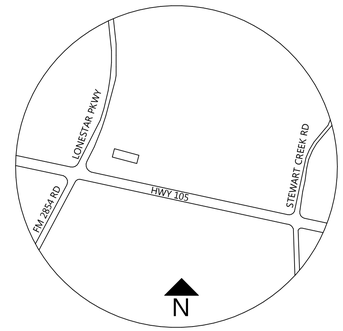
SOLIS MAMMOGRAPHY - MONTGOMERY CONROE

INTERIOR BUILD-OUT

20042 EVA STREET, SUITE 104
MONTGOMERY, TX 77356



RS&H JOB NO.: 512-1792-002
ISSUE DATE: JULY 06, 2018
TDLR # EABPRJB882162
NOT FOR CONSTRUCTION

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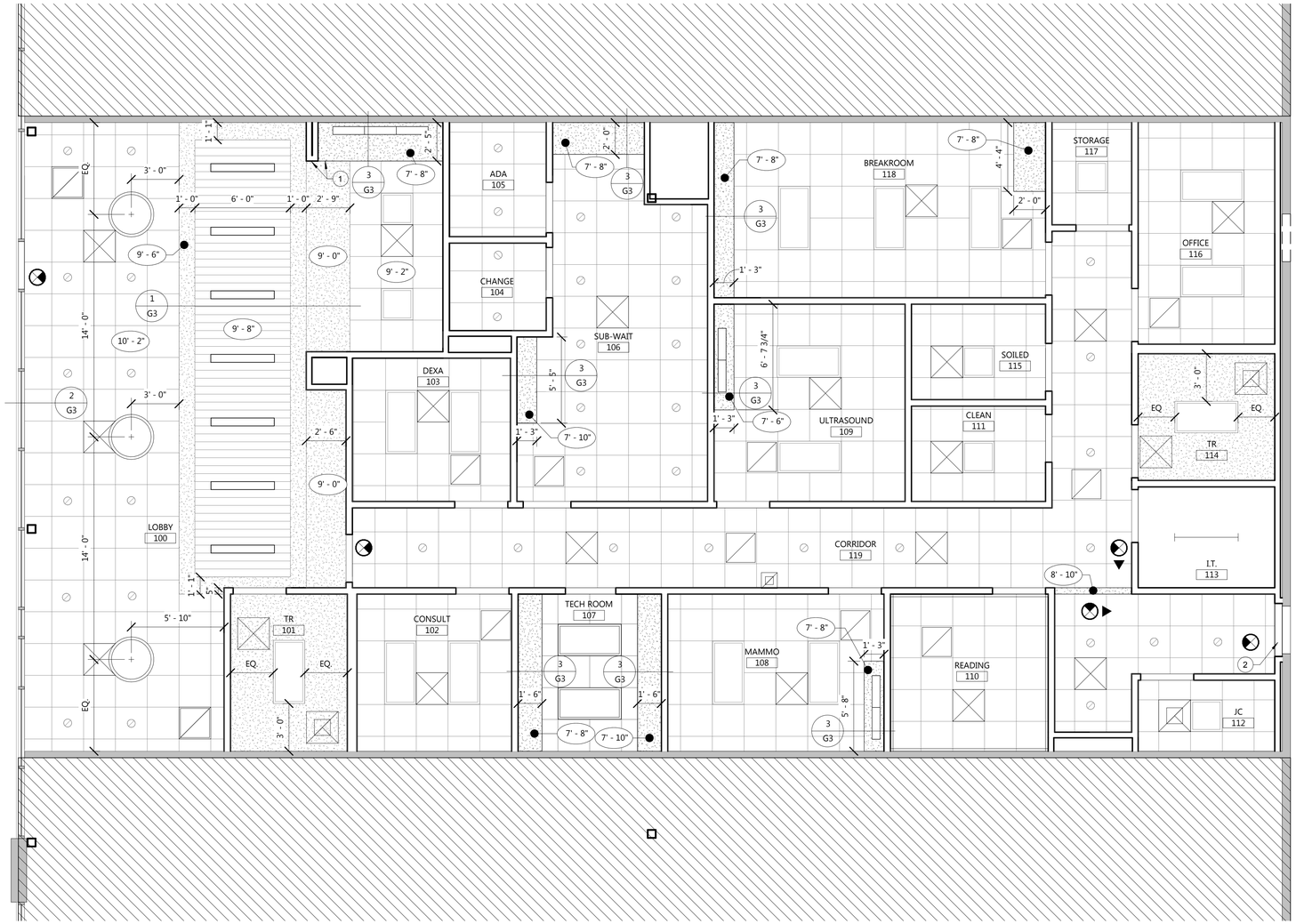
07/05/18

ARCHITECTURE | ENGINEERING | CONSULTING RS&H



T.N.

1 / A2 CEILING PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. ALL DIMENSIONS ARE TO FINISH FACE OF PARTITION UNLESS OTHERWISE NOTED.
2. ALL CEILING HEIGHTS ARE 9'-0" UNLESS OTHERWISE NOTED.
3. ALL ANGLES SHALL BE 45, 90, 135 DEGREES UNLESS NOTED OTHERWISE ON PLAN.
4. CEILING FINISHES TO BE SPECIFIED ON PLANS AND IN FINISH SPECIFICATIONS.
5. G.C. SHALL COORDINATE FIRE PROTECTION, HVAC, ELECTRICAL SYSTEMS, AND FIRE ALARM SYSTEMS LOCATED IN CEILING. RELOCATE OR INSTALL NEW AS REQUIRED. PROCURE PERMITS FOR THIS WORK AS REQUIRED. NOTIFY ARCHITECT IF INFORMATION FROM THAT GIVEN.
6. IF ANY LIGHT FIXTURE CANNOT BE INSTALLED DUE TO CONFLICTS WITH BEAMS, HVAC, PIPING, ETC., CLARIFY WITH ARCHITECT BEFORE PROCEEDING WITH FIXTURES IN QUESTION OR RELATED FIXTURES IN AREA, HVAC, PIPING, ETC., TO BE DESIGNED TO WORK WITH LIGHT FIXTURE OF LOCATIONS GIVEN.
7. ALL 2x4 RECESSED LIGHT FIXTURES SHALL REST ON TWO (2) MAIN "T"s OR CONTRACTOR SHALL PROVIDE SUPPORT AS NECESSARY AT FREE CORNERS OF FIXTURE.
8. EXIT LIGHTS AND EMERGENCY LIGHTING TO BE INSTALLED PER CODE REQUIREMENTS. LOCATIONS TO BE APPROVED BY ARCHITECT. REFER TO ELECTRICAL DRAWINGS.
9. G.C. SHALL NOTE ANY CONFLICTS OCCURRING AMONG ELECTRICAL, FIRE PROTECTION, ARCHITECTURAL, OR MECHANICAL TRADES AND DRAWINGS. G.C. SHALL INFORM ARCHITECT OF CONFLICTS PRIOR TO START OF WORK IN A ROOM OR AREA.
10. G.C. TO INSTALL DETECTORS AND STROBES AS NECESSARY TO ACCOMODATE TENANT'S NEW CONSTRUCTION IN ACCORDANCE WITH LOCAL FIRE SAFETY REQUIREMENTS.
11. G.C. SHALL INSTALL AIR GRILLS AND DUCTWORK AS REQUIRED BY NEW PARTITION LAYOUT. G.C. SHALL BE RESPONSIBLE FOR PROVIDING REQUIRED C.F.M. TO EACH SPACE.
12. G.C. SHALL PROVIDE TESTING. TEST AND BALANCE REPORT IS REQUIRED.
13. SOUND ATTENUATION INSULATION USED ABOVE THE FINISHED CEILING SHALL BE 24" X 48", 3" UN-FACED MINERAL FIBER DESIGNED TO ABSORB SOUND AND BE SPECIFICALLY MANUFACTURED FOR USE ABOVE SUSPENDED CEILINGS. SEE PARTITION TYPES FOR LOCATION.
14. CELING USED AS RETURN AIR PLENUM. FLAME SPREAD AND SMOKE DEVELOPMENTRATINGS SHALL BE 25 AND 50 MAXIMUM RESPECTIVELY.

SHEET NOTES

1. ALIGN FACE OF SOFFIT WITH FACE OF ADJACENT PARTITION.
2. PROVIDE GYPSUM BOARD RETURN AT TOP OF EXISING DOOR FRAME.
3. ALIGN VERTICAL FACE OF SOFFITT WITH ADJACENT WALL FACE.

LEGEND

- LAY IN LIGHT FIXTURE
- DOWNLIGHT FLUSH RECESSED FIXTURE
- DECORATIVE PENDANT FIXTURE
- EXIT LIGHT WITH DIRECTIONAL ARROWS
- LIGHT FIXTURE MOUNTED ON UNDERSIDE OF CABINET
- LIGHT FIXTURE MOUNTED IN METALWORKS CEILING
- HVAC GRILL - SUPPLY
- HVAC GRILL - RETURN
- SUSPENDED LINEAR LIGHT FIXTURE

RS&H

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Texas Registration Nos. BR751 * F-3401

SOLIS MAMMOGRAPHY - MONTGOMERY CONROE

20042 EVA STREET, SUITE 104
MONTGOMERY , TX 77356

THESE DRAWINGS ARE NOT APPROVED UNLESS SIGNED AND SEALED BELOW.

REGISTERED ARCHITECT
DANIEL E. DARILEK
26257
STATE OF TEXAS

JULY 05, 2018

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED:	**JULY 06, 2018**
REVIEWED BY:	**DED**
DRAWN BY:	**LM**
DESIGNED BY:	**RS&H**

AEP PROJECT NUMBER
512-1792-002

SHEET TITLE

CEILING PLAN

SHEET NUMBER

A2

NOT FOR CONSTRUCTION

GENERAL NOTES:

1. ALL WORK SHALL COMPLY WITH THE CURRENT INTERNATIONAL BUILDING, MECHANICAL, AND PLUMBING CODES, AND APPLICABLE NFPA CODES.
2. COORDINATE MECHANICAL WORK WITH THAT OF OTHER TRADES IN ORDER TO AVOID INTERFERENCE AND MAINTAIN CLEARANCES. COORDINATE WITH BUILDING OWNER'S ROOFING CONTRACTOR FOR ROOFING IN NEW CURBS, VENTS, AND OTHER ROOF PENETRATIONS OR ROOF-MOUNTED EQUIPMENT.
3. FURNISH APPROVED OPERATING INSTRUCTIONS FOR ALL NEW EQUIPMENT. THE OPERATING INSTRUCTIONS SHALL INCLUDE WIRING DIAGRAMS, CONTROL SCHEMATICS, AND MAINTENANCE REQUIREMENTS FOR EACH SYSTEM.
4. WHERE INSTALLATION PROCEDURES OR ANY PART THEREOF ARE REQUIRED TO BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, FURNISH PRINTED COPIES OF THE RECOMMENDATIONS PRIOR TO INSTALLATION.
5. ALL EQUIPMENT AND MATERIALS PROVIDED FOR THIS PROJECT SHALL BE NEW AND FREE FROM DEFECTS.
6. PROVIDE PERMANENT IDENTIFICATION PLATES FOR ALL EQUIPMENT AND PLASTIC PIPE MARKERS ON ALL PIPING SYSTEMS. PROVIDE VALVE TAGS FOR ALL VALVES. DUCTWORK JACKETS AND SIMILAR FINISHES MAY BE IDENTIFIED WITH STENCIL PAINTING.
7. PROVIDE SLEEVES FOR ALL DUCTWORK AND PIPING PENETRATIONS. PLACE SLEEVES PRIOR TO COMPLETION OF NEW CONSTRUCTION WHERE POSSIBLE.
8. ALL PENETRATIONS AND OPENINGS IN FIRE-RATED WALLS OR OTHER CONSTRUCTION SHALL BE CLOSED AND SEALED WITH AN APPROVED FIRESTOPPING MATERIAL IN ACCORDANCE WITH UL FIRE RESISTANCE DIRECTORY DETAILS AND PRODUCT MANUFACTURER'S INSTRUCTIONS.
9. SELECT AND INSTALL PIPE SUPPORTS AND ANCHORS IN ACCORDANCE WITH MSS SP 58 AND SP 69. PROVIDE SINGLE OR MULTIPLE HANGERS AS APPROPRIATE. PROVIDE HANGERS WITH ADJUSTABLE MEANS FOR CONTROLLING THE LEVEL OR SLOPE OF PIPES.
10. PROVIDE ELASTOMERIC PADS BENEATH ALL PAD MOUNTED EQUIPMENT WITH ROTATING PARTS, INCLUDING CONDENSING UNITS. PADS SHALL BE 5/16-INCH MINIMUM THICKNESS WAFFLED OR RIBBED NEOPRENE. PROVIDE 3/8-INCH THICK NEOPRENE AND ABS STRIPS (KELLET LP-13 OR EQUAL) FOR CURB-MOUNTED ROOFTOP UNITS.
11. ROOFTOP UNITS, AIR HANDLERS, AND CONDENSING UNITS SHALL HAVE INTERNAL VIBRATION ISOLATION FOR FANS AND COMPRESSORS, UTILIZING OPEN-SPRING OR NEOPRENE ISOLATORS, FREESTANDING AND LATERALLY STABLE WITH NO HOUSING.
12. ALL PIPE INSULATION WITHIN THE BUILDING SHALL BE ASTM C547, CLASS 1 PREFORMED FIBERGLASS PIPE INSULATION WITH AN ALL-SERVICE VAPOR-BARRIER JACKET. 1/2-INCH THICK FOR PIPE SIZES UP TO AND INCLUDING 1-1/4 INCHES. MAXIMUM FLAME-SPREAD/SMOKE-DEVELOPED RATING SHALL BE 25/50 WHEN TESTED IN ACCORDANCE WITH ASTM E-84. ASTM C534, TYPE I FLEXIBLE UNICELLULAR INSULATION, 3/4-INCH THICK, MAY BE USED IN EXTERIOR LOCATIONS ONLY. PROVIDE A UV-RESISTANT COATING OR JACKET ON ALL EXTERIOR INSULATION.
13. INSULATE ALL DUCTWORK, PLENUMS, FAN CABINETS AND EQUIPMENT CASINGS EXCLUDING PRE-INSULATED FLEXIBLE DUCTS AND PRE-INSULATED EQUIPMENT. INSULATE THE BACKS OF SUPPLY AIR DIFFUSERS AND GRILLES.
14. INSULATION FOR DUCTS AND DIFFUSERS SHALL BE 2-INCH THICK ASTM C553, TYPE I, CLASS B-4, 1-1/2 LBI/CU FT DENSITY FLEXIBLE FIBERGLASS BLANKET WITH FSK JACKET. ALL SEAMS, JOINTS AND PUNCTURES IN EXTERNAL INSULATION JACKET SHALL BE SEALED WITH GLASS-REINFORCED FABRIC AND VAPOR-BARRIER MASTIC.
15. CONDENSATE DRAIN PIPING FOR HVAC EQUIPMENT SHALL BE TYPE DWV COPPER TUBING, ASTM B306, DRAWN TEMPER, WITH ASME B16.29 WROUGHT-COPPER, SOLDER-JOINT, DWV DRAINAGE FITTINGS.
16. REFRIGERANT PIPING FOR HVAC SYSTEMS SHALL BE SEAMLESS COPPER TUBING, ASTM B280, TYPE ACR, HARD-DRAWN, STRAIGHT LENGTHS AND SOFT-ANNEALED COILS. FITTINGS SHALL BE WROUGHT-COPPER, ANSI B16.22, STREAMLINED PATTERN. BRAZING FILLER METAL SHALL BE AWS A5.8, CLASSIFICATION BAG-1 (SILVER). INSTALL REFRIGERANT PIPING IN ACCORDANCE WITH ASHRAE STANDARD 15. ARRANGE PIPING TO ALLOW NORMAL INSPECTION AND SERVICING OF COMPRESSOR AND OTHER EQUIPMENT. INSTALL VALVES AND SPECIALTIES IN ACCESSIBLE LOCATIONS. PROVIDE LIQUID AND SUCTION SERVICE PORTS AND ISOLATION VALVES FOR EACH CIRCUIT. INSPECT, TEST, AND PERFORM CORRECTIVE ACTION OF REFRIGERANT PIPING IN ACCORDANCE WITH ASME CODE B31.5, CHAPTER VI. REPAIR LEAKING JOINTS USING NEW MATERIALS, AND RETEST FOR LEAKS. THOROUGHLY DRY AND EVACUATE PIPING SYSTEMS BEFORE CHARGING.
17. HVAC EQUIPMENT SHALL BE UL APPROVED, EQUAL TO THAT SCHEDULED ON THE DRAWINGS. ALL EQUIPMENT SHALL BE FACTORY TESTED. SYSTEMS SHALL COMPLY WITH ARI STANDARD 210. CONDENSING UNITS SHALL BE FACTORY-ASSEMBLED, PRE-PIPED AND PRE-WIRED UNITS SUITABLE FOR OUTDOOR USE CONSISTING OF COATED CALVANIZED STEEL CABINET, HERMETIC SCROLL COMPRESSOR(S), COPPER-TUBE CONDENSING COIL, ALUMINUM PROPELLAR FAN(S), INTEGRAL SUBCOOLING CIRCUIT(S), REFRIGERANT PIPING, REFRIGERATION SPECIALTIES, AND CONTROLS. PROVIDE FULL 5-YEAR PARTS AND LABOR WARRANTY ON AIR-CONDITIONING COMPRESSORS. INSTALLER SHALL ANCHOR CONDENSING-UNIT TO CONCRETE PAD.
18. ALL EQUIPMENT SHALL HAVE DISCONNECTS AND OVERCURRENT PROTECTION AS REQUIRED BY THE NATIONAL ELECTRICAL CODE. COORDINATE WITH WORK OF DIVISION 26.
19. ALL DUCTWORK SHALL BE GALVANIZED STEEL, CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE. FLEXIBLE DUCTS AND DUCT CONNECTORS SHALL BE UL-181, CLASS 1 WITH FLAME-SPREAD/SMOKE-DEVELOPED RATINGS OF 25/50 OR LESS, FABRICATED WITH METAL HELIX REINFORCEMENT AND MINIMUM R-6 INSULATION BETWEEN FIRE-RETARDANT INNER LINER AND GLASS TAPE, AND NYLON HANGING CORD. SECURE FLEXIBLE DUCT TO COLLAR OR SLEEVE WITH DUCT SEALER, 1/2-INCH CLAMPS AND SHEET METAL SCREWS. SECURE INSULATION COVER WITH GLASS FABRIC AND MASTIC. PROVIDE RIGID ROUND DUCTS WHERE RUNOUT LENGTHS EXCEED 8 FEET. PROVIDE LISTED GAS VENT FOR WATER HEATER, INCLUDING ROOF THIMBLE AND CAP.
20. MANUAL VOLUME-CONTROL DAMPERS SHALL HAVE MINIMUM 16-GAUGE GALVANIZED-STEEL FRAMES AND MINIMUM 20-GAUGE FORMED BLADES. GALVANIZED STEEL AXLE SHALL HAVE BEARINGS AT BOTH ENDS AND SHAFT SHALL EXTEND SO THAT OPERATOR CLEARS EXTERNAL INSULATION. PROVIDE INDICATING QUADRANT AND LOCKING DEVICE. USE SINGLE-BLADE DAMPERS FOR WIDTHS UP TO 8 INCHES AND OPPOSED-BLADE DESIGN FOR SIZES ABOVE 8 INCHES.
21. FABRICATE TURNING VANES ACCORDING TO SMACNA HVAC DUCT CONSTRUCTION STANDARDS, FIGURES 2-2 THROUGH 2-7.
22. FLEXIBLE DUCT CONNECTORS SHALL BE FABRICATED OF FLAME-RETARDED OR NONCOMBUSTIBLE FABRICS, COATINGS, AND ADHESIVES COMPLYING WITH UL STANDARD 181, CLASS 1, WITH METAL-EDGED CONNECTORS. PROVIDE FLEXIBLE DUCT CONNECTORS AT CONNECTION OF NEW DUCTWORK TO FAN TERMAINL UNITS.
23. AIR DEVICES SHALL BE EQUAL TO PRODUCTS SCHEDULED. TEST AND RATE AIR OUTLETS AND INLETS IN ACCORDANCE WITH ARI 650 "STANDARD FOR AIR OUTLETS AND INLETS". MOUNTINGS SHALL BE LAY-IN TYPE FOR ACOUSTICAL PANEL CEILINGS AND SURFACE-MOUNT WITH 1-1/4 INCH BORDER FOR GYPSUM-BOARD CEILINGS (REFER TO REFLECTED CEILING PLANS) OR WALLS. LOUVERS SHALL BE ALUMINUM EXTRUSIONS, ASTM B 221, ALLOY 6063-T52, WITH INDICATED AIRFLOW AND ZERO WATER PENETRATION AT 700 FEET PER MINUTE. PROVIDE LOUVERS WITH FRAME AND SILL STYLES THAT ARE COMPATIBLE WITH ADJACENT SUBSTRATE AND MANUFACTURED TO FIT INTO WITH ACCURATE FIT AND ADEQUATE SUPPORT. PROVIDE 1/4-INCH SQUARE MESH ANODIZED ALUMINUM WIRE SCREENS MOUNTED IN REMOVABLE EXTRUDED ALUMINUM FRAMES.
24. PROVIDE TEST AND BALANCE OF ALL HVAC SYSTEMS BY AN INDEPENDENT TEST AND BALANCE FIRM, WHO IS NEBB OR AABC CERTIFIED WITH A MINIMUM OF 5 YEARS EXPERIENCE. TESTING, ADJUSTING AND BALANCING SHALL CONFORM TO ASHRAE, ANSI AND EITHER NEBB "PRODEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OR ENVIRONMENTAL SYSTEMS" OR AABC MN-1 "NATIONAL STANDARDS", AS APPLICABLE TO MECHANICAL AIR DISTRIBUTION SYSTEMS, ASSOCIATED EQUIPMENT AND APPARATUS.

