

The existing facility was constructed in 1959 with an addition in 1974 and another in 1995. The central boiler system dates to the original construction. It was altered somewhat in the 1995 addition. It continues to supply hot water to the Chapel and Cultural Center air handlers as well as the perimeter fin pipe heating system installed at nearly all perimeter rooms. While the boiler and associated piping appear to be in good condition they are well beyond the listed ASHRAE life cycle of 25 years. There were some reports of leaking pipes but I believe much of that can be attributed to a single issue. The risers from pipes located in the tunnel travel through the floor. It appears the thermal expansion difference of the fin pipe units to the piping below eventually fatigued the riser pipe. The resulting leak is mostly an isolated case and does not necessarily indicate that the heating water piping is universally in poor condition.

The focus of this report is to develop options for adding cooling to those spaces in the facility currently without. Attached is a highlighted floor plan from the 1995 addition and remodel.

Area 1 (Chapel) is served by a central air handler in the mechanical mezzanine. This unit was modified with the addition of direct expansion (DX) refrigerant coils in 1995. The condensing units should be considered on borrowed time as any compressor unit older than 20 years has the potential to need more service than the value of the unit. However, replacement will involve the replacement of the interior coil as well as the outdoor unit because of the switch from R-22 to R-410A. Replacing the indoor coils due to location will not be an easy task. As noted before heat for this area is from the central boiler to a hot water coil. There is an airside economizer on this system. Control of the system is via older Honeywell electric controls installed in 1995.

Area 2 (Cultural Center) is served by a central air handler in the mechanical mezzanine. This unit was modified with the addition of direct expansion (DX) refrigerant coils in 1995. The same as noted for the Chapel unit can be said of the cooling system for this area.

Area 3 (West Office Areas) is cooled with ductless mini-split units installed in 1995. These are units that have a wall mounted indoor unit connected to a small outdoor unit with copper refrigerant lines. These units carry the same concerns as the other 20 year old compressor equipped systems. Replacement when either the interior or exterior unit fails would involve complete replacement of indoor and outdoor units. However, due to the devices location and size replacement is not difficult. Heat is provided as noted earlier from perimeter hot water fin pipe units. Controls are from 1995 and are either thermostatically controlled direct acting electric valves or self-contained thermostatically controlled valves. Mechanical ventilation for this area is non-existent. Operable windows serve the ventilation needs but appear to be undersized based on current code.

Area 4 (North Classroom Areas) is cooled with ductless mini-split units installed prior to 1995. The area these units serve is somewhat flexible. In both 4A and 4B areas there are two units serving three rooms if the folding partitions are open. If the partitions are closed the center two classrooms receive no cooling. At the time of the visit the folding partitions were open. The commentary

associated with the Area 3 systems (relative to ventilation, heating, and cooling) would apply to these systems as well.

Area 5 (Relief Society) is cooled with a furnace and DX coil located in one of the nearby storage rooms. The gas furnace is ducted to floor supply grilles. This system is very similar to those used at many of the Meeting Houses in this region. There is an R-22 condensing unit that predates the 1995 work serving this system. Ventilation is provided by a duct from the return side of the unit to the exterior.

Area 6 (South Office Areas) is cooled with ductless mini-split units installed in 1995. See commentary related to Area 3 for more information.

The balance of the areas are heated with hot water fin pipe units served by the central boiler. The exception to this are the two classrooms east of the women's restrooms (Room 121 and 122). Those rooms have hot water fed fan coil units for heat (FC-1 and 2). Ventilation to these spaces is provided by ductwork routed to the exterior sized for a full economizer cycle. Controls to all these systems were installed in 1995.

It is important to note that the current electrical service is a 240v Delta three phase system. The entire service is rated at 600-Amps but the three phase portion of that system is limited to 400-Amps. We don't have an electric demand for this facility. Based on other Stake buildings with 600-Amp services the service has sufficient capacity to add more load. We would estimate the current service peak demand is about 210-Amps. The Delta service is a concern as it relates to the service transformer. If sufficient load is added that requires an up-sizing of the transformer the serving utility may not support the Delta service. If that is the case there may be a charge from the utility to change the transformers. The conductors are sized sufficiently for the 600-Amp load. A change to a Y-service from the Delta would require a relabeling of the service at the least. Potentially the main switch board (dating to 1958) would need to be replaced. If the service were replaced any 240 volt loads would need to be converted to 208 volt compatible devices. This could affect existing condensing units and motors in the air handling units that serve the Chapel and Cultural Center.

Cooling Option #1

Retain the existing DX systems noted in areas 1, 2, 3, 4, 5, and 6. Maintain those systems per current methods and replace when failures occur. Confirm boiler water treatment is monitored and administered correctly.

Rooms 121 and 122: Due to the small size of FC-1 and FC-2 adding DX coils to these units will be difficult. Matching outdoor units to these types of coils is impossible with today's offerings. For that reason I suggest adding ductless mini-splits to each room. Similar to the current spaces cooled with mini-split units there will be a wall mounted fan-coil unit with an outdoor ground mounted condensing unit for each system. Provide controls to eliminate the possibility of simultaneous heating and cooling. Please note that ductless mini-split systems are not currently listed in the LDS Construction Specifications Standards but have been used successfully on several recent LDS buildings.

Rooms 112, 114, 155 and 162: Add a ductless mini-split to each room. System configuration information is per above. At the Serving 155 I suggest a heat-pump unit since there is an absence of hydronic heat in this room currently.

Rooms 126 to 130 and 134: Install a gas fired condensing furnace in a portion of the storage room at the east side of the facility. Gas furnace system to include DX coil and exterior ground mounted condensing unit. Duct ceiling supply air in the attic space and floor returns to the crawl space. Due to the slab on grade construction the return air for room 134 will need to be ducted overhead. Provide with Honeywell Jade controller (per LDS control standards). Eliminate fin pipe units from this area or provide controls to allow those devices to supplement gas heating portion of the furnace system only during heating operation. The size of this system is large enough so as to anticipate the need or reasonable desire for an air-side economizer rather than just a minimum outside air source. These new system elements are per LDS Construction Specifications Standards.

Rooms 101 to 103 and 107 to 109: Install two gas-fired condensing furnaces in a portion of the mechanical / boiler room. Duct both supply air and return air in the attic space as the construction of this area is slab on grade. One furnace is to cover the east facing rooms while the second is to cover the west. This will provide sub-zoning based on exposure. Provide with Honeywell Jade controller (per LDS control standards). Eliminate fin pipe units from this area or provide controls to allow those devices to supplement gas heating portion of the furnace system only during heating operation. Each system is small enough that neither code nor practical design would require an air-side economizer. Only a ventilation duct to the exterior is required. These new system elements are per LDS Construction Specifications Standards.

Option #1 Benefits

This option would be the least costly of the options suggested.

Systems are relatively easy to maintain, controls were necessary are per LDS standards.

The heating system at the exterior perimeter offices and classrooms is fin-pipe. This type of is a very comfortable heat.

Option #1 Draw-Backs

This option does not provide for any cooling in the foyers, vestibules, restrooms or corridors of the facility.

The 20 year old existing cooling systems are not replaced. Or at least don't have to be replaced.

The 1958 heating system is not replaced. These components could be replaced but that will increase this options cost.

Lack of ventilation air in some spaces that retain mini-split systems do not have ventilation air.

Number of compressors matched the number of zones.

Cooling Option #2

This option is called Variable Refrigerant Flow (VRF). This system allows multiple indoor units to be connected to a single outdoor condensing unit style heat pump. These systems are very efficient. They use EC motor fans in the fan-coil units. So they use only as much power as necessary to move the required air to maintain the necessary temperature across the heating / cooling coil. This varies with load. They use inverter driven compressor motors and so have modulating capacity for heating / cooling rather than staged compressors or hot gas by-pass. They include a controller that allows heat from one zone that is in cooling mode to be used in another zone that needs heat. By intentionally mixing exposures on the same compressor unit maximum heat recovery potential is achieved. There are many indoor unit options. The basic components of the system are a single outdoor heat pump compressor unit for a given number of indoor fan-coil units. Each fan-coil unit is piped to the outdoor unit through a heat recovery control unit. The piping that connects these components is copper refrigerant piping operating at pressures of about 450 PSI on the high side of the cycle. By using refrigerant piping to transfer energy to the zones these systems are ideal for remodel and retrofit installations as refrigerant piping is smaller than ductwork or water piping. Zoning could be more extensive than Option #1 if wall mounted or cassette units are used. If ducted fan coils are used the zoning of the Option #1 could be matched. For spaces such as offices that have a low occupancy level I would suggest using a cassette or ducted unit so that ventilation air can be connected to the system directly. At the large high occupancy spaces I would suggest using air handler kits that would allow connection of the VRF outdoor compressors to those units. The air handlers would receive new refrigerant coils designed for operation with R-410a refrigerant (replacing those installed in 1995). In those spaces with higher occupancies (such as classrooms) I would recommend the installation of a ventilation recovery (heat recovery) unit. Cut sheets include an example of this type of unit. Ventilation air in quantities to satisfy the Mechanical code are brought in from outside. That air crosses an energy recovery cell that has the exhaust air stream on the other side. Through this energy recovery cell the warm or cool energy from the room exhaust provides a pre-heat or pre-cool function to the ventilation air. This heat recover system is not required for smaller zones but it is a nice way of somewhat controlling the temperature of ventilation air brought into the zones outside of the VRF fan-coil unit.

