GENERAL NOTES

A. SEAL ALL DUCT AND PIPE PENETRATIONS THRU EXTERIOR WALLS AND ROOF AIRTIGHT WITH WATER PROOF SEALANT.

B. SIZE AND INSTALL REFRIGERANT PIPING AND RELATED APPURTENANCES PER MANUFACTURER'S RECOMMENDATION.

C. COORDINATE DUCTWORK AND PIPING INSTALLATIONS WITH STRUCTURE AND OTHER DISCIPLINES.

D. TERMINATE RESTROOM EXHAUST DUCTS AT SOFFIT IN 10"x8" FACE GRILLE, KRUEGER S80 OR EQUIVALENT UNLESS OTHERWISE INDICATED. PROVIDE BACKDRAFT DAMPER AND INSECT SCREEN AT GRILLE OUTLET.

KEYED NOTES

1 INSTALL ALUMINUM OUTSIDE AIR GRILLE IN SOFFIT. PROVIDE BACKDRAFT DAMPER AND BIRD SCREEN AT OUTSIDE AIR GRILLE INLET.

2 INSTALL BALANCING DAMPER TO ACHIEVE OUTSIDE AIR CFM REQUIRED BY ASSOCIATED FAN COIL UNIT. REFER TO SCHEDULES.

3 INSTALL NEW OWNER PROVIDED KITCHEN HOOD ACCORDING TO MANUFACTURER AND KITCHEN CONSULTANT RECOMMENDATION.

4 INSTALL 12"x4" RETURN GRILLE IN DOOR AS SCHEDULED.

5 4" DIA RIGID METAL DRIER VENT DUCT WITH SMOOTH INTERIOR SURFACE. VENT SHALL HAVE BACKDRAFT DAMPER, POINT DOWN, AND BE A MINIMUM OF 12" ABOVE FINISHED GRADE. INSTALL AT DRIER EXHAUST PER MANUFACTURER'S INSTRUCTIONS.

6 TERMINATE 3/4" SECONDARY CONDENSATE DRAIN PIPE AT SOFFIT POINTING DOWN AND DRAINING TO OUTDOORS AS INDICATED.

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8 FLOOR DRAIN AT ATTIC MEZZANINE LEVEL. COORDINATE WITH PLUMBING. ROUTE 3/4" DIA CONDENSATE PIPES TO DRAIN.

9 3/4" DIA CONDENSATE DRAIN FROM FAN COIL UNIT TO SINK TAIL PIECE LOCATION AS INDICATED. COORDINATE WITH PLUMBER TO PROVIDE BAFFLE TEE TAIL PIECE ADAPTER.

10 ROUTE 3/4" SECONDARY CONDENSATE DRAIN FROM FAN COIL UNIT TO ABOVE SINK LOCATION. PROVIDE ESCUTHEON PLATE AT CEILING.

11 PROVIDE 3-WAY THROW DIFFUSER AS INDICATED.

12 ROOFTOP INTAKE VENTILATOR GREENHECK MODEL GRSI SIZE 12 OR APPROVED EQUAL. INSTALL ON PITCHED ROOF ACCORDING TO MANUFACTURER SPECIFICATION. FLASH AND SEAL ALL ROOF PENETRATIONS. PROVIDE BIRD SCREEN AND BACKDRAFT DAMPER. REFER TO ARCHITECTURAL ROOF PLAN FOR FINAL LOCATION. MAINTAIN MINIMUM 10'-0" BETWEEN INTAKE AND SANITARY PLUMBING VENTS AND EXHAUST.

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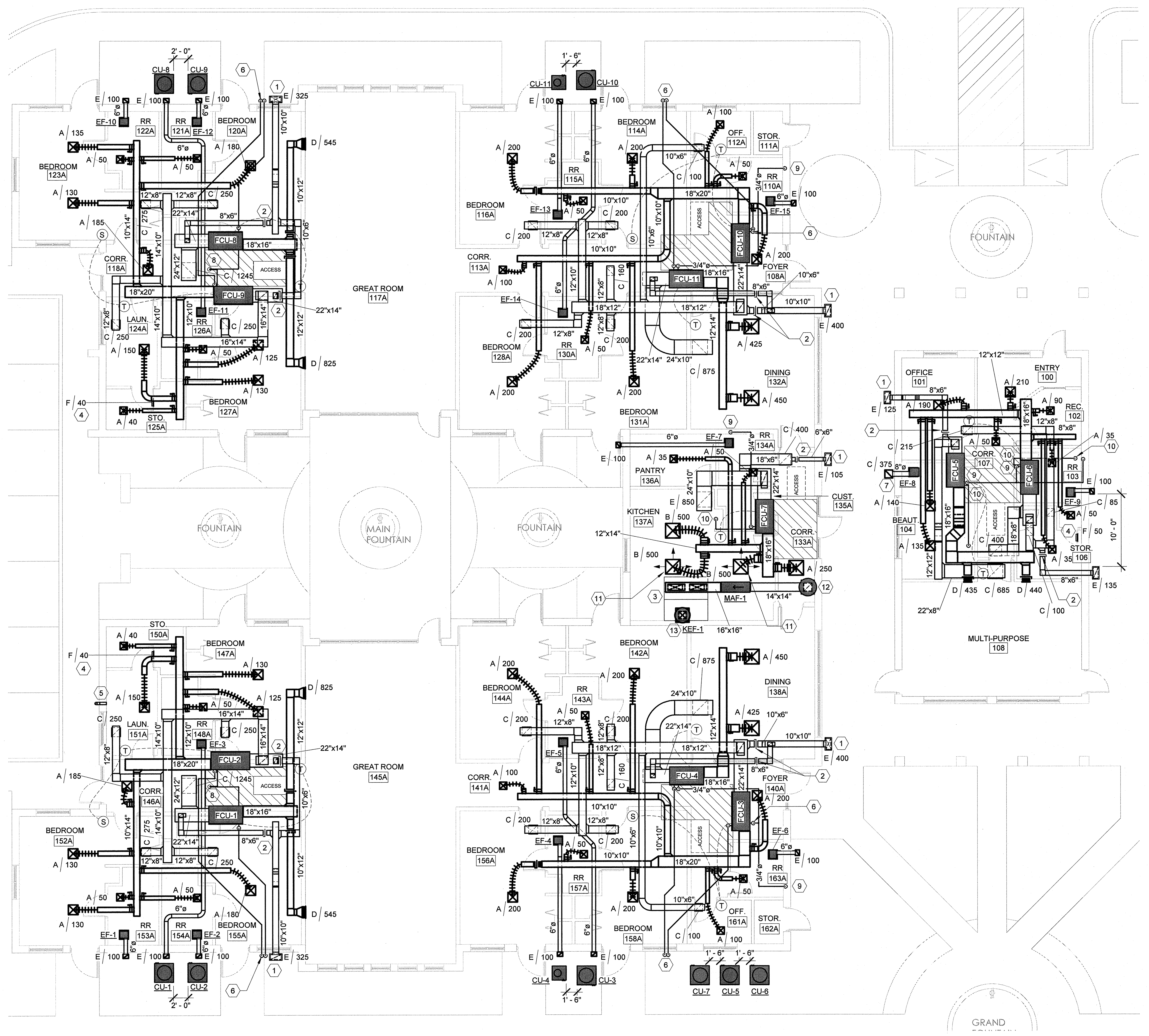
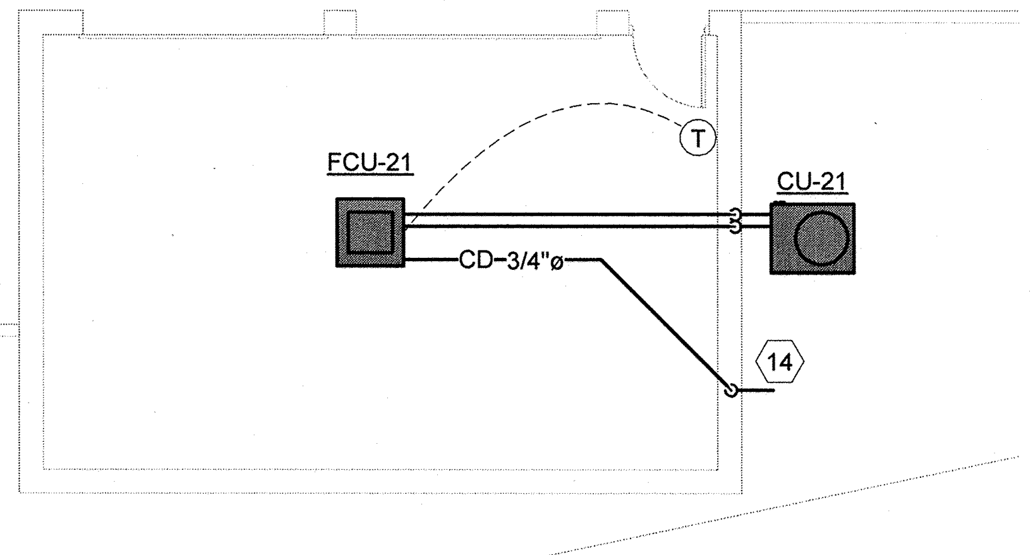
14 TERMINATE 3/4" DIAMETER CONDENSATE DRAIN 2'-0" FROM BUILDING AND 0'-2" ABOVE FINISHED GRADE. CONTRACTOR SHALL INSTALL FRENCH DRAIN AND TERMINATE CONDENSATE PIPE OVER FRENCH DRAIN.