TYPICAL DRAWING SYMBOLS ALL MECHANICAL DRAWINGS

SYMBOL	DESCRIPTION
S1 200 8"Ø — DIFFUSER MARK, AIR QUANTITY (CFM), NECK SIZE	AIR DEVICE DESIGNATION
	SUPPLY GRILLE
	RETURN GRILLE
	EXHAUST GRILLE
	SUPPLY AIR ELBOW DOWN
	SUPPLY AIR ELBOW UP
	RETURN AIR AIR ELBOW DOWN
	RETURN AIR AIR ELBOW UP
	EXHAUST AIR ELBOW DOWN
	EXHAUST AIR ELBOW UP
	MANUAL VOLUME DAMPER
FD	FIRE DAMPER
DN	ROUND DUCT OFF-SET UP (UP) OR (DN)
UP	RECTANGULAR DUCT OFF-SET UP (UP) OR (DN)
	RECTANGULAR TO ROUND TRANSITION
	DUCT SIZE TRANSITION
24"Ø	LOW AND MEDIUM VELOCITY ROUND DUCT SIZE
24"X12"	LOW AND MEDIUM VELOCITY RECTANGULAR DUCT SIZE FIRST NUMBER INDICATES SIZE FOR SIDE SHOWN. SIZES INDICATED ARE FREE AREA DIMENSIONS.
	TEE WITH SINGLE THICKNESS AIRFOIL TYPE TURNING VANES
	TEE, BRANCH TAKE-OFF (RECTANGULAR TO RECTANGULAR) (RETURN & EXHAUST ONLY)
	45° RECTANGULAR BRANCH TAKE-OFF TO DIFFUSER (TAP OUT OF BOTTOM OF BRANCH)
	90° ELBOW WITH SINGLE THICKNESS TYPE TURNING VANES
	45° ELBOW WITH SINGLE THICKNESS TYPE TURNING VANES
	FLEXIBLE DUCT & DIFFUSER
R	DUCT RISE (R) OR DROP (D) IN DIRECTION OF AIR FLOW (SINGLE LINE & DOUBLE LINE SYMBOLS)

AHU-1	EQUIPMENT MARK NO. SEE EQUIPMENT SCHEDULES
	CONNECT TO EXISTING
	DEMO LIMIT
1	MECHANICAL KEYED NOTE

A / M401 — LETTERS FOR DIAGRAMS & SECTIONS. NUMBERS FOR DETAILS & FLOOR PLANS; SHEET ON WHICH SECTION OR DETAIL IS ACTUALLY DETAILED; SECTION & DETAIL SYMBOL

MECHANICAL LEGEND

ABBREVIATION	SYMBOL	DESCRIPTION
CD	CD	CONDENSATE DRAIN
RL/RS	RL/RS	REFRIGERANT LIQUID AND SUCTION
		(ONE LINE SHOWN FOR CLARITY)
	T	THERMOSTAT, 4'-0" AFF
	S	TEMPERATURE SENSOR, 4'-0" AFF
	SD	DUCT SMOKE DETECTOR

CODES AND STANDARDS

THE FOLLOWING CODES, INCLUDING LOCAL AMENDMENTS ADOPTED BY THE CITY OF MONTGOMERY, TEXAS APPLY TO THIS PROJECT:

2015 INTERNATIONAL BUILDING CODE AND LOCAL AMENDMENTS
2015 INTERNATIONAL FIRE CODE AND LOCAL AMENDMENTS
2015 INTERNATIONAL FUEL GAS CODE AND LOCAL AMENDMENTS
2015 INTERNATIONAL MECHANICAL CODE AND LOCAL AMENDMENTS
2015 INTERNATIONAL PLUMBING CODE AND LOCAL AMENDMENTS
2015 INTERNATIONAL ENERGY CONSERVATION CODE AND LOCAL AMENDMENTS
TAS STATE OF TEXAS ACCESSIBILITY STANDARDS

CONDENSATE DRAIN SIZING CHART

EQUIPMENT CAPACITY IN TONS OF REFRIGERATION	MINIMUM PIPE DIAMETER IN INCHES
UP TO 10 TONS	0.75
11-40	1.00
41-90	1.25
91-125	1.50
126-250	2.00

COMcheck Software Version 4.1.0.0

Mechanical Compliance Certificate

Project Information

Energy Code: 2015 IECC
Project Title: Solis Mammography Montgomery Conroe Lakes
Location: Montgomery, Texas
Climate Zone: 2a
Project Type: Alteration

Construction Site: 20042 Eva Street, Suite 104 Montgomery, TX
Owner/Agent:
Designer/Contractor:

Mechanical Systems List

Quantity System Type & Description

1 RTU-1 (Multiple-Zone):
Heating: 1 each - Unit Heater, Electric, Capacity = 75 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Single Package DX Unit, Capacity = 128 kBtu/h, Air-Cooled Condenser, Air Economizer
Proposed Efficiency = 12.10 EER, Required Efficiency: 11.20 EER + 12.8 IEER
Fan System: RTU-1 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 1 Supply, Multi-Zone VAV, 3150 CFM, 3.0 motor nameplate hp, 0.0 fan efficiency grade

1 Water Heater 1:
Electric Storage Water Heater, Capacity: 20 gallons w/ Circulation Pump
No minimum efficiency requirement applies

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2015 IECC requirements in COM*check* Version 4.1.0.0 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

MECHANICAL SYSTEMS ABBREVIATION SCHEDULE

ABV	ABOVE	DX	DIRECT EXPANSION	GA	GAUGE	SA	SUPPLY AIR
AP	ACCESS PANEL	EF	EXHAUST FAN	HP	HORSEPOWER	SF	SUPPLY FAN
ADJ	ADJUSTABLE	EXA	EXHAUST AIR	KW	KILOWATTS	SS	STAINLESS STEEL
AFF	ABOVE FINISHED FLOOR	EA	EACH	LAT	LEAVING AIR TEMPERATURE	T	TEMPERATURE SENSOR
AHU	AIR HANDLING UNIT	EAT	ENTERING AIR TEMPERATURE	MAX	MAXIMUM	TA	TRANSFER AIR
BD	BELT DRIVE	EDH	ELECTRIC DUCT HEATER	MIN	MINIMUM	TG	TRANSFER GRILLE
BLDG	BUILDING	EER	ENERGY EFFICIENCY RATIO	MVD	MANUAL VOLUME DAMPER	TEFC	TOTALLY ENCLOSED FAN COOLED
BHP	BRAKE HORSEPOWER	EG	EXHAUST GRILLE	NEC	NATIONAL ELECTRIC CODE	TEMP	TEMPERATURE
BTUH	BRITISH THERMAL UNIT / HOUR	ELEC	ELECTRICAL	NTS	NOT TO SCALE	TYP	TYPICAL
C/C	COOLING COIL	ENT	ENTERING	OA	OUTSIDE AIR	UH	UNIT HEATER
CFM	CUBIC FEET PER MINUTE	EQ	EQUAL	OBD	OPPOSED BLADE DAMPER	VAV	VARIABLE AIR VOLUME
CLG	CEILING	ERV	ENERGY RECOVERY VENTILATOR	OP	OPERATING	VFD	VARIABLE FREQUENCY DRIVE
COND	CONDITION	EXT	EXTERNAL	PD	PRESSURE DROP	V-PH-HZ	VOLTS-PHASE-HERTZ
CONT	CONTINUOUS	F	FAHRENHEIT	PSI	POUNDS PER SQUARE INCH	W	WATTS
COP	COEFFICIENT OF PERFORMANCE	FF	FINAL FILTER	REQD	REQUIRED	W/	WITH
CU	CONDENSING UNIT	FL	FLOOR	RG	RETURN GRILLE	W/O	WITHOUT
DB	DRYBULB	FLEX	FLEXIBLE CONNECTION	RH	RELATIVE HUMIDITY	WB	WETBULB
DD	DIRECT DRIVE	FTU	FAN POWERED VAV TERMINAL UNIT	RPM	REVOLUTIONS PER MINUTE	WWF	WOVEN WIRE FABRIC
DWG	DRAWING	FPM	FEET PER MINUTE	RA	RETURN AIR	RS	REFRIGERANT SENSOR

RS&H

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STATE OF TEXAS — BRETT A. METCALF — 118833 — LICENSED PROFESSIONAL ENGINEER — 7/5/18

JULY 05, 2018

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED:	JULY 06, 2018
REVIEWED BY:	BAM
DRAWN BY:	SBA
DESIGNED BY:	SBA

AEP PROJECT NUMBER
512-1792-002

SHEET TITLE

MECHANICAL NOTES, LEGEND, ABBREVIATIONS

SHEET NUMBER

M0

NOT FOR CONSTRUCTION

SECTION 23 HEATING, VENTILATION, AND AIR CONDITIONING:

23 05 00 COMMON WORK RESULTS FOR HVAC

GENERAL REQUIREMENTS

REQUIREMENTS UNDER DIVISION ONE AND THE GENERAL AND SUPPLEMENTARY CONDITIONS OF THESE SPECIFICATIONS SHALL BE PART OF THIS SECTION. CONTRACTOR SHALL BECOME THOROUGHLY ACQUAINTED WITH ITS CONTENTS AS TO REQUIREMENTS THAT AFFECT THIS DIVISION OR SECTION. THE WORK REQUIRED UNDER THIS SECTION INCLUDES MATERIAL, EQUIPMENT, APPLIANCES, TRANSPORTATION, SERVICES, AND LABOR REQUIRED TO COMPLETE THE ENTIRE SYSTEM AS REQUIRED BY THE DRAWINGS AND SPECIFICATIONS.

THE SPECIFICATIONS AND DRAWINGS FOR THE PROJECT ARE COMPLEMENTARY AND PORTIONS OF THE WORK DESCRIBED IN ONE SHALL BE PROVIDED AS IF DESCRIBED IN BOTH. IN THE EVENT OF DISCREPANCIES, NOTIFY THE ENGINEER AND REQUEST CLARIFICATION PRIOR TO PROCEEDING WITH THE WORK INVOLVED.

DEFINITIONS

FURNISH: THE TERM "FURNISH" IS USED TO MEAN "SUPPLY AND DELIVER TO THE PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION, AND SIMILAR OPERATIONS.

INSTALL: THE TERM "INSTALL" IS USED TO DESCRIBE OPERATIONS AT THE PROJECT SITE INCLUDING THE ACTUAL UNLOADING, UNPACKING, ASSEMBLY, ERECTION, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING, AND SIMILAR OPERATIONS.

PROVIDE: THE TERM "PROVIDE" MEANS TO FURNISH, TRANSPORT, INSTALL, CONNECT, WARRANT, AND START-UP INCLUSIVELY.

FURNISHED BY OWNER OR FURNISHED BY OTHERS: THE ITEM WILL BE FURNISHED BY THE OWNER OR OTHERS. IT IS TO BE INSTALLED AND CONNECTED UNDER THE REQUIREMENTS OF THIS DIVISION, COMPLETE AND READY FOR OPERATION, INCLUDING ITEMS INCIDENTAL TO THE WORK, INCLUDING SERVICES NECESSARY FOR PROPER INSTALLATION AND OPERATION. THE INSTALLATION SHALL BE INCLUDED UNDER THE GUARANTEE REQUIRED BY THIS DIVISION.

ENGINEER: WHERE REFERENCED IN THIS DIVISION, "ENGINEER" IS THE ENGINEER OF RECORD AND THE DESIGN PROFESSIONAL FOR THE WORK UNDER THIS DIVISION, AND IS A CONSULTANT TO AND AN AUTHORIZED REPRESENTATIVE OF, THE ARCHITECT, AS DEFINED IN THE GENERAL AND/OR SUPPLEMENTARY CONDITIONS. WHEN USED IN THIS DIVISION, IT MEANS INCREASED INVOLVEMENT BY, AND OBLIGATIONS TO, THE ENGINEER IN ADDITION TO INVOLVEMENT BY, AND OBLIGATIONS TO, THE "ARCHITECT".

AHJ: THE LOCAL CODE AND/OR INSPECTION AGENCY (AUTHORITY) HAVING JURISDICTION OVER THE WORK.

THE TERMS "APPROVED EQUAL", "EQUIVALENT", OR "EQUAL" ARE USED SYNONYMOUSLY AND SHALL MEAN ACCEPTED BY OR ACCEPTABLE TO THE ENGINEER AS EQUIVALENT TO THE ITEM OR MANUFACTURER SPECIFIED. THE TERM "APPROVED" SHALL MEAN LABELED, LISTED, OR BOTH BY A NATIONALLY RECOGNIZED TESTING LABORATORY (E.G. UL, ETL C6A) AND ACCEPTABLE TO THE AHJ OVER THIS PROJECT.

MATERIAL AND WORKMANSHIP

THE DRAWINGS ARE DIAGRAMMATIC BUT ARE REQUIRED TO BE FOLLOWED AS CLOSELY AS ACTUAL CONSTRUCTION AND WORK OF OTHER TRADES WILL PERMIT. DATA INDICATED ON THE DRAWINGS AND IN THESE SPECIFICATIONS ARE AS EXACT AS COULD BE SECURED, BUT THEIR ABSOLUTE ACCURACY IS NOT WARRANTED. BRANCH CIRCUITS, PIPING ARRANGEMENTS, AND MECHANICAL AND ELECTRICAL COMPONENT LOCATIONS AND THE LIKE HAVE BEEN DESIGNED FOR ECONOMY CONSISTENT WITH GOOD PRACTICE AND OTHER CONSIDERATIONS.

PROVIDE NEW MATERIAL, EQUIPMENT, AND APPARATUS UNDER THIS CONTRACT UNLESS OTHERWISE STATED HERIN, OF BEST QUALITY NORMALLY USED FOR THE PURPOSE IN GOOD COMMERCIAL PRACTICE, AND FREE FROM DEFECTS. MODEL NUMBERS LISTED IN SPECIFICATIONS OR SHOWN ON THE DRAWINGS ARE NOT NECESSARILY INTENDED TO DESIGNATE THE REQUIRED TRIM. WRITTEN DESCRIPTIONS OF THE TRIM GOVERN MODEL NUMBERS.

PIPE, PIPE FITTINGS, PIPE SPECIALTIES, AND VALVES SHALL BE MANUFACTURED IN PLANTS LOCATED IN THE UNITED STATES OR CERTIFIED TO MEET THE SPECIFIED ASTM AND ANSI STANDARDS.

WORK PERFORMED UNDER THIS CONTRACT SHALL PROVIDE A NEAT AND "WORKMANLIKE" APPEARANCE WHEN COMPLETED, TO THE SATISFACTION OF THE ARCHITECT AND ENGINEER. WORKMANSHIP SHALL BE THE FINEST POSSIBLE BY EXPERIENCED MECHANICS. INSTALLATIONS SHALL COMPLY WITH APPLICABLE CODES AND LAWS.

A. DISABLED PERSONS AND ADA REQUIREMENTS

1. THE PLANS AND SPECIFICATIONS HAVE BEEN PREPARED IN ACCORDANCE WITH THE ENGINEER'S INTERPRETATIONS OF THE APPLICABLE PROVISIONS OR REGULATIONS, CODES, AND ORDINANCES REGARDING DISABLED PERSONS. IT IS ASSUMED THAT THE CONTRACTOR IS ALSO KNOWLEDGEABLE OF THE SAME AND THEIR APPLICATION WITH REGARD TO HIS WORK.

2. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE TYPE OF EQUIPMENT BEING INSTALLED AND ITS LOCATION, MOUNTING HEIGHT, AND CLEARANCES AS PRESCRIBED BY ALL APPLICABLE DISABILITY REGULATIONS, CODES, AND ORDINANCES PRIOR TO PLACING EQUIPMENT ORDERS AND PRIOR TO INSTALLATION OF ALL WORK.

THE COMPLETE INSTALLATION SHALL FUNCTION AS DESIGNED AND INTENDED WITH RESPECT TO EFFICIENCY, CAPACITY, NOISE LEVEL, ETC. ABNORMAL NOISE CAUSED BY RATTLING EQUIPMENT, PIPING, DUCTS, AIR DEVICES, AND SQUEAKS IN ROTATING COMPONENTS WILL NOT ACCEPTABLE. IN GENERAL, MATERIALS AND EQUIPMENT SHALL BE OF COMMERCIAL SPECIFICATION GRADE IN QUALITY. LIGHT DUTY AND RESIDENTIAL TYPE EQUIPMENT WILL NOT BE ACCEPTED.

REMOVE FROM THE PREMISES WASTE MATERIAL PRESENT AS A RESULT OF WORK INCLUDING CARTONS, CRATING, PAPER, STICKERS, AND/OR EXCAVATION MATERIAL NOT USED IN BACKFILLING, ETC. CLEAN EQUIPMENT UNDER THIS CONTRACT TO PRESENT A NEAT AND CLEAN INSTALLATION AT THE TERMINATION OF WORK.

THE CONTRACTOR SHALL TAKE PROPER PRECAUTIONS TO PROTECT ANY EXISTING CONSTRUCTION AND ADJACENT PROPERTY, WITH WHICH WORK COMES IN CONTACT, AND OVER WHICH HE MAY TRANSPORT, HOIST OR MOVE MATERIALS, EQUIPMENT, DEBRIS, ETC., AND SHALL REPAIR OR REPLACE ALL DAMAGES AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT TO THE SATISFACTION OF AUTHORITIES AND REGULATIONS HAVING JURISDICTION.