Option #2 Benefits

- All new refrigerant piping takes the place of the existing heating water piping
- New outdoor heat pump takes the place of the boiler and provides cooling at all zones
- Package control system can be relatively easy to use depending on interface purchased.
- Very quiet operating system
- Highest efficiency of the three systems
- Can be designed to include more zones than Option # 1.

Option #2 Draw-Backs

More costly than Option #1. For the purposes of comparison the zoning of Option #1 was used in the schematic estimate for Option #2. Additionally the means of ventilation is matched between the two systems; meaning if the space currently uses windows for ventilation under Option #1 that remains the same under Option #2. This will need to be confirmed code compliant if this option is selected.

System and control components do not meet LDS Standards

Ventilation of space with operable windows could remain without mechanical ventilation



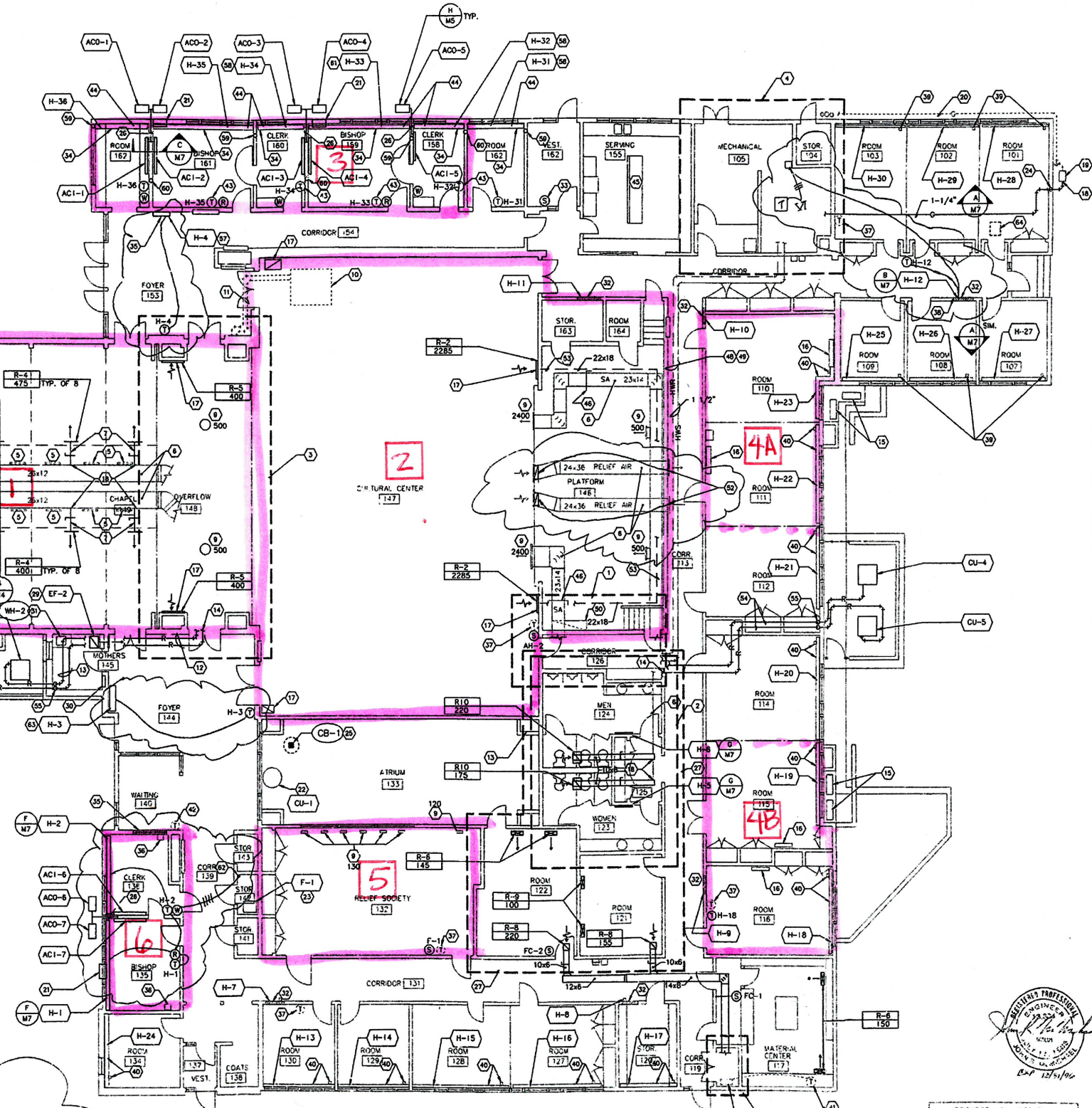
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Project: Eugene River Road Stake HVAC Upgrade				6/10/2017
Description	Units	Quantity	Unit Price	Extension
Option #1				
Split Systems				
Units	per unit	7	\$2,200	\$15,400
Install with piping	per unit	7	\$2,100	\$14,700
Electrical	per system	7	\$1,200	\$8,400
Ducted Units				
Units	per system	3	\$5,500	\$16,500
Installation	per system	3	\$3,500	\$10,500
Ductwork and insulation	per sq. ft.	4335	\$8	\$34,680
Diffusers and balancing	per	28	\$350	\$9,800
Gas line	per ft.	300	\$17	\$5,100
Electrical	per system	3	\$2,500	\$7,500
Ceiling patch and repair	per system	7	\$1,000	\$7,000
Pads	per unit	3	\$1,000	\$3,000
Permits	allowance	1	\$2,500	\$2,500
Option #1 Total				\$135,080
Option #2				
DX coil at Chapel / Cultural Ctr Air Handler	per unit	2	\$5,000	\$10,000
Coil install with piping	per unit	2	\$12,000	\$24,000
Fan-coil unit	per unit	6	\$2,200	\$13,200
Fan-coil unit installation with piping	per unit	6	\$2,500	\$15,000
Fan coil electrical	per unit	6	\$800	\$4,800
Fan coil ductwork	per sq. ft.	4335	\$8	\$34,680
Diffusers and balancing	per unit	28	\$350	\$9,800
DOAS for fan-coil unit	per unit	6	\$2,500	\$15,000
DOAS install	per unit	6	\$2,300	\$13,800
Unit electrical	per unit	6	\$800	\$4,800
Wall mount unit	per system	15	\$800	\$12,000
Wall mount unit installation with piping	per system	15	\$1,200	\$18,000
Unit electrical	per unit	15	\$500	\$7,500
Heat pump unit	per ton	44	\$1,500	\$66,000
Pad	per system	1	\$2,000	\$2,000
Electrical (assumes no service upgrade)	per system	1	\$22,000	\$22,000
Ceiling patch and repair	per system	7	\$1,000	\$7,000
Permits	allowance	1	\$2,500	\$2,500
Option #2 Total				\$282,080