1 Optimum Care Mechanical Plan - West

1/8" = 1'-0"



2 Garage Plan - Southwest

1/8" = 1'-0"

HVAC LEGEND

⧄	NEW RETURN AIR GRILLE
☒	NEW SUPPLY AIR DIFFUSER
Ⓣ	NEW ZONE CONTROLLER OR THERMOSTAT AT 48" A.F.F.
Ⓢ	NEW TEMPERATURE SENSOR AT 48" A.F.F.
EX / 0	AIR DEVICE / CFM
▭	NEW RIGID DUCTWORK
╫	NEW FLEX DUCT
⊏	SPIN-IN VOLUME DAMPER
⬡1	KEYNOTE
⬚	ACCESS DOOR
▨	ATTIC MAINTENANCE PLATFORM

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Revision Schedule

#	Date	Description
1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECH FLOOR PLAN

Sheet No.

M1.1

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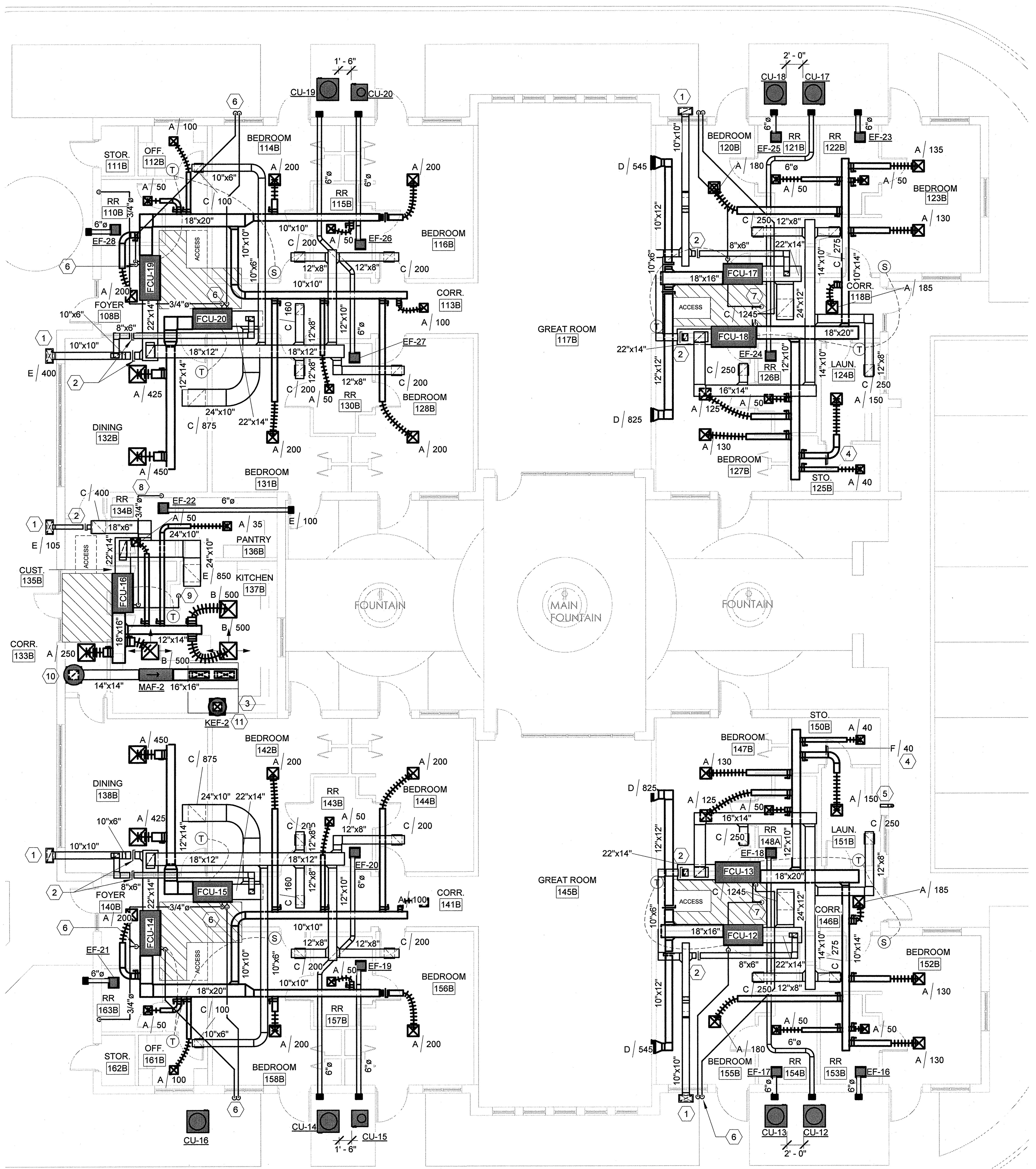

1 Optimum Care Mechanical Plan - East

1/8" = 1'-0"

GENERAL NOTES

A. SEAL ALL DUCT AND PIPE PENETRATIONS THRU EXTERIOR WALLS AND ROOF AIRTIGHT WITH WATER PROOF SEALANT.

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Revision Schedule

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1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECH FLOOR PLAN

Sheet No.

M1.2

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FAN SCHEDULE

PROJECT: OPTIMUM CARE

TAG	EF-1-7, 9-28	KEF-1,2	EF-8	MAF-1,2
SERVICE	EXHAUST	EXHAUST	EXHAUST	SUPPLY
AREA SERVED	RESTROOM	KITCHEN	BEAUTY	KITCHEN
FAN TYPE	CABINET FAN	ROOF UPBLAST	CABINET FAN	DIRECT INLINE
WHEEL TYPE	CENTRIFUGAL	BACKWARD INCLINED	CENTRIFUGAL	BACKWARD INCLINED
AIR FLOW CFM	100	1400	375	1100
EXT. STATIC PRES	0.2" WG	1.0" WG	0.2" WG	0.25" WG
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT
MOTOR DATA	80 W	1/2 hp	144 W	1/4 hp
VOLTS/PH/CYCLES	115/1/60	115/1/60	115/1/60	115/1/60
ACCESSORIES				
FACTORY DISCONNCT	NO	YES	NO	YES
BACK DRAFT DAMPER	YES	NO	YES	NO
FAN SPEED CONTROLLER	YES	NO	YES	YES
MANUFACTURER	GREENHECK	GREENHECK	GREENHECK	GREENHECK
MODEL OR EQ.	SP-B110	CUE-121-A	CSP-A390	SQ-100-A
NOTES	1,2	3,4,5	1,2	2,4,6

NOTES:

1. INTERLOCK FAN WITH LIGHT SWITCH. COORDINATE WITH ELECTRICAL CONTRACTOR.
2. INSTALL VIBRATION ISOLATOR KIT FOR SUSPENDED INSTALLATION.
3. PROVIDE PITCHED ROOF CURB.
4. INTERLOCK KEF-1 AND MAF-1 FOR SIMULTANEOUS OPERATION.
5. FAN SHALL BE UL-762 LISTED FOR GREASE EXHAUST.
6. FAN SHALL HAVE FILTER BOX SEGMENT ACCESSORY.

HEAT PUMP SCHEDULE

PROJECT: OPTIMUM CARE

SYSTEM NUMBER	21
SERVICES	GARAGE
FAN COIL	
TAG	FCU-21
CONFIGURATION	CASSETTE
SUPPLY CFM	470
MCA/MOCP	0.4/15
VOLTS/PH/CYCLES	208/1/60
SENSIBLE COOLING BTUH	14,100
RATED COOLING BTUH	18,000
ENT DB/WB, °F	80/67
LVG DB/WB, °F	55/54
RATED HEATING BTUH	20,000
FACTORY DISCONNECT	NO
SINGLE POINT WIRING	YES
CONCEALED CONDENSATE PUMP	NO
REFRIGERANT	R-410A
DAIKIN MODEL OR EQUAL	FCQ18PAVJU
CONDENSING UNIT	
TAG	CU-21
AMBIENT TEMP, °F	95
MINIMUM SYSTEM ARI SEER	17.2
SPEED	MODULATING
OPERATES DOWN TO, °F	23° CLG / 0° HTG
MCA/MOCP	16.5/20
VOLTS/PH/CYCLES	208/1/60
DAIKIN MODEL OR EQUAL	RZQ18PVJU9