PROVIDE PERMANENT IDENTIFICATION PLATES FOR ALL EQUIPMENT AND PLASTIC PIPE MARKERS ON ALL PIPING SYSTEMS. PROVIDE VALVE TAGS FOR ALL VALVES. DUCTWORK JACKETS AND SIMILAR FINISHES MAY BE IDENTIFIED WITH STENCIL PAINTINGS.

COORDINATION

COORDINATE WORK WITH THAT OF OTHER TRADES SO THAT THE VARIOUS COMPONENTS OF THE SYSTEMS WILL BE INSTALLED AT THE PROPER TIME, WILL FIT THE AVAILABLE SPACE, AND WILL ALLOW PROPER SERVICE ACCESS TO THOSE ITEMS REQUIRING MAINTENANCE. COMPONENTS WHICH ARE INSTALLED WITHOUT REGARD TO THE ABOVE SHALL BE RELOCATED AT NO ADDITIONAL COST TO THE OWNER.

IN THE CASE WHERE TWO OR MORE TRADES OR CONTRACTORS ARE INVOLVED IN THE INSTALLATION OF ANY ITEM, ALL SUCH PERSONS SHALL BE RESPONSIBLE FOR COORDINATING THEIR WORK AMONG THEMSELVES TO PROVIDE A COMPLETE, FUNCTIONING INSTALLATION.

UNLESS OTHERWISE INDICATED, THE GENERAL CONTRACTOR WILL PROVIDE CHASES AND OPENINGS IN BUILDING CONSTRUCTION REQUIRED FOR INSTALLATION OF THE SYSTEMS SPECIFIED HERIN. CONTRACTOR SHALL FURNISH THE GENERAL CONTRACTOR WITH INFORMATION WHERE CHASES AND OPENINGS ARE REQUIRED, KEEP INFORMED AS TO THE WORK OF OTHER TRADES ENGAGED IN THE CONSTRUCTION OF THE PROJECT, AND EXECUTE WORK IN A MANNER AS TO NOT INTERFERE WITH OR DELAY THE WORK OF OTHER TRADES.

FIGURED DIMENSIONS SHALL BE TAKEN IN REFERENCE TO SCALE DIMENSIONS. CONTRACTOR SHALL TAKE HIS OWN MEASUREMENTS AT THE BUILDING, AS VARIATIONS MAY OCCUR. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ERRORS THAT COULD HAVE BEEN AVOIDED BY PROPER CHECKING AND INSPECTION.

PROVIDE MATERIALS WITH TRIM THAT WILL PROPERLY FIT THE TYPES OF CEILING, WALL, OR FLOOR FINISHES ACTUALLY INSTALLED. MODEL NUMBERS LISTED IN THE SPECIFICATIONS OR SHOWN ON THE DRAWINGS ARE NOT INTENDED TO DESIGNATE THE REQUIRED TRIM.

UNLESS DETAILED OTHERWISE MAINTAIN A MINIMUM CLEARANCE FOR LIGHTS OF 7" ABOVE FINISHED CEILINGS AND 1" MINIMUM BELOW ALL DUCTS, PIPES, CONDUIT, OR ANY OTHER EQUIPMENT IN THE CEILING SPACE. PROVIDE MANUFACTURER'S RECOMMENDED SERVICE ACCESS CLEARANCE AT ALL EQUIPMENT.

ORDINANCES AND CODES

WORK PERFORMED UNDER THIS CONTRACT SHALL, AT A MINIMUM, BE IN CONFORMANCE WITH APPLICABLE NATIONAL, STATE, AND LOCAL CODES HAVING JURISDICTION. EQUIPMENT FURNISHED AND ASSOCIATED INSTALLATION WORK PERFORMED UNDER THIS CONTRACT SHALL BE IN STRICT COMPLIANCE WITH CURRENT APPLICABLE CODES AND STANDARDS ADOPTED BY THE LOCAL AHJ INCLUDING AND AMENDMENTS AND STANDARDS AS SET FORTH BY THE NATION FIRE PROTECTION ASSOCIATION (NFPA), UNDERWRITERS LABORATORIES (UL), OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME), AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE), AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN SOCIETY OF TESTING MATERIALS (ASTM), AND OTHER NATIONAL STANDARDS AND CODES WHERE APPLICABLE. WHERE THE CONTRACT DOCUMENTS EXCEED THE REQUIREMENTS OF THE REFERENCED CODES, STANDARDS, ETC., THE CONTRACT DOCUMENTS SHALL TAKE PRECEDENCE.

PROCURE AND PAY FOR PERMITS AND LICENSES REQUIRED FOR THE ACCOMPLISHMENT OF THE WORK HERIN DESCRIBED. WHERE REQUIRED, OBTAIN, PAY FOR, AND FURNISH CERTIFICATES OF INSPECTION TO OWNER. CONTRACTOR WILL BE HELP RESPONSIBLE FOR VIOLATIONS OF THE LAW.

PROTECTION OF EQUIPMENT AND MATERIALS

STORE AND PROTECT FROM DAMAGE, EQUIPMENT AND MATERIALS DELIVERED TO JOB SITE. COVER WITH WATERPROOF, TEAR RESISTANT, HEAVY TARP OR POLYETHYLENE PLASTIC AS REQUIRED TO PROTECT FROM PLASTER, DIRT, PAINT, WATER OR PHYSICAL DAMAGE. EQUIPMENT AND MATERIAL THAT HAS BEEN DAMAGED BY CONSTRUCTION ACTIVITIES WILL BE REJECTED, AND CONTRACTOR IS OBLIGATED TO FURNISH NEW EQUIPMENT AND MATERIAL OF A LIKE KIND.

KEEP PREMISES BROOM CLEAN FROM FOREIGN MATERIAL CREATED DURING WORK PERFORMED UNDER THIS CONTRACT. PIPING, EQUIPMENT, ETC. SHALL HAVE A NEAT AND CLEAN APPEARANCE AT THE TERMINATION OF THE WORK.

PLUG OR CAP OPEN END OF DUCTWORK AND PIPING SYSTEMS WHILE STORED AND INSTALLED DURING CONSTRUCTION WHEN NOT IN USE TO PREVENT THE ENTRANCE OF DEBRIS INTO THE SYSTEMS.

SUBSTITUTIONS

THE BASE BID SHALL INCLUDE ONLY THE PRODUCTS FROM MANUFACTURERS SPECIFICALLY NAMED IN THE DRAWINGS AND SPECIFICATIONS. NO SUBSTITUTION WILL BE CONSIDERED PRIOR TO RECEIPT OF BIDS UNLESS WRITTEN REQUEST FOR APPROVAL TO BID HAS BEEN RECEIVED BY THE ENGINEER AT LEAST TEN CALENDAR DAYS PRIOR TO THE DATE FOR RECEIPT OF BIDS. EACH SUCH REQUEST SHALL INCLUDE THE NAME OF THE MATERIAL OR EQUIPMENT FOR WHICH IS TO BE SUBSTITUTED AND A COMPLETE DESCRIPTION OF THE PROPOSED SUBSTITUTE INCLUDING DRAWINGS, CUTS, PERFORMANCE, AND TEST DATA AND OTHER INFORMATION NECESSARY FOR AN EVALUATION. A STATEMENT SETTING FORTH CHANGES IN OTHER MATERIALS, EQUIPMENT, OR OTHER WORK THAT INCORPORATION OF THE MERIT OF THE PROPOSED SUBSTITUTE IS UPON THE PROPOSER. THE ENGINEER'S DECISION OF APPROVAL OR DISAPPROVAL TO BID OF A PROPOSED SUBSTITUTION SHALL BE FINAL.

THE TERMS "APPROVED", "APPROVED EQUAL", AND "EQUAL" REFERS TO APPROVAL BY THE ENGINEER AS AN ACCEPTABLE ALTERNATE BID. NO SUBSTITUTIONS WILL BE CONSIDERED THAT ARE NOT AS AN ALTERNATE. NO MATERIAL SUBSTITUTIONS SHALL BE CONSIDERED FOR APPROVAL PRIOR TO AWARD OF CONTRACT.

COORDINATE AND VERIFY WITH OTHER TRADES WHETHER OR NOT THE SUBSTITUTED EQUIPMENT CAN BE INSTALLED AS SHOWN ON THE CONSTRUCTION DRAWINGS WITHOUT MODIFICATION TO ASSOCIATED SYSTEMS OR ARCHITECTURAL OR ENGINEERING DESIGN. INCLUDE ADDITIONAL COSTS FOR ARCHITECTURAL AND ENGINEERING DESIGN FEES IN BID IF DRAWING MODIFICATIONS ARE REQUIRED BECAUSE OF SUBSTITUTES EQUIPMENT.

COORDINATE EQUIPMENT SUBSTITUTIONS FOR THE SCHEDULED OR SPECIFIED ITEM WITH ALL OTHER TRADES. COMPENSATION TO OTHER TRADES DUE TO CHANGES IN RATED VOLTAGE, PHASE, PHYSICAL SIZE, ARRANGEMENTS, SHAPE, COLOR, AND ALL OTHER CHARACTERISTICS AND THEIR RELATED EFFECTS ARISING FROM EQUIPMENT SUBSTITUTIONS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR MAKING THE CHANGE.

SHOP DRAWINGS

UPON BEING AWARDED A CONTRACT, SUBMIT TO THE ARCHITECTS FOR APPROVAL, ELECTRONIC COPIES OF MANUFACTURER'S SHOP DRAWINGS FOR EQUIPMENT TO BE FURNISHED UNDER THIS CONTRACT, ITEMS REQUIRING COORDINATION BETWEEN CONTRACTORS, AND SHEET METAL DUCTWORK FABRICATION DRAWINGS. BEFORE SUBMITTING SHOP DRAWINGS AND MATERIALS LISTS, VERIFY THAT EQUIPMENT SUBMITTED IS MUTUALLY COMPATIBLE AND SUITABLE FOR THE INTENDED USE, AND WILL FIT THE AVAILABLE SPACE AND ALLOW AMPLE ROOM FOR MAINTENANCE. HIGHLIGHT, MARK, LIST, OR INDICATE THE MATERIALS, PERFORMANCE CRITERIA, AND ACCESSORIES THAT ARE BEING PROPOSED. SUBMIT SHOP DRAWINGS AS EARLY AS REQUIRED TO SUPPORT THE PROJECT SCHEDULE.

FOR ELECTRONIC SUBMITTALS, CONTRACTOR SHALL SUBMIT THE DOCUMENTS IN ACCORDANCE WITH THE PROCEDURES SPECIFIED IN DIVISION 1. CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER THAT THE SHOP DRAWINGS HAVE BEEN POSTED. FOR SUBMITTALS SENT BY E-MAIL, CONTRACTOR SHALL COPY THE ARCHITECT AND ENGINEER'S DESIGNATED REPRESENTATIVES. CONTRACTOR SHALL ALLOW THE ENGINEER REVIEW TIME AS SPECIFIED ABOVE IN THE CONSTRUCTION SCHEDULE. CONTRACTOR SHALL SUBMIT ONLY THE DOCUMENTS REQUIRED TO PURCHASE THE MATERIALS AND/OR EQUIPMENT IN THE ELECTRONIC SUBMITTAL AND SHALL CLEARLY INDICATE THE MATERIALS, PERFORMANCE CRITERIA, AND ACCESSORIES BEING PROPOSED. GENERAL PRODUCT CATALOG DATA NOT SPECIFICALLY NOTED TO BE PART OF THE SPECIFIED PRODUCT WILL BE REJECTED AND RETURNED WITHOUT REVIEW.

LABEL THE CATALOG DATA WITH THE EQUIPMENT IDENTIFICATION ACRONYM OR NUMBER AS USED ON THE DRAWINGS AND INCLUDE PERFORMANCE CURVES, CAPACITIES, SIZES, WEIGHTS, MATERIALS, FINISHES, WIRING DIAGRAMS, ELECTRICAL REQUIREMENTS, AND DEVIATIONS FROM SPECIFIED EQUIPMENT OR MATERIALS. FOR EQUIPMENT WITH MOTOR STARTERS OR VFDs, INCLUDE SHORT CIRCUIT CURRENT RATINGS. MARK OUT INAPPLICABLE ITEMS. SHOP DRAWINGS WILL BE RETURNED WITHOUT REVIEW IF THE ABOVE MENTIONED REQUIREMENTS ARE NOT MET.

OPERATION AND MAINTENANCE INSTRUCTIONS

DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPILE A COMPLETE ELECTRONIC BROCHURE OF EQUIPMENT FURNISHED AND INSTALLED ON THIS PROJECT. INCLUDE OPERATIONAL AND MAINTENANCE INSTRUCTIONS, MANUFACTURER'S CATALOG SHEETS, WIRING DIAGRAMS, PARTS LISTS, APPROVED SHOP DRAWINGS, AND DESCRIPTIVE LITERATURE AS FURNISHED BY THE EQUIPMENT MANUFACTURER. INCLUDE AN INSIDE COVER SHEET THAT LISTS THE PROJECT NAME, DATE, OWNER, ARCHITECT, CONSULTING ENGINEER, GENERAL CONTRACTOR, SUB-CONTRACTOR, AND AN INDEX OF CONTENTS.

SUBMIT COPIES OF LITERATURE BOUND IN ELECTRONIC FORMAT WITH TABLE OF CONTENTS TO THE ARCHITECT AND OWNER AT THE TERMINATION OF THE WORK. FINAL APPROVAL OF MECHANICAL SYSTEMS INSTALLED UNDER THIS CONTRACT WILL BE WITHHELD UNTIL THIS EQUIPMENT BROCHURE IS RECEIVED AND DEEMED COMPLETE BY THE ARCHITECT AND ENGINEER. INSTRUCT WORKMAN TO SAVE REQUIRED LITERATURE SHIPPED WITH THE EQUIPMENT ITSELF, FOR INCLUSION IN THIS BROCHURE.

PROVIDE "AS-BUILT" DRAWINGS (SEE DIVISION 1 AND GENERAL CONDITIONS).

SPARE PARTS

FURNISH OWNER, WITH RECEIPT, THE FOLLOWING SPARE PARTS FOR THE EQUIPMENT FURNISHED FOR THIS PROJECT:

A. ONE SET OF SPACE FILTERS OF EACH TYPE REQUIRED FOR EACH UNIT. IN ADDITION TO THE SPARE SET OF FILTERS, INSTALL NEW FILTERS PRIOR TO TESTING, ADJUSTING, AND BALANCING WORK AND BEFORE TURNING SYSTEM OVER TO OWNER.

B. FURNISH ONE COMPLETE SET OF BELTS FOR EACH FAN AS REQUIRED.

WARRANTIES

WARRANT EACH SYSTEM AND EACH ELEMENT THEROF AGAINST ALL DEFECTS DUE TO FAULTY WORKMANSHIP, DESIGN, OR MATERIAL FOR A PERIOD OF 12 MONTHS FROM DATE OF SUBSTANTIAL COMPLETION, UNLESS SPECIFIC ITEMS ARE NOTED TO CARRY A LONGER WARRANTY IN THE CONSTRUCTION DOCUMENTS OR MANUFACTURER'S STANDARD WARRANTY EXCEEDS 12 MONTHS. REMEDY ALL DEFECTS, OCCURRING WITHIN THE WARRANTY PERIOD, AS STATED IN THE GENERAL CONDITIONS AND DIVISION 1.

WARRANTIES SHALL INCLUDE LABOR AND MATERIAL. MAKE REPAIRS AND REPLACEMENTS WITHOUT ANY ADDITIONAL COSTS TO THE OWNER.

PERFORM THE REMEDIAL WORK PROMPTLY, UPON WRITTEN NOTICE FROM THE ENGINEER OR OWNER.

AT THE TIME OF SUBSTANTIAL COMPLETION, DELIVER TO THE OWNER ALL WARRANTIES, IN WRITING AND PROPERLY EXECUTED, INCLUDING TERM LIMITS FOR WARRANTIES EXTENDING BEYOND THE ONE YEAR PERIOD, EACH WARRANTY INSTRUMENT BEING ADDRESSED TO THE OWNER AND STATING THE COMMENCEMENT DATE AND TERM.

CUTTING AND PATCHING

PERFORM CUTTING OF WALLS, FLOORS, CEILINGS, ETC. AS REQUIRED TO INSTALL WORK UNDER THIS SECTION. DO NOT CUT OR DISTURB STRUCTURAL MEMBERS WITHOUT PRIOR APPROVAL. CUT HOLES AS SMALL AS POSSIBLE. GENERAL CONTRACTOR SHALL PATCH WALLS, FLOORS, ETC. AS REQUIRED BY WORK UNDER THIS SECTION. PATCHING SHALL MATCH THE ORIGINAL MATERIAL AND CONSTRUCTION. REPAIR AND REFINISH AREAS DISTURBED BY WORK TO THE CONDITIONS OF ADJOINING SURFACES IN A MANNER SATISFACTORY TO THE ARCHITECT.

ROUGH-IN

COORDINATE WITHOUT DELAY ROUGHING-IN GENERAL CONSTRUCTION. CONCEAL PIPING AND CONDUIT ROUGH-IN EXCEPT IN FINISHED AREAS AND WHERE OTHERWISE SHOWN.

MAKE WRITTEN NOTICE TO THE ARCHITECT/ENGINEER ADEQUATELY IN ADVANCE OF WHEN ROUGH-INS ARE COMPLETE BUT NOT COVERED.

STRUCTURAL STEEL

STRUCTURAL STEEL USED FOR SUPPORT OF EQUIPMENT, DUCTWORK, AND PIPING SHALL BE NEW, CLEAN, AND CONFORM TO ASTM DESIGNATION A-36.

SUPPORT MECHANICAL COMPONENTS FROM THE BUILDING STRUCTURE. DO NOT SUPPORT MECHANICAL COMPONENTS FROM CEILINGS, OTHER MECHANICAL OR ELECTRICAL COMPONENTS, AND OTHER NON-STRUCTURAL ELEMENTS.

PENETRATIONS

SEAL ROOF PENETRATIONS WATERTIGHT AND WEATHERTIGHT WITH NON-SHRINK, NON-HARDENING COMMERCIAL SEALANT. PACK WITH MINERAL WOOL AND SEAL BOTH ENDS WITH MINIMUM OF 1/2" OF SEALANT.

SEAL AROUND PENETRATIONS OF FIRE RATED ASSEMBLIES. COORDINATE FIRE RATINGS AND LOCATIONS WITH THE ARCHITECTURAL DRAWINGS. REFER T ARCHITECTURAL SPECIFICATIONS FOR FIRE STOPPING. PROVIDE A PRODUCT SCHEDULE FOR UL LISTING, LOCATION, WALL, OR FLOOR RATING AND INSTALLATION DRAWING FOR EACH PENETRATION FIRE STOP SYSTEM.

EXTEND PIPE INSULATION FOR INSULATED PIPE THROUGH FLOOR, WALL, AND ROOF PENETRATIONS, INCLUDING FIRE RATED WALLS AND FLOORS. THE VAPOR BARRIER SHALL BE MAINTAINED. SIZE SLEEVE FOR MINIMUM OF 1" ANNULAR CLEAR SPACE BETWEEN INSIDE OF SLEEVE AND OUTSIDE OF INSULATION.