NOTES THIS SHEET

- 1 SEE 3/4 FOR ENLARGED MECHANICAL ROOM ABOVE.
- 2 SEE 3/43 FOR ENLARGED PLUMBING PLAN.
- 3 SEE 1/44 FOR ENLARGED MECHANICAL ROOM ABOVE.
- 4 SEE 2/44 FOR ENLARGED BOILER ROOM.
- 5 DEMOLISH SUPPLY GRILLE AND SEAL DUCT OPENING WITH LINED SHEET METAL AND DUCT SEALER.
- 6 EXISTING DUCTWORK TO REMAIN.
- 7 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 20x6 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE. EXTEND TO EDGE OF CEILING (SEE 4/44) CENTERED ON BEAMS.
- 8 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 16x4 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE. EXTEND TO EDGE OF CEILING (SEE 4/44) CENTERED ON BEAMS.
- 9 AIR BALANCE EXISTING INLET/OUTLET TO QUANTITY INDICATED.
- 10 DEMOLISH 15 TON CONDENSING UNIT FROM ROOF.
- 11 DEMOLISH REFRIGERATION PIPING ON ROOF.
- 12 REFRIGERATION PIPING ON EXTERIOR WALL UNDER EAVE. HOLD TIGHT TO SOFFIT.
- 13 OFFSET REFRIGERATION PIPING IN ATTIC. ROUTE PIPING THROUGH NORTH STEEPLE WALL.
- 14 REFRIGERATION PIPING TO MECHANICAL ROOM.
- 15 EXISTING HEAT PUMP/CONDENSING UNIT TO REMAIN.
- 16 EXISTING HEAT PUMP FAN COIL TO REMAIN.
- 17 DEMOLISH RETURN GRILLE.
- 18 POINT OF CONNECTION: NEW TO EXISTING.
- 19 EXISTING GAS METER TO REMAIN.
- 20 DEMOLISH EXTERIOR GAS PIPING.
- 21 DEMOLISH THROUGH THE WALL AIR CONDITIONING UNIT TO REMAIN.
- 22 EXISTING RELIEF SOCIETY CONDENSING UNIT TO REMAIN.
- 23 EXISTING RELIEF SOCIETY GAS FURNACE TO REMAIN. INSTALL VOLUME DAMPER IN 8" GAS DUCT. 1-1/4" GAS PIPING UP IN WALL TO ATTIC.
- 24 DEMOLISH DRAIN AND INSTALL CATCH BASIN 1/4" BELOW SLAB. SLOPE NEW CONCRETE OUT TO 12" FROM RM. CONNECT TO EXISTING PIPING.
- 25 INSTALL DRAIN AND REFRIGERATION PIPING IN EXISTING WALL.
- 26 SEE 2/43 FOR PLUMBING DEMOLITION PLAN & 1/43 FOR HEATING & VENTILATION DEMOLITION PLAN.
- 27 DEMOLISH CABINET UNIT HEATER.
- 28 12x3 EXHAUST DUCT THROUGH NORTH WALL OF STEEPLE 12" ABOVE FOYER ROOF WITH WALL CAP.
- 29 EXISTING ELECTRIC WALL HEATER TO REMAIN.
- 30 INSTALL WH-2 UNDER SINK. CONNECT TO EXISTING PIPING WITH BALL VALVES. ROUTE T & P DISCHARGE THRU WALL.
- 31 RETAIN EXISTING CONVECTOR REPLACE COVER.
- 32 SENSOR FOR BOILER/PUMPS THERMOSTAT.
- 33 RETAIN EXISTING HEATER.
- 34 REPLACE CABINET UNIT HEATER.
- 35 DEMOLISH ELECTRIC WALL HEATER.
- 36 DEMOLISH T7400 THERMOSTAT.
- 37 INSTALL 3-WAY CONTROL VALVE IN COVER.
- 38 DEMOLISH CONTROL VALVE. SEE A/M7 & D/M7 FOR MODIFICATIONS.
- 39 DEMOLISH CONTROL VALVE & HEATER ENCLOSURE. SEE E/M7 FOR MODIFICATIONS.
- 40 DEMOLISH CONVECTOR THERMOSTAT.
- 41 DEMOLISH CABINET UNIT HEATER THERMOSTAT.
- 42 EXISTING THERMOSTAT.
- 43 DEMOLISH CONTROL VALVE.
- 44 RETAIN EXISTING CEILING HEAT & THERMOSTAT.
- 45 INSTALL VOLUME DAMPER IN EXISTING DUCT.
- 46 INSTALL CONTROL DAMPERS IN EXISTING DUCT.
- 47 EXISTING HEATING WATER SUPPLY & HEATING WATER RETURN PIPING IN ATTIC TO REMAIN.
- 48 INSTALL INSULATION ON EXISTING HEATING WATER SUPPLY & HEATING WATER RETURN PIPING.
- 49 DEMOLISH 66x16 RETURN AIR RISER (ABOVE & BELOW STAGE).
- 50 NOT USED.
- 51 SEAL CLOSED EXISTING LOUVER WITH SHEET METAL. CLOSE MECH. DAMPERS PAINT TO MATCH SIDING.
- 52 INSTALL RETURN AIR DUCT UNDER STAGE.
- 53 REFRIGERATION PIPING IN ATTIC.
- 54 REFRIGERATION PIPING DOWN AND THRU WALL AT 6" ABOVE EQUIPMENT SLAB.
- 55 SEE 1/45 FOR ENLARGED MECHANICAL ROOM PLAN.
- 56 CONNECT H-4 TO EXISTING HWS/HWR PIPING. SIMILAR TO B/M7.
- 57 INSTALL V-8 ON HWS & 1/2" BALANCING VALVE ON HWR. SIMILAR TO C/M7.
- 58 EXISTING HWR RISER SERVING FIN TUBE.
- 59 EXISTING HWS RISER SERVING FIN TUBE.
- 60 INSTALL 1/2" BALANCING VALVE IN HWS & V-8 W/BYPASS ON HWR SIMILAR TO C/M7.
- 61 CONTROL TRANSFORMER FOR H-1 & H-2 CONTROL VALVES. SIMILAR TO B/M7.
- 62 EXISTING ATTIC ACCESS DOOR.

AS BUILTS



FLOOR PLAN-MECHANICAL

SCALE: 1/8"=1'-0"



PROJECT NO. 93247
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SANTA CLARA REMODEL
 The Church of Jesus Christ of Latter Day Saints
 5132 RIVER ROAD
 EUGENE, OREGON 97404

FLOOR PLAN -
 MECHANICAL

DRAWN
 K.D.N.