NOTES

- SINGLE POINT ELEC CONNECTION INCLUDES INTERNAL FUSING AND CONTACTORS FOR STARTERS FOR MOTORS

GAS FURNACE/COOLING COIL SCHEDULE

PROJECT: OPTIMUM CARE

SYSTEM NUMBER	1,8,12,17	2,9,13,18	3,10,14,19	4,11,15,20	5	6	7,16
AREA SERVED	GREAT ROOM	BEDROOMS	BEDROOMS	DINING	MULTIPURPOSE	OFFICE	KITCHEN
INDOOR UNIT TAG	FCU-1,8,12,17	FCU-2,9,13,18	FCU-3,10,14,19	FCU-4,11,15,20	FCU-5	FCU-6	FCU-7,16
FURNACE DATA							
CONFIGURATION	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
CFM	1370	1225	1400	1050	875	935	1835
OUTSIDE AIR CFM	125	200	240	160	125	135	105
EXT. STATIC PRESSURE IN. W.C.	0.25	0.4	0.4	0.25	0.4	0.4	0.3
FAN HP	3/4	3/4	3/4	3/4	3/4	3/4	3/4
VOLTS/PHASE	120/1	120/1	120/1	120/1	120/1	120/1	120/1
MCA/MOCP	10.3/15	10.3/15	10.3/15	9.5/15	9.5/15	9.5/15	10.3/15
ECM MOTOR	YES	YES	YES	YES	YES	YES	YES
GAS HEAT MBH INPUT	84,000	84,000	84,000	63,000	84,000	84,000	84,000
MBH OUTPUT	69,000	69,000	69,000	51,000	69,000	69,000	69,000
MIN AFUE %	80	80	80	80	80	80	80
HEATING STAGES	1	1	1	1	1	1	1
FILTER TYPE	2" / MERV 8	2" / MERV 8	2" / MERV 8	2" / MERV 8	2" / MERV 8	2" / MERV 8	2" / MERV 8
MANUFACTURER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER
MODEL OR APPROVED EQUAL	58PH*090-16	58PH*090-16	58PH*090-16	58PH*070-16	58PH*070-16	58PH*070-16	58PH*090-16
DX COIL DATA							
COOLING COIL NOMINAL TONS	3.5	3.5	4	2.5	2.5	2.5	5
AIR ENT DB/WB	76.9/63.2	78.6/65.4	79.6/66.2	79.9/66.9	78.7/66.7	78.1/64.6	80.0/67.2
AIR LVG DB/WB	55/54	55/54	55/54	55/54	55/54	55/54	55/54
CAPACITY BTUH SENSIBLE	29,000	26,900	28,400	16,200	18,100	19,200	41,700
CAPACITY BTUH TOTAL	36,300	38,600	42,300	28,700	28,000	26,800	50,000
MANUFACTURER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER
MODEL OR APPROVED EQUAL	CNPHP42	CNPHP42	CNPHP48	CNPHP30	CNPHP30	CNPHP30	CNPHP60
CONDENSING UNIT TAG	CU-1,8,12,17	CU-2,9,13,18	CU-3,10,14,19	CU-4,11,15,20	CU-5	CU-6	CU-7,16
AMBIENT TEMP, °F	95	95	95	95	95	95	95
MINIMUM ARI SEER	13	13	13	13	13	13	13
OPERATES DOWN TO, °F	30	30	30	30	30	30	30
VOLTS/PH/CYCLES	208/1/60	208/1/60	208/1/60	208/1/60	208/1/60	208/1/60	208/1/60
MCA/MOCP	23.5/40	23.5/40	26.2/40	16.8/25	16.8/25	16.8/25	34.2/50
MANUFACTURER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER	CARRIER
MODEL OR APPROVED EQUAL	24ABB342	24ABB342	24ABB348	24ABB330	24ABB330	24ABB330	24ABB360

NOTES

1 SCHEDULED EXTERNAL STATIC PRESSURE DOES NOT INCLUDE UNIT CASING, COOLING COIL, HEATING COIL, OR FILTER LOSSES.
2 PROVIDE PROGRAMMABLE THERMOSTAT OR SENSOR/CONTROLLER AS INDICATED.
3 CONFORM TO THE LOCAL ADOPTED IECC AND AMENDMENTS.
4 PROVIDE ELECTRICAL DISCONNECT.
5 PROVIDE ANTI-SHORT CYCLE KIT AND TIME DELAY RELAY.
6 PROVIDE CRANKCASE HEATERS.
7 PROVIDE DRAIN PAN BELOW UNIT.
8 INTERLOCK GAS FURNACE WITH CONDENSING UNIT TO ENSURE NON-SIMULTANEOUS OPERATION.
9 PROVIDE NON-HCFC REFRIGERANT AND PROOF OF PROPER REFRIGERANT CHARGE.
10 BLOWER ACCESS PANEL SHALL BE CONFIGURED ON ACCESSIBLE SIDE OF UNIT. REFER TO PLANS FOR ACCESS LOCATIONS.

Air Terminal Schedule

Mark	System Type	Model (or approved equal)	Neck Size	CFM Range	Description	Comments
A	Supply Air	Krueger 6500	6" Ø	0-120	12"x12" Face, Steel, Coordinate Finish	1,2,3,4
A	Supply Air	Krueger 6500	8" Ø	125-250	16"x16" Face, Steel, Coordinate Finish	1,2,3,4
A	Supply Air	Krueger 6500	12" Ø	255-550	24"x24" Face, Steel, Coordinate Finish	1,2,3,4
B	Supply Air	Krueger 56500	12" Ø	255-550	24"x24" Face, Aluminum, Coordinate Finish	1,2,3,4
C	Return Air	Krueger S580	10"x10"	105-175	12"x12" Face, Steel, Coordinate Finish	3,4
C	Return Air	Krueger S80	12"x12"	180-300	15"x15" Face, Steel, Coordinate Finish	3,4
C	Return Air	Krueger S80	16"x16"	305-500	19"x19" Face, Steel, Coordinate Finish	3,4
C	Return Air	Krueger S80	22"x22"	505-1300	24"x24" Face, Steel, Coordinate Finish	3,4
D	Supply Air	Krueger 880	12"x10"	435-575	Sidewall Diffuser, Steel, Coordinate Finish	2,3,4
D	Supply Air	Krueger 880	18"x10"	485-775	Sidewall Diffuser, Steel, Coordinate Finish	2,3,4
D	Supply Air	Krueger 880	18"x12"	780-945	Sidewall Diffuser, Steel, Coordinate Finish	2,3,4
E	Return Air	Krueger S580	6"x4"	0-100	8"x6" Face, Aluminum, Coordinate Finish	3,4
E	Return Air	Krueger S580	18"x8"	180-400	20"x10" Face, Aluminum, Coordinate Finish	3,4
E	Return Air	Krueger S580	22"x22"	505-1300	24"x24" Face, Aluminum, Coordinate Finish	3,4
F	Supply Air	Krueger 600	12"x4"	0-250	Door Grille, Steel, Coordinate Finish	4

1 4-WAY THROW UNLESS OTHERWISE INDICATED ON PLAN.
2 PROVIDE OPPOSE BLADE DAMPER AT EACH SUPPLY AND EXHAUST UNLESS BALANCING DAMPER IS PROVIDED AT RUNOUT TAKE-OFF.
3 LAY-IN OR SURFACE MOUNT FRAME TO MATCH ARCHITECTURAL CEILING TYPE.
4 COORDINATE FINISH WITH ARCHITECT

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Project No.

MECH SCHEDULES

Sheet No.

M2.1

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HVAC DESIGN CRITERIA
INDOOR TEMPERATURE
75ºF COOLING (MINIMUM ALLOWED BY 2009 IECC, SECTION 302.1)
72ºF HEATING (MAXIMUM ALLOWED BY 2009 IECC, SECTION 302.1)

HUMIDITY CONTROL: THIS PROJECT HAS NO DIRECT CONTROL OF HUMIDITY

OUTDOOR DESIGN CONDITIONS (SUGAR LAND, TEXAS) PER 2009 IECC TABLE 302.2: 96ºF DB, 80ºF WB SUMMER; 28ºF DB WINTER. 1365 DEGREE DAYS HEATING; 3058 DEGREE DAYS COOLING; CLIMATE ZONE 2A

CODE INFORMATION:
APPLICABLE CODES INCLUDE BUT ARE NOT LIMITED TO:

2009 INTERNATIONAL BUILDING CODE
2009 INTERNATIONAL MECHANICAL CODE (IMC)
2009 IECC COMMERCIAL ENERGY CONSERVATION CODE:

OUTSIDE AIR REQUIREMENTS- 2009 IMC
MULTIPURPOSE ASSEMBLY : 0.5 CFM PER PERSON & .06 CFM/SQ. FT.
NURSING ROOM: 25 CFM PER PERSON
OFFICE SPACES: 0.5 CFM PER PERSON & 0.06 CFM/SQ FT.
DINING ROOMS: 7.5 CFM PER PERSON & 0.18 CFM/SQ.FT.
CORRIDORS: 0.06 CFM/SQ.FT.

ENERGY CODE PER 2009 IECC CHAPTER 5
SUGAR LAND IS ZONE 2 WARM-HUMID

503.2.1 Calculation of heating and cooling loads. Engineer has performed HVAC load calculations using Elite or Trace
503.2.3 HVAC equipment performance requirements. Equipment shall meet the minimum efficiency requirements of Tables503.2.3
503.2.4 HVAC system controls. Each heating and cooling system shall be provided with thermostatic controls
503.2.4.1 Thermostatic controls. The supply of heating and cooling energy to each zone shall be controlled by individual thermostatic controls capable of responding to temperature within the zone. Where humidification or dehumidification or both is provided, at least one humidity control device shall be provided for each humidity control system.

503.2.4.2 Set point overlap restriction. Where used to control both heating and cooling, zone thermostatic controls shall provide a temperature range or deadband of at least 5°F within which the supply of heating and cooling energy to the zone is capable of being shut off or reduced to a minimum.

503.2.4.3 Off-hour controls. Each zone shall be provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.
Exceptions: 1. Zones that will be operated continuously. 2. Zones with a full HVAC load demand not exceeding 6,800 Btu/h and having a readily accessible manual shutoff switch.

503.2.4.3.1 Thermostatic setback capabilities. Thermostatic setback controls shall have the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F or up to 85°F.

503.2.4.3.2 Automatic setback and shutdown capabilities. Automatic time clock or programmable controls shall be capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for at least 10 hours. Additionally, controls shall have a manual override that allows temporary operation of the system for up to 2 hours; a manually operated timer capable of being adjusted to operate the system for up to 2 hours; or an occupancy sensor.

503.2.4.4 Shutoff damper controls. Both outdoor air supply and exhaust ducts shall be equipped with motorized dampers that will automatically shut when the systems or spaces served are not in use. Exceptions: 1. Gravity dampers shall be permitted in buildings less than three stories in height. 2. Gravity dampers shall be permitted for buildings of any height located in climate zones 1, 2, and 3. 3. Gravity dampers shall be permitted for outside air intake or exhaust airflows of 300 cfm or less.

503.2.5 Ventilation. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.

503.2.7 Duct and plenum insulation and sealing. All supply and return air ducts and plenums shall be insulated with a minimum of R-5 insulation when located in unconditioned spaces and with a minimum of R-8 insulation when located outside the building. Exceptions: When the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F. All joints, longitudinal and transverse seams and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded- fabric systems or tapes.

503.2.7.1.1 Low-pressure duct systems. All longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches w.g. shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions.

