HVAC SYSTEMS DESCRIPTION

Outdoors:

Winter: 0 Degrees F

BETWEEN PIPES, CONDUIT, DUCTS, EQUIPMENT, ARCHITECTURAL AND STRUCTURAL FEATURES SHALL BE AVOIDED. PROVIDE ITEMS THAT MAY BE REQUIRED TO MEET THE CONDITIONS AT THE BUILDING.

AT THE COST OF THE CONTRACTOR AT FAULT.

COORDINATE ALL WORK WITH WORK SHOWN ON DRAWINGS FOR OTHER TRADES. COORDINATE EXACT LOCATION OF DIFFUSERS, REGISTERS AND GRILLES WITH THE ARCHITECTS.

INDICATED DUCT SIZES ARE CLEAR INSIDE OF DUCT DIMENSIONS, INCLUDING LINER WHERE USED.

2.

AND SCREW-ON CAPS.

400 Morgan Center
Butler, PA 16001

M200 GROUND FLOOR MECHANICAL DUCT PLAN

UNLESS OTHERWISE NOTED, MINIMUM SIZE FOR ALL PIPING SHALL BE 3/4".

THE MECHANICAL CONTRACTOR SHALL PROVIDE ACCESS PANELS NOT SMALLER THAN 24"x24" FOR ACCESS TO CONCEALED TRAPS, VALVES, CLEANOUTS, MOTORS, FIRE

ROOMS WHERE THE ABOVE LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION. REFER TO THE M300 SERIES DRAWINGS FOR THE THERMOSTAT (DB Temp/RH) (DB Temp)

(REFERS TO NOTES ON SAME SHEET)

CLASSROOM 76°F DB/Approx. 50% RH 70°F DB

TEACHING LAB 76°F DB/Approx. 50% RH 70°F DB

DIGITAL THERMOMETER

DIFFUSER/REGISTER/GRILLE MARK

DENOTES LIMIT OF DEMOLITION

2-WAY CONTROL VALVE

AUTOMATIC FLOW CONTROL VALVE

BLOW DOWN STRAINER

PIPE TEE TURNED DOWN

HOT WATER SUPPLY PIPE

SQUARE TO ROUND TRANSITION

FLEXIBLE DUCTWORK (BLACK TRIANGLE INDICATES BLANK-OFF)

SLOT DIFFUSER

218010631
DEMONSTRATES THE OVERALL SYSTEM DESIGN.

GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH APPLICABLE DETAILS.

SERIES OF SHEETS WILL START OVER AT NOTE 1.

THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.

MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY INSTALL ALL SMOKE DETECTORS PER THE CORRESPONDING DETAIL.

COORDINATE WITH THE ELECTRICAL CONTRACTOR TO PROVIDE A COMPLETE SYSTEM.

DEFINED IN THE AIR TERMINAL UNIT SCHEDULE ON THE M700 SERIES DRAWINGS.

REFER TO THE TERMINAL BALANCE SCHEDULE FOR THE ZONE CONTROL SEQUENCE NUMBER AND THE CORRESPONDING SET POINTS.

The top of the diffuser shall be 10'-0" above the floor.

Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.

Coordinate the location of the fan coil unit and first duct take-off.

Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.

Provide welding snorkel equal to Movex RX-3000 with 5" diameter. Provide wall mounting accessories.

Provide bird screen over duct opening.

Provide plenum box the full height and width of the louver. The depth of the plenum shall be 10'-0" height wise with the top half for the elevator machine room exhaust and the bottom half for the electrical room and extend a minimum of 24 inches into the room.

Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.

Two 10'-0" diameter ID round metal ducts in area above the door to not conflict with IT equipment or components.

Locate the AC unit above the door to not conflict with IT equipment or components.

Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.

Connect to the exhaust snorkel. The discharge of the fan shall point towards the plenum. Transition to exhaust duct to 10" and connect into the plenum with a bellmouth connection.

Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.

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Provide a 30x20 opening in the side of the duct to allow air to enter the room. The opening shall be a minimum of 2 inches above the bottom of the duct.
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM DEMONSTRATES THE OVERALL SYSTEM DESIGN.

GENERAL NOTES

REFER TO THE DETAIL SHEET DRAWINGS (M500 SERIES) FOR ALL GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH APPLICABLE DETAILS SERIES OF SHEETS WILL START OVER AT NOTE 1.

THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.

INSTALL ALL EQUIPMENT AND DUCTWORK TO ALLOW FOR THE MFR'S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.

SEQUENCE NUMBER AND THE CORRESPONDING SET POINTS.

INSTALL ALL SMOKE DETECTORS PER THE CORRESPONDING DETAIL.

CVR, CV, VV, AND VVR ARE ALL TYPES OF TERMINAL UNITS AND ARE DEFINED IN THE AIR TERMINAL UNIT SCHEDULE ON THE M700 SERIES.

LENGTH FOR ACOUSTIC CONSIDERATIONS.

UP 4.

FS 5.

STAIR 6.

MENS TOILET 7.

8 310

6"Ø EA

8"305

10"Ø EA

22"x22"2

2 375 EA

400 Morgan Center

101 East Diamond

tel: 724.285.4761

www.stantec.com
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH APPLICABLE DETAILS.

1. THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.

3. INSTALL ALL EQUIPMENT AND DUCTWORK TO ALLOW FOR THE MFR'S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.

3. SEQUENCE NUMBER AND THE CORRESPONDING SET POINTS.

5. INSTALL ALL SMOKE DETECTORS PER THE CORRESPONDING DETAIL.

5. COORDINATE WITH THE ELECTRICAL CONTRACTOR TO PROVIDE A COMPLETE SYSTEM.

5. CVR, CV, VV, AND VVR ARE ALL TYPES OF TERMINAL UNITS AND ARE (TYP OF 2)

7. VVR 2-3 IS NOT USED. ALL FLEXIBLE DUCTWORK TO DIFFUSER (LINEAR & 2X2) SHALL BE 5FT IN LENGTH FOR ACOUSTIC CONSIDERATIONS.

9. www.stantec.com

200 Morgan Center
Butler, PA 16001
Tel: 724.285.4761
www.stantec.com
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM DEMONSTRATES THE OVERALL SYSTEM DESIGN.

REFER TO THE DETAIL SHEET DRAWINGS (M500 SERIES) FOR ALL GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH APPLICABLE DETAILS.

SERIES OF SHEETS WILL START OVER AT NOTE 1.

THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.

INSTALL ALL EQUIPMENT AND DUCTWORK TO ALLOW FOR THE MFR'S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.

REFER TO THE TERMINAL BALANCE SCHEDULE FOR THE ZONE CONTROL SEQUENCE NUMBER AND THE CORRESPONDING SET POINTS.

INSTALL ALL SMOKE DETECTORS PER THE CORRESPONDING DETAIL.

COORDINATE WITH THE ELECTRICAL CONTRACTOR TO PROVIDE A COMPLETE SYSTEM.

CVR, CV, VV, AND VVR ARE ALL TYPES OF TERMINAL UNITS AND ARE DRAWINGS.

VVR 2-3 IS NOT USED. ALL FLEXIBLE DUCTWORK TO DIFFUSER (LINEAR & 2X2) SHALL BE 5FT IN LENGTH FOR ACOUSTIC CONSIDERATIONS.

TERMINAL BALANCE SCHEDULE

<table>
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<th>Zone / Room</th>
<th>Zone / Room</th>
<th>CFM Min.</th>
<th>Zone / Room</th>
<th>Zone / Room</th>
<th>CFM Min.</th>
<th>Zone / Room</th>
<th>Zone / Room</th>
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<td>770</td>
<td>2</td>
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</tbody>
</table>

KEY NOTES

- REFER TO M002 FOR THE ENTIRE LIST OF ALL KEY NOTES.
- ONLY THE KEY NOTES USED ON A SPECIFIC SHEET WILL BE LISTED ON THAT SHEET.
- KEY NOTES ARE PROJECT SPECIFIC.
- M1 Provide bird screen over duct opening.
- M18 Provide 12" duct to fume hood. Provide transition to the fume hood connection size
- M39 Refer to the M500 series detail drawings for the corresponding detail. Coordinate the location of the fan coil unit and first duct take-off.
- M45 The linear diffuser shall be located in the high horizontal section of drywall on the
- M51 Loop the supply over the main to allow for the full length of flexible ductwork.
GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH SERIES OF SHEETS WILL START OVER AT NOTE 1.