DATE
 JUNE 1995

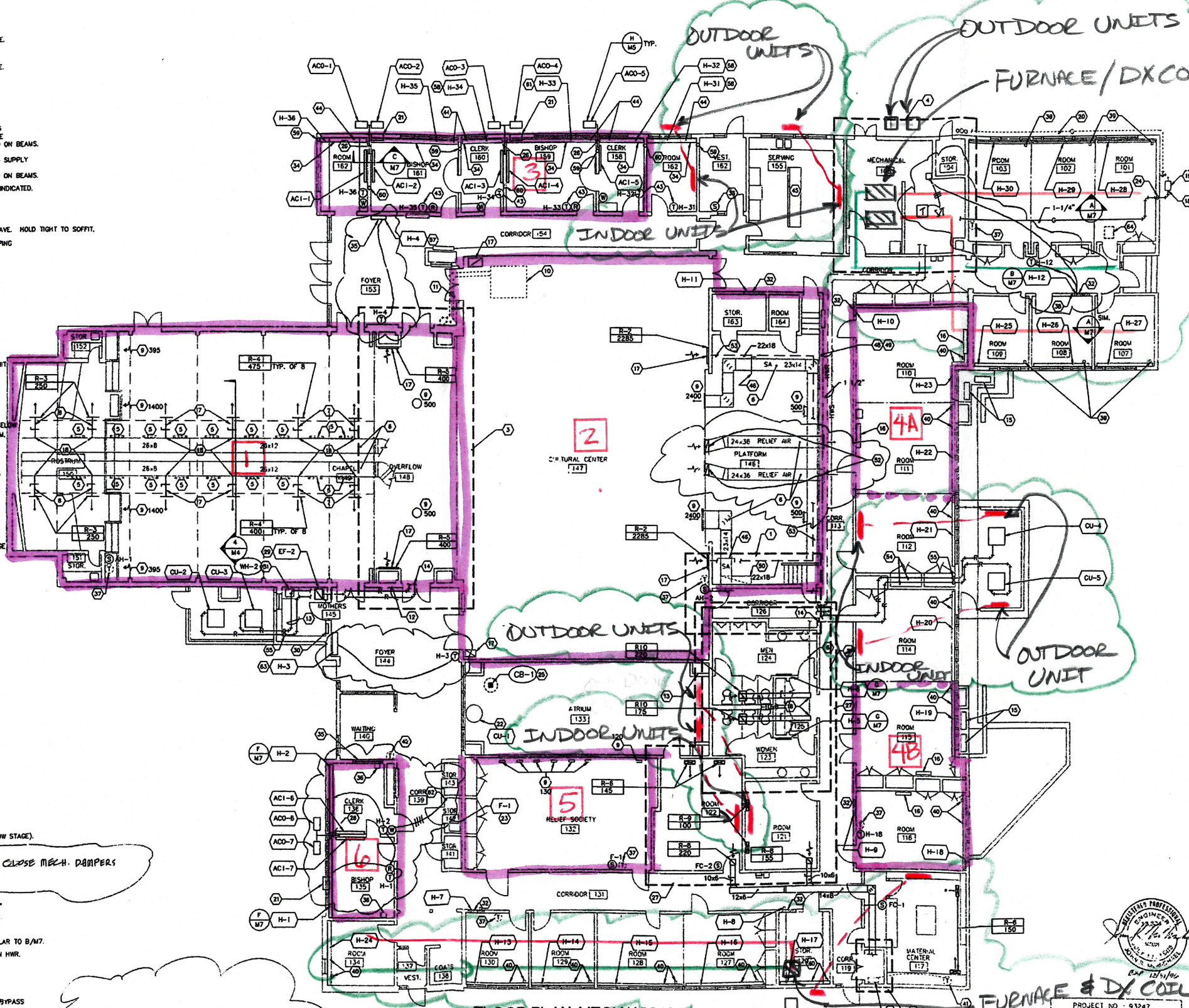
JOB NO.
 93-247.02

SHEET NO.
 M-2

24X

NOTES THIS SHEET

- 1 SEE 3/4" FOR ENLARGED MECHANICAL ROOM ABOVE.
- 2 SEE 3/4" FOR ENLARGED PLUMBING PLAN.
- 3 SEE 1/4" FOR ENLARGED MECHANICAL ROOM ABOVE.
- 4 SEE 2/4" FOR ENLARGED BOILER ROOM.
- 5 DEMOLISH SUPPLY GRILLE AND SEAL DUCT OPENING WITH LINED SHEET METAL AND DUCT SEALER.
- 6 EXISTING DUCTWORK TO REMAIN.
- 7 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 20x6 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE. EXTEND TO EDGE OF CEILING (SEE 4/4") CENTERED ON BEAMS.
- 8 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 16x4 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE. EXTEND TO EDGE OF CEILING (SEE 4/4") CENTERED ON BEAMS.
- 9 AIR BALANCE EXISTING INLET/OUTLET TO QUANTITY INDICATED.
- 10 DEMOLISH 15 TON CONDENSING UNIT FROM ROOF.
- 11 DEMOLISH REFRIGERATION PIPING ON ROOF.
- 12 REFRIGERATION PIPING ON EXTERIOR WALL UNDER EAVE. HOLD TIGHT TO SOFFIT.
- 13 OFFSET REFRIGERATION PIPING IN ATTIC. ROUTE PIPING THROUGH NORTH STEEPLE WALL.
- 14 REFRIGERATION PIPING TO MECHANICAL ROOM.
- 15 EXISTING HEAT PUMP/CONDENSING UNIT TO REMAIN.
- 16 EXISTING HEAT PUMP FAN COIL TO REMAIN.
- 17 DEMOLISH RETURN GRILLE.
- 18 POINT OF CONNECTION: NEW TO EXISTING.
- 19 EXISTING GAS METER TO REMAIN.
- 20 DEMOLISH EXTERIOR GAS PIPING.
- 21 DEMOLISH THROUGH THE WALL AIR CONDITIONING UNIT.
- 22 EXISTING RELIEF SOCIETY CONDENSING UNIT TO REMAIN.
- 23 EXISTING RELIEF SOCIETY GAS FURNACE TO REMAIN. INSTALL VOLUME DAMPER IN B/S OSA DUCT.
- 24 1-1/4" GAS PIPING UP IN WALL TO ATTIC.
- 25 DEMOLISH DRAIN AND INSTALL CATCH BASIN 1/4" BELOW SLAB. SLOPE NEW CONCRETE OUT TO 12" FROM RIM. CONNECT TO EXISTING PIPING.
- 26 INSTALL DRAIN AND REFRIGERATION PIPING IN EXISTING WALL.
- 27 SEE 2/4" FOR PLUMBING DEMOLITION PLAN & 1/4" FOR HEATING & VENTILATION DEMOLITION PLAN.
- 28 DEMOLISH CABINET UNIT HEATER.
- 29 12x3 EXHAUST DUCT THROUGH NORTH WALL OF STEEPLE 12" ABOVE FOYER ROOF WITH WALL CAP.
- 30 EXISTING ELECTRIC WALL HEATER TO REMAIN.
- 31 INSTALL WH-2 UNDER SINK. CONNECT TO EXISTING PIPING WITH BALL VALVES. ROUTE T & P DISCHARGE THRU WALL.
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AS BUILTS

FLOOR PLAN-MECHANICAL

SCALE: 1/8"=1'-0"



SANTA CLARA REMODEL
The Church of Jesus Christ of Latter Day Saints
EUGENE, OREGON 97404

FLOOR PLAN -
MECHANICAL

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JUNE 1995

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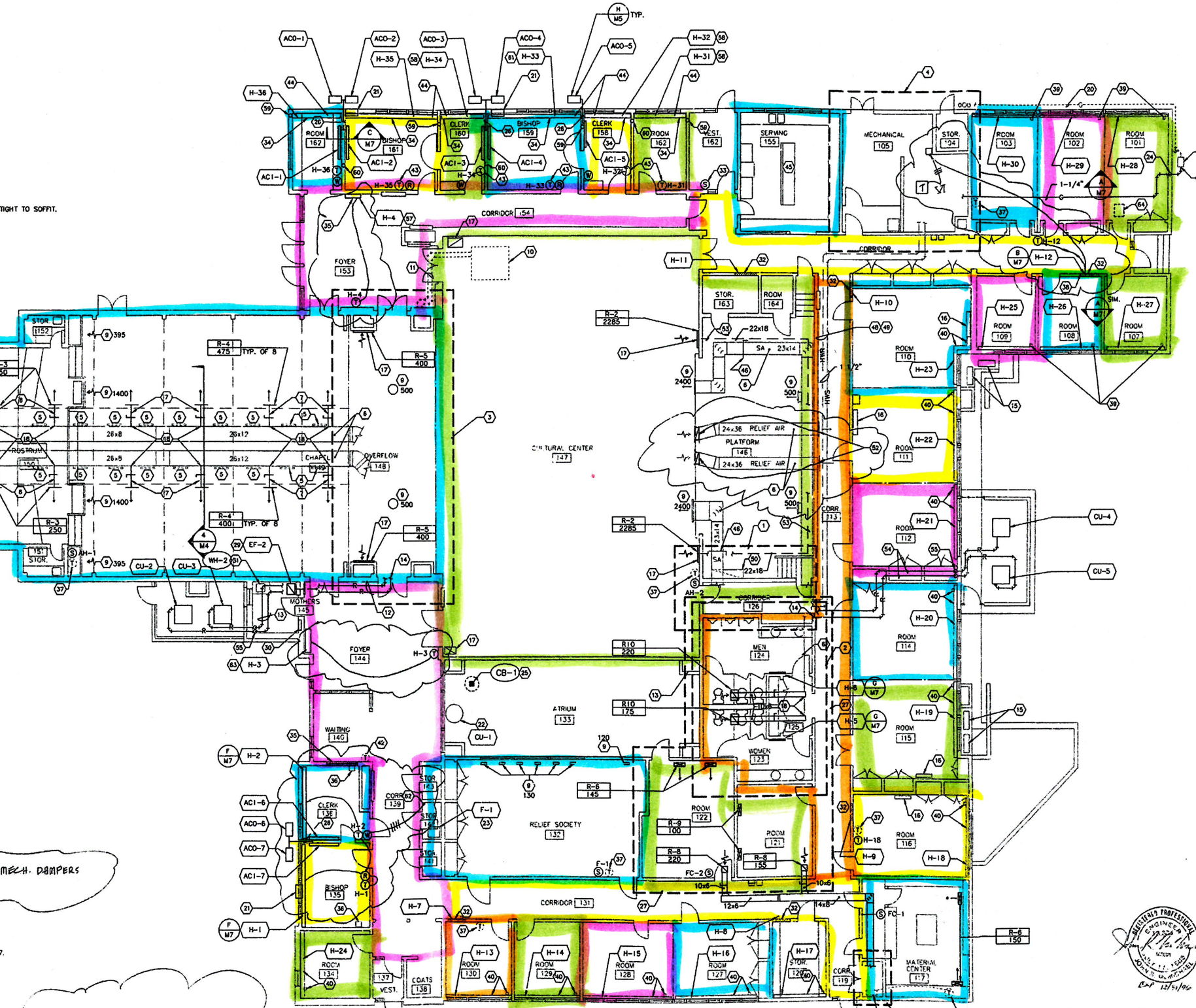
SHEET NO.
M-2

