

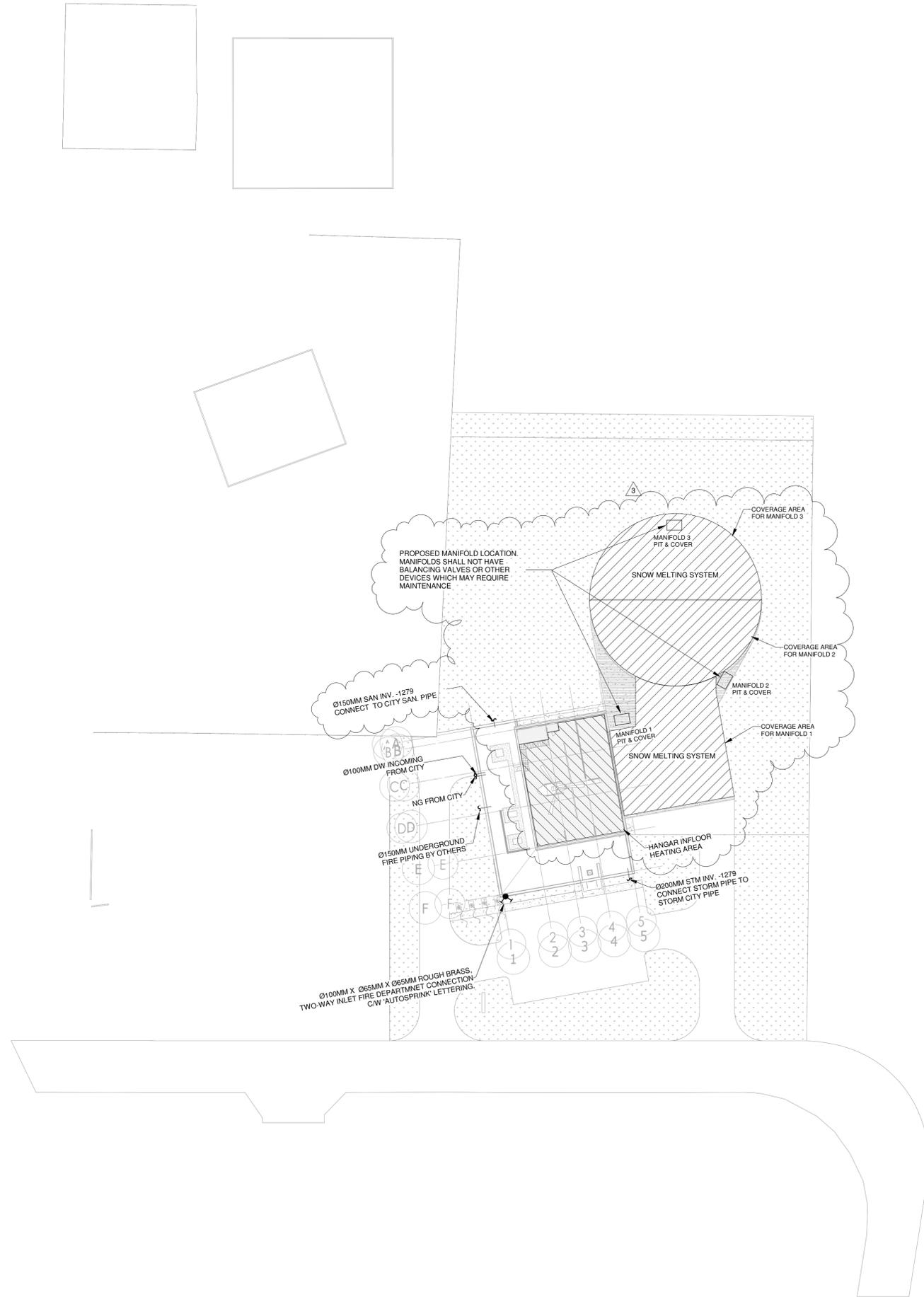


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YORK REGIONAL POLICE HELICOPTER HANGAR

350 GARFIELD WRIGHT
BOULEVARD
TOWN OF EAST GWILLIMBURY

Key
Plan



NO.	ISSUED	DATE
3	ISSUED FOR ADDENDUM 3	2024-09-23
2	ISSUED FOR TENDER	2024-09-09
1	ISSUED FOR BUILDING PERMIT	2024-07-31

Issues

All measurements are to be checked and verified on site by the contractor before proceeding with work

Do not scale drawings

Drawn by: Fizzah Khan/ Iulian Turiga
Checked by: Ali Nakhaei-Zadeh
Original Issue Date: 2024-07-31
Project No: TT-24-005
Scale: As indicated