503.2.8 Piping insulation. All piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table 503.2.8.Exceptions: 1. Factory-installed piping within HVAC equipment. 2. Piping that conveys fluids that have a design operating temperature range between 55°F and 105°F. 3. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power. 4. Runout piping not exceeding 4 feet in length and 1 inch in diameter between the control valve and HVAC coil.

503.2.9 HVAC system completion. Prior to the issuance of a certificate of occupancy, the design professional shall provide evidence of system completion in accordance with:
503.2.9.1 Air system balancing. Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 25 hp and larger.
503.2.9.3 Manuals. The construction documents shall require that an operating and maintenance manual be provided to the building owner by the mechanical contractor. The manual shall include, at least, the following: 1. Equipment capacity (input and output) and required maintenance actions. 2. Equipment operation and maintenance manuals. 3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments. 4. A complete written narrative of how each system is intended to operate.

WIND LOAD & EQUIPMENT ANCHORAGE
EXTERIOR HVAC EQUIPMENT SHALL BE SECURELY FASTENED IN PLACE. SUPPORTS SHALL BE DESIGNED AND CONSTRUCTED TO SUSTAIN VERTICAL AND HORIZONTAL LOADS WITHIN THE STRESS LIMITATIONS SPECIFIED IN THE BUILDING CODE FOR A WIND SPEED OF 100 MPH, 3 SECOND GUST. EXTERIOR DUCTS SHALL BE SUPPORTED IN A LIKE MANNER.

HVAC GENERAL NOTES (APPLY TO ALL SHEETS)
- DRAWINGS ARE DIAGRAMMATIC; CONFIRM DIMENSIONS AND LOCATIONS IN THE FIELD.
- RUNOUTS TO INDIVIDUAL AIR DEVICES ARE SAME SIZE AS AIR DEVICE NECK.
- DUCT SIZES SHOWN ARE FREE AREA
- SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR TYPE OF CEILING AND LOCATION OF CEILING DEVICES.
- SEE ARCH ELEVATIONS FOR LOCATION OF WALL MTD DEVICES
- PLENUMS ARE CROWDED AND NOT ALL OBSTACLES ARE INDICATED. ALLOW FOR ADDITIONAL DUCT OR PIPE OFFSETS OR TRANSITIONS NOT INDICATED ON DRAWINGS
- SEAL ALL PENETRATIONS OF FLOORS, RATED WALLS, EXTERIOR WALLS
- CONTRACTOR SHALL SUBMIT DRWGS FOR ALL PERMITS IN A TIMELY MANNER AND PAY ALL PERMIT FEES
- PROVIDE ANY REQUIRED TEMPORARY UTILITIES
- SELECT AND INSTALL ALL EQUIPMENT TO PROVIDE CLEARANCE AROUND ALL HVAC EQUIPMENT CONFORMING TO MANUFACTURER'S MINIMUM RECOMMENDED SPACE FOR MAINTENANCE AND/ OR AIR FLOW AND SUFFICIENT TO ALLOW INSPECTION, SERVICE, REPAIR OR REPLACEMENT WITHOUT REMOVING ELEMENTS OF PERMANENT CONSTRUCTION OR DISABLING THE FUNCTION OF FIRE RESISTANCE RATED ASSEMBLIES.
- DO NOT RUN DUCT OR PIPE ABOVE ELECTRICAL PANELS

HVAC SPECIFICATIONS

23 05 00 BASIC MECHANICAL REQUIREMENTS
Warranty: Guarantee labor and materials for 1 year. Warranties begin upon Owner's acceptance of substantial completion of the installation.
Shop drawings: Submit complete information on all equipment, air devices, valves, duct accessories and controls. Submit complete ductwork and piping shop drawings, based on approved equipment and field observation of building conditions. Submit detailed layout of mechanical rooms and yards. Incomplete submittals will be returned to the contractor unreviewed. No time extensions or cost increases will be allowed for delays caused by return of incomplete submittals.
Operations and maintenance instructions: Provide 3 copies of operation and maintenance manuals to Owner. Provide within 90 days after the date of system acceptance. These manuals shall be in accordance with industry-accepted standard such as ASHRAE Guideline 1 and shall include, at a minimum, the following: (a) Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance. (b) Operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified. (c) Names and addresses of at least one service agency. (d) HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments. (e) A complete narrative of how each system is intended to operate, including suggested setpoints. Provide instruction on system operation to Owner's representatives.
Record drawings: Within 90 days after the date of system acceptance, provide record drawings in AutoCAD or Revit (using the same software and version the project was designed in), plus full size hard copy. Project designed in Revit. Electronic backgrounds may be available from Engineer for a fee. Record drawings shall include as a minimum the installed location and performance data on each piece of equipment, air devices, control sensors, control panels, general configuration of duct and pipe distribution system including sizes, and the terminal air or water design flow rates.
Coordination: Provide Electrical Contractor with electrical requirements of approved equipment in sufficient time to order panel boards, disconnects, etc.
Access doors: Provide *Milcor* or equal as required for access to all valves, filters, controls, dampers or other devices requiring attention. Doors shall match wall or ceiling rating. Architect must approve location and appearance of all access doors. Access panels for fire or smoke dampers shall be openable without the use of tools.
Sleeves: Provide metal sleeves where pipes or control wiring penetrate walls
Overflow drain pans: Provide under all above-ceiling units. Pans to be minimum 24 gauge galvanized sheet steel; minimum 1-1/2" deep and not less than 3" larger than unit or coil dimensions. Provide separate 3/4" drain from pan to conspicuous location; provide escutcheon plates at ceiling penetrations. When allowed by local authority, may provide float switch in overflow pan instead of discharge piping; float switch shall shut unit off if water is detected. Pans equipped with float switch shall have screw cap nipple on bottom or side of pan to allow water to be drained from pan.

23 05 03 PIPES FOR HVAC PIPING AND EQUIPMENT
HVAC condensate drains: Inside building use insulated copper or galvanized steel in environmental air plenums. Inside (but not in environmental air plenums) may use insulated PVC. Outside building, use uninsulated UV-resistant PVC. Slope to outlet min 1/8'' per foot. Provide trap (unless HVAC unit is internally trapped) and clean out plugs. Size condensate drain per applicable code; size shall not be less than outlet size of unit or less than 3/4 inches. Discharge condensate to an approved location inside or outside building. Do not discharge into a gutter system if that gutter discharges onto a public walk or street.

Copper pipe fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 - 1480 degrees F.

23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
Test motors in accordance with NEMA MG 1, including winding resistance, no-load speed and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.
Install securely on firm foundation. Mount ball bearing motors with shaft in any position. Install engraved plastic nameplates. Ground and bond motors.
Single Phase Motors: Permanent split-capacitor type where available, otherwise use split-phase start/capacitor run or capacitor start/capacitor run motor. Terminal lugs to match branch circuit conductor quantities, sizes and materials.

23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING & EQUIPMENT
Pipe, duct and equipment hangers and supports shall be per the local code. Support piping at a minimum every 10' or less for 1" and larger pipe, every 6' on 3/4" or smaller. With copper pipe use copper hangers or tape at contact point.

Support flex ducts per manufacturer's installation instructions (provide instructions for inspector review). Alternate acceptable flex duct support is 26 gage, 1.5 inch wide galvanized iron straps on 4 ft maximum spacing.

Roof curbs (required for all roof mounted equipment): Galvanized steel shell and base, mitered cant, insulation, wood nailer. Roof curbs shall match the roof pitch and shall be compatible with the roof type.

Provide concrete or prefabricated pads for all ground mounted equipment.
Flash and seal equipment and pipe stacks.

Furnaces, fans and fan coils shall be suspended or supported with spring isolator unless internally isolated.
Provide flexible duct connections at all air handlers and fans, unless internally isolated.

23 05 53 IDENTIFICATION FOR HVAC PIPING & EQUIPMENT
Equipment: Permanent label (stencil, metal tag or engraved plastic) with unit tag or name and area or space served.

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Revision Schedule

#	Date	Description
1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECHANICAL SPECS

Sheet No.

M3.1

23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC
Balance may be by a qualified employee of the mechanical contractor. Technician shall be AABC certified

Balance according with NEBB Procedural Standards –1999 Procedural Standards for Building Systems

Adjust system to achieve air quantities shown, then adjust volumes to provide constant temperature (±2 deg F) throughout the zone. Adjust fan sheaves. Calibrate all thermostats. Mark setpoints on all dampers and valves. Return to project at 1 and 3 month intervals after completion to make balance adjustments in response to Owner's perceived comfort.

Submit report (NEBB format). Include:
General data: Nameplate data on all equipment. Outside air temp; cfm each supply, exhaust and return grille and actual room temperatures vs. setpoints
Fans: Volume and static pressure; fan rpm and amps
Dx air handlers, fan coils or furnaces: supply and return air temp, volume and static pressure; fan rpm and amps. Outside air cfm.
Dx condensing units: Condensing air temp, units amps

Air systems shall be balanced in a manner to first minimize throttling losses. Then, for fans with fan system power greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

HVAC control systems shall be tested to ensure that control elements are calibrated, adjusted, and in proper working condition. Submit test documentation.

23 07 01 PIPING INSULATION
Pipe insulations, mastics and jackets located in environmental air plenums shall have maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

Primary condensate drains inside buildings- 3/4" Armaflex for entire length. No insulation required outdoors.
Insulation of secondary (overflow) condensate drains not required.

Refrigerant suction piping: 1" Armaflex. Paint outdoor portions with manufacturer's recommended water retardant ultraviolent solar radiation protective coating.

23 07 03 DUCTWORK INSULATION
Flame spread less than 25, smoke developed less than 50 as per ASTM E84, NFPA 255, UL273. Minimum required installed R values for non-residential projects (excluding film resistance) are:
1. In non-conditioned attics, garages or crawl spaces (i.e. outside the bldg envelope insulation): Supply R8; Return –R5.6; Exhaust or relief: R6; Conditioned outside air R8.