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NOTES THIS SHEET

- 1 SEE 3/4" FOR ENLARGED MECHANICAL ROOM ABOVE.
- 2 SEE 3/4" FOR ENLARGED PLUMBING PLAN.
- 3 SEE 1/4" FOR ENLARGED MECHANICAL ROOM ABOVE.
- 4 SEE 2/4" FOR ENLARGED BOILER ROOM.
- 5 DEMOLISH SUPPLY GRILLE AND SEAL DUCT OPENING WITH LINED SHEET METAL AND DUCT SEALER.
- 6 EXISTING DUCTWORK TO REMAIN.
- 7 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 20x6 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE EXTEND TO EDGE OF CEILING (SEE 4/M4) CENTERED ON BEAMS.
- 8 CONNECT TO EXISTING SUPPLY MAIN WITH NEW 16x4 SUPPLY BRANCH, VOLUME DAMPER & SUPPLY GRILLE EXTEND TO EDGE OF CEILING (SEE 4/M4) CENTERED ON BEAMS.
- 9 AIR BALANCE EXISTING INLET/OUTLET TO QUANTITY INDICATED.
- 10 DEMOLISH 15 TON CONDENSING UNIT FROM ROOF.
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- 31 RETAIN EXISTING CONVECTOR REPLACE COVER.
- 32 SENSOR FOR BOILER/PUMPS THERMOSTAT.
- 33 RETAIN EXISTING HEATER.
- 34 REPLACE CABINET UNIT HEATER.
- 35 DEMOLISH ELECTRIC WALL HEATER.
- 36 DEMOLISH T7400 THERMOSTAT.
- 37 INSTALL 3-WAY CONTROL VALVE IN COVER.
- 38 DEMOLISH CONTROL VALVE. SEE A/M7 & D/M7 FOR MODIFICATIONS.
- 39 DEMOLISH CONTROL VALVE & HEATER ENCLOSURE. SEE E/M7 FOR MODIFICATIONS.
- 40 DEMOLISH CONVECTOR THERMOSTAT.
- 41 DEMOLISH CABINET UNIT HEATER THERMOSTAT.
- 42 EXISTING THERMOSTAT.
- 43 DEMOLISH CONTROL VALVE.
- 44 RETAIN EXISTING CEILING HEAT & THERMOSTAT.
- 45 INSTALL VOLUME DAMPER IN EXISTING DUCT.
- 46 INSTALL CONTROL DAMPERS IN EXISTING DUCT.
- 47 EXISTING HEATING WATER SUPPLY & HEATING WATER RETURN PIPING IN ATTIC TO REMAIN.
- 48 INSTALL INSULATION ON EXISTING HEATING WATER SUPPLY & HEATING WATER RETURN PIPING.
- 49 DEMOLISH 66x16 RETURN AIR RISER (ABOVE & BELOW STAGE).
- 50 NOT USED.
- 51 SEAL CLOSED EXISTING LOUVER WITH SHEET METAL. CLOSE MECH. DAMPERS LEAK TO WATER SERVICE.
- 52 INSTALL RETURN AIR DUCT UNDER STAGE.
- 53 REFRIGERATION PIPING IN ATTIC.
- 54 REFRIGERATION PIPING DOWN AND THRU WALL AT 6" ABOVE EQUIPMENT SLAB.
- 55 SEE 1/M5 FOR ENLARGED MECHANICAL ROOM PLAN.
- 56 CONNECT H-4 TO EXISTING HWS/HWR PIPING. SIMILAR TO B/M7.
- 57 INSTALL V-4 ON HWS & 1/2" BALANCING VALVE ON HWR. SIMILAR TO C/M7.
- 58 EXISTING HWR RISER SERVING FIN TUBE.
- 59 EXISTING HWS RISER SERVING FIN TUBE.
- 60 INSTALL 1/2" BALANCING VALVE IN HWS & V-8 W/BYPASS ON HWR SIMILAR TO C/M7.
- 61 CONTROL TRANSFORMER FOR H-1 & H-2 CONTROL VALVES. SIMILAR TO B/M7.
- 62 EXISTING ATTIC ACCESS DOOR.

AS BUILTS



FLOOR PLAN-MECHANICAL
SCALE: 1/8"=1'-0"



PROJECT NO. 93247
MILLER ARCHITECTS
1111 EAST 10TH AVENUE, SUITE 200
EUGENE, OREGON 97401

JEPPESEN, MILLER & TOBIAS ARCHITECTS
2380 NW KINGS BLVD.
CORVALLIS, OREGON 97330
PH 503-754-7541 FAX 503-754-7542

SANTA CLARA REMODEL
The Church of Jesus Christ of Latter Day Saints
5132 RIVER ROAD
EUGENE, OREGON 97404

FLOOR PLAN -
MECHANICAL


DRAWN
K.D.N.


DATE
JUNE 1995


JOB NO.
93-247.02


SHEET NO.
M-2


A wide variety of ducted and duct-free indoor fan coil units


			0.6 Ton	0.75 Ton	1.0 Ton	1.5 Ton	2.0 Ton	2.5 Ton	3.0 Ton	4.0 Ton
INDOOR UNITS - FXSQ Concealed Ceiling Unit										
	Model			FXSQ09MVJU	FXSQ12MVJU	FXSQ18MVJU	FXSQ24MVJU	FXSQ30MVJU	FXSQ36MVJU	FXSQ48MVJU
	Cooling Capacity	Btu/h			12,000	18,000	24,000	30,000	36,000	48,000
	Heating Capacity	Btu/h			13,500	20,000	27,000	34,000	40,000	54,000
	Sound Pressure Level H/L	dB(A)			41/35 ¹	44/38 ¹	44/38 ¹	45/39 ¹	45/39 ¹	48/43 ¹
	Airflow H/L	cfm			340/230	530/390	740/490	950/720	990/740	1,300/950
	Weight	lbs.			69	73	95	119	119	122
	Dimensions (H x W x D)	in.			11 7/8 x 21 5/8 x 31 1/2	11 7/8 x 27 1/2 x 31 1/2	11 7/8 x 30 3/8 x 31 1/2		11 7/8 x 35 1/8 x 31 1/2	


INDOOR UNITS - FXMQ Concealed Ceiling Unit (medium static)										
	Model							FXMQ30MVJU	FXMQ36MVJU	FXMQ48MVJU
	Cooling Capacity	Btu/h						30,000	36,000	48,000
	Heating Capacity	Btu/h						34,000	40,000	54,000
	Sound Pressure Level H/L	dB(A)						45/41 ²	45/41 ²	48/45 ²
	Airflow H/L	cfm						690/565	1,020/810	1,270/1020
	Weight	lbs.						99	139	144
	Dimensions (H x W x D)	in.						15 3/8 x 28 3/8 x 27 1/8	15 3/8 x 43 3/8 x 27 1/8	


INDOOR UNITS - FXDQ Slim Duct Built-In Concealed Ceiling Unit										
	Model		FXDQ07MVJU	FXDQ09MVJU	FXDQ12MVJU	FXDQ18MVJU	FXDQ24MVJU			
	Cooling Capacity	Btu/h	7,500	9,500	12,000	18,000	24,000			
	Heating Capacity	Btu/h	8,500	10,500	13,500	20,000	27,000			
	Sound Pressure Level H/L	dB(A)	33/29 ²	33/29 ²	33/29 ²	35/31 ²	36/32 ²			
	Airflow H/L	cfm	280/226	280/226	280/226	440/350	580/460			
	Weight	lbs.	49	49	49	68	75			
	Dimensions (H x W x D)	in.		7 7/8 x 27 9/16 x 24 7/16		7 7/8 x 35 7/16 x 24 7/16	7 7/8 x 43 5/16 x 24 7/16			

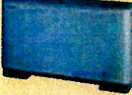
INDOOR UNITS - FXOQ Vertical Air Handling Unit (FXOQ42MVJU model also available)										
	Model				FXOQ12MVJU	FXOQ18MVJU	FXOQ24MVJU	FXOQ30MVJU	FXOQ36MVJU	FXOQ48MVJU
	Cooling Capacity	Btu/h			12,000	18,000	24,000	30,000	36,000	48,000
	Heating Capacity	Btu/h			12,000	18,000	24,000	30,000	40,000	54,000
	Sound Pressure Level H/L	dB(A)			N/A	N/A	N/A	N/A	N/A	N/A
	Airflow H/L	cfm			400	600	800	1,000	1,200	1,600
	Weight	lbs.			120	120	120	140	210	210
	Dimensions (H x W x D)	in.			44 x 22 x 15	44 x 22 x 15	44 x 22 x 15	48 x 22 x 18.5	49 x 26 x 20	49 x 26 x 20

