that are not permanent.
 - 4. Clean transparent materials. Remove excess glazing compounds.
 - 5. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
 - 6. Vacuum carpeted surfaces and wax resilient flooring.
 - 7. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and foreign substances. Clean light fixtures, lamps, globes, and reflectors.

3.5 OPERATION AND MAINTENANCE MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are unavailable and where the information is necessary for proper operation and maintenance of equipment or systems.

New York State Insurance Fund CRAC Unit Replacement 8 Computer Dr. West, Albany, NY

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams.

3.6 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
 - 1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION 017000