External duct wrap: foil face rigid or flexible fiberglass with vapor retarder. R value stenciled on outside. ASTM A96 Water Vapor Permeance: 0.5 perms maximum. Mold Growth per ASTM C1338- No Growth. GREENGUARD Environmental Institute Certified. Vapor Retarder Jacket conforming to ASTM C 1136 Type II: Foil Scrim Kraft (FSK), or White polypropylene – scrim –kraft (PSK). 2" Staple flange on longitudinal seam. Adhere to duct with vapor barrier type adhesive. Overlap all joints. Cover all joints or breaks with glass fab imbedded in vapor barrier mastic.

Insulate backs of supply diffusers when in attics or when ceiling plenum is not used for return air.

23 09 23 ELECTRIC CONTROLS FOR HVAC
Electric, programmable thermostats and controllers, automatic changeover, battery backup.

When indicated, provide Carrier T-55 Space Temeprature Sensor (or approved equal) and Carrier EDGE 33CS2PP2S-02 Programmable thermostat zone controller (or approved equal). See sequence of operation.

23 09 93 SEQUENCES OF OPERATION

1. ALL SYSTEMS
a. **Dead Bands:** Where used to control both heating and cooling, automatic changeover zone thermostatic controls shall be capable of providing a temperature range or dead band of at least 5°F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum. Exceptions: Special applications where wide temperature ranges are not acceptable (retirement homes, data processing, museums, some areas of hospitals) and are approved by the authority having jurisdiction.
b. **Automatic Shutdown.** Each HVAC system shall have controls that can start and stop the system under different time schedules for seven different daytypes per week, are capable of retaining programming and time setting during loss of power for a period of at least 10 hours, and include an accessible manual override, or equivalent function, that allows temporary operation of the system for up to two hours.
c. **Setback Controls.** Heating systems have the capability to automatically restart and temporarily operate the system to maintain *zone* temperatures above a heating setpoint adjustable down to 55°F or lower. Cooling systems shall have the capability to automatically restart and temporarily operate the system as required to maintain *zone* temperatures below a cooling setpoint adjustable up to 85°F or higher or to prevent high space humidity levels.
d. **Gravity Hoods, Vents, and Ventilators.** All outdoor air supply and exhaust hoods, vents, and ventilators shall have motorized dampers that automatically shut when the spaces served are not in use.
e. **Shutoff Damper Controls.** Both outdoor air supply and exhaust systems shall be equipped with motorized dampers that automatically shut when the systems or spaces served are not in use. Ventilation outdoor *air* dampers shall automatically shutting off during preoccupancy building warm-up, cool down, and *setback*. Exceptions:
i. Gravity (non-motorized) dampers are acceptable in exhaust systems in ASHRAE 90.1 2004 climate zones 1, 2, 3, such as City of Houston.
ii. Gravity (nonmotorized) dampers are acceptable in systems with a design outdoor air intake or exhaust capacity of 300 cfm or less.

2. SINGLE ZONE CONSTANT VOLUME SPLIT SYSTEM:
a. Thermostat or space sensor shall measure temperature in space (as indicated on plans). If space sensor is shown, space sensor shall relay temperature to zone controller located in staff area.
b. Thermostat or zone controller controls system off/on cycles; multiple cycles per day. When system is on, fan runs continuously.
c. Thermostat or zone controller cycles compressor(s), then stages heater to maintain zone thermostat set point.

23 23 00 REFRIGERANT PIPING AND SPECIALTIES
Size per A/C unit manufacturer's recommendation, including requirement for long line applications. Provide solenoid valves, traps and/or accumulator when recommended by condensing unit vendor, such as for underground lines. Use factory sealed line sets, unless size or distance exceeds factory set availability. Route hidden from view. Insulate suction line. Seal wall penetrations.
Copper Tubing: ASTM B280, Type ACR hard drawn or annealed. Fittings: ASME B16.22 wrought copper. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F. Unions, flanges, and couplings: copper pipe: bronze, soldered joints.

23 31 00 HVAC DUCTS
Do not fabricate duct from these drawings, confirm all dimensions and available space in field. Dimensions given on drawings are inside free area, sheet metal is larger on lined duct. Branch takeoffs to have 45 degree entry fitting with volume damper.
Elbows to be radius type with minimum centerline radius 1.5 times width or mitered elbows with single thickness turning vanes

Sheet metal: Use galvanized sheetmetal, conforming to current SMACNA for construction, reinforcing, support and other aspects.
PRESSURE CLASS:
Supply from single zone units: +1"
Return: –1"
Exhaust: -1" upstream of fan, 1" downstream
DUCT SEALING:
Definitions (per ASHRAE 2008 TABLE 18-1) :
Seal Level A: All transverse joints and longitudinal seams, and all duct wall penetrations
Seal Level B: All transverse joints and longitudinal seams
Round or flat oval spiral seams need not be sealed
Transverse joints include connections (including but not limited to spin-ins, taps, branches, access door frames, duct connections to equipment)
Duct wall penetrations include but are not limited to screws, pipe, tubes, rods, wires & non self-sealing fasteners .
Supply and outside air ducts, all locations: Seal Level A.
Return or exhaust ducts, outdoors: Seal Level A; all other locations: Seal Level B
Seal all metal ducts using Hardcast or equal mastic plus fiberglas scrim).

Sealant: Fosters 95-90 or 32-19. Do not use oil or solvent base sealants inside bldgs. Do not exceed LEED/SCAQMD volatile organic compound limits inside bldgs. Tape sealants are not allowed
Externally insulated ducts shall be sealed before being insulated. Sealants of exterior ducts shall form a water and air-tight seal, bond to the metal involved, remain flexible with metal movement and have a service temperature range of –30 to 175 F. If exposed to direct sunlight, sealant shall be UV and ozone resistant.

Flex duct
Shall not exceed 8 ft in length nor to be bent more than 90 deg. Flex duct is same size as diffuser neck. Flexmaster 5B, 5M, 6B, 6M, 8B, 8M or eq. Nylon, CPE or foil/fiberglass/polyester laminate, supported by helically wound spring steel wire; fiberglass insulation; vapor barrier film. UL 181 class I; 25/50 Flame/Smoke rating. Pressure Rating: 6 inches WG positive; 1.0 inches WG negative. Vapor barrier Perm rating of .10 or less per ASTM E96 procedure A. Insulation : R value to meet that required for ductwork. Inner core shall maintain shape and full free area at 90 degree bends without glues or reinforcement.

Grease exhaust duct from cooking hoods
Liquid tight, welded 16-gage steel or 18 gage stainless. Duct sloped toward hood minumum1/4 inch per linear foot (I'' per foot if horizontal length exceeds 75 ft). Minimum 1500 fpm velocity; maximum 2500 fpm. Confirm location and size of hood connections- See Food Service equipment plans.
Access cleanouts doors in changes of direction. UL listed or matching duct construction. In duct side or top (not bottom) and at all changes of direction. Within 18 inches of hood collar when hood has dampers. On both sides of inline fans. On horizontal ducts: 20 x20 for personnel entry; when 20x20 is not possible, provide access panels every 12 feet. Signage on panels: ''ACCESS PANEL- DO NOT OBSTRUCT''

Field fabricated ducts: Liquid tight, welded 16-gage steel or 18 gage stainless. Enclose portion of duct from ceiling penetration to or thru roof with 2 hour, UL 1978 classified wrap system *3M FireBarrier Duct Wrap 15A or equal.* Installation, supports, access panel insulation per manufacturer's instructions. Grease duct enclosure systems shall be tested to UL 2221. Enclosures shall be vented to bldg exterior.

DOMESTIC DRIER VENTS
Use 4" minimum diameter rigid metal duct with smooth interior surface. Do not use sheet metal screws or other fasteners which obstruct the air flow. Flexible all metal duct allowed only where field conditions prohibit rigid; use of flex must be specifically approved by Owner for each circumstance. Transitions between drier and wall connection shall be aluminum flex or GE WX8X73 Supurr-FLEX. Wall caps shall be 4" opening and be equal to GE WX8X59 and shall have a backdraft damper. Outlets shall point down and shall be a minimum 12" above the ground or any other obstructions.

23 33 00 DUCTWORK ACCESSORIES
Provide manual balancing dampers in all supply and exhaust branches. Provide manual balancing dampers in outside air and return ducts to each air unit. Provide manual balancing damper at each location motorized duct damper location.
VOLUME CONTROL DAMPERS: per SMACNA HVAC Duct Construction Standards - Metal and Flexible. Single blade dampers for duct sizes up to 6 x 30 inch. Multi-Blade Damper: opposed blade pattern. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware. Except in round ductwork 12 inches and smaller, furnish end bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

Outdoor air, supply and exhaust air dampers shall have a maximum leakage rate of 0.3 cfm per square foot.
Furnish locking, indicating quadrant regulators on single and multi-blade dampers. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters to allow full insulation thickness. Where rod lengths exceed 30 inches furnish regulator at both ends.

All balance damper operators shall be accessible via access panel, lay-in ceiling or remote cable operator. All motorized damper operators shall be accessible and shall not block the air stream.
BACKDRAFT DAMPERS: Parallel-action, gravity-balanced, galv. 16 gage thick steel or extruded aluminum blades with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Adjustment device to permit setting for varying differential static pressure.
FLEXIBLE DUCT CONNECTIONS: per SMACNA. Fabric crimped into 24 gage galvanized metal edging strip. Fabric: Approx. 3 inches wide. UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A.
DUCT TEST HOLES: air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

23 37 00 AIR INLETS AND OUTLETS
For air devices located in lay-in ceilings, vendor shall confirm ceiling grid type and size prior to ordering air devices.