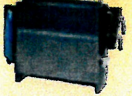
INDOOR UNITS - FXFQ 4 Way Ceiling Mounted Cassette Unit (3'x3')										
	Model		FXFQ07MVJU	FXFQ09MVJU	FXFQ12MVJU	FXFQ18MVJU	FXFQ24MVJU	FXFQ30MVJU	FXFQ36MVJU	
	Cooling Capacity	Btu/h	7,500	9,500	12,000	18,000	24,000	30,000	36,000	
	Heating Capacity	Btu/h	8,500	10,500	13,500	20,000	27,000	34,000	40,000	
	Sound Pressure Level H/L	dB(A)	31/29 ²	31/29 ²	31/28 ²	33/28 ²	34/29 ²	38/32 ²	40/33 ²	
	Airflow H/L	cfm	320/247	320/247	460/350	570/390	670/490	990/710	990/740	
	Weight (panel weight)	lbs.	41.9	41.9	55 (11)	55 (11)	55 (11)	66 (11)	66 (11)	
	Unit Dimensions (H x W x D)	in.			9 1/8 x 33 1/8 x 33 1/8		9 1/8 x 37 3/8 x 37 3/8		11 3/8 x 33 1/8 x 33 1/8	

INDOOR UNITS - FXZQ 4 Way Ceiling Mounted Cassette Unit (2'x2')										
	Model		FXZQ07M7VJU	FXZQ09M7VJU	FXZQ12M7VJU	FXZQ18M7VJU				
	Cooling Capacity	Btu/h	7,500	9,500	12,000	18,000				
	Heating Capacity	Btu/h	8,500	10,500	13,500	20,000				
	Sound Pressure Level H/L	dB(A)	31/29 ²	31/29 ²	33/29 ²	41/34 ²				
	Airflow H/L	cfm	320/247	320/247	335/265	495/353				
	Weight	lbs.	41.9	41.9	41.9	41.9				
	Dimensions (H x W x D)	in.			11 1/4 x 22 5/8 x 22 5/8					

INDOOR UNITS - FXHQ Ceiling Suspended Cassette Unit										
	Model				FXHQ12MVJU		FXHQ24MVJU		FXHQ36MVJU	
	Cooling Capacity	Btu/h			12,000		24,000		36,000	
	Heating Capacity	Btu/h			13,500		27,000		40,000	
	Sound Pressure Level H/L	dB(A)			38/33 ²		44/36 ²		46/41 ²	
	Airflow H/L	cfm			410/340		710/600		830/670	
	Weight	lbs.			55		80		90	
	Dimensions (H x W x D)	in.			7 1/16 x 37 13/16 x 26 3/4		7 1/16 x 55 1/8 x 26 3/4		7 1/16 x 62 5/8 x 26 3/4	

INDOOR UNITS - FXAQ Wall Mounted Unit										
	Model		FXAQ07MVJU	FXAQ09MVJU	FXAQ12MVJU	FXAQ18MVJU	FXAQ24MVJU			
	Cooling Capacity	Btu/h	7,500	9,500	12,000	18,000	24,000			
	Heating Capacity	Btu/h	8,500	10,500	13,500	20,000	27,000			
	Sound Pressure Level H/L	dB(A)	36/31 ³	37/31 ³	38/31 ³	43/37 ³	47/40 ³			
	Airflow H/L	cfm	265/160	285/175	300/180	500/400	635/470			
	Weight	lbs.	25	25	25	31	31			
	Dimensions (H x W x D)	in.			11 3/8 x 31 1/4 x 9		11 3/8 x 41 3/8 x 9			

INDOOR UNITS - FXLQ Floor Console Unit										
	Model				FXLQ12MVJU	FXLQ18MVJU	FXLQ24MVJU			
	Cooling Capacity	Btu/h			12,000	18,000	24,000			
	Heating Capacity	Btu/h			13,500	20,000	27,000			
	Sound Pressure Level H/L	dB(A)			36/33 ⁴	40/35 ⁴	41/36 ⁴			
	Airflow H/L	cfm			280/210	490/380	560/420			
	Weight	lbs.			66	80	80			
	Dimensions (H x W x D)	in.			23 5/8 x 44 7/8 x 8 3/4		23 5/8 x 55 7/8 x 8 3/4			

INDOOR UNITS - FXNQ Concealed Floor Console Unit										
	Model				FXNQ12MVJU	FXNQ18MVJU	FXNQ24MVJU			
	Cooling Capacity	Btu/h			12,000	18,000	24,000			
	Heating Capacity	Btu/h			13,500	20,000	27,000			
	Sound Pressure Level H/L	dB(A)			36/33 ⁴	40/35 ⁴	41/36 ⁴			
	Airflow H/L	cfm			280/210	490/380	560/420			
	Weight	lbs.			51	59	59			
	Dimensions (H x W x D)	in.			24 x 42 1/8 x 8 5/8		24 x 53 1/8 x 8 5/8			

Notes: ¹ at 5 ft below bottom suction grill of unit ² at 5 ft below the unit ³ at 3.3 ft below and from the unit ⁴ measured at 5 ft away, 5 ft high

OUTDOOR UNIT

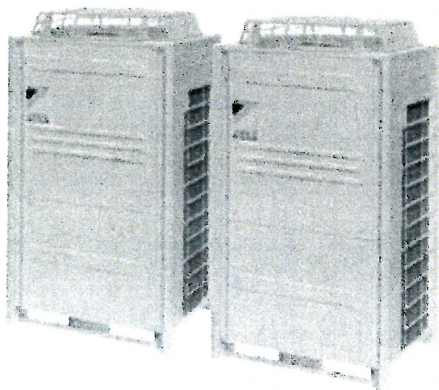
Double Module Systems

Model	Name		RXYQ144PATJ	RXYQ168PATJ	RXYQ192PATJ	RXYQ216PTJUR	RXYQ240PTJUR
	Combination:		RXYQ72PATJ x 2	RXYQ96PATJ + RXYQ72PATJ	RXYQ96PATJ x 2	RXYQ120PTJUR + RXYQ96PATJ	RXYQ120PTJUR x 2
Performance	Nominal Cooling Capacity ¹	Btu/h	144,000	168,000	192,000	216,000	240,000
	Rated Cooling Capacity	Btu/h	138,000	160,000	184,000	206,000	240,000
	Rated Cooling Input Power (system)	kW	11.31	14.04	17.20	19.43	24.49
	Rated Full Load EER ^{1,3} (system)		12.2	11.4	10.7	10.60	9.80
	Nominal Heating Capacity ²	Btu/h	162,000	188,000	216,000	243,000	270,000
	Rated Heating Capacity	Btu/h	154,000	180,000	206,000	232,000	258,000
	Rated Heating Input Power (system)	kW (Btu/h)	13.3	16.0	18.9	21.25	23.63
	Rated Full Load COP ^{2,3} (system)		3.4	3.3	3.2	3.2	3.2
	Power	V/ph/Hz	208-230/3/60	208-230/3/60	208-230/3/60	208-230/3/60	208-230/3/60
	Sound Pressure Level at 3ft.	dB(A)	61	61	62	62	63
Refrigerant Piping	Refrigerant Type and Quantity	(lbs.)	R-410A (18.1 + 18.1)	R-410A (19.8+18.1)	R-410A (19.8+19.8)	R-410A (20.1+19.8)	R-410A (20.1+20.1)
	Liquid Pipe (Main Line)	in.	1/2 (Braze)	5/8 (Braze)	5/8 (Braze)	5/8 (Braze)	5/8 (Braze)
	Suction Gas Pipe (Main Line)	in.	1-1/8 (Braze)	1-1/8 (Braze)	1-1/8 (Braze)	1-1/8 (Braze)	1-3/8 (Braze)
	High and Low Pressure Equalization Pipe	in.	3/4 (Braze)	3/4 (Braze)	3/4 (Braze)	3/4 (Braze)	3/4 (Braze)
	Vertical Pipe Length (if unit is below FCU)	ft.	295	295	295	295	295
	Vertical Pipe Length (if unit is above FCU)	ft.	164 (295 with Option)	164 (295 with Option)	164 (295 with Option)	164 (295 with Option)	164 (295 with Option)
	Actual Pipe Length (Equivalent Length)	ft.	540 (620)	540 (620)	540 (620)	540 (620)	540 (620)
	Total Pipe Length	ft.	3,280	3,280	3,280	3,280	3,280
Connection Ratio	Connectable Indoor Unit Ratio	%	50-130% as Standard (Up to 200% is permitted depending on application & fan coil unit selection)				
	Maximum Number of Indoor Units	Qty.	25	29	33	37	41
Unit	Weight	lbs.	560 + 560	560 + 560	560 + 560	560 + 560	560 + 560
	Dimensions (H x W x D)	in.	(66-1/8 x 36-5/8 x 30-1/8) x 2				
Fan	Air Flow	cfm	6,530 + 6,530	6,530 + 6,530	6,530 + 6,530	7,060 + 6,530	7,060 + 7,060
	External Static Pressure	in. W.G.	0.32	0.32	0.32	0.32	0.32
	Fan Motor Output and Quantity	kW (Qty.)	0.75 x 2	0.75 x 2	0.75 x 2	0.75 x 2	0.75 x 2
Electrical	Maximum Overcurrent Protection (MOP)	A	40 + 40	50 + 40	50 + 50	50 + 60	60 + 60
	Minimum Circuit Amps (MCA)	A	36.1 + 36.1	36.1 + 36.1	36.1 + 36.1	41.3 + 36.1	41.3 + 41.3
	Minimum Starting Current (MSC)	A	137	137	138	154	155
	Compressor Rated Load Amps (RLA)	A	(14.2) x 2	(7.8 + 16.8) + 14.2	(7.8 + 16.8) + (7.8 + 16.8)	(12.2 + 16.8) + (7.8 + 16.8)	(12.2 + 16.8) x 2
Compressor	Compressor Type		Daikin Scroll x 4	Daikin Scroll x 4	Daikin Scroll x 4	Daikin Scroll x 4	Daikin Scroll x 4
	Compressor Set-Up		(1 INV + 1 FIX) x 2	(1 INV + 1 FIX) x 2	(1 INV + 1 FIX) x 2	(1 INV + 1 FIX) x 2	(1 INV + 1 FIX) x 2
	Compressor Capacity Control	%	13 - 100	9 - 100	7 - 100	7 - 100	6 - 100