MOTORS AND STARTERS

PROVIDE MOTORS AND STARTING EQUIPMENT WHERE NOT FURNISHED WITH THE EQUIPMENT PACKAGE. MOTORS SHALL HAVE COPPER WINDINGS, CLASS B INSULATION, AND STANDARD SQUIRREL CAGE WITH STARTING TORQUE CHARACTERISTICS SUITABLE FOR THE EQUIPMENT SERVED. MOTORS CONTROLLED BY VARIABLE FREQUENCY DRIVES SHALL BE RATED FOR VOLTAGE PEAKS AND MINIMUM RISE TIMES IN ACCORDANCE WITH NEMA MG1, PART 31. MOTORS FOR AIR HANDLING EQUIPMENT SHALL BE SELECTED FOR QUIET OPERATION. EACH MOTOR SHALL BE CHECKED FOR PROPER ROTATION AFTER ELECTRICAL CONNECTION HAS BEEN COMPLETED. PROVIDE DRIP-PROOF ENCLOSURE FOR LOCATIONS PROTECTED FROM WEATHER AND NOT IN AIR STREAM OF FAN; AND TOTALLY ENCLOSED FAN COOLED ENCLOSURE FOR MOTORS EXPOSED TO WEATHER. MOTORS SHALL BE MANUFACTURED BY CENTURY, GENERAL ELECTRIC, WESTINGHOUSE, OR APPROVED EQUAL.

PROVIDE EVERY MOTOR, EXCEPT FRACTIONAL HORSEPOWER SINGLE PHASE MOTORS WITH AN APPROVED TYPE OF "BUILT-IN" THERMAL OVERLOAD PROTECTION, WITH A MOTOR STARTER. EACH STARTER SHALL BE PROVIDED WITH OVERLOAD HEATERS SIZED TO THE MOTOR RATINGS, AND EVERY THREE PHASE MOTOR STARTER SHALL HAVE OVERLOAD HEATERS IN EACH PHASE. AMBIENT COMPENSATED HEATERS SHALL BE INSTALLED WHEREVER NECESSARY. UNLESS NOTED OTHERWISE, MOTOR STARTERS SHALL BE FURNISHED BY DIVISION 23 CONTRACTOR FOR INSTALLATION AND CONNECTION BY THE DIVISION 26 CONTRACTOR. STARTERS SHALL BE ALLEN-BRADLEY, CLARK, FURNAS, SQUARE D, OR APPROVED EQUAL.

PROVIDE ELASTOMERIC PADS BENEATH ALL PAD MOUNTED EQUIPMENT WITH ROTATING PARTS, INCLUDING CONDENSING UNITS. PADS SHALL BE 5/16" MINIMUM THICKNESS WAFFLED OR RIBBED NEOPRENE. PROVIDE 3/8" THICK NEOPRENE AND ABS STRIPS (KELLET LP-113 OR EQUAL) FOR CURB-MOUNTED ROOFTOP UNITS.

ELECTRICAL WIRING

LINE VOLTAGE WIRING SHALL BE PROVIDED BY DIVISION 26. LINE VOLTAGE CONTROL AND INTERLOCK WIRING FOR MECHANICAL SYSTEMS SHALL ALSO BE PROVIDED BY DIVISION 26 CONTRACTOR. LOW VOLTAGE CONTROL WIRING SHALL BE PROVIDED BY THE DIVISION 23 CONTRACTOR. FURNISH WIRING DIAGRAMS TO THE DIVISION 26 CONTRACTOR AS REQUIRED FOR PROPER EQUIPMENT HOOKUP. COORDINATE WITH THE DIVISION 26 CONTRACTOR THE ACTUAL WIRE SIZING AMPS FOR MECHANICAL EQUIPMENT (FROM THE EQUIPMENT NAMEPLATE) TO ENSURE PROPER INSTALLATION.

REFRIGERANT AND OIL

PROVIDE FULL REFRIGERANT AND OIL CHARGE IN NEW AIR CONDITIONING REFRIGERATION SYSTEMS, AND MAINTAIN IT FOR FULL TERM OF GUARANTEE.

UPON COMPLETION OF WORK:

THOROUGHLY CLEAN ALL EXPOSED PORTIONS OF THE MECHANICAL AND ELECTRICAL EQUIPMENT, EQUIPMENT PROVIDED, AND THE GENERAL AREA WHERE WORK WAS PERFORMED. REMOVE ALL TRACES OF SOIL, LABELS, GREASE, OIL, AND OTHER FOREIGN MATERIALS USING ONLY THE TYPE CLEANER RECOMMENDED BY THE MANUFACTURER OF ANY ITEM BEING CLEANED.

PROVIDE MANUFACTURER'S OPERATING AND MAINTENANCE INSTRUCTIONS TO THE OWNER'S REPRESENTATIVE FOR ALL MAJOR MECHANICAL AND ELECTRICAL EQUIPMENT PROVIDED. PROVIDE 4 HOURS OF FORMAL TRAINING (2 HOURS ON TWO DIFFERENT DAYS) TO OWNER'S MAINTENANCE PERSONNEL IN ORDER TO FAMILIARIZE THEM WITH THE SYSTEM OPERATION AND REQUIRED PERIODIC MAINTENANCE.

DOCUMENTATION OF ANY TEST AND THE "AS-BUILT" RECORD DRAWINGS SHALL BE PROVIDED TO THE BUILDING OWNER AND TENANT UPON COMPLETION.

23 05 29 HANGERS AND SUPPORTS

DESIGN SUPPORTS FOR MULTIPLE PIPES CAPABLE OF SUPPORTING COMBINED WEIGHT OF SUPPORTED SYSTEMS, SYSTEM CONTENTS, AND TEST WATER. DESIGN EQUIPMENT SUPPORTS CAPABLE OF SUPPORTING COMBINED OPERATING WEIGHT OF SUPPORTED EQUIPMENT AND CONNECTED SYSTEMS AND COMPONENTS. DESIGN SEISMIC-RESTRAINT HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT AND OBTAIN APPROVAL FROM AUTHORITIES HAVING JURISDICTION.

STEEL PIPE HANGERS AND SUPPORTS

MSS SP-58, TYPES 1 THROUGH 58, FACTORY-FABRICATED COMPONENTS. PROVIDE STEEL PIPE HANGERS AND SUPPORTS (SUBJECT TO COMPLIANCE) BY A SINGLE MANUFACTURER BY AAA TECHNOLOGY & SPECIALTIES CO, B-LINE SYSTEMS, EMPIRE INDUSTRIES, ERICO/MICHIGAN HANGER CO, GLOBE PIPE HANGER PRODUCTS, GRINNELL CORP, NATIONAL PIPE HANGER CORPORATION, PHD MANUFACTURING, PHS INDUSTRIES, OR PIPING TECHNOLOGY & PRODUCTS. GALVANIZED OR METALLIC COATINGS SHALL BE PREGALVANIZED OR HOT DIPPED. NONMETALLIC COATINGS SHALL BE PLASTIC COATING, JACKET, OR LINER. PADDED HANGERS SHALL BE WITH FIBERGLASS OR OTHER PIPE INSULATION PAD OR CUSHION FOR SUPPORT OF BEARING SURFACE OF PIPING.

FASTENER SYSTEMS

POWDER-ACTUATED FASTENERS: THREADED-STEEL STUD, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH PULL-OUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED. PROVIDE POWDER-ACTUATED FASTENERS (SUBJECT TO COMPLIANCE) BY A SINGLE MANUFACTURER BY HILTI, ITW RAMSET/RED HEAD, MASTERSET FASTENING SYSTEMS, MKT FASTENING, OR POWERS FASTENERS.

MECHANICAL-EXPANSION ANCHORS: INSERT-WEDGE-TYPE ZINC-COATED OR STAINLESS STEEL, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH PULL-OUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED. PROVIDE POWDER-ACTUATED FASTENERS (SUBJECT TO COMPLIANCE) BY A SINGLE MANUFACTURER BY B-LINE SYSTEMS, EMPIRE INDUSTRIES, HILTI, OR ITW RAMSET/RED HEAD.

EQUIPMENT SUPPORTS: WELDED, SHOP OR FIELD-FABRICATED EQUIPMENT SUPPORT MADE FROM STRUCTURAL-STEEL SHAPES.

MISCELLANEOUS MATERIALS

STRUCTURAL STEEL SHALL BE ASTM A 36, STEEL PLATES, SHAPES, AND BARS; BLACK AND GALVANIZED. GROUT SHALL BE ASTM C 1107, FACTORY-MIXED AND -PACKAGED, DRY, HYDRAULIC-CEMENT, NONSHRINK AND NONMETALLIC GROUT; SUITABLE FOR INTERIOR AND EXTERIOR APPLICATIONS. NON-STAINING, NONCORROSIVE, AND NONGASEOUS. 5000-PSI, 28-DAY COMPRESSIVE STRENGTH MIX.

APPLICATIONS

USE HANGERS AND SUPPORTS WITH GALVANIZED, METALLIC COATINGS FOR PIPING AND EQUIPMENT THAT WILL NOT HAVE FIELD-APPLIED FINISH. USE NONMETALLIC COATINGS ON ATTACHMENTS FOR ELECTROLYTIC PROTECTION WHERE ATTACHMENTS ARE IN DIRECT CONTACT WITH COPPER TUBING. USE PADDED HANGERS FOR PIPING THAT IS SUBJECT TO SCRATCHING. HORIZONTAL-PIPING HANGERS AND SUPPORTS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES: ADJUSTABLE, STEEL CLEVIS HANGERS (MSS TYPE 1): FOR SUSPENSION OF NONINSULATED OR INSULATED STATIONARY PIPES, NPS 1/2 TO NPS 8. ADJUSTABLE, STEEL BAND HANGERS (MSS TYPE 7): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 1/2 TO NPS 8.

VERTICAL-PIPING CLAMPS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES: EXTENSION PIPE OR RISER CLAMPS (MSS TYPE 8): FOR SUPPORT OF PIPE RISERS, NPS 3/4 TO NPS 8. CARBON OR ALLOY-STEEL RISER CLAMPS (MSS TYPE 42): FOR SUPPORT OF PIPE RISERS, NPS 3/4 TO NPS 8, IF LONGER ENDS ARE REQUIRED FOR RISER CLAMPS.

HANGER-ROD ATTACHMENTS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES: STEEL TURNBUCKLES (MSS TYPE 13): FOR ADJUSTMENT UP TO 6 INCHES FOR HEAVY LOADS. STEEL CLEVISES (MSS TYPE 14): FOR 120 TO 450 DEG F PIPING INSTALLATIONS.

BUILDING ATTACHMENTS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES: STEEL OR MALLEABLE CONCRETE INSERTS (MSS TYPE 18): FOR UPPER ATTACHMENT TO SUSPEND PIPE HANGERS FROM CONCRETE CEILING; TOP-BEAM C-CLAMPS (MSS TYPE 19): FOR USE UNDER ROOF INSTALLATIONS WITH BAR-JOIST CONSTRUCTION TO ATTACH TO TOP FLANGE OF STRUCTURAL SHAPE; SIDE-BEAM OR CHANNEL CLAMPS (MSS TYPE 20): FOR ATTACHING TO BOTTOM FLANGE OF BEAMS, CHANNELS, OR ANGLES; CENTER-BEAM CLAMPS (MSS TYPE 21): FOR ATTACHING TO CENTER OF BOTTOM FLANGE OF BEAMS; WELDED BEAM ATTACHMENTS (MSS TYPE 22): FOR ATTACHING TO BOTTOM OF BEAMS IF LOADS ARE CONSIDERABLE AND ROD SIZES ARE LARGE; C-CLAMPS (MSS TYPE 23): FOR STRUCTURAL SHAPES; WELDED-STEEL BRACKETS: FOR SUPPORT OF PIPES FROM BELOW, OR FOR SUSPENDING FROM ABOVE BY USING CLIP AND ROD. USE ONE OF THE FOLLOWING FOR INDICATED LOADS: LIGHT (MSS TYPE 31): 750 LB; MEDIUM (MSS TYPE 32): 1500 LB; HEAVY (MSS TYPE 33): 3000 LB. SIDE-BEAM BRACKETS (MSS TYPE 34): FOR SIDES OF STEEL OR WOODEN BEAMS. PLATE LUGS (MSS TYPE 57): FOR ATTACHING TO STEEL BEAMS IF FLEXIBILITY AT BEAM IS REQUIRED.

USE POWDER-ACTUATED FASTENERS OR MECHANICAL-EXPANSION ANCHORS INSTEAD OF BUILDING ATTACHMENTS WHERE REQUIRED IN CONCRETE CONSTRUCTION.

23 05 48 HVAC AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

VIBRATION ISOLATION

ROOFTOP UNITS, AIR HANDLERS, AND CONDENSING UNITS SHALL HAVE INTERNAL VIBRATION ISOLATION FOR FANS AND COMPRESSORS, UTILIZING OPEN SPRING OR NEOPRENE ISOLATORS, FREE-STANDING AND LATERALLY STABLE WITH NO HOUSING.

MANUFACTURERS: PROVIDE VIBRATION ISOLATION EQUIPMENT AND MATERIALS (SUBJECT TO COMPLIANCE) BY A SINGLE MANUFACTURER BY ACE MOUNTINGS CO, AMBER/BOOTH COMPANY, ISOLATION TECHNOLOGY, KINETICS NOISE CONTROL, MASON INDUSTRIES, VIBRATION ELIMINATOR CO, VIBRATION ISOLATION, OR VIBRATION MOUNTINGS & CONTROLS. IF TYPE AND DEFLECTION FOR SPECIFIC EQUIPMENT IS NOT SPECIFIED WITH THE CONTRACT DOCUMENTS, REFERENCE ASHRAE HANDBOOK "HVAC APPLICATIONS" OR PROVIDE PER MANUFACTURER'S RECOMMENDATIONS.

GENERAL REQUIREMENTS: SELECT VIBRATION ISOLATORS BY THE WEIGHT DISTRIBUTION TO PRODUCE UNIFORM DEFLECTION. VIBRATION ISOLATORS SHALL HAVE EITHER KNOWN UN-DEFLECTED HEIGHTS OR CALIBRATION MARKINGS SO THAT, AFTER ADJUSTMENT, THE STATIC DEFLECTION CAN BE VERIFIED, THUS DETERMINING THAT THE LOAD IS WITHIN THE PROPER RANGE OF THE ISOLATOR. ISOLATORS SHALL OPERATE IN THE LINEAR PORTION OF THEIR LOAD VERSUS DEFLECTION CURVES. SPRING ISOLATORS SHALL HAVE 50 PERCENT EXCESS CAPACITY WITHOUT BECOMING COIL-BOUND. COAT VIBRATION ISOLATORS WITH FACTORY-APPLIED PAINT. COAT VIBRATION ISOLATORS EXPOSED TO WEATHER AND OTHER CORROSIVE ENVIRONMENTS WITH FACTORY-APPLIED CORROSION RESISTANCE PROTECTION. INSTALL AND ADJUST VIBRATION ISOLATORS IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.

PIPE CONNECTIONS: PROVIDE FLEXIBLE CONNECTORS FOR PIPING SYSTEM CONNECTIONS ON EQUIPMENT SIDE OF SHUTOFF VALVES FOR ALL PUMPS, MECHANICAL EQUIPMENT SUPPORTED OR SUSPENDED BY SPRING ISOLATORS, AND WHERE INDICATED ON THE DRAWINGS. FABRICATE FLEXIBLE PIPING CONNECTORS FROM STAINLESS STEEL OR RUBBER MATERIALS AS SUITABLE FOR SYSTEM FLUID. FLEXIBLE PIPING CONNECTORS SHALL BE BELLOWS, SPHERICAL, OR BRAIDED HOSE TYPE AS RECOMMENDED BY THE MANUFACTURER FOR THE APPLICATION.

ISOLATOR TYPES

PADS: ARRANGED IN SINGLE OR MULTIPLE LAYERS OF SUFFICIENT STIFFNESS FOR UNIFORM LOADING OVER PAD AREA, MOLDED WITH A NONSLIP PATTERN AND GALVANIZED-STEEL BASEPLATES, AND FACTORY CUT TO SIZES THAT MATCH REQUIREMENTS OF SUPPORTED EQUIPMENT. RESILIENT MATERIAL SHALL BE OIL AND WATER-RESISTANT NEOPRENE, RUBBER OR HERMETICALLY SEALED COMPRESSED FIBERGLASS.

MOUNTS: DOUBLE-DEFLECTION TYPE, WITH MOLDED, OIL-RESISTANT RUBBER, HERMETICALLY SEALED COMPRESSED FIBERGLASS, OR NEOPRENE ISOLATOR ELEMENTS WITH FACTORY-DRILLED, ENCAPSULATED TOP PLATE FOR BOLTING TO EQUIPMENT AND WITH BASEPLATE FOR BOLTING TO STRUCTURE. COLOR-CODE OR OTHERWISE IDENTIFY TO INDICATE CAPACITY RANGE. CAST-DUCTILE-IRON OR WELDED STEEL HOUSING CONTAINING TWO SEPARATE AND OPPOSING, OIL-RESISTANT RUBBER OR NEOPRENE ELEMENTS THAT PREVENT CENTRAL THREADED ELEMENT AND ATTACHMENT HARDWARE FROM CONTACTING THE HOUSING DURING NORMAL OPERATION. SHOCK-ABSORBING MATERIALS COMPOUNDED ACCORDING TO THE STANDARD FOR BRIDGE-BEARING NEOPRENE AS DEFINED BY AASHTO.

SPRING ISOLATORS: FREESTANDING, LATERALLY STABLE, OPEN-SPRING ISOLATORS. OUTSIDE SPRING DIAMETER SHALL BE NOT LESS THAN 80 PERCENT OF THE COMPRESSED HEIGHT OF THE SPRING AT RATED LOAD. MINIMUM ADDITIONAL TRAVEL SHALL BE 50 PERCENT OF THE REQUIRED DEFLECTION AT RATED LOAD. LATERAL STIFFNESS SHALL BE MORE THAN 80 PERCENT OF RATED VERTICAL STIFFNESS. OVERLOAD CAPACITY SHALL SUPPORT 200 PERCENT OF RATED LOAD, FULLY COMPRESSED, WITHOUT DEFORMATION OR FAILURE. BASEPLATES SHALL BE FACTORY DRILLED FOR BOLTING TO STRUCTURE AND BONDED TO 1/4-INCH THICK, RUBBER ISOLATOR PAD ATTACHED TO BASEPLATE UNDERSIDE. BASEPLATES SHALL LIMIT FLOOR LOAD TO 500 PSIG. TOP PLATE SHALL BE THREADED WITH ADJUSTMENT BOLT AND CAP SCREW TO FASTEN AND LEVEL EQUIPMENT.

ELASTOMERIC HANGERS: SINGLE OR DOUBLE-DEFLECTION TYPE, FITTED WITH MOLDED, OIL-RESISTANT ELASTOMERIC ISOLATOR ELEMENTS BONDED TO STEEL HOUSINGS WITH THREADED CONNECTIONS FOR HANGER RODS. COLOR-CODE OR OTHERWISE IDENTIFY TO INDICATE CAPACITY RANGE.