KEY NOTES ARE NUMBERED SEQUENTIALLY FROM M1 TO THE LAST KEY NOTE. THEY ARE PROJECT SPECIFIC. REFER TO M002 FOR THE ENTIRE LIST OF ALL KEY NOTES. ONLY THE KEY NOTES USED ON A SPECIFIC SHEET WILL BE LISTED ON THAT SHEET.

1. REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM DEMONSTRATES THE OVERALL SYSTEM DESIGN.
2. REFER TO THE DETAIL SHEET DRAWINGS (M500 SERIES) FOR ALL APPLICABLE DETAILS.
3. THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.
4. INSTALL ALL EQUIPMENT AND DUCTWORK TO ALLOW FOR THE MFR’S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.
5. REFER TO THE TERMINAL BALANCE SCHEDULE FOR THE ZONE CONTROL SEQUENCE NUMBER AND THE CORRESPONDING SET POINTS.
6. INSTALL ALL SMOKE DETECTORS PER THE CORRESPONDING DETAIL.
7. COORDINATE WITH THE ELECTRICAL CONTRACTOR TO PROVIDE A COMPLETE SYSTEM.
8. CVR, CV, VV, AND VVR ARE ALL TYPES OF TERMINAL UNITS AND ARE DEFINED IN THE AIR TERMINAL UNIT SCHEDULE ON THE M700 SERIES DRAWINGS.
9. VVR 2-3 IS NOT USED.
10. ALL FLEXIBLE DUCTWORK TO DIFFUSER (LINEAR & 2X2) SHALL BE 5FT IN LENGTH FOR ACOUSTIC CONSIDERATIONS.
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH REFER TO THE DETAIL SHEET DRAWINGS (M500 SERIES) FOR ALL SERIES OF SHEETS WILL START OVER AT NOTE 1.

1. COMPLETE SYSTEM.


2. ALL PIPING MATERIAL FROM THE VERTICAL RISER TO THE LEVEL ISOLATION VALVE SHALL BE THE SAME MATERIAL. THERE SHALL BE NO CHANGE IN MATERIAL AS PART OF THE PIPE RISER. THE ELECTRIC SEPARATION SHALL BE MADE AT THE ISOLATION VALVE ON THE BUILDING SIDE (AS OPPOSED TO THE RISER SIDE) OF THE ISOLATION VALVE.

3. EQUIPMENT ARE NOTED ON THE CORRESPONDING M700 SERIES SCHEDULE. THE MINIMUM SIZE SHALL BE 3/4" REFER TO THE DUCT HEATING COIL SCHEDULE FOR ALL OF THE DUCT HEATING COIL FLOWS.

4. PROVIDE A DRAIN WITH BALL VALVE AND HOSE CONNECTION FOR ALL LOW POINTS IN THE SYSTEM THAT WILL NOT DRAIN. THESE

5. ALL EQUIPMENT SHALL HAVE A DEDICATED ISOLATION VALVE. IT CAN NOT BE PART OF A LARGER VALVE ASSEMBLY / PERMANENTLY JOINED TO OTHER VALVES.

6. SUPPORT FRAMES BY BIG FOOT, MODEL LD STANDARD FRAMES.

7. SUPPORT THE CONDENSING UNITS, PROVIDE NON-PENETRATING TOILET

8. STAFF TOILET

9. 2"ø HWS

10. 1"ø HWR

11. GBH 21.4

12. 3.0 GPM

13. VERIFY THE LOCATION OF THE ISOLATION VALVE AND PIPE SCALE MATERIAL TO SUPPORT THE CONDENSING UNITS, PROVIDE NON-PENETRATING FOR ALL 2"ø HWS/WR

14. 2"ø D UP

15. 2"ø HWS UP

16. 2"ø HWR UP

17. 1 1/2"ø D

18. 1 1/2"ø HWS

19. 1 1/2"ø HWR

20. MBH 9.8

21. MBH 21.4

22. 1.5 ELEV

23. 2"ø D UP

24. 2"ø HWS UP

25. 3/4"ø D

26. 3/4"ø HWS

27. 3/4"ø HWR

28. 1"ø HWS

29. 1"ø HWR

30. 2"ø HWS

31. 2"ø HWR

32. 3/4"ø HWS

33. 3/4"ø HWR

34. 3/4"ø HWS

35. 3/4"ø HWR

36. 3/4"ø HWS

37. 3/4"ø HWR
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH SERIES OF SHEETS WILL START OVER AT NOTE 1.