1 Indoor temp. : 80°FDB or 67°FWB / outdoor temp. : 95°FDB / Equivalent piping length : 25 ft (7.5 m), level difference : 0 ft.

2 Indoor temp. : 70°FDB / outdoor temp. : 47°FDB or 43°FWB / Equivalent piping length : 25 ft (7.5 m), level difference : 0 ft.

3 The tested system EER and COP values reflect "full load efficiency only and are the results from testing to the Alternate Test Method (ATM) guidelines provided by the U.S. Department of Energy (DOE) in the Federal Register / Vol. 74, No. 68 / Friday April 8, 2009 / Notices / Pages 15955-15958



RXYQ144PATJ
RXYQ168PATJ
RXYQ192PATJ
RXYQ216PTJUR
RXYQ240PTJUR

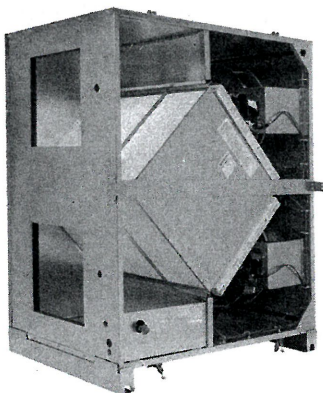


HEAT RECOVERY UNIT



HE 1.5XINH (ECM OPTION)

INDOOR UNIT



SPECIFICATIONS

Ventilation Type:
Static plate, heat and humidity transfer

Typical Airflow Range: 375-1,575 CFM

AHRI 1060 Certified Core:
One L62-G5 and one L125-G5

Standard Features:
Non-fused disconnect
24 VAC transformer/relay package

Filters:
Total qty. 4, MERV 8: (2) 14" x 20" x 2" and (2) 16" x 20" x 2"

Unit Dimensions & Weight:
53 1/4" L x 34 1/2" W x 53 3/4" H
336-463 lbs.

Max. Shipping Dimensions & Weight (on pallet):
70" L x 47" W x 53" H
530 lbs.

Motor(s):
Qty. 2, 1.0 HP ea., Direct drive ECM motorized impeller packages

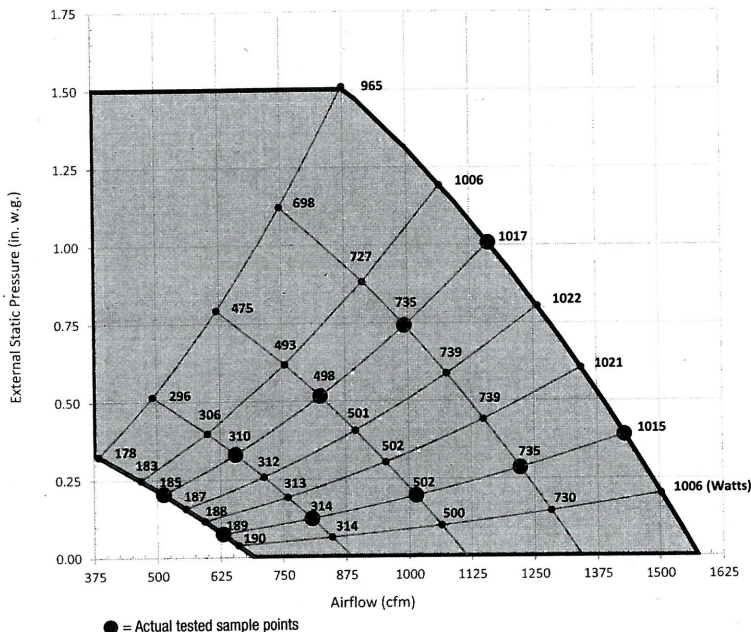
Options:
Fused disconnect
Double wall construction
Gravity backdraft dampers
Motorized isolation dampers - OA, EA or both airstreams
Qty. 2, Factory mounted filter alarms

Accessories:
Filters - MERV 13, 2" (shipped loose)
Backdraft damper - OA or EA
Potentiometer speed control - remote installed
Digital time clock - wall mount (TC7D-W)
Digital time clock - in exterior enclosure (TC7D-E)
Motion occupancy control - ceiling mount (MC-C)
Motion occupancy control - wall mount (MC-W)
Carbon dioxide control - wall mount (CO2-W)
Carbon dioxide control - duct mount (CO2-D)

ECM OPTION OPERATING RANGE

HE1.5XINH ECM		
Sample Points Depicted in Larger Dots		
Airflow (CFM)	External Static Pressure (Inches Water Column)	Unit Power Consumption (Watts)
630	0.07	189
807	0.12	314
1014	0.20	502
1222	0.28	735
1430	0.39	1015
513	0.20	185
656	0.33	310
825	0.52	498
994	0.74	735
1163	1.01	1017

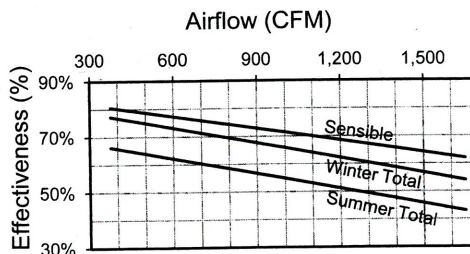
Note: Watts is for the entire unit.
Note: Airflow performance includes effect of clean, standard filter supplied with unit.



ELECTRICAL DATA

HP	Volts	HZ	Phase	FLA per motor	Min. Cir. Amps	Max. Overcurrent Protection Device
1.0	120	60	Single	8.0	18.0	20
1.0	208-230	60	Single	6.2	14.0	15

CORE PERFORMANCE



At AHRI 1060 standard conditions. See all AHRI certified ratings at www.ahrinet.org.

HE1.5XINH

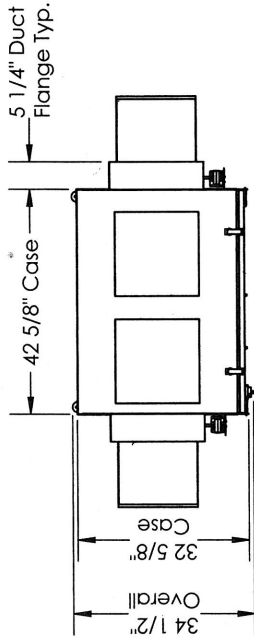
ABBREVIATIONS
 EA: Exhaust Air to outside
 OA: Outside Air intake
 RA: Room Air to be exhausted
 FA: Fresh Air to inside

INSTALLATION ORIENTATION
 Unit may be installed in any orientation.