SPRING HANGERS: COMBINATION COIL-SPRING AND ELASTOMERIC-INSERT HANGER WITH SPRING AND INSERT IN COMPRESSION. STEEL FRAME, FABRICATED FOR CONNECTION TO THREADED HANGER RODS AND TO ALLOW FOR A MAXIMUM OF 30 DEGREES OF ANGULAR HANGER-ROD MISALIGNMENT WITHOUT BINDING OR REDUCING ISOLATION EFFICIENCY. OUTSIDE SPRING DIAMETER SHALL BE NOT LESS THAN 80 PERCENT OF THE COMPRESSED HEIGHT OF THE SPRING AT RATED LOAD. MINIMUM ADDITIONAL TRAVEL SHALL BE 50 PERCENT OF THE REQUIRED DEFLECTION AT RATED LOAD. LATERAL STIFFNESS SHALL BE MORE THAN 80 PERCENT OF RATED VERTICAL STIFFNESS. OVERLOAD CAPACITY SHALL SUPPORT 200 PERCENT OF RATED LOAD, FULLY COMPRESSED, WITHOUT DEFORMATION OR FAILURE. ELASTOMERIC ELEMENT SHALL BE MOLDED, OIL-RESISTANT RUBBER OR NEOPRENE. STEEL-WASHER-REINFORCED CUP TO SUPPORT SPRING AND BUSHING PROJECTING THROUGH BOTTOM OF FRAME. SELF-CENTERING HANGER ROD CAP TO ENSURE CONCENTRICITY BETWEEN HANGER ROD AND SUPPORT SPRING COIL.

23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC

FINAL SYSTEM TESTING, BALANCING, AND ADJUSTMENTS (TAB) SHALL BE PERFORMED BY A CONTRACTOR CERTIFIED BY THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), ASSOCIATED AIR BALANCE COUNCIL (AABC), OR TESTING, ADJUSTING, AND BALANCING BUREAU (TABB). TAB SHALL BE PERFORMED IN ACCORDANCE WITH THE MOST CURRENT EDITION OF THE CERTIFIED AGENCIES PROCEDURAL STANDARD FOR TESTING, ADJUSTING, AND BALANCING AND SHALL COMPLY WITH THE STRICTEST INTERPRETATION OF THAT STANDARD FOR EXECUTION AND REPORTING OF ALL TAB WORK. WORK SHALL INCLUDE BUT NOT BE LIMITED TO: PERFORM TEST READINGS ON FANS, UNITS, COILS, ETC. AND ADJUST EQUIPMENT TO DELIVER SPECIFIED AMOUNTS OF AIR. PREPARE TESTING AND BALANCING REPORT LOG SHOWING AIR SUPPLY QUANTITIES, AIR ENTERING AND LEAVING TEMPERATURES AND PRESSURES AT DESIGN FLOW, FAN AND UNIT TEST READINGS, MOTOR VOLTAGE AND AMP DRAWS, ETC., AND SUBMIT ELECTRONIC COPIES OF THE FINAL COMPILATION OF DATA TO THE ARCHITECT FOR EVALUATION AND APPROVAL BEFORE FINAL INSPECTION OF THE PROJECT. BALANCE AIR SYSTEMS TO WITHIN PLUS OR MINUS 10 PERCENT FOR TERMINAL DEVICES AND BRANCH LINES AND PLUS OR MINUS 5 PERCENT FOR MAIN DUCTS AND AIR HANDLING EQUIPMENT OF THE AMOUNT OF AIR SHOWN ON THE DRAWINGS. TAB CONTRACTOR SHALL RECORD SPACE TEMPERATURES AND MAKE ADJUSTMENTS IN AIRFLOW TO EACH DIFFUSER TO OBTAIN UNIFORM TEMPERATURE (NO GREATER THAN +/- 3°F) IN SPACES. DOCUMENT TEMPERATURES AND ADJUSTMENTS IN TAB REPORT. ADJUST EQUIPMENT TO OPERATE AS INTENDED BY THE SPECIFICATION. TAB REPORT SHALL INCLUDE A 'REPORT SUMMARY/REMARKS' SECTION IN ACCORDANCE WITH THE PROCEDURAL STANDARD THAT PROVIDES BOTH SYSTEM SET UP AND A SUMMARY OF DEFICIENCIES AS DEFINED BY THE PROCEDURAL STANDARD.

TAB CONTRACTOR SHALL BE RESPONSIBLE TO CALIBRATE, SET, AND ADJUST AUTOMATIC TEMPERATURE CONTROL SENSORS, ACTUATORS, AND CONTROL DEVICES. CHECK PROPER SEQUENCING OF INTERLOCK SYSTEMS, AND OPERATION OF SAFETY CONTROLS, ADJUST THERMOSTATS, AND CONTROL SETPOINTS. LIMITS AND TIME BASED ADJUSTMENTS TO OPERATE IN ACCORDANCE WITH THE PERFORMANCE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS. ADJUST PUMPS, FANS, ETC. FOR PROPER AND EFFICIENT OPERATION. CERTIFY TO ARCHITECT THAT ADJUSTMENTS HAVE BEEN MADE AND THAT SYSTEM IS OPERATING SATISFACTORILY. CALIBRATE, SET, AND ADJUST AUTOMATIC TEMPERATURE CONTROLS. CHECK PROPER SEQUENCING OF INTERLOCK SYSTEMS AND OPERATION OF SAFETY CONTROLS.

MECHANICAL CONTRACTOR SHALL ALIGN BEARINGS AND REPLACE BEARINGS THAT HAVE DIRT OR FOREIGN MATERIAL IN THEM WITH NEW BEARINGS WITHOUT ADDITIONAL COST TO THE OWNER.

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THESE DRAWINGS ARE NOT APPROVED UNLESS SIGNED AND SEALED BELOW.

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7/5/18

JULY 05, 2018

REVISIONS

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SECTION 23 HEATING, VENTILATION, AND AIR CONDITIONING CONTINUED:

23 07 00 HVAC INSULATION

INSULATION FOR DUCTS AND DIFFUSERS SHALL BE 2" THICK, ASTM C553, TYPE I, CLASS B-4, 1-1/2 LB/CU FT DENSITY, FLEXIBLE FIBERGLASS BLANKET WITH FSK BLANKET. MINIMUM R-6.0 DUCT WRAP. OWENS-CORNING, KNAUF, OR EQUIVALENT, WITH HEAVY-DUTY FOIL FACING. ALL SEAMS, JOINTS, AND PUNCTURES IN EXTERNAL INSULATION JACKET SHALL BE SEALED WITH GLASS-REINFORCED FABRIC AND VAPOR-BARRIER MASTIC.

DUCT LINER SHALL BE 1" LINER, 3 PCF DENSITY COMPLYING WITH REQUIREMENTS OF ASTM C1071 FOR PHYSICAL PROPERTIES EXCEPT LINER SHALL BE CERTIFIED FOR FUNGI RESISTANCE WHICH SHALL BE 100% NO GROWTH AND NFPA-90A AND 90B.

INSULATE ALL DUCTWORK, PLENUMS, EXCLUDING PRE-INSULATED FLEXIBLE DUCTS AND PRE-INSULATED EQUIPMENT. INSULATE THE BACKS OF SUPPLY AIR DIFFUSERS AND GRILLES.

INDOOR INSULATING MATERIALS, ADHESIVES, COATINGS, ETC. SHALL NOT EXCEED FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPED RATING OF 50 PER ASTM E 84. CONTAINERS FOR MASTIC AND ADHESIVES SHALL HAVE U.L. LABEL. OUTDOOR DOOR INSULATING MATERIALS, ADHESIVES, COATINGS, ETC. SHALL NOT EXCEED FLAME SPREAD RATING OF 75 AND SMOKE DEVELOPED RATING OF 150 PER ASTM E 84. CONTAINERS FOR MASTIC AND ADHESIVES SHALL HAVE U.L. LABEL.

23 09 23 DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

GENERAL REQUIREMENTS

PROVIDE A SYSTEM OF TEMPERATURE CONTROLS INCLUDING THERMOSTATS, CONTROL PANELS, TIME SWITCHES, OVERRIDE TIMERS, DAMPER MOTORS, AND RELAYS AS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. PROVIDE INTEGRATED WIRING DIAGRAMS SHOWING INTERCONNECTIONS BETWEEN FIELD INSTALLED EQUIPMENT AND PACKAGE WIRING FURNISHED WITH THE HVAC EQUIPMENT. CONTROL WIRING SHALL BE SIZED TO ACCOMMODATE THE VOLTAGE DROP ASSOCIATED WITH THE DISTANCE BETWEEN THE CONTROL DEVICE AND THE CONTROLLER.

DRY-BULB TEMPERATURE SENSORS SHALL BE ACCURATE TO +/- 2°F OVER THE RANGE OF 40 TO 80°F. ENTHALPY SENSOR AND THE VALUE OF THE DIFFERENTIAL SENSOR SHALL BE ACCURATE TO +/- 3 BTU/LB OVER THE RANGE OF 20 TO 36 BTU/LB.

PROVIDE SUPERVISION AND ON-JOB CHECKOUT SERVICE AS REQUIRED TO ENSURE THAT INSTALLATION MEETS REQUIREMENTS OF THE SPECIFICATION. THE SYSTEM SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FOLLOWING THE ACCEPTANCE OF THE SYSTEM BY THE ARCHITECT/ENGINEER. CORRECT DEFECTS OCCURRING DURING THIS PERIOD AT NO ADDITIONAL COST TO OWNER.

EQUIPMENT

INSTALL TEMPERATURE SENSORS AND THERMOSTATS 4'-0" AFF TO MEET ADA REQUIREMENTS UNLESS OTHERWISE NOTED ON THE PLANS. COORDINATE LOCATION WITH FURNITURE, MEDIA, ETC ON WALLS BEFORE INSTALLING TO ENSURE ACCESSIBILITY.

SMOKE DETECTORS FURNISHED AND INSTALLED AS INDICATED IN SECTION 23 OR AS SCHEDULED ON PLANS (OR HEAT DETECTORS, IF PERMITTED BY CODE) SHALL SHUT DOWN EACH ASSOCIATED UNIT SUPPLY FAN UPON ACTIVATION WHERE REQUIRED BY CODE. PROVIDE REMOTE VISUAL AND AUDIBLE ALARM DEVICE IN AN APPROVED LOCATION IF SMOKE DETECTORS ARE NOT CONNECTED TO A FIRE ALARM PANEL AND LABEL DEVICE AS "AIR DUCT DETECTOR TROUBLE".

23 23 00 REFRIGERANT PIPING AND INSULATION

COPPER TUBING: ASTM B 280, ALLOY C12200, TYPE ACR, HARD-DRAWN STRAIGHT LENGTHS, AND SOFT-ANNEALED COILS, SEAMLESS COPPER TUBING. TUBING SHALL BE FACTORY CLEANED, READY FOR INSTALLATION, AND HAVE ENDS CAPPED TO PROTECT CLEANLINESS OF PIPE INTERIORS PRIOR TO SHIPPING.

FITTINGS: WROUGHT-COPPER, ANSI B16.22, STREAMLINED PATTERN.

BRAZING FILLER METALS: AWS A5.8; COPPER (CU), PHOSPHOROUS (P) 4.8-5.2%, AND SILVER (AG) 14.5-15.5 FOR JOINING WROUGHT COPPER FITTINGS AND COPPER TUBING. BRAZE JOINTS WITH A SLOW STREAM OF DRY NITROGEN PASSING THROUGH THE PIPING.

INSULATE SUCTION SECTIONS WITH 1" AND LIQUID LINES WITH 1/2" FOAMED PLASTIC INSULATION, ARMAFLEX OR EQUAL. PIPING INSULATION SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND A SMOKE DEVELOPED RATING OF 50 OR LESS WHEN TESTED IN ACCORDANCE WITH ASTM E84. ASTM C534, TYPE 1, FLEXIBLE UNICELLULAR INSULATION, 3/4" THICK, MAY BE USED IN EXTERIOR LOCATIONS ONLY. PROVIDE A UV-RESISTANT COATING OR JACKET ON ALL EXTERIOR INSULATION. INSTALL AND SUPPORT PIPING TO KEEP NOISE AND VIBRATION TO A MINIMUM. SUPPORT AND SECURE PIPING TO UNISTRUT TYPE SUPPORTS SO THAT NO VIBRATION PASSES TO THE BUILDING STRUCTURE. PIPE ATTACHMENTS SHALL BE COPPER-PLATED OR HAVE NONMETALLIC COATING FOR ELECTROLYTIC PROTECTION WHERE ATTACHMENTS ARE IN DIRECT CONTACT WITH COPPER TUBING. INSTALL A SUPPORT WITHIN ONE FOOT OF EACH CHANGE OF DIRECTION. MOUNT PIPE HANGERS AROUND THE OUTSIDE OF THE INSULATION WITH SADDLES TO PREVENT HANGERS FROM RUPTURING THE INSULATION. REPLACE INSULATION THAT IS CUT OR BROKEN BY THE HANGERS.

RUN REFRIGERANT LINES PARALLEL AND PERPENDICULAR TO WALL AND FLOOR LINES AND TO APPEAR STRAIGHT AND IN GOOD ORDER. PITCH SUCTION LINES DOWN SLIGHTLY (1" IN 20') TOWARDS THE COMPRESSOR. PROVIDE OIL TRAPS AT THE BASE OF VERTICAL SUCTION RISERS OVER 6 FEET HIGH.

INSTALL REFRIGERANT PIPING IN ACCORDANCE WITH ASHRAE STANDARD 15. ARRANGE PIPING TO ALLOW NORMAL INSPECTION AND SERVICING OF COMPRESSOR AND OTHER EQUIPMENT. INSTALL VALVES AND SPECIALTIES IN ACCESSIBLE LOCATIONS.

INSTALL LIQUID LINE SIGHT GLASSES IN LIQUID LINES NEAREST THE EXPANSION VALVE. FACTORY MOUNT EXPANSION VALVES WITH THE SENSING BULBS SHIPPED LOOSE. FIELD MOUNT EXPANSION VALVE BULBS AFTER REFRIGERANT PIPING IS COMPETE (DAMAGE MAY OCCUR IF BULBS COME IN CONTACT WITH HEAT).

THE CONTRACTOR SHALL HAVE THE OPTION TO PROVIDE COPPER REFRIGERANT TUBING LINE SET SIZED AS RECOMMENDED BY EQUIPMENT MANUFACTURER AND OF LENGTH AS REQUIRED FOR THE INSTALLATION. PROVIDE 1" THICK FORMED PLASTIC INSULATION, ARMAFLEX OR EQUAL, ON THE SUCTION LINE. PROVIDE QUICK-CONNECT FLARE TUBING COMPRESSION FITTINGS OR SOLDER CONNECTIONS AS REQUIRED TO MATCH THE CONNECTIONS OF THE CONDENSING UNIT AND EVAPORATOR COIL.

SYSTEM EVACUATION AND CHARGING

BLOW OUT REFRIGERATION LINES WITH DRY NITROGEN AT A SUITABLE PRESSURE BEFORE MAKING FINAL CONNECTION AT THE CONDENSING UNIT OR COIL TO ENSURE AGAINST DIRT, SCALE, OR OTHER FOREIGN MATERIAL BEING IN THE LINES. DRAW A VACUUM OF 29" OF MERCURY. BREAK THIS VACUUM BY CHARGING DRY REFRIGERANT GAS INTO THE SYSTEM, RAISING THE PRESSURE TO 0 PSIG. REPEAT THE LATTER TWO STEPS FOR A TRIPLE EVACUATION BEFORE THE FINAL EVACUATION IS STARTED. MAKE FINAL EVACUATION BY REDUCING THE SYSTEM ABSOLUTE PRESSURE TO A MAXIMUM OF 0.5 MILLIMETERS (500 MICRONS) AND ALLOWING THE PUMP TO RUN AT THIS PRESSURE FOR A MINIMUM OF TWO HOURS.

REPEAT THE PROPER AMOUNT OF REFRIGERATION CHARGE PER THE MANUFACTURER'S RECOMMENDATIONS. RECORD THE AMOUNT OF REFRIGERANT BY WEIGHT CHARGED INT THE SYSTEM FOR EACH CIRCUIT RECORDED TO THE NEAREST 1/4 POUND ON TAGS AND ATTACH TAGS TO THE LIQUID LINE NEAR THE CONDENSING UNIT. REFRIGERANT SHALL BE SUPPLIED BY THE HVAC CONTRACTOR.

23 31 13 METAL DUCTS

PROVIDE GALVANIZED STEEL DUCTWORK AND HOUSINGS AS SHOWN ON THE DRAWINGS. CONSTRUCT DUCTWORK INCLUDING FITTINGS AND TRANSITIONS IN CONFORMANCE WITH CURRENT SMACNA STANDARDS RELATIVE TO GAUGE, BRACING, JOINTS, ETC. MINIMUM THICKNESS OF DUCT SHALL BE 26-GAUGE SHEET METAL. REINFORCE HOUSINGS AND DUCTWORK OVER 30" WITH 1-1/4" ANGLES NOT LESS THAN 5'-8" ON CENTERS, AND CLOSER IF REQUIRED FOR SUFFICIENT RIGIDITY TO PREVENT VIBRATION. SUPPORT HORIZONTAL RUNS OF DUCT FROM STRAP IRON HANGERS ON CENTERS NOT TO EXCEED 8'-0". DO NOT SUPPORT CEILING GRID, CONDUITS, PIPES, EQUIPMENT, ETC. FROM DUCTWORK. COORDINATE ROUTING OF DUCTWORK WITH OTHER CONTRACTORS SUCH THAT PIPING, ELECTRICAL CONDUIT, AND ASSOCIATED SUPPORTS ARE NOT ROUTED THROUGH THE DUCTWORK.

CONSTRUCT SUPPLY DUCTS TO MEET SMACNA POSITIVE PRESSURE OF 2" W.G. CONSTRUCT RETURN, OUTDOOR AIR, AND EXHAUST DUCTWORK UPSTREAM OF FANS TO MEET SMACNA NEGATIVE PRESSURE OF 2" W.G.

SEAL DUCTWORK WITH HEAVY LIQUID SEALANT, HARDCAST IRONGRIP 601, DESIGN POLYMER DP 1010, UNITED MCGILL DUCT SEALER, OR APPROVED EQUAL, APPLIED ACCORDING TO SEALANT MANUFACTURER'S INSTRUCTIONS. FOR DUCTS WITH PRESSURE CLASSIFICATION OF 2" W.G. AND GREATER, SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIRTIGHT TO MEET SMACNA CLASS B. FOR DUCTS WITH PRESSURE CLASSIFICATIONS LESS THEN 2" W.G., SEAL TRANSVERSE JOINTS AIRTIGHT TO MEET SMACNA CLASS C. TAPES AND MASTICS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181A. FOR EXHAUST DUCTS OPERATING UNDER POSITIVE PRESSURE, SEAL JOINTS AND PENETRATIONS TO MEET SMACNA SEAL CLASS A.

PROVIDE RADIUS ELBOWS, TURNS, AND OFFSETS WITH A MINIMUM CENTERLINE RADIUS OF 1-1/2 TIMES THE DUCT WIDTH. WHERE SPACE DOES NOT PERMIT FULL RADIUS ELBOWS, PROVIDE SHORT RADIUS ELBOWS WITH A MINIMUM OF TWO (2) CONTINUOUS SPLITTER VANES. VANES SHALL BE THE ENTIRE LENGTH OF THE BEND. PROVIDE MITERED ELBOWS WHERE SPACE DOES NOT PERMIT RADIUS ELBOWS. WHERE SHOWN ON THE DRAWINGS, OR AT THE OPTION OF THE CONTRACTOR WITH THE ENGINEER'S APPROVAL, MITERED ELBOWS LESS THAN 45 DEGREES SHALL NOT REQUIRE TURNING VANES. MITERED ELBOWS 45-DEGREES AND GREATER SHALL HAVE SINGLE THICKNESS TURNING VANES OF SAME GAUGE AS DUCTWORK, RIGIDLY FASTENED WITH GUIDE STRIPS IN DUCTWORK. VANES FOR MITERED ELBOWS SHALL BE PROVIDED IN ALL SUPPLY AND EXHAUST DUCTWORK AND IN RETURN AND OUTSIDE AIR DUCTWORK THAT HAS AN AIR VELOCITY EXCEEDING 1000 FPM. DO NOT INSTALL VANES IN GREASE DUCTWORK.