1. COMPLETE SYSTEM.
2. MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.
3. ISOLATION VALVE SHALL BE THE SAME MATERIAL. THERE SHALL BE ISOLATION VALVE. THE BUILDING SIDE (AS OPPOSED TO THE RISER SIDE) OF THE ISOLATION VALVE.
4. ALL GRAVITY CONDENSATE SHALL BE SLOPED. PROVIDE CLEANOUTS AT EACH CHANGE IN DIRECTION.
5. ISOLATION VALVE SHALL BE JOINED TO OTHER VALVES.
6. THE BUILDING SIDE (AS OPPOSED TO THE RISER SIDE) OF THE ISOLATION VALVE.
7. DRAIN WITH BALL VALVE AND HOSE CONNECTION FOR ALL ALL MINIMUM BRANCH RUN OUT PIPE SIZES TO THE TERMINAL EQUIPMENT ARE NOTED ON THE CORRESPONDING M700 SERIES SCHEDULE. THE MINIMUM SIZE SHALL BE 3/4" REFER TO THE DUCT HEATING COIL SCHEDULE FOR ALL OF THE DUCT HEATING COIL FLOWS.
8. PROVIDE A DRAIN WITH BALL VALVE AND HOSE CONNECTION FOR ALL TO SUPPORT THE CONDENSING UNITS, PROVIDE NON-PENETRATING SEAL.
9. ISOLATION VALVE SHALL BE THE SAME MATERIAL. THERE SHALL BE ISOLATION VALVE. IT CAN JOINED TO OTHER VALVES.
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM DEMONSTRATES THE OVERALL SYSTEM DESIGN.

GENERAL NOTES

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APPLICABLE DETAILS.

THE CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS FOR A COMPLETE SYSTEM.

INSTALL ALL EQUIPMENT AND PIPING TO ALLOW FOR THE MFR'S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY SERVICE THE SYSTEM.

ALL GRAVITY CONDENSATE SHALL BE SLOPED. PROVIDE CLEANOUTS AT EACH CHANGE IN DIRECTION.

ALL PIPING MATERIAL FROM THE VERTICAL RISER TO THE LEVEL ISOLATION VALVE SHALL BE THE SAME MATERIAL. THERE SHALL BE NO CHANGE IN MATERIAL AS PART OF THE PIPE RISER. THE ELECTRIC SEPARATION SHALL BE MADE AT THE ISOLATION VALVE ON THE BUILDING SIDE (AS OPPOSED TO THE RISER SIDE) OF THE ISOLATION VALVE.

ALL MINIMUM BRANCH RUN OUT PIPE SIZES TO THE TERMINAL EQUIPMENT ARE NOTED ON THE CORRESPONDING M700 SERIES SCHEDULE. REFER TO THE DUCT HEATING COIL SCHEDULE FOR ALL OF THE DUCT HEATING COIL FLOWS.

PROVIDE A DRAIN WITH BALL VALVE AND HOSE CONNECTION FOR ALL LOW POINTS IN THE SYSTEM THAT WILL NOT DRAIN. THESE LOCATIONS SHOULD BE ADDED TO THE ACCESS DRAWINGS.

ALL EQUIPMENT SHALL HAVE A DEDICATED ISOLATION VALVE. IT CAN NOT BE PART OF A LARGER VALVE ASSEMBLY / PERMANENTLY JOINED TO OTHER VALVES.

TO SUPPORT THE CONDENSING UNITS, PROVIDE NON-PENETRATING SUPPORT FRAMES BY BIG FOOT, MODEL LD STANDARD FRAMES.
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5. ALL MINIMUM BRANCH RUN OUT PIPE SIZES TO THE TERMINAL EQUIPMENT SHALL BE JOINTED TO OTHER VALVES.

6. THE AIR DOOR IS OVER A SECONDARY ENTRANCE AT A MID LEVEL LANDING. THE HOT WATER PIPING LOCATE THE CONTROL VALVE AND VALVE ASSEMBLY IN THE JC.

7. THE PIPING WILL NEED TO OFFSET BELOW AND BACK UP ON THE OTHER SIDE OF A DEEP BEAM. PROVIDE LOW POINT VENTS AND DRAINS ON THE OFFICE SIDE OF THE BEAM FOR DRAINING THE LINE.