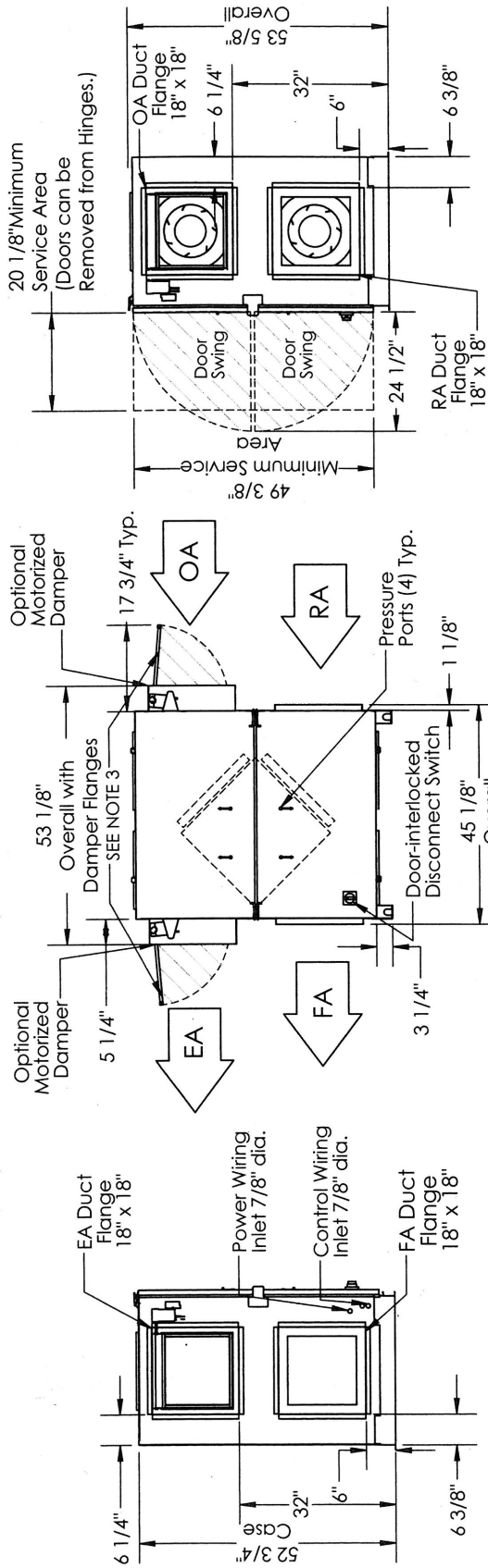
NOTE
 1. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE ROUNDED TO THE NEAREST EIGHTH OF AN INCH.

2. SPECIFICATIONS MAY BE SUBJECT TO CHANGE WITHOUT NOTICE.

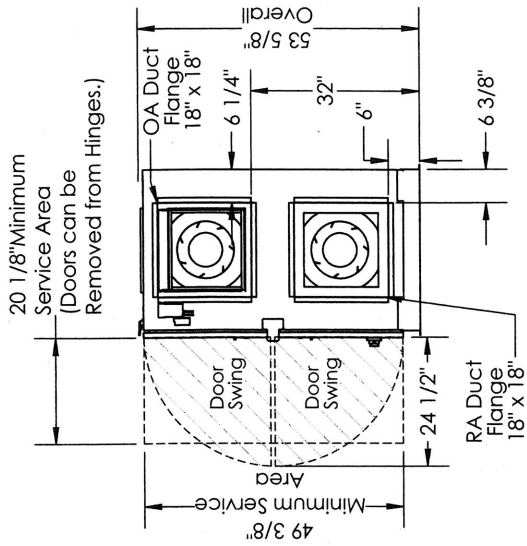
3. DAMPER SWING IS AWAY FROM THE UNIT. MIN. DUCT CLEARANCE FROM DAMPER BLADE WHEN FULLY OPENED TO BE 2". SMACNA RULES APPLY.



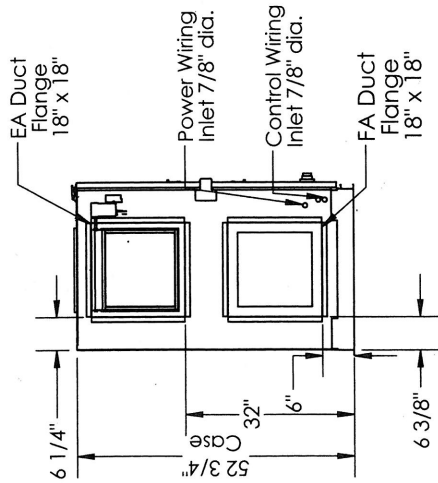
TOP VIEW



FRONT VIEW



RIGHT VIEW



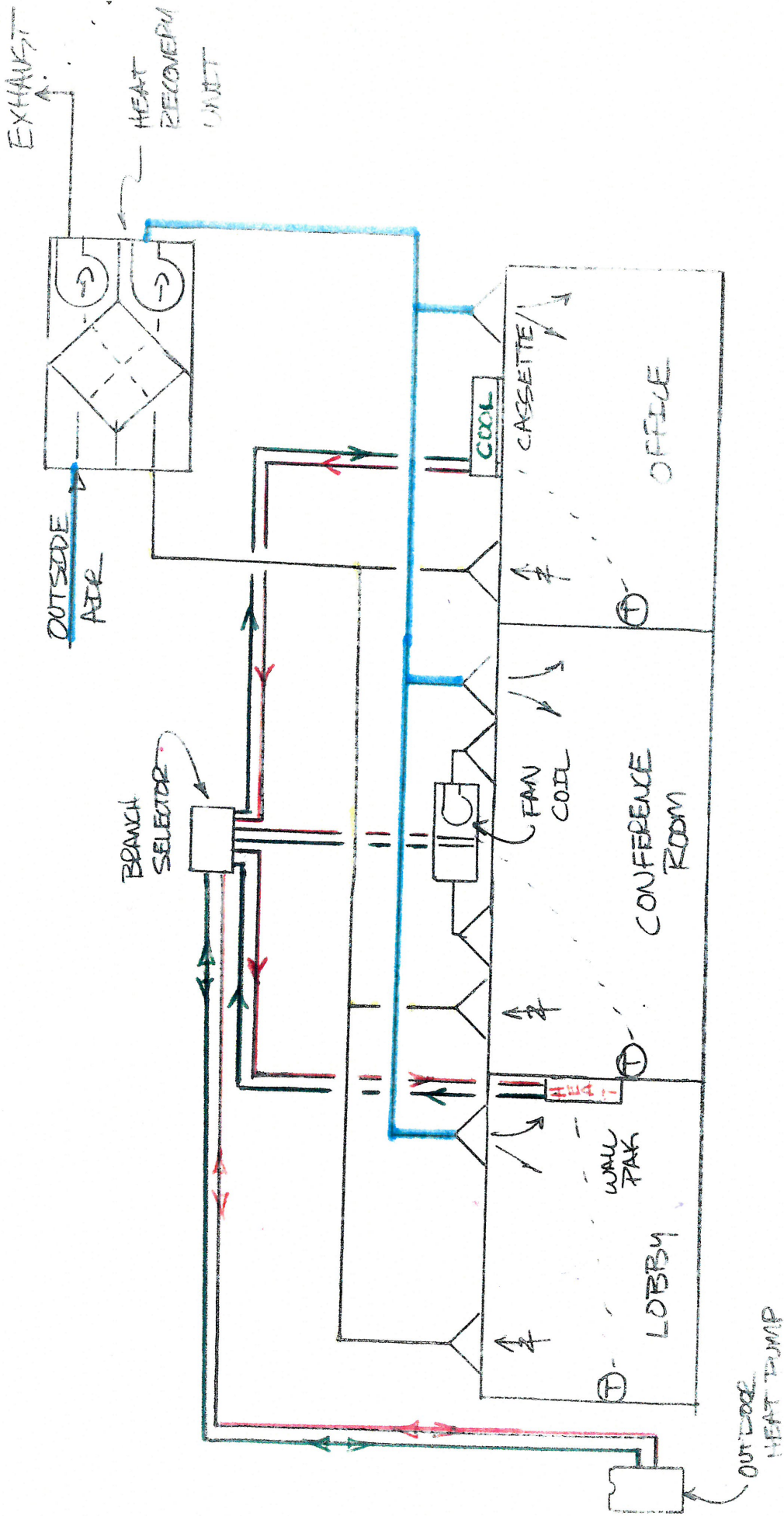
LEFT VIEW

AIRFLOW CONFIGURATION
 Available as shown in dimension drawing.



UNIT MOUNTING & APPLICATION
 Can be mounted in any orientation. RA/EA airstream can be switched with OA/FA airstream unless certain options are selected. Duct configuration is field convertible.

HE-SERIES



VARIABLE REFRIGERANT VOLUME (VRV)
WITH HEAT RECOVERY

AND CENTRAL VENTILATION