ROUND OR OVAL DUCTWORK SHALL BE SEMCO, UNITED, WESCO, OR EQUAL SHEETMETAL, WITH SMOOTH INTERIOR SURFACE, WITH LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) ROUND DUCTWORK GAUGES PER THE FOLLOWING TABLE (REFERENCE SMACNA HVAC DUCT CONSTRUCTION STANDARDS FOR GAUGES WHEN PRESSURES EXCEED 2" W.G.):

SIZE	DUCT GAUGE	FITTING GAUGE
14" & UNDER	28	24

LINX INDUSTRIES SPIROSAFE, LEWIS & LAMBERT, OR APPROVED EQUAL FACTORY-MANUFACTURED ROUND DUCTWORK AND FITTINGS MAY BE SUBSTITUTED FOR SPECIFIED ROUND BRANCH DUCTWORK, AT CONTRACTOR'S OPTION. HEAVY LIQUID JOINT SEALANT MAY BE OMITTED ON FACTORY-MANUFACTURED ROUND DUCTWORK.

LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) FITTINGS 24" IN DIAMETER AND LESS SHALL BE PRE-FABRICATED, SPOTWELDED, AND INTERNALL SEALED. FITTING GAUGE SHALL BE 22 GAUGE FOR 36" FITTINGS AND UNDER. 30 DEGREE TEES SHALL BE CONICAL TYPE. SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIRTIGHT WITH HEAVY LIQUID SEALANT APPLIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS. PROVIDE GAUGE THICKNESS IN MEDIUM PRESSURE (DUCT PRESSURE CLASS 3" TO 6" W.G.) DUCTWORK AS RECOMMENDED BY SMACNA.

23 31 23 POWER VENTILATORS

PROVIDE INLINE EXHAUST FANS AS SCHEDULED ON THE DRAWINGS, MANUFACTURED BY COOK, GREENHECK, OR EQUAL, COMPLETE WITH ALUMINUM HOUSING, ALUMINUM CENTRIFUGAL WHEEL, ECM MOTOR, PRE-WIRED NEMA-1 DISCONNECT SWITCH, UNIT MOUNTED SPEED CONTROLLER, AND BACKDRAFT DAMPER.

PROVIDE CEILING-MOUNTED EXHAUST FANS AS SCHEDULED ON THE DRAWINGS, COOK, GREENHECK, OR EQUAL, COMPLETE WITH ALUMINUM HOUSING, ALUMINUM CENTRIFUGAL WHEEL, INTEGRAL DISCONNECT AND BACKDRAFT DAMPER, ALUMINUM CEILING GRILLE, AND HANGING ISOLATOR KIT.

23 33 00 AIR DUCT ACCESSORIES

FLEXIBLE DUCT

LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) AND MEDIUM PRESSURE (DUCT PRESSURE CLASS 2.1" TO 8" W.G.) FLEXIBLE DUCT SHALL BE FLEXMASTER TYPE SB, THERMAFLEX TYPE G-KM, M-KE, JPL TYPE SILVER JACKET, OR EQUAL (FORE RETARDANT POLYETHYLENE) PROTECTIVE VAPOR BARRIER, U.L. 181, CLASS 1, ACOUSTICAL INSULATED DUCT WITH METAL-EDGED CONNECTORS, R-6.0 FIBERGLASS INSULATION. PROVIDE CPE LINER WITH STEEL WIRE HELIX MECHANICALLY LOCKED OR PERMANENTLY BONDED TO THE LINER.

FLEXIBLE DUCT RUNS SHALL NOT EXCEED 6 FEET IN LENGTH, AND SHALL BE INSTALLED FULLY EXTENDED AND STRAIGHT AS POSSIBLE AVOIDING TIGHT TURNS. INSTALL FLEXIBLE DUCT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. SUPPORT FLEXIBLE DUCT AT MAXIMUM 5 FEET ON CENTER AND WITHIN 8 INCHES OF BENDS. BENDS SHALL NOT EXCEED A CENTERLINE RADIUS OF ONE DUCT DIAMETER. DUCT SAG SHALL NOT EXCEED 1/2". SUPPORTING MATERIALS IN DIRECT CONTACT WITH THE DUCT SHALL NOT BE LESS THAN 1-1/2 INCHES IN WIDTH.

CONNECT FLEXIBLE DUCT TO RIGID METAL OR DUCT OR AIR DEVICES AS RECOMMENDED BY THE MANUFACTURER. AT A MINIMUM, INSTALL TWO WRAPS OF DUCT TAPE AROUND THE INNER CORE CONNECTION AND A METALIC OR NON-METALIC CLAMP OVER THE TAPE AND TWO WRAPS OF DUCT TAPE OR A CLAMP OVER THE OUTER JACKET. DUCT CLAMPS SHALL BE LABELED IN ACCORDANCE WITH UL 181B AND MARKED 181B-C. DUCT TAPE SHALL BE LABELED IN ACCORDANCE WITH UL 181B AND MARKED 181B-FX.

FLEXIBLE CONNECTIONS

DUCTS SHALL BE CONNECTED TO FANS, FAN CASINGS, AND FAN PLENUMS BY MEANS OF FLEXIBLE CONNECTORS. FLEXIBLE CONNECTORS SHALL BE NEOPRENE COATED GLASS CLOTH CANVAS CONNECTIONS, DURO-DYNE, ELGEN, VENTFABRIC, OR EQUAL. FLEXIBLE CONNECTORS SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPED RATING OF NOT LESS HIGHER THAN 50. MAKE AIRTIGHT JOINTS AND INSTALL WITH MINIMUM 1-1/2" SLACK.

DAMPERS

PROVIDE BALANCING DAMPERS, MANUFACTURED BY AIR BALANCE INC, FLEXMASTER USA, RUSKIN, GREENHECK, METALAIRE, NAILOR INDUSTRIES, CESCO LOUVERS & DAMPERS, TAMCO, POTTORFF, OR APPROVED EQUAL, WHERE SHOWN ON DRAWINGS AND WHEREVER NECESSARY FOR COMPLETE CONTROL OF AIR FLOW. MANUAL VOLUME CONTROL DAMPERS SHALL HAVE MINIMUM 16 GAUGE GALVANIZED STEEL FRAMES AND MINIMUM 20 GAUGE FORMED BLADES. GALVANIZED STEEL AXLES SHALL HAVE BEARINGS AT BOTH ENDS AND SHAFT SHALL EXTEND SO THAT OPERATOR CLEARS EXTERNAL INSULATION. PROVIDE INDICATING QUADRANT AND LOCKING DEVICE. USE SINGLE BLADE DAMPERS FOR WIDTHS UP TO 8 INCHES AND OPPOSED BLADE DAMPERS FOR SIZES ABOVE 8 INCHES.

RECTANGULAR VOLUME DAMPERS SHALL BE OPPOSED BLADE INTERLOCKING TYPE. ROUND VOLUME DAMPERS SHALL BE BUTTERFLY TYPE CONSISTING OF CIRCULAR BLADE MOUNTED TO A SHAFT. DAMPER LEAKAGE FOR OUTSIDE AIR DAMPERS SHALL NOT EXCEED 4.0 CFM PER SQUARE FOOT IN FULL CLOSED POSITION AT 1" W.G. PRESSURE DIFFERENTIAL ACROSS DAMPER. REFERENCE MANUFACTURER AND MODEL NUMBER FOR OUTSIDE AIR DAMPERS IS RUSKIN MODEL CD-50. PROVIDE FLEXMASTER MODEL STO OR EQUAL 45 DEGREES RECTANGULAR / ROUND SIDE TAKEOFF FITTING WITH MODEL SLBO DOUBLE BEARING DAMPER WITH INSULATION BUILD OUR FOR ROUND DUCTWORK BRANCH TAKEOFFS TO INDIVIDUAL AIR DEVICES. OMIT DAMPER AT TAKEOFF FITTING WHEN DAMPER IS LOCATED DOWNSTREAM OF TAKEOFF.

23 36 00 AIR TERMINAL UNITS

PROVIDE TERMINAL BOXES AS SPECIFIED ON THE DRAWINGS OR APPROVED EQUAL, INCLUDING SINGLE-DUCT VARIABLE AIR VOLUME (VAV) BOXES AND FAN TERMINAL UNITS (FTU), MANUFACTURED BY ENVIROTECH, NAILOR, PRICE, TITUS, OR TRANE. ALL AIR TERMINAL UNITS SHALL BE OF THE SAME MANUFACTURER. TERMINAL BOXES SHALL HAVE VARIABLE AIRFLOW INLET WITH AIRFLOW MEASUREMENT RING OR CROSS, CONTROL ENCLOSURE, 24V TRANSFORMER, MULTI-STAGE ELECTRIC RESISTANCE HEATER, AND BE INTERNALL INSULATED. TEMPERATURE CONTROLS SHALL BE FACTORY INSTALLED PRIOR TO SHIPMENT. PROVIDE A REMOTE SPACE TEMPERATURE SENSOR FOR EACH TERMINAL UNIT THAT SHALL COMMUNICATE WITH THE APPROPRIATE TERMINAL UNIT CONTROLLER.

HEATING COILS SHALL HAVE CAPACITY AS SPECIFIED ON THE DRAWINGS WITH ENCLOSED COPPER TUBE, ALUMINUM FINNED ELEMENT OF COILED NICKEL-CHROME RESISTANCE WIRE CENTERED IN TUBES AND EMBEDDED IN REFRACTORY MATERIAL. EXPOSED HELICAL COIL OF NICKEL-CHROME RESISTANCE WIRE WITH REFRACTORY CERAMIC SUPPORT BUSHINGS WILL NOT BE ALLOWED.

CONTROL BOX SHALL BE CLEARLY MARKED WITH AN IDENTIFICATION LABEL THAT LISTS SUCH INFORMATION AS NOMINAL CFM, MAXIMUM AND MINIMUM FACTORY-SET AIRFLOW LIMITS, COIL TYPE, AND COIL CONNECTION ORIENTATION, WHERE APPLICABLE.

BOXES SHALL BE FACTORY-BUILT, PRESSURE INDEPENDENT UNITS, FACTORY SET, FIELD-ADJUSTABLE AIR FLOW RATE, SUITABLE FOR SINGLE DUCT APPLICATIONS. USE OF DUAL-DUCT AIR TERMINAL UNITS IS NOT PERMITTED. CLEARLY SHOW ON EACH UNIT THE UNIT NUMBER AND FACTORY SET AIR VOLUMES CORRESPONDING TO THE CONTRACT DRAWINGS. COORDINATE FLOW CONTROLLER SEQUENCE AND DAMPER OPERATION DETAILS WITH THE DRAWINGS.

UNIT CASING SHALL BE CONSTRUCTED OF GALVANIZED STEEL NO LIGHTER THAN 22 GAUGE. PROVIDE HANGER BRACKETS FOR ATTACHMENT OF SUPPORTS. LINING SHALL BE SUITABLE TO PROVIDE REQUIRED ACOUSTIC PERFORMANCE, THERMAL INSULATION, AND PREVENT SWEATING. SHALL BE NFPA 90A, UL 181, AND ASTMC 665 COMPLIANT. INSULATION SHALL CONSIST OF 1/2" THICK NON-POROUS FOIL FACED RIGID FIBERGLASS INSULATION OF 4-LB/CU.FT, SECURED BY FULL LENGTH GALVANIZED STEEL Z-STRIPS WHICH ENCLOSE AND SEAL ALL EDGES. TAPE AND ADHESIVES SHALL NOT BE USED.

PROVIDE ACCESS PANELS LARGE ENOUGH FOR INSPECTION, ADJUSTMENT, AND MAINTENANCE WITHOUT DISCONNECTING DUCTS, AND FOR CLEANING HEATING COILS ATTACHED TO UNIT, EVEN IF THERE ARE NO MOVING PARTS. PANELS SHALL BE INSULATED TO SAME STANDARDS AS THE REST OF THE CASING AND SHALL BE SECURED AND GASKETED AIRTIGHT.

TOTAL LEAKAGE FROM CASING SHALL NOT EXCEED 2% OF THE NOMINAL CAPACITY OF THE UNIT WHEN SUBJECTED TO A STATIC PRESSURE OF 3"WG, WITH ALL OUTLETS SEALED SHUT AND INLETS FULLY OPEN. TOTAL LEAKAGE FROM DAMPER SHALL NOT EXCEED 2% OF THE MAXIMUM RATED CAPACITY OF THE UNIT, WHEN CLOSED AGAINST INLET STATIC PRESSURE OF 4"WG.

FAN-POWERED UNITS

THE FAN WILL BE IN A PARALLEL OR SERIES CONFIGURATION (AS INDICATED ON THE DRAWINGS) INSIDE THE UNIT CASING. FAN ASSEMBLY SHALL BE FORWARD-CURVED, DIRECT-DRIVEN CENTRIFUGAL BLOWER WITH ECM TYPE MOTOR WITH THERMAL OVERLOAD PROTECTION AND ADJUSTABLE SPEED CONTROL. THE MOTOR ASSEMBLY SHALL BE COMPLETELY ISOLATED FROM THE CABINET WITH RUBBER VIBRATION MOUNTS.

FACTORY MOUNT AND WIRE DDC CONTROLS AS SPECIFIED IN THIS SPECIFICATION AND ON THE DRAWINGS. MOUNT ELECTRICAL COMPONENTS IN A NEMA-1 CONTROL BOX WITH REMOVABLE COVER. INCORPORATE SINGLE POINT ELECTRICAL CONNECTION TO POWER SOURCE. PROVIDE TERMINAL STRIP IN CONTROL BOX FOR FIELD WIRING OF POWER SOURCE. PROVIDE FACTORY WIRED NON-FUSED DISCONNECT SWITCH AT EACH TERMINAL UNIT.

AIR FILTERS

PROVIDE 1-INCH THICK, THROWAWAY TYPE FILTERS IN THE RETURN AIR INLET. PROVIDE NEW FILTERS WHEN TERMINAL UNITS ARE OPERATED BEFORE FINAL ACCEPTANCE.

IF HVAC EQUIPMENT IS USED DURING THE CONSTRUCTION PERIOD, CONTRACTOR SHALL PROVIDE ONE SET OF FILTERS WHEN THE UNIT IS STARTED AND REPLACE FILTERS AS NEEDED, BUT NOT LESS THAN EVERY MONTH. ON THE DAY OF SUBSTANTIAL COMPLETION, THE CONTRACTOR SHALL CLEAN THE UNIT AND PROVIDE A NEW SET OF FILTERS IN THE UNIT.

23 37 13 DIFFUSERS, REGISTERS, AND GRILLES

PROVIDE AIR DEVICES AS SCHEDULED ON DRAWINGS OR APPROVED EQUAL, MANUFACTURED BY KRUEGER, METALAIRE, NAILOR, PRICE, OR TITUS. SELECT AIR DEVICES TO LIMIT ROOM NOISE TO NO HIGHER THAN NC-30 UNLESS OTHERWISE SHOWN. PROVIDE DEVICES WITH A SOFT PLASTIC GASKET TO MAKE AN AIRTIGHT SEAL AGAINST THE MOUNTING SURFACE. COORDINATE FINAL LOCATION, FRAME, AND MOUNTING TYPE OF AIR DEVICES WITH ARCHITECTURAL REFLECTED CEILING PLANS.

SUBMIT COMPLETE SHOP DRAWINGS INCLUDING INFORMATION ON NOISE LEVEL, PRESSURE DROP, THROW, STYLES, BORDERS, ETC. CLEARLY MARKED WITH SPECIFIED EQUIPMENT NUMBER.

PROVIDE CEILING MOUNTED AIR DEVICES OF LAY-IN OR SURFACE MOUNTED TYPE AS REQUIRED TO BE COMPATIBLE WITH CEILING CONSTRUCTION. PROVIDE CEILING DIFFUSERS AND GRILLES WITH WHITE ENAMEL FINISH UNLESS NOTED OTHERWISE.

23 74 15 PACKAGED ROOFTOP AIR CONDITIONING UNITS

PROVIDE ELECTRIC COOLING, GAS HEATING ROOFTOP UNITS AS SCHEDULED ON THE DRAWINGS MANUFACTURED BY TRANE, AAON, JOHNSON CONTROLS, DAIKIN, OR YORK, COMPLETE WITH FACTORY INSTALLED DIRECT-DRIVE HERMETIC COMPRESSORS WITH INTERNAL SPRING VIBRATION ISOLATION, BUILT-IN MOTOR THERMAL OVERLOAD PROTECTION, CRANKCASE HEATER, AND LOW PRESSURE SWITCHES; DIRECT EXPANSION COOLING AND CONDENSING COILS, MINIMUM SEER OR EER RATING (COOLING) AS REQUIRED BY THE APPLICABLE ENERGY CODE OR GREATER IF SCHEDULED ON THE DRAWINGS, CENTRIFUGAL EVAPORATOR BLOWER; AIR FILTER RACK WITH 2" THICK THROWAWAY FILTERS, PROPELLER TYPE CONDENSER FAN; ALUMINIZED STEEL HEAT EXCHANGER, MINIMUM AFUE RATING (HEATING) AS REQUIRED BY THE APPLICABLE ENERGY CODE OR GREATER IF SCHEDULED ON THE DRAWINGS, FORCED COMBUSTION AIR BLOWER; COMPLETE FACTORY-INSTALLED MICRO-PROCESSOR CONTROLS INCLUDING ANTI-SHORT CYCLE TIMERS, TIME DELAY RELAYS AND MINIMUM 'ON' TIME CONTROLS, 100 PERCENT SAFETY GAS SHUTOFF, DIRECT SPARK IGNITION SYSTEM; BUILT-IN THERMAL OVERLOAD PROTECTION ON MOTORS AND COMPRESSORS; OUTDOOR AIR DAMPER; BAROMETRIC RELIEF DAMPER; WEATHERTIGHT HOUSING CONSTRUCTED ON ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL WITH WEATHER-RESISTANT BAKED ENAMEL FINISH; MINIMUM INSULATED DOWNFLOW STANDARD ROOF CURB WITH MINIMUM HEIGHT OF 12 INCHES FOR ROOFS WITH NO INSULATION, 14 INCHES FOR ROOFS WITH INSULATION OR AS SCHEDULED ON THE DRAWINGS; SINGLE-POINT ELECTRICAL POWER CONNECTION. PROVIDE SLOPED ROOF CURB AS REQUIRED TO MATCH SLOPE OF ROOF STRUCTURE SO THAT UNIT IS INSTALLED LEVEL. PROVIDE GUARDS OR LOUVERED PANELS TO PROTECT THE CONDENSER COIL FROM HAIL OR OTHER DAMAGE. PROVIDE A 125 VAC, 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMP LOCATIONS WHEN IN USE. PROVIDE ELECTRONIC PROGRAMMABLE TYPE THERMOSTAT. PROVIDE UNIT COMPLETE WITH MANUFACTURER'S ONE YEAR GUARANTEE ON COMPONENTS PLUS AN ADDITIONAL FOUR YEAR GUARANTEE ON THE COMPRESSORS AND HEAT EXCHANGERS.

AIR FILTERS

PROVIDE MERV 13, PLEATED, THROWAWAY TYPE FILTERS. AIR HANDLING UNITS SHALL HAVE NEW FILTERS INSTALLED WHEN THEY ARE OPERATED BEFORE FINAL ACCEPTANCE.

IF HVAC EQUIPMENT IS USED DURING THE CONSTRUCTION PERIOD, CONTRACTOR SHALL PROVIDE ONE SET OF FILTERS WHEN THE UNIT IS STARTED AND REPLACE FILTERS AS NEEDED, BUT NOT LESS THAN EVERY MONTH. ON THE DAY OF SUBSTANTIAL COMPLETION, THE CONTRACTOR SHALL CLEAN THE UNIT AND PROVIDE A NEW SET OF FILTERS IN THE UNIT.