8. THE ALTERNATE RADIATOR / FIN TUBE SECTIONS SHALL BE PIRED IN REVERSE RETURN FOR SELF BALANCING EACH RADIATOR. THE CONTROL VALVE SHALL BE DESIGNED FOR 4 GPM.
REFER TO M601 FOR THE AIR RISER DIAGRAM. THIS DIAGRAM DEMONSTRATES THE OVERALL SYSTEM DESIGN.

GENERAL NOTES

GENERAL NOTES APPLY TO ALL SHEETS IN THE SERIES THAT THEY ARE ON. EACH REFER TO THE DETAIL SHEET DRAWINGS (M500 SERIES) FOR ALL

1. INSTALL ALL EQUIPMENT AND PIPING TO ALLOW FOR THE MFR'S MINIMUM ACCESS REQUIREMENTS THAT IS REQUIRED TO PROPERLY

2. ALL GRAVITY CONDENSATE SHALL BE SLOPED. PROVIDE CLEANOUTS AT EACH CHANGE IN DIRECTION.

3. ISOLATION VALVE SHALL BE THE SAME MATERIAL. THERE SHALL BE ELECTRIC SEPARATION SHALL BE MADE AT THE ISOLATION VALVE ON THE BUILDING SIDE (AS OPPOSED TO THE RISER SIDE) OF THE ISOLATION VALVE.

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5. PROVIDE A DRAIN WITH BALL VALVE AND HOSE CONNECTION FOR ALL LOW POINTS IN THE SYSTEM THAT WILL NOT DRAIN. THESE LOCATIONS SHOULD BE ADDED TO THE ACCESS DRAWINGS.

6. ALL EQUIPMENT SHALL HAVE A DEDICATED ISOLATION VALVE. IT CAN NOT BE PART OF A LARGER VALVE ASSEMBLY / PERMANENTLY JOINED TO OTHER VALVES.

7. REFER TO THE DUCT HEATING COIL SCHEDULE FOR ALL OF THE LOCATIONS SHOULD BE ADDED TO THE ACCESS DRAWINGS.

8. REFER TO M3 Refrigerant line riser from FCUs to condenser unit on roof. Contractor shall size pipe run based on manufacturer recommendations. The routing shall comply with limiting the max vertical height to 60ft and the total linear ft to

9. M5 Run refrigerant lines through shaft up to condensing unit on the roof. Size the lines per the mfr's recommendation for the application.

10. M304 Refer to the plumbing plans for the gas piping and connection. Run condensate to floor drain.

11. M5 Run refrigerant lines through shaft up to condensing unit on the roof. Size the lines per the mfr's recommendation for the application.

12. M35 Provide required separation of boilers per L&I

13. M36 HWS/R from below to run low under the pump assembly and then rise up to

14. M37 Boiler sequencer panel

15. M38 Building automations control panel

16. M50 Provide a minimum of 3ft separation between the primary supply and primary

17. M39 HWS/R from below to run low under the pump assembly and then rise up to

18. M39 Boiler sequencer panel

19. M39 Building automations control panel

20. M50 Provide a minimum of 3ft separation between the primary supply and primary

21. M50 Provide a minimum of 3ft separation between the primary supply and primary
SMOKE DETECTOR INSTALLATION IN RECTANGULAR OR SQUARE DUCT DETAIL

MAGNEHELIC GAUGE INSTALLATION

ROUND DIFFUSER TERMINATION DETAIL

REHEAT COIL DUCT DETAIL

GOOSENECK ON ROOF CURB DETAIL

RETURN/EXHAUST GRILLE DETAIL OPTION 1

RETURN/EXHAUST GRILLE DETAIL OPTION 2

FLUE THROUGH ROOF DETAIL

FAN COIL RETURN DUCT DETAIL

DETAILS OF LOW VELOCITY DUCT LAYOUT

DUCTWORK AND EQUIPMENT CONNECTION TO ROOF CURB DETAIL
### DIFFUSER, REGISTER, AND GRILLE SCHEDULE

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<thead>
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<th>MARK</th>
<th>SQUARE/RECT-ROUND-LINEAR</th>
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<tr>
<td>SIZE</td>
<td>MOUNT. PATTERN MATERIAL FINISH MANUFACTURER MODEL REMARKS FACE NECK</td>
</tr>
<tr>
<td>1 SQUARE</td>
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<tr>
<td>6 SQUARE</td>
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</tr>
<tr>
<td>7 LINEAR</td>
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<td>5' x 1''</td>
</tr>
<tr>
<td>9 LINEAR</td>
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### VARIABLE VOLUME REHEAT TERMINAL UNIT SCHEDULE