SIDEWALL AIR DEVICES
Sidewall supply- double deflection, 3/4" spacing, front blades vertical, opposed blade damper.
Wall return grille: steel or aluminum, white, 35 deg horizontal louvers on 3/4" spacing. Opposed blade damper. *T*

23 40 00 HVAC AIR CLEANING DEVICES
Filters to be 2", 30 percent efficiency as per ASHRAE 52.2 -1999, Maximum initial resistance at 500 fpm =. 25. *"AAF 'Perfect Pleat HC M8' or equal'.* Use standard sizes only.

23 54 00 GAS FURNACES WITH DX COILS
Horizontal or vertical as shown on drawings. AGA certified. Automatic electronic pilot. Route condensate drain (provide 3" deep trap) to floor or hub drain provided by plumber. Install with manufacturer's required clearances to combustibles. Provide overflow pan for attic units, with discharge to drip through soffit. Provide type B flue through roof to Breidert cap. Gas piping is by Plumber.

23 81 26 SPLIT-SYSTEM AIR-CONDITIONERS
DX FAN COIL UNITS: Factory painted galvanized steel, insulated casing; sloped drain pan; filter rack; multispeed blower, control transformer, supply and return duct flanges, copper coil/alum fin. Manufacturer's standard exp. valve or metering device. Coil factory matched to condensing unit.

AIR COOLED CONDENSING UNITS: UL or CSA listed and ARI certified. Copper tube, aluminium fin coils. 5 year compressor warranty for commercial use and have external service valves, crankcase heater, high and low press switches, compressor start capacitor/relay, sound attenuation blanket for compressor, filter drier, reversing valve, antishort cycle timer. Mount outdoor units on poured concrete base. Refrigerant lines shall be factory sealed line kits, sized as per heat pump manufacturer, suction line fully insulated

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Revision Schedule

#	Date	Description
1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECHANICAL SPECS

Sheet No.

M3.2

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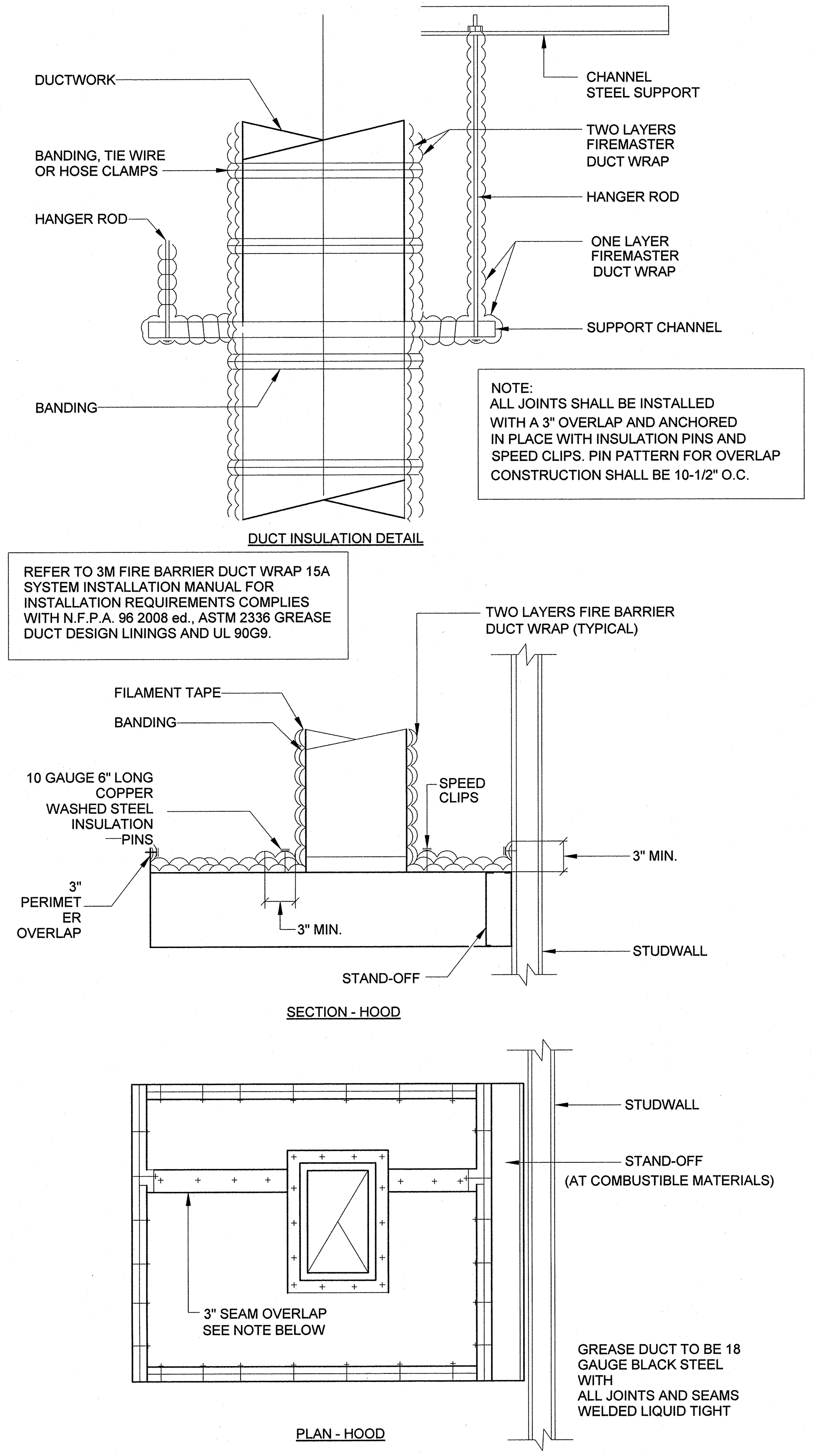
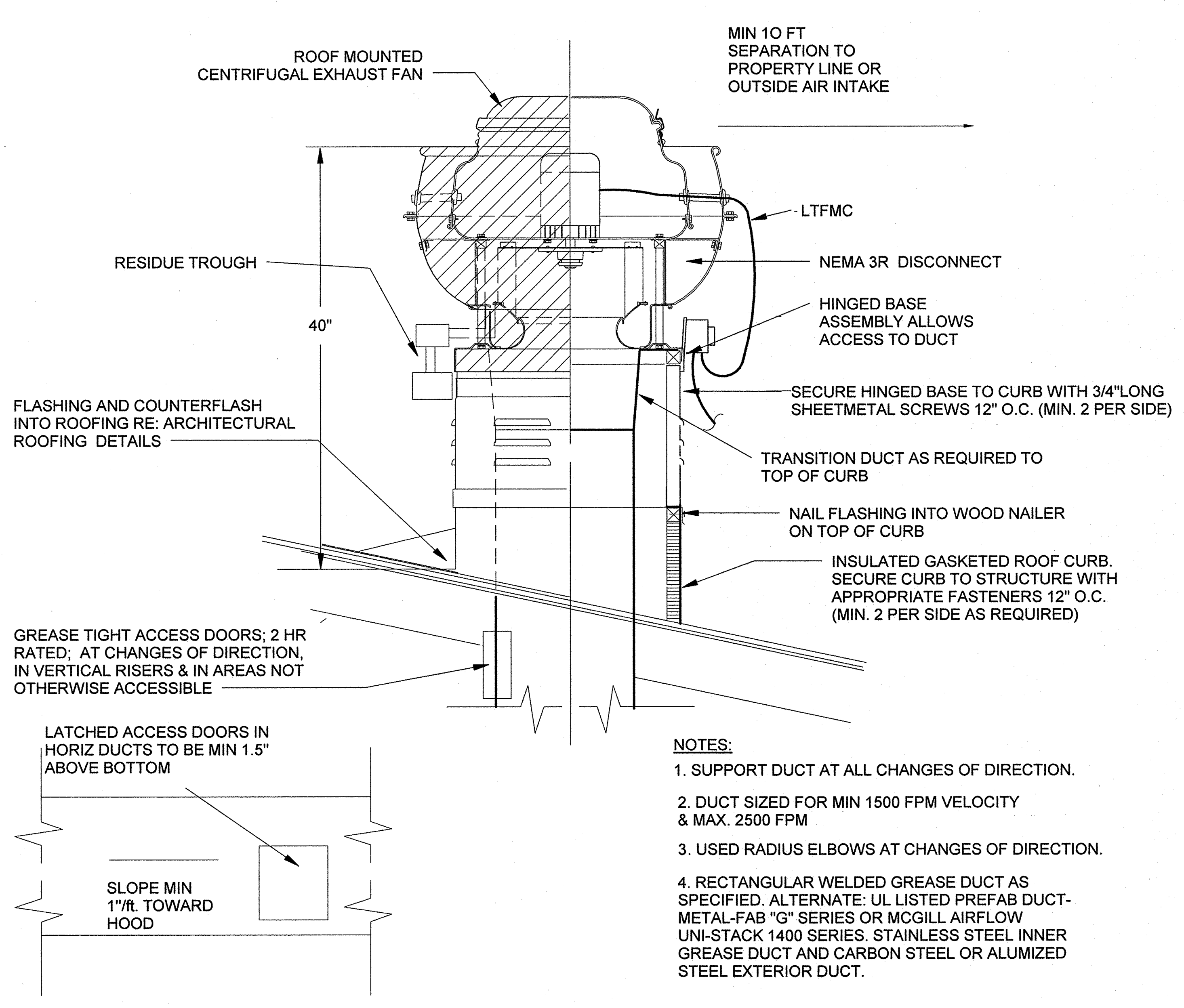


NOTE:
ALL JOINTS SHALL BE INSTALLED WITH A 3" OVERLAP AND ANCHORED IN PLACE WITH INSULATION PINS AND SPEED CLIPS. PIN PATTERN FOR OVERLAP CONSTRUCTION SHALL BE 10-1/2" O.C.