23 81 26 DUCTLESS SPLIT AIR CONDITIONING SYSTEMS

PROVIDE DUCTLESS SPLIT SYSTEM AS SPECIFIED ON THE DRAWINGS OR EQUAL CONSISTING OF EVAPORATOR SECTION FOR CEILING MOUNTING OR WALL MOUNTING AS INDICATED AND REMOTE CONDENSING SECTION MANUFACTURED BY MITSUBISHI, LG, TRANE, OR DAIKIN. EVAPORATOR CABINET SHALL BE FACTORY ASSEMBLED, PRE-WIRED, CONSISTING OF FURNITURE-GRADE STEEL WITH BAKED ENAMEL FINISH, FRONT ACCESS, WITH DIRECT-DRIVE CENTRIFUGAL FANS, 2-SPEED MOTOR, AND CLEANABLE FOAM FILTER. EVAPORATOR COIL SHALL BE DIRECT-EXPANSION COOLING COIL OF SEAMLESS COPPER TUBES EXPANDED INTO ALUMINUM FINS, WITH THERMAL-EXPANSION VALVE WITH EXTERNAL EQUALIZER. AIR-COOLED CONDENSER SHALL BE OF CORROSION-RESISTANT CABINET CONTAINING COMPRESSOR, COPPER TUBE ALUMINUM FIN COILS, DIRECT-DRIVE PROPELLER FANS WITH MOTORS WITH INTERNAL OVERLOAD PROTECTION; INDOOR EVAPORATOR SECTION SHALL HAVE POWER FED FROM REMOTE CONDENSING SECTION; CAPACITY CONTROL TO 0°F.

PROVIDE PREFABRICATED EQUIPMENT SUPPORT RAILS EQUIVALENT TO THYCURB MODEL TMS-1 FASTENED SECURELY TO ROOF FOR CONDENSING SECTIONS ON ROOF. SECURELY ATTACH UNITS TO RAIL.

PROVIDE REFRIGERANT PIPING SIZED AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER WITH FOAMED PLASTIC INSULATION OF THE SUCTION LINE AS SPECIFIED IN THIS SECTION.

PROVIDE CONDENSATE PIPING SIZED AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER AND PUMP AS SPECIFIED ON THE DRAWINGS OR EQUAL.

CONTROL SYSTEM: UNIT-MOUNTED PANEL WITH CONTACTORS, CONTROL TRANSFORMER WITH CIRCUIT BREAKER, SOLID-STATE TEMPERATURE AND HUMIDITY CONTROL MODULES. PROVIDE SOLID-STATE, UNIT-MOUNTED CONTROL PANEL WITH START-STOP SWITCH, ADJUSTABLE HUMIDITY SET-POINT, AND ADJUSTABLE TEMPERATURE SET-POINT. REFER TO SEQUENCE OF OPERATION.

21 05 00 FIRE PROTECTION SYSTEM

ADJUST THE EXISTING FIRE SPRINKLER SYSTEM AS REQUIRED TO PROVIDE FULL COVERAGE FOR THE NEW ARCHITECTURAL FINISH OUT OF THE AREA OF CONSTRUCTION INCLUDING ADDING OR RELOCATING HEADS. REFERENCE THE ARCHITECTURAL CEILING PLAN AND PROVIDE SPRINKLER HEAD LAYOUT TO AVOID CONFLICT. ALL SPRINKLER HEADS WITHIN A GIVEN ROOM SHALL MATCH. ALL SPRINKLER HEADS SHALL THE BASE BUILDING STANDARD.

EXISTING SPRINKLER HEADS MAY BE UPRIGHT IN UNFINISHED SPACES. THIS WOULD REQUIRE REMOVING AND REPLACING WITH CEILING MOUNTED SPRINKLER HEADS. CONTRACTOR SHALL VISIT THE SITE TO COORDINATE PRIOR TO BID.

THE DRAWINGS SHOW THE GENERAL ARRANGEMENT OF PLUMBING, AIR CONDITIONING, PIPING, DUCTWORK, AND OTHER APPARATUS. THE CONTRACTOR SHALL PREPARE WORKING DRAWINGS OF THE ENTIRE SYSTEM AND SHALL COORDINATE THIS WORK WITH ALL OTHER CONSTRUCTION SO THAT THERE SHALL BE NO CONFLICT AS TO SPACE REQUIRED. THE MECHANICAL AND ELECTRICAL WORK SHALL, IN GENERAL, TAKE PRECEDENCE OVER SPRINKLER WORK, EXCEPT WHERE IT IS ABSOLUTELY NECESSARY TO MAINTAIN REQUIRED COVERAGE. SPRINKLER COVERAGE FOR VARIOUS HAZARD CLASSIFICATIONS IN THE BUILDING SHALL BE DETERMINED BY THE CONTRACTOR.

WHEN REQUESTED, PROVIDE THE OWNERS REPRESENTATIVE WITH MANUFACTURER'S CERTIFICATE THAT MATERIALS MEET OR EXCEED MINIMUM REQUIREMENTS AS SPECIFIED.

ALL ASPECTS OF DESIGN, SECURING APPROVAL, OF DESIGN AND CONSTRUCTION, SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE NATION FIRE PROTECTION ASSOCIATION STANDARDS, INCLUDING, BUT NOT LIMITED TO NFPA - 10, 13, 14, 20, AND 24, AND SHALL CONFORM IN ALL RESPECTS TO THE RULES AND REGULATIONS OF THE CITY BUILDING CODE, CITY FIRE CODE, AND ALL APPROVED AUTHORITIES HAVING JURISDICTION.

ALL MATERIALS AND EQUIPMENT PROVIDED UNDER THIS SECTION OF THE SPECIFICATIONS SHALL BE UL LISTED FOR FIRE PROTECTION SYSTEM INSTALLATION.

ALL DESIGN AND INSTALLATION WORK SHALL BE PERFORMED BY A STATE OF TEXAS LICENSED FIRE PROTECTION CONTRACTOR HAVING A MINIMUM OF FIVE (5) YEARS EXPERIENCE IN SIMILAR INSTALLATIONS.

SPRINKLER HEADS SHALL BE OF PROPER TEMPERATURE RATING AS REQUIRED BY NFPA AND APPROVED AUTHORITIES.

SPRINKLER HEADS SHALL BE CENTERED IN CEILING TILES.

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Texas Registration Nos. BR751 * F-3401

SOLIS MAMMOGRAPHY - MONTGOMERY CONROE

20042 EVA STREET, SUITE 104
MONTGOMERY , TX 77356

THESE DRAWINGS ARE NOT APPROVED UNLESS SIGNED AND SEALED BELOW.

BRETT A. METCALF
118833
7/5/18
JULY 05, 2018

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED: JULY 06, 2018
REVIEWED BY: BAM
DRAWN BY: SBA
DESIGNED BY: SBA

AEP PROJECT NUMBER
512-1792-002

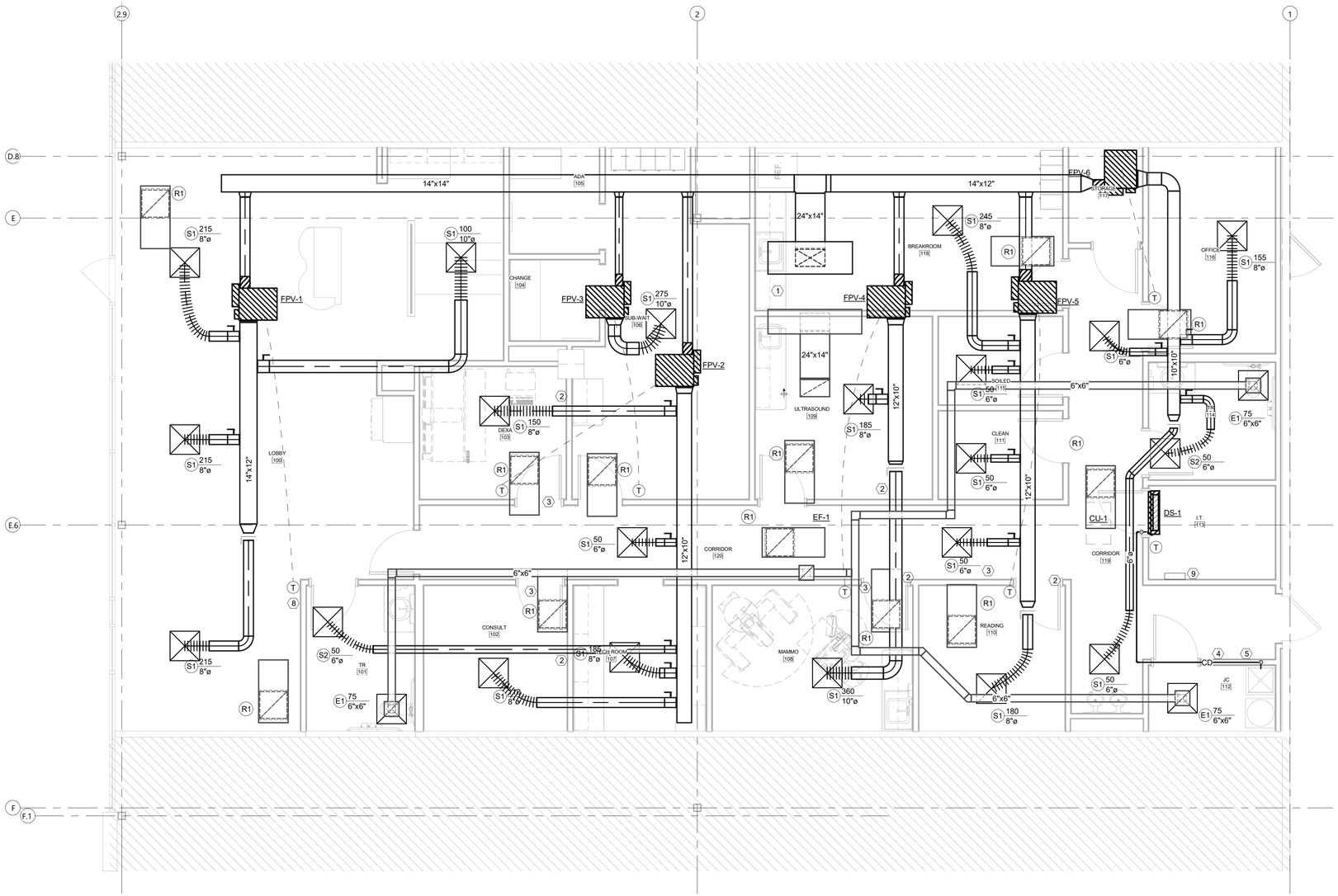
SHEET TITLE

MECHANICAL SPECIFICATIONS

SHEET NUMBER

M2

NOT FOR CONSTRUCTION



T.N.

1
M3

HVAC PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS-BUILT DRAWINGS AND LIMITED SITE OBSERVATION. CONTRACTOR TO FIELD VERIFY ALL CURRENT SPACE CONDITIONS PRIOR TO BID.

2. CONTRACTOR SHALL PROVIDE BALANCING DAMPERS AT ALL TAPS. PROVIDE THRU FACE REMOTE CABLE BALANCING DAMPERS FOR DIFFUSERS/GRILLES IN INACCESSIBLE CEILINGS.

3. DUCT RUNOUT WITH TAKEOFF SHALL MATCH DIFFUSER'S NECK SIZE.

4. PENETRATIONS OF WALLS FOR THE PASSAGE OF PIPING, DUCTWORK, OR OTHER EQUIPMENT SHALL BE PROPERLY SEALED AFTER INSTALLATION OF EQUIPMENT. VERIFY WALL PENETRATIONS AND PROPERLY SEAL AS REQUIRED TO MAINTAIN WALL RATING. PENETRATIONS OF RATED WALL ASSEMBLIES SHALL HAVE PROPERLY RATED DAMPERS.

5. CONTRACTOR SHALL REFER TO THE ARCHITECTURAL RELECTED CEILING PLAN FOR EXACT LOCATIONS OF ALL AIR DEVICES.

6. CONTRACTOR SHALL COMPLY WITH ALL LANDLORD REQUIREMENTS.

7. CONTRACTOR SHALL ENSURE PROPER RETURN AIR PATH BACK TO AIR HANDLERS. PROVIDE OPENINGS ABOVE CEILING OR EXTEND RETURN AIR BOOT/TRANSFER DUCT THROUGH WALL ABOVE CEILING WHERE REQUIRED.

8. CONTRACTOR SHALL PROVIDE HVAC ZONING LEGEND TO END USER AT COMPLETION OF CONSTRUCTION.

9. LABEL ALL THERMOSTATS WITH ASSOCIATED VAV BOX DESIGNATION.

10. LABEL ALL SUPPLY AIR DIFFUSERS WITH ASSOCIATED VAV BOX DESIGNATION SERVING EACH DIFFUSER.

11. FLEXIBLE DUCTS SHALL BE LIMITED TO 6 FEET MAXIMUM. PROVIDE RIGID ROUND DUCTS AS REQUIRED WHERE RUNOUT LENGTHS EXCEED 6 FEET.

12. SMOKE DETECTORS SHALL BE PROVIDED IN RETURN AIR DUCT PRIOR TO RTU.

SHEET NOTES

1. SUPPLY AND RETURN DROPS FROM RTU. TRANSITION AS REQUIRED TO CONNECT.

2. PATCH AND SEAL FULL HEIGHT WALL WHERE DUCT PASSES THROUGH TO MAINTAIN SOUND ATTENUATION.

3. EXTEND RETURN AIR BOOT THROUGH FULL HEIGHT WALL FOR RETURN AIR PATH. PATCH AND SEAL WHERE DUCT PASSES THROUGH TO MAINTAIN SOUND ATTENUATION.

4. ROUTE PUMPED CONDENSATE FROM DS-1 ABOVE CEILING AND DROP IN WALL AT MOP SINK.

5. DROP PUMPED CONDENSATE IN WALL AND TERMINATE AT MOP SINK 2" ABOVE FLOOD RIM.

6. ROUTE REFRIGERANT LINES UP THROUGH WEATHER PROOF ENCLOSURE TO CU-1 ON ROOF. COORDIANTE FINAL LOCATION OF CONDENSING UNIT WITH LANDLORD.

7. EXHAUST DUCT UP TO EF-1 ON ROOF. TRANSITION AS REQUIRED TO CONNECT. MAINTAIN MINIMUM 10'-0" CLEARANCE FROM ANY FRESH AIR INTAKE. COORDIANTE WITH LANDLORD AND ROOF MANUFACTURER FOR FINAL LOCATION.

8. PROVIDE LOCKED COVER ON THERMOSTAT

9. HVAC CONTROLLER

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BRETT A. METCALF
118833
LICENSED
PROFESSIONAL ENGINEER
7/5/18

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HVAC PLAN

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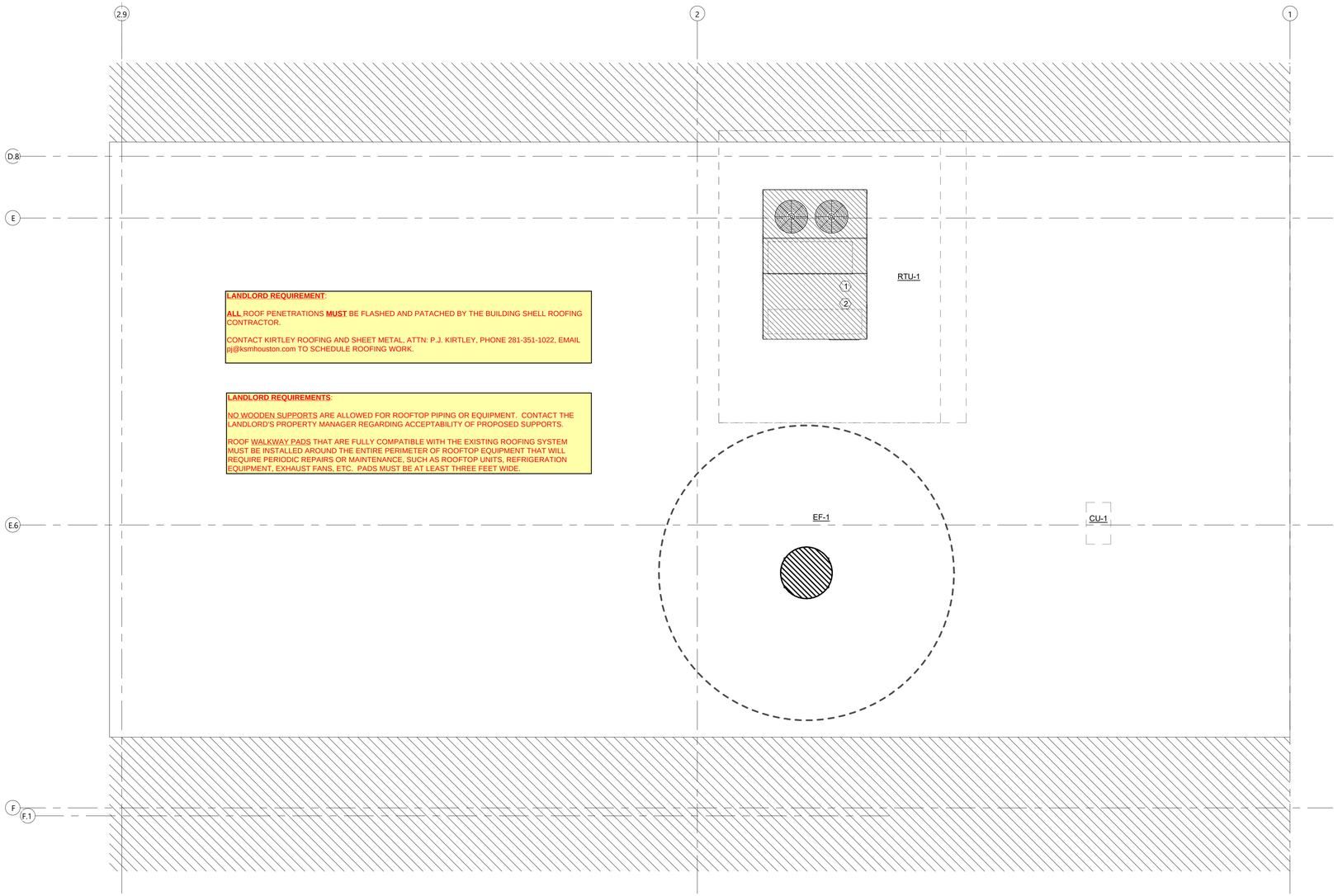

LANDLORD REQUIREMENT:

ALL ROOF PENETRATIONS **MUST** BE FLASHED AND PATACHED BY THE BUILDING SHELL ROOFING CONTRACTOR.

CONTACT KIRTLEY ROOFING AND SHEET METAL, ATTN: P.J. KIRTLEY, PHONE 281-351-1022, EMAIL pj@ksrmhouston.com TO SCHEDULE ROOFING WORK.

LANDLORD REQUIREMENTS:

NO WOODEN SUPPORTS ARE ALLOWED FOR ROOFTOP PIPING OR EQUIPMENT. CONTACT THE LANDLORD'S PROPERTY MANAGER REGARDING ACCEPTABILITY OF PROPOSED SUPPORTS.