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### ADDENDUM 01
- 9/22/14

### ADDENDUM 02
- 11/04/14

### ADDENDUM 03
- 12/25/14

### ADDENDUM 04
- 01/10/15

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### PRICE SCHEDULES

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<td>VVR 2</td>
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<td>VVR 6</td>
<td>851</td>
</tr>
<tr>
<td>VVR 10</td>
<td>3201</td>
</tr>
</tbody>
</table>
GENERAL HVAC APPLICATIONS AND PROGRAMS

A. DUTY CYCLING PROGRAM:

The sequence shall rotate equipment position based on run time to equalize the run time for all regulators, equipment, valve, control valve, coil, equipment control valve, where multiple units exist.

B. LOSS OF POWER PROGRAM:

When power is lost, all pieces of equipment (not on emergency power) will shut down and equipment that is on emergency power will stay online and command all equipment off. When power is restored, the BAS shall begin to stage equipment back on to minimize the peak electrical use (user-adjustable setpoint for peak demand). The program shall have an adjustable list of all pieces of major equipment. The supply and exhaust systems shall have priority followed by the heating system.

C. PROVIDE A HOT WATER RESET PROGRAM TO RESET THE HOT WATER TEMPERATURE FROM 180 DEG F DOWN TO...
UNIT SEQUENCING

THE AIR HANDLING SYSTEM SHALL RUN WHEN SCHEDULED ON AND WHEN COMMANDED ON BY THE NIGHT SETBACK PROGRAM OR MORNING WARM-UP SETPOINT.

THE UNIT SHALL BE PASSED ACROSS THE CONTROL LAN. THE UNIT SHALL BE ABLE TO ALARMS.

WHEN STARTING THE UNIT: THE CONTROL RETURN AIR DAMPER AND THE DISCHARGE FAN SEQUENCING.

THE SUPPLY FAN VFD SHALL VARY THE FAN SPEED TO MAINTAIN THE SAME TIME UNLESS A FAN IS MANUALLY DISCONNECTED.

THE AHU SHOULD BE A PACKAGED CONTROLLER FROM THE AHU MFR WHICH SHALL CONTROL AS ASPECTS ON THE UNIT AND INTEGRATE INTO THE BAS.

10. THE COOLING COIL SHALL BE NEVER OPERATE WHEN THE UNIT IS IN HEATING MODE. HEATING MODE OR COOLING MODE SHALL BE DETERMINE BASED ON THE MIXED AIR TEMPERATURE SENSOR.

ALL SAFETIES SHALL BE HARD WIRED TO THE RESPECTIVE VFD OR DAMPER. SAFETIES THAT THEY CONTROL. THE WIRING OF ALL DAMPERS SHALL BE COORDINATE BETWEEN TRADES TO MAINTAIN ALL REQUIRED UL AND CODE REQUIREMENTS. THE LIFE OF CODE COMPLIANCE.

HEATING MODE OR COOLING MODE SHALL BE DETERMINE BASED ON THE MIXED AIR TEMPERATURE SENSOR.

THE DX COIL / COMPRESSORS SHALL MODULATE / STAGE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SET POINT WHERE BOTH CONTROL VALVES SHALL REMAIN 0% OPEN.

THE MIN DAMPER PERCENT OPEN SET POINT WHICH SHALL BE EQUAL TO THE DEGREE F. THEN THE UNIT SHALL BE FAILED.

SAFETY COMPONENT SHALL OVER-RIDE ALL BAS COMMANDS.

END SWITCH FAILS TO VERIFY DAMPER DETECTION AT FAN. IF PROOF OF OPERATION IS NOT RECEIVED WITH-IN 180 SECONDS OF THE AHU BEING COMMANDED ON, THEN THE UNIT SHALL BE FAILED. A CURRENT SWITCH ISOLATION DAMPER CONFIGURED TO CLOSE SLOW ENOUGH TO NOT DAMAGE THE UNIT WHEN SMOKE IS DETECTED AND THEY SHUT. THE CLOSING TIME SHALL STILL COMPLY WITH ALL CODE

END SWITCH

REMOTE STATIC PRESSURE SENSOR

REMOTE AIR TEMPERATURE SENSOR. IF THE MIXED AIR TEMPERATURE IS LESS THAN THE EXHAUST AIR TEMPERATURE.