REFER TO 3M FIRE BARRIER DUCT WRAP 15A SYSTEM INSTALLATION MANUAL FOR INSTALLATION REQUIREMENTS COMPLIES WITH N.F.P.A. 96 2008 ed., ASTM 2336 GREASE DUCT DESIGN LININGS AND UL 90G9.

6 KITCHEN GREASE DUCT INSULATION DETAIL

12" = 1'-0"



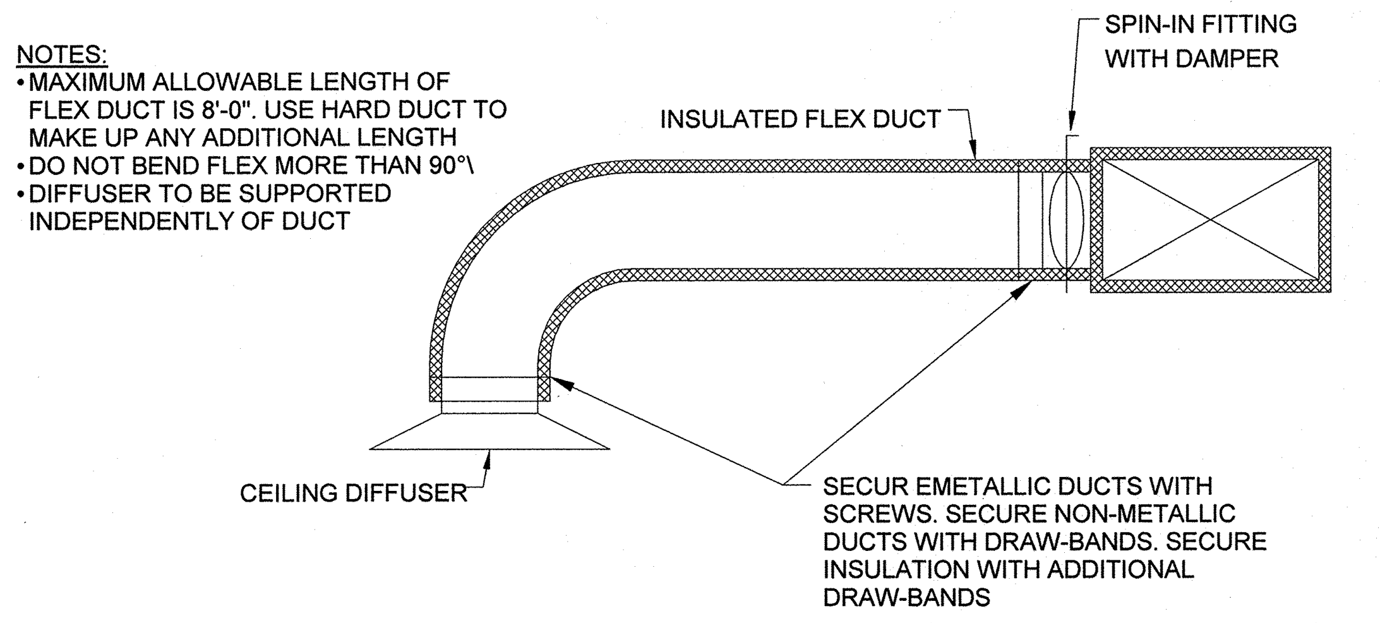
NOTES:

1. SUPPORT DUCT AT ALL CHANGES OF DIRECTION.
2. DUCT SIZED FOR MIN 1500 FPM VELOCITY & MAX. 2500 FPM
3. USED RADIUS ELBOWS AT CHANGES OF DIRECTION.
4. RECTANGULAR WELDED GREASE DUCT AS SPECIFIED. ALTERNATE: UL LISTED PREFAB DUCT-METAL-FAB "G" SERIES OR MCGILL AIRFLOW UNI-STACK 1400 SERIES. STAINLESS STEEL INNER GREASE DUCT AND CARBON STEEL OR ALUMIZED STEEL EXTERIOR DUCT.

7 KITCHEN EXHAUST FAN DETAIL

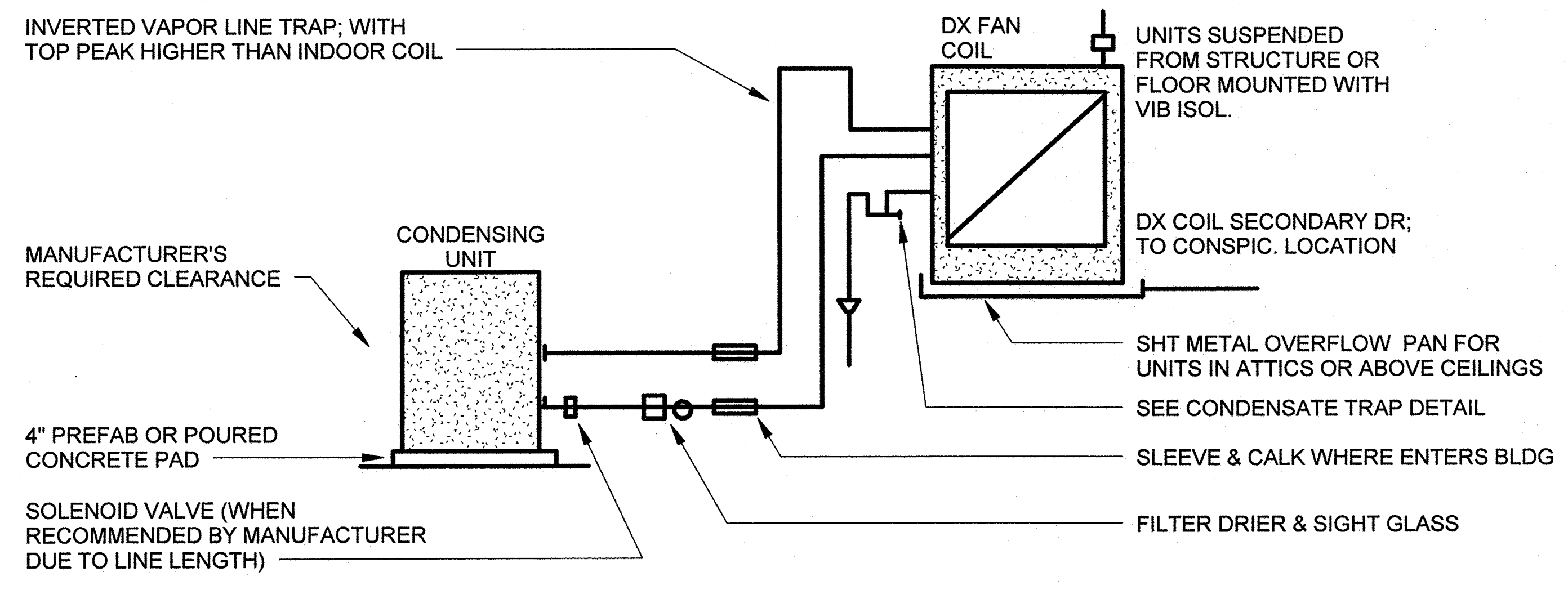
NOT TO SCALE

NOTES:
- MAXIMUM ALLOWABLE LENGTH OF FLEX DUCT IS 6'-0". USE HARD DUCT TO MAKE UP ANY ADDITIONAL LENGTH
- DO NOT BEND FLEX MORE THAN 90°\
- DIFFUSER TO BE SUPPORTED INDEPENDENTLY OF DUCT