Sheet
Title:
MECHANICAL SITE PLAN

Drawing
No:
M-100



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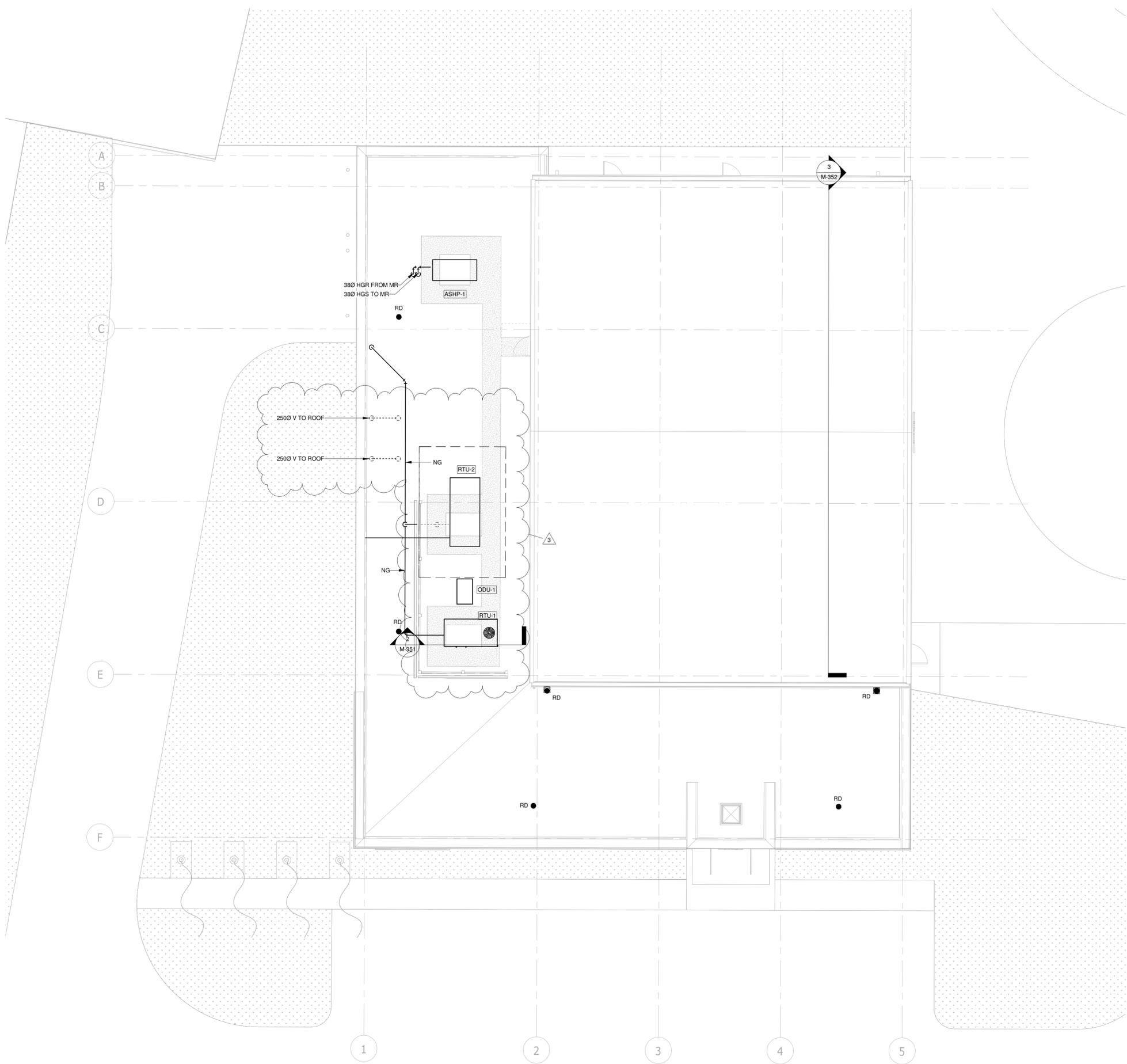
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Sheet
Title: **ROOF PLAN**

Drawing
No: **M-150**





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Sheet
Title: **FOUNDATION PLAN**