THE AHU BEING COMMANDED ON, THEN THE UNIT SHALL BE FAILED. A CURRENT SWITCH ISOLATION DAMPER CONFIGURED TO CLOSE SLOW ENOUGH TO NOT DAMAGE THE UNIT WHEN SMOKE IS DETECTED AND THEY SHUT. THE CLOSING TIME SHALL STILL COMPLY WITH ALL CODE

END SWITCH

REMOTE STATIC PRESSURE SENSOR

REMOTE AIR TEMPERATURE SENSOR. IF THE MIXED AIR TEMPERATURE IS LESS THAN THE EXHAUST AIR TEMPERATURE.
**Exhaust Fan Control (Electrical Room Ventilation)**

- **High Limit Space Temperature 85 Deg F**
- **Fan Failure**
- **End Switch Failures to Verify Damper Loss of Power**
- **PROGRAM**
- **DIAGRAM**

**2.1A Exhaust Fan Control Diagram**

- **Sequences 2.1**
- **Point Description**
- **Analogue**
- **Application**
- **Maintenance**
- **Energy Value**
- **Welding Exhaust Fan**

**Penthouse Ventilation and EMR Ventilation**

- **High Limit Space Temperature 85 Deg F**
- **Fan Failure**
- **End Switch Failures to Verify Damper Loss of Power**
- **Program**
- **Diagram**

**2.1B Exhaust Fan Control Diagram**

- **Sequences 2.1B**
- **Point Description**
- **Analogue**
- **Application**
- **Maintenance**
- **Energy Value**
- **Welding Exhaust Fan**

**2.2 Welding Exhaust Fan Control**

- **Point Description**
- **Analogue**
- **Application**
- **Maintenance**
- **Energy Value**
- **Welding Exhaust Fan**

**2.3 Penthouse and EMR Ventilation Control Diagram**

- **Sequences 2.3**
- **Point Description**
- **Analogue**
- **Application**
- **Maintenance**
- **Energy Value**
- **Welding Exhaust Fan**

**2.4 Toilet Exhaust Control Diagram**

- **Sequences 2.4**
- **Point Description**
- **Analogue**
- **Application**
- **Maintenance**
- **Energy Value**
- **Welding Exhaust Fan**
**APPLICATION**

**CHEMISTRY LAB W/OUT FUME HOOD**

**ANALOG DEMAND CONTROL VENTILATION CONTROL WITH FCU**

**2-STAGE VENTILATION W/ FCU**

**75/70**

**APPLICATION**

**M803**

**MAINTENANCE**

**POINT DESCRIPTION**

**75/70**

**M803**

**ANALOG**

**ANALOG**

**ENERGY**

**DI**

**CHEMISTRY LAB CONTROL**

**MAINTENANCE**

**VALUE**

---

1. Refer to the plan drawings for the number of fan coil units in each particular zone. There is one air terminal per level.

2. "TBS" refer to the terminal balance schedule on the 200 plan drawings.

3. The fan coil unit controller shall be a packaged controller to control the space cooling (including the fan).

4. The fan is an ECM motor. The fan speed shall be adjustable through the space controller.

5. Provide condensate high limit alarm to shut down the fan coil.

6. The switch shall be a 2-position toggle switch with cover.

---

**REFERENCE**

**HIGH LIMIT SPACE TEMPERATURE**

**TYPE**

**HIGH CONDENSATE LEVEL**

**VENTILATION AIR FLOW NOT AT SET POINT**

**COLOR GRAPHICS**

**TREND ALL POINTS**

**NIGHT SET BACK PROGRAM**

---

75/70

**REFERENCE**

**RELATIONSHIP**

**SETPOINT**

**ALARMS**

**SPACE TEMPERATURE**

**DIGITAL**

**FCU FAILURE**

**HIGH CONDENSATE LEVEL**

**VENTILATION AIR FLOW NOT AT SET POINT**

**TREND ALL POINTS**

---

**NOTES:**

- 3 VENTILATION FLOW RATES:
  - Room occupied or unoccupied with hoods on (design)
  - Room unoccupied with hoods off (low)
  - Room unoccupied (based on the building schedule), the space temperature cooling and heating setpoints shall be reset by an adjustable