5 DIFFUSER CONNECTION

NOT TO SCALE

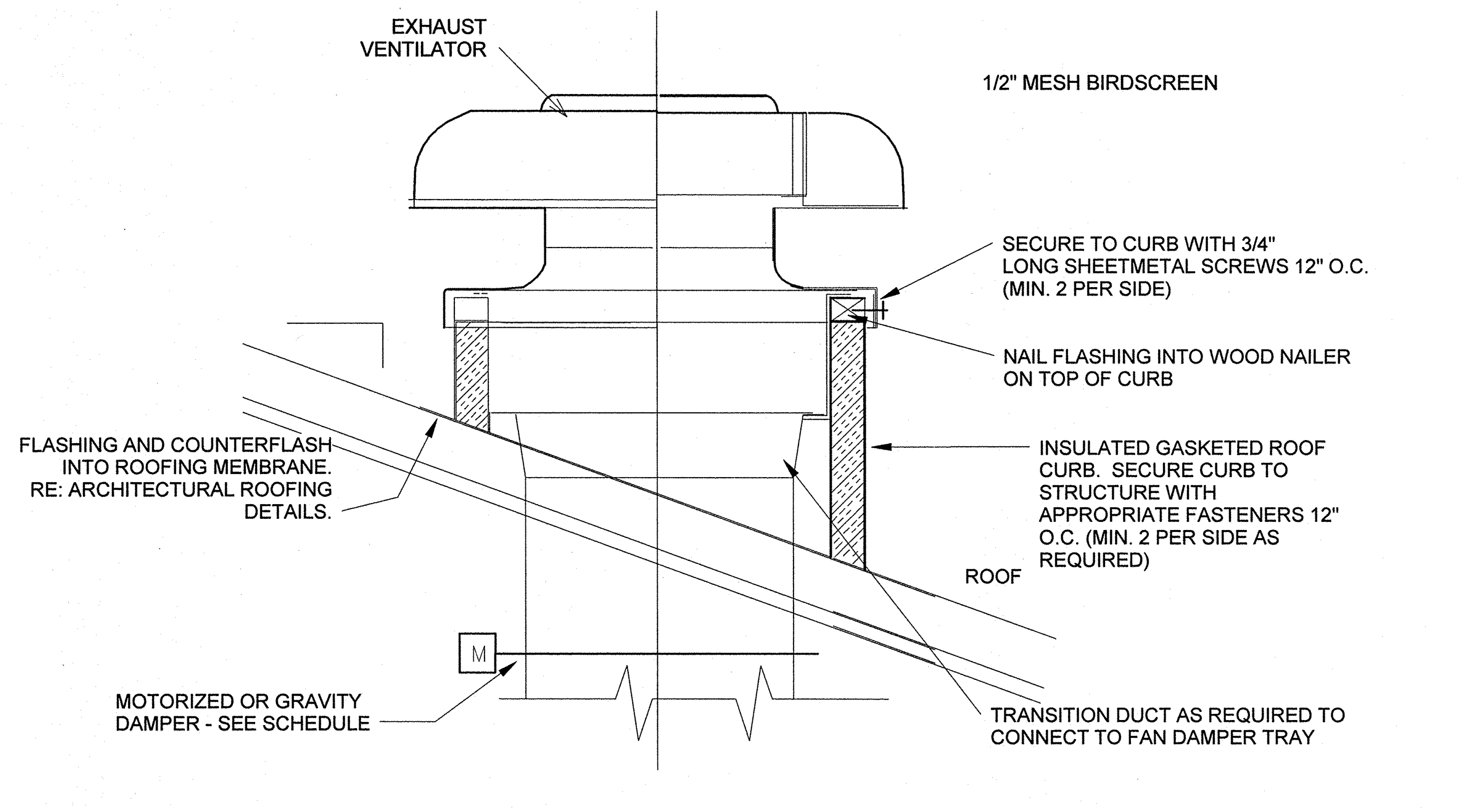


NOTES:

1. SUCITON LINE TO INSULATED; INSULATION INSIDE BUILDING TO HAVE 25/50 FLAME/SMOKE RATING
2. HVAC CONTRACTOR RESPONSIBLE FOR LOW VOLTAGE CONTROL WIRING; ELECTRICAL CONTRACTOR PROVIDES LINE VOLTAGE WIRING & DISCONNECTS
3. SIZE REFRIG LINES AS PER MANUFACTURER
4. DUCT SUPPLY & RETURN. PROVIDE FLEX DUCT CONNECTION ON SUPPLY & RETURN DUCT (UNLESS FIBERGLASS DUCT)

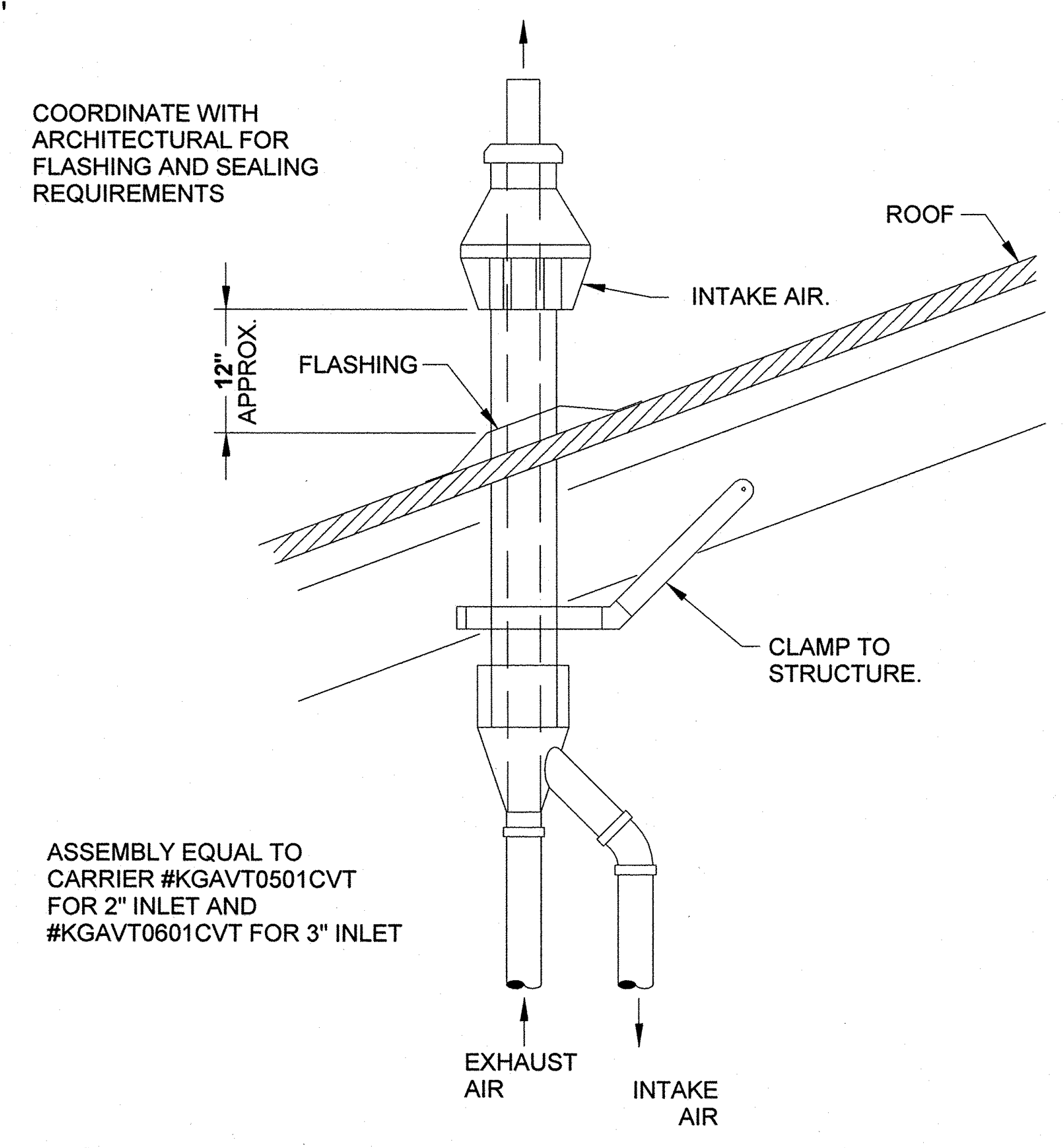
4 DIRECT EXPANSION COOLING COIL AND CONDENSING UNIT

NOT TO SCALE



3 GRAVITY ROOF VENTILATOR DETAIL

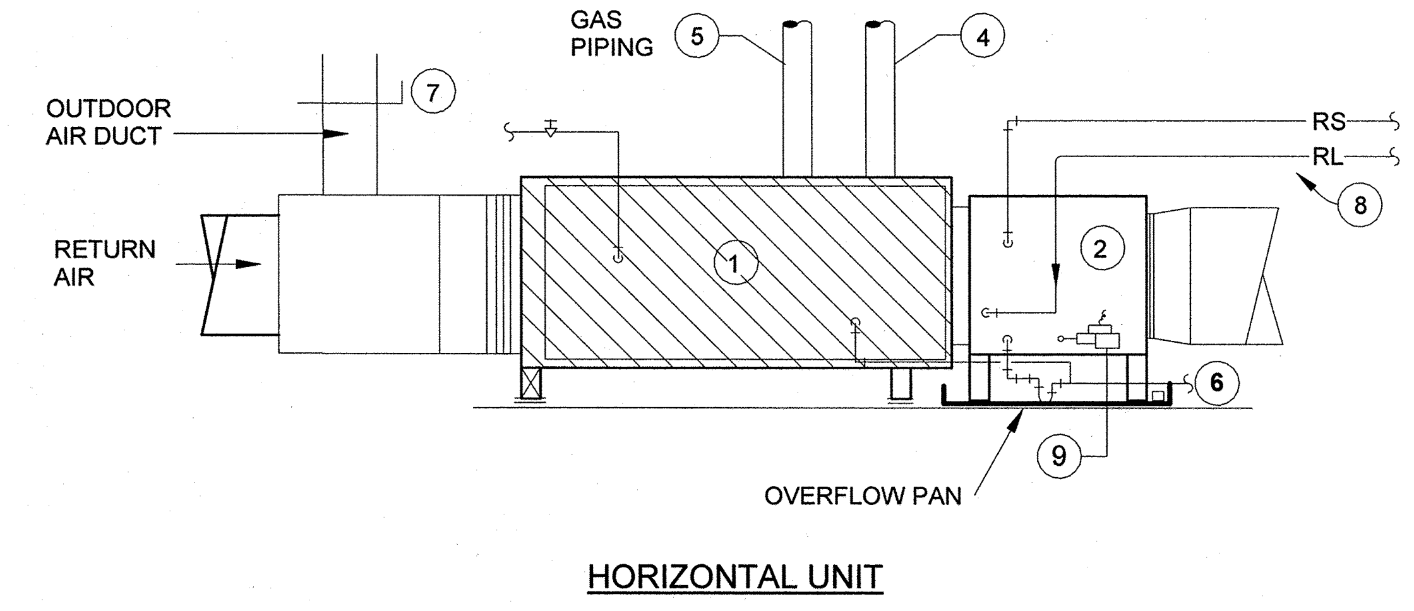
12" = 1'-0"



2 FURNACE CONCENTRIC VENT/COMBUSTION INTAKE DETAIL

12" = 1'-0"

① FURNACE.
② COOLING COIL
③ FLEX DUCT CONNECTION.
④ COMBUSTION AIR INTAKE PIPE.
⑤ EXHAUST AIR OUTLET PIPE.
⑥ COOLING COIL CONDENSATE DRAIN TRAP AND ROUTE TO FLOOR DRAIN
⑦ OUTSIDE AIR DAMPER.
⑧ REFRIGERANT PIPING.
⑨ SECONDARY DRAIN CONNECTION - INSTALL LITTLE GIANT AC-5 OVERFLOW SAFETY SWITCH 120V ELEC.



1 FURNACE/COOLING COIL DETAIL

12" = 1'-0"

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Revision Schedule

#	Date	Description
1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECHANICAL DETAILS

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