ROOF WALKWAY PADS THAT ARE FULLY COMPATIBLE WITH THE EXISTING ROOFING SYSTEM MUST BE INSTALLED AROUND THE ENTIRE PERIMETER OF ROOFTOP EQUIPMENT THAT WILL REQUIRE PERIODIC REPAIRS OR MAINTENANCE, SUCH AS ROOFTOP UNITS, REFRIGERATION EQUIPMENT, EXHAUST FANS, ETC. PADS MUST BE AT LEAST THREE FEET WIDE.

T.N.

1 / M4 HVAC ROOF PLAN

SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. PROVIDE INSULATED ROOF CURB FOR SUPPORT IF ALL HVAC EQUPMENT. COORDINATE WITH LANDLORD AND ROOF MFG.
2. CALL EXHAUST/VENT OPENINGS SHAL MAINTAIN MINIMUM 10'-0" CLEARANCE FROM FRESH AIR INTAKE.
3. ENSURE PROPER MANUFACTURER RECOMMENDED CLEARANCES FOR ALL HVAC EQUIPMENT.
4. PROVIDE SPLEEPER APDS ON ROOF UNDER CONDENSATE DRAIN LINE. SUPPORTS SHALL BE PROVIDED IN ACCORDANCE WITH THE MANUFACTURER APPROVED MATERIAL.

SHEET NOTES

1. 1" CONDENSATE PIPING DOWN THRU ROOF. ROUTE TO MOP SINK IN JANITORS CLOSET.
2. PROVIDE CONVENIENCE OUTLET AT RTU-1.REFER TO ELECTRICAL.

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SHEET TITLE

HVAC ROOF PLAN

SHEET NUMBER

M4

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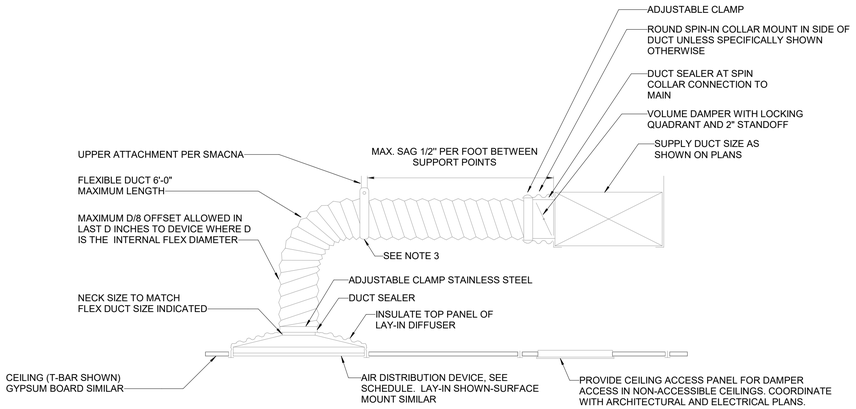
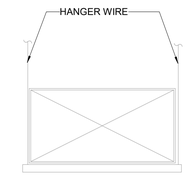


NOTES:

1. FLEXIBLE DUCTS SHALL BE ONE-PIECE AND SHALL NOT BE SPLICED TOGETHER.
2. EXTEND FLEXIBLE DUCT WITH INSULATION TO DUCT/DIFFUSER PANEL INSULATION AND SEAL WITH MASTIC.
3. MINIMUM 1" WIDE 22 GAUGE GALVANIZED STRAP HANGER WITH HEMMED EDGES PER SMACNA FIGURE 3-10.
4. FLEXIBLE AIR DUCT SHALL BE FULLY EXTENDED AND NOT COMPRESSED WITH ELBOW RADIUS NO LESS THAN R/D=1.0.

1 / M5 FLEXIBLE DUCT DETAIL

SCALE: N.T.S.

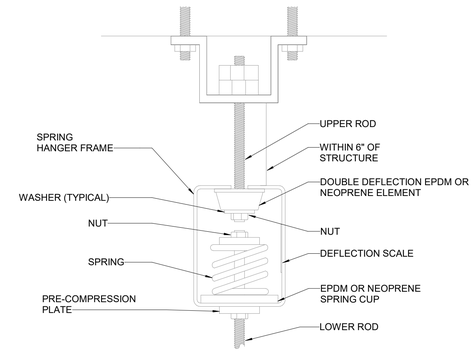


NOTES:

1. MAXIMUM SPACING BETWEEN HANGER LOCATIONS SHALL BE 8'-0" PER PAIR.
2. REFER TO SMACNA FOR ADDITIONAL REQUIREMENTS.

2 / M5 DUCT HANGER DETAIL

SCALE: N.T.S.

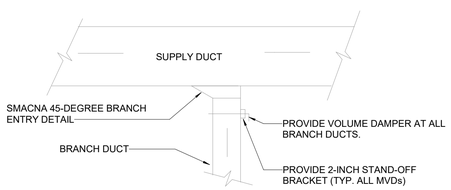


NOTES:

1. TYPICAL SPRING & NEOPRENE IN SERIES ISOLATOR DETAIL. OTHER TYPES OF VIBRATION ISOLATORS ARE SIMILAR.
2. THE SPRING SHALL BE PRE-COMPRESSED SO THAT WHEN PROPERLY INSTALLED AND LOADED, THE SPRING IS ADJUSTED TO THE MID-POINT OF THE DEFLECTION SCALE.
3. REFER TO THE SPECIFICATIONS FOR THE DEFLECTION REQUIREMENTS.

3 / M5 SPRING AND NEOPRENE ISOLATOR DETAIL

SCALE: N.T.S.

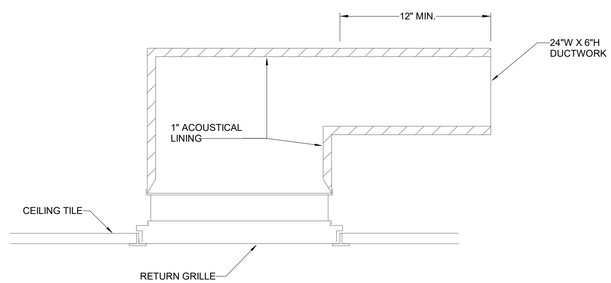


NOTES :

1. RETURN AND EXHAUST BRANCH DUCTS ARE SIMILAR.

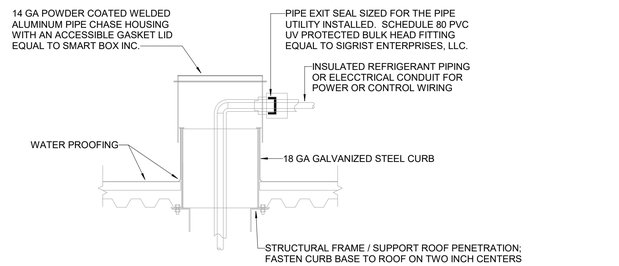
6 / M5 SUPPLY BRANCH DUCT TAKE-OFF DETAIL

SCALE: N.T.S.



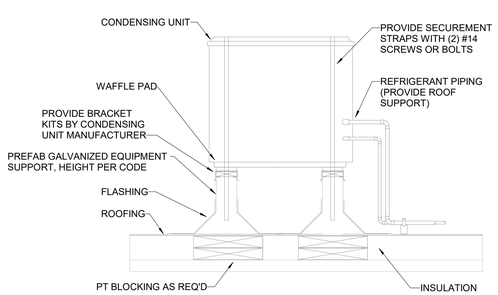
5 / M5 RETURN AIR GRILLE BOOT DETAIL

SCALE: N.T.S.



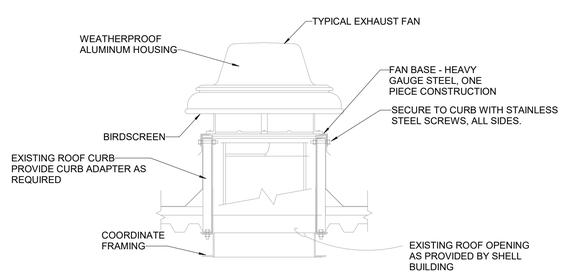
4 / M5 PIPING ROOF PENETRATION WITH CURB DETAIL

SCALE: N.T.S.



7 / M5 ROOF MOUNTED CONDENSING UNIT DETAIL

SCALE: N.T.S.

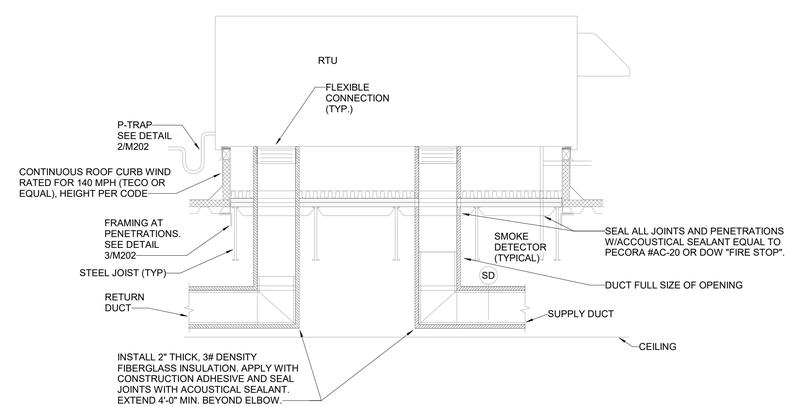


NOTES :

1. PROVIDE NEMA 4X STAINLESS STEEL ELECTRICAL DISCONNECT, MOUNTED ON UNIT. RUN CONDUIT FOR ELECTRICAL POWER THROUGH CURB AND INSIDE FAN BASE.
2. PROVIDE SELF-ACTING BACKDRAFT DAMPER, SECURED TO ROOF CURB
3. PROVIDE TIE-DOWN POINTS AND ATTACH PER MANUFACTURER'S RECOMMENDATIONS.

8 / M5 ROOF MOUNTED EXHAUST FAN DETAIL

SCALE: N.T.S.



9 / M5 RTU INSTALLATION DETAIL

SCALE: N.T.S.

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SOLIS MAMMOGRAPHY - MONTGOMERY CONROE

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STATE OF TEXAS
BRETT A. METCALF
118833
LICENSED PROFESSIONAL ENGINEER
7/5/18

JULY 05, 2018

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED:	JULY 06, 2018
REVIEWED BY:	BAM
DRAWN BY:	SBA
DESIGNED BY:	SBA

AEP PROJECT NUMBER
512-1792-002

SHEET TITLE

HVAC DETAILS

SHEET NUMBER

M5

NOT FOR CONSTRUCTION

AIR TERMINAL UNITS SCHEDULE

MARK	SERVES	PRIMARY AIR INLET SIZE	PRIMARY AIR MAX CFM	PRIMARY AIR MIN CFM	FAN CFM	FAN SP IN WG.	FAN HP	FAN V	FAN PH	EAT F	ELECTRIC HEAT COIL CAP [KW]	ELECTRIC HEAT COIL STAGE	ELECTRIC HEAT COIL V	ELECTRIC HEAT COIL PH	MAX DISCHARGE NC	MAX RADIATED NC	NOTES	PRICE MODEL NUMBER
FPV-01	Lobby	8	740	225	515	0.50	1/8	277	1	65.4	3	1	480	3	22.0	20.0	1-7	FDV-2008
FPV-02	Dexa, Tech, Consult, TR, Corridor	8	545	165	380	0.50	1/8	277	1	65.5	4	2	480	3	20.0	-	1-7	FDV-2008
FPV-03	Sub-wait	6	275	85	190	0.50	1/8	277	1	66.2	3	1	480	3	22.0	-	1-7	FDV-2006
FPV-04	Mammo, u/s	8	535	165	370	0.50	1/8	277	1	65.4	4	2	480	3	20.0	-	1-7	FDV-2008
FPV-05	Break, Clean, Soiled, Corridor, Reading	10	575	175	400	0.50	1/4	277	1	65.4	5	SCR	480	3	20.0	22.0	1-7	FDV-2010
FPV-06	Office, TR, Corridor	6	305	95	210	0.50	1/8	277	1	66.4	3	1	480	3	21.0	-	1-7	FDV-2006

NOTES:

1. PROVIDE A DISCONNECT SWITCH.
2. PROVIDE WITH ECM MOTOR.
3. PROVIDE COMPLETE PRESSURE-INDEPENDENT DDC CONTROLS AS SPECIFIED.
4. PROVIDE SINGLE POINT ELECTRICAL CONNECTION FOR HEATER AND FAN MOTOR, UL DISCONNECTS, AND TRANSFORMERS FOR NEW EQUIPMENT.
5. VERIFY CONFIGURATION OF FACTORY-MOUNTED CONTROLS AND ELECTRIC HEATING COIL TO ALLOW REQUIRED CLEARANCES.
6. CONTRACTOR TO PROVIDE TEMPORARY FILTERS DURING CONSTRUCTION AND REPLACE WITH NEW 1" MERV 8 FILTERS UPON SIGNIFICANT COMPLETION OF CONSTRUCTION.
7. PROVIDE SPACE TEMPERATURE SENSOR FOR ALL UNITS WITH SETPOINT ADJUSTMENT AND BYPASS MODE.

DX ROOFTOP UNIT SCHEDULE

ALTITUDE 787 FEET

MARK		RTU-1
NOMINAL CAPACITY		12.5
SERVES		ENTIRE SPACE
SQUARE FOOTAGE		3,230
MINIMUM OUTSIDE AIR	CFM	331
	Outside Air - CFM/SF	0.11
SUPPLY FAN	CFM	3,150
	# FANS @ CFM/EA	1 @ 3,150
	TOTAL (in WG)	1.896
	EXT SP (in WG)	1.75
MOTOR	Qty @ HP / FLA	1 @ 3 / 4.8
FAN DIAMETER / TYPE / CLASS		
COOLING COIL		
EAT (DB / WB)	BF	79.4 / 65.6
LAT (DB / WB)	BF	55.22 / 55.22
TOTAL CAPACITY (GROSS)	MBTUH	128.0
SENSIBLE CAPACITY (GROSS)	MBTUH	95.9
FILTER		
EFFICIENCY		80%
TYPE / DEPTH (INCHES)		MERV-13 / 2
ELECTRICAL DATA	V / PH / MCA / MOCP	460 / 3 / 30 / 40
MANUFACTURER		TRANE
MODEL		THD150G4R0
DIMENSIONS (H X W X L)	INCHES	4.68 / 7.02 / 10.14
WEIGHT	LBS	2,700

NOTES:

1. PROVIDE A SINGLE POINT OF POWER CONNECTION FOR A UNIT MOUNTED NON-FUSED DISCONNECT.
2. PROVIDE A SEPARATE 120V / 1 PH / 20 AMP CIRCUIT FOR UNIT SERVICE RECEPTACLES.
3. PROVIDE A SEPARATE MINIMUM OUTSIDE AIR DAMPER WITH AIR FLOW MONITORING STATION.
4. 100% AIR SIDE ECONOMIZER WITH BAROMETRIC RELIEF.
5. PROVIDE SMOKE DETECTORS IN SUPPLY AND RETURN DUCT AS REQUIRED BY CODE.

VENTILATION AIR SCHEDULE

UNIT	SPACE	AREA (SQ.FT.)	AREA RATE (CFM/SQ.FT.)	NO. OF PEOPLE	PEOPLE RATE (CFM/PERSON)	O/A CFM REQUIRED
FPV-1	LOBBY EXTERIOR	496	0.06	7	5	65
	LOBBY INTERIOR	306	0.06	7	5	53
					COOLING	118
					HEATING	148
FPV-2	TOILET ROOM	73	0.06	0	5	0
	CONSULT	96	0.06	2	5	16
	TECH	89	0	3	0	20
	DEXA	90	0.06	2	5	15
	CORRIDOR	205	0.06	0	5	12
					COOLING	63
					HEATING	79
FPV-3	SUB-WAIT	321	0.06	9	5	64
					COOLING	64
					HEATING	80
FPV-4	MAMMO	135	0.06	2	5	18
	ULTRASOUND	139	0.06	2	5	18
					COOLING	36
					HEATING	45
FPV-5	BREAK ROOM	247	0.00	4	5	16
	READING	98	0.06	2	5	35
	SOILED	48	0.12	0	5	6
	CLEAN	48	0.12	0	5	6
	CORRIDOR	205	0.06	0	5	12
					COOLING	75
					HEATING	94
FPV-6	TOILET ROOM	502	0.00	0	5	5
	JANITOR	38	0.06	0	5	0
	OFFICE	121	0.06	2	5	17
	CORRIDOR	214	0.06	0	5	4
	STORAGE	32	0.12	0	5	13
					COOLING	39
					HEATING	49

GRILLES, REGISTERS, AND DIFFUSERS

MARK	DESCRIPTION	MFG / MODEL	CEILING / BORDER	FINISH COLOR	PANEL SIZE	MATERIAL	NECK SIZE	NOTES
S1	PLAQUE FACE SUPPLY	TITUS / OMNI	LAY-IN / 3	WHITE	24"X24"	STEEL	SEE PLANS	1-6
S2	PLAQUE FACE SUPPLY	TITUS / OMNI	SURFACE / 1	WHITE	12"X12"	STEEL	SEE PLANS	1-6
R1	EGGCRATE RETURN	TITUS / 50F	LAY-IN / 3	WHITE	24"X24"	ALUMINUM	SEE PLANS	1-3, 7, 8
E1	EGGCRATE EXHAUST	TITUS / 50F	SURFACE / 1	WHITE	24"X24"	ALUMINUM	SEE PLANS	1-3, 5, 6

NOTES:

1. PROVIDE SURFACE MOUNTING BORDER FOR GYPSUM BOARD CEILINGS OR LAY-IN FRAME WHERE REQUIRED. SEE ARCH CEILING PLANS. PLASTER FRAMES SHALL BE FACTORY PRIMED FOR FIELD PAINTING.
2. CONFIRM FINISH WITH ARCHITECT.
3. PROVIDE MOUNTING CLIPS.
4. PROVIDE MOLDED INSULATED BLANKET OR INSULATE THE BACKSIDE OF DIFFUSER PAN FOR SUPPLY APPLICATIONS.
5. DUCT-MOUNTED VOLUME DAMPERS SHALL BE PROVIDED AT TAKE-OFF.
6. PROVIDE REMOTE BALANCING DAMPER EQUAL TO TITUS ROTOTWIST FOR INACCESSIBLE CEILINGS. WHERE REQUIRED, CABLE CONTROL SHALL BE ACCESSIBLE THROUGH THE FACE OF AIR DEVICE.
7. PAINT ALL OBJECTS VISIBLE THROUGH GRILLE FLAT BLACK WHEN NOT DUCTED.
8. PROVIDE WITH RETURN AIR BOOT WHERE APPLICABLE. REFER TO DETAIL 5/M2.

FAN SCHEDULE

MARK	SERVICE / TYPE	FAN CFM	FAN SP [in WG]	FAN RPM	ELECTRICAL HP	ELECTRICAL V/PH/HZ	MAX SONES	WEIGHT [LBS]	MANUFACTURER/MODEL	NOTES
EF-1	EXHAUST / DOWNBLAST	225	0.50	1,572	1/10	115/1/60	7.9	30	GREENHECK G-085-VG	1-6

NOTES:

1. PROVIDE ANTI-BLOWING INTERNAL WIND BAND AND NEMA-3R TYPE DISCONNECT.
2. PROVIDE BIRD SCREEN.
3. PROVIDE BACKDRAFT DAMPER.
4. PROVIDE ECM MOTOR WITH UNIT MOUNTED SPEED CONTROLLER.
5. PROVIDE INSULATED ROOF CURB WITH WOOD NAILER AND DAMPER TRAY.
6. FAN TO RUN CONTINUOUSLY DURING OCCUPIED HOURS.

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DRAWN BY:	**JGR**
DESIGNED BY:	**SBA**

AEP PROJECT NUMBER
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SHEET TITLE

HVAC SCHEDULES

SHEET NUMBER

M6

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