---

**REFERENCE**

**HIGH SPACE TEMPERATURE**

**AIR FLOW NOT AT SET POINT**

**TREND SPACE OCCUPANCY BY ROOM NUMBER**

**COLOR GRAPHICS**

**TREND ALL POINTS**

**SETTING**

**NOT TO SCALE**
3.5 DUCT RE-HEAT COIL

3.6 EXHAUST FLOOR TRACKING CONTROL

3.7 CHEMISTRY PREP

3.8 BIOLOGY PREP

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NOTES:
1. REFER TO THE PLAN DRAWINGS FOR THE NUMBER OF AIR TERMINALS AND FAN COIL UNITS IN EACH PARTICULAR ZONE.
2. THE FAN SHOULD NOT START UNTIL THE ISOLATION DAMPER IS CONFIRMED OPEN VIA THE END SWITCH.
3. THE FAN SHALL HAVE A PROOF VIA CURRENT DETECTION. THE FUME HOOD MONITOR SHOULD INDICATE AN UN-SAFE CONDITION IF THE FAN FAILS.
SEQUENCE 4.2

UNIT HEATER

<table>
<thead>
<tr>
<th>SETPOINT</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>SPACE TEMPERATURE</td>
<td>60 DEG F</td>
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4.2 CABINET UNIT HEATER CONTROL DIAGRAM

4.3 UNIT HEATER CONTROL DIAGRAM

SEQUENCE 4.4

UNIT IN ALARM

YEARLY FILTER CHANGE ALARM

RUN TIME CALCULATION

COLOR GRAPHICS

SETPOINT | VALUE
<table>
<thead>
<tr>
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<td>AIR CURTAIN OA HIGH LIMIT</td>
<td>40 DEG F</td>
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4.4 AIR CURTAINS (STAIRS ENTRIES)

NOT TO SCALE

4.5 VESTIBULE

NOT TO SCALE

4.6 AIR CURTAINS (STAIRS ENTRIES)

NOT TO SCALE
1. The hot water plant shall be enabled based on the hot water demand exceeding the hot water demand threshold set point. (# of zones all control setpoints, time delays, etc., shall be adjustable.)

2. All pumps all have proof of operation through current detection at management. The hot water pump speed shall be varied from the min speed (20 Hz) to the max speed (60 Hz) to maintain the differential pressure transmitter placed across each pump. If current and/or water flow is not detected within 20 seconds of the point signal for the pump to start, an alarm shall be generated and the pump shall be failed. The pumps shall be in a duty / standby configuration. The pump order shall be rotated to equalize the pump run times for each pump. Pumps the VFD points shown on the corresponding control diagram shall be hard wired to the respective controller. Also provide a serial connection to the BAS for all VFDS. There shall be a dedicated graphics page for each VFD showing the values for all VFD points if not available as a point through the serial VFD connection, provide a binary dry contact to indicate when the drive is placed into bypass and a 0-10V DC signal to correspond to the drive signal (in Hz).

5.1 Boiler control

The BAS shall adjust the hot water temperature set point. The boiler control panel / sequencer shall stage and control the boilers to maintain optimal efficiency. It shall also start the primary pumps and proof boiler flow prior to turning on the boiler. The BAS shall determine the total hot water energy in KBTU used per day, per month, and per year. The BAS shall also record the max hot water demand in both MBH and GPM per day, per month, and per year. This information should be trended and displayed on the dedicated energy graphics page in both table and graph format.

5.1.1 Boiler control

- DO - Start/Stop
- DI - Status
- AO - Speed Adjust
- DI - Bypass (Hand)

5.1.2 Boiler sequencer

- TO LAN
- Remote
- AI
- AO
- AI
- AI
- AI
- DI

Remote differential pressure sensor
- VFD
- D/P
- TO LAN

N.C. Hot water bypass
- Insertion
- Magnetic
- Meter
- FM
- Bypass

Central
- HWR
- HWS
- T
- T
- Stem building

5.2 Hot water diagram and sequences

- Project status
- Issued GMP 09-15-2014
- Revisions
- No. Date Description
- 218010631
- M806
- 10/28/2014 2:02:16 PM