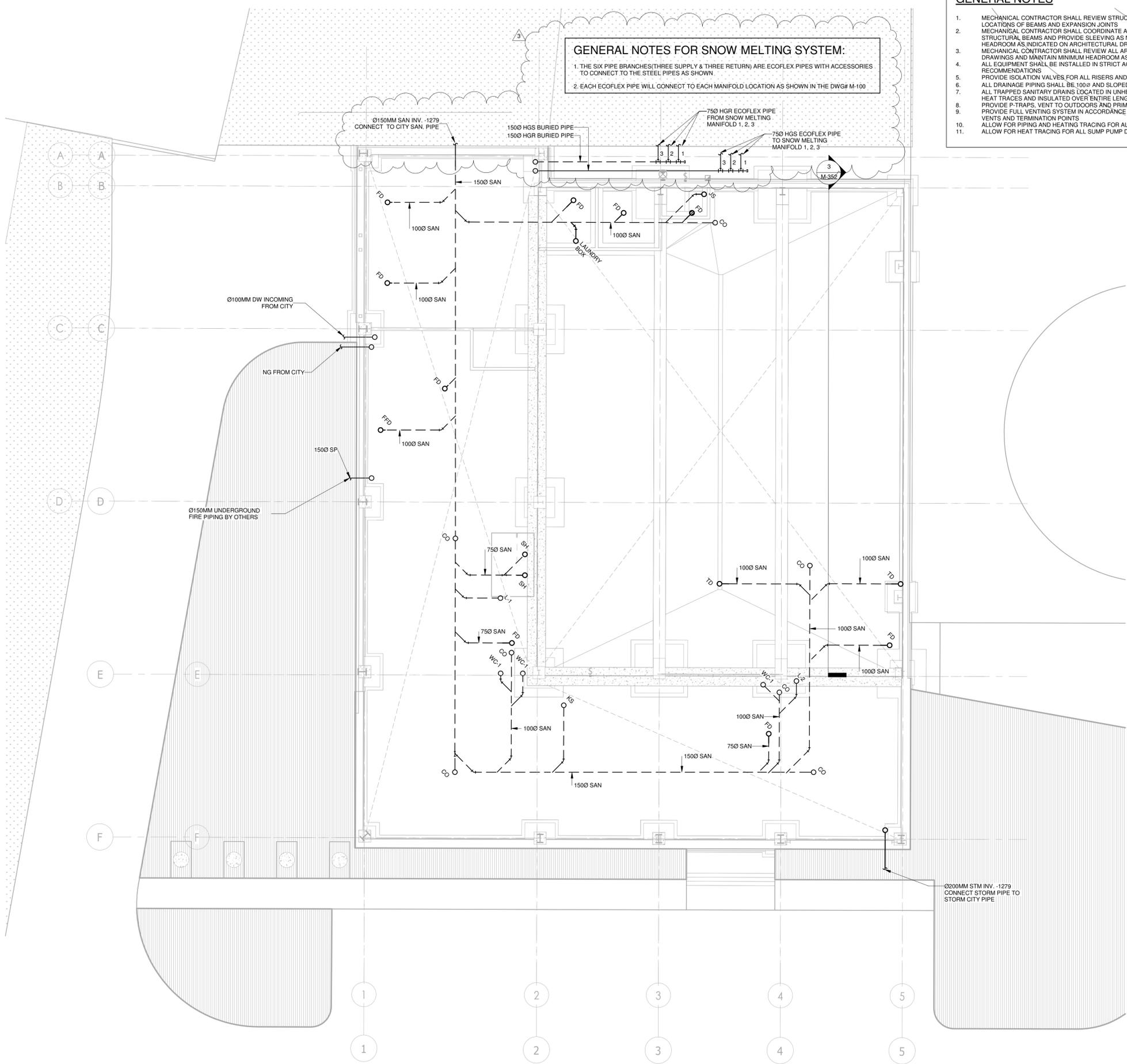
Drawing
No: **M-250**

GENERAL NOTES

- MECHANICAL CONTRACTOR SHALL REVIEW STRUCTURAL DRAWINGS REGARDING SIZE AND LOCATIONS OF BEAMS AND EXPANSION JOINTS
- MECHANICAL CONTRACTOR SHALL COORDINATE ALL PIPING AND DUCTWORK WITH STRUCTURAL BEAMS AND PROVIDE SLEEVING AS NECESSARY TO MAINTAIN MINIMUM HEADROOM AS INDICATED ON ARCHITECTURAL DRAWINGS
- MECHANICAL CONTRACTOR SHALL REVIEW ALL ARCHITECTURAL AND INTERIOR DESIGN DRAWINGS AND MAINTAIN MINIMUM HEADROOM AS INDICATED
- ALL EQUIPMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS
- PROVIDE ISOLATION VALVES FOR ALL RISERS AND AT EACH FIXTURE
- ALL DRAINAGE PIPING SHALL BE 100Ø AND SLOPED AT 1% UNLESS NOTED OTHERWISE
- ALL TRAPPED SANITARY DRAINS LOCATED IN UNHEATED SPACE SHALL BE ELECTRICALLY HEAT TRACES AND INSULATED OVER ENTIRE LENGTH
- PROVIDE P-TRAPS, VENT TO OUTDOORS AND PRIMING TO ALL FLOOR DRAINS
- PROVIDE FULL VENTING SYSTEM IN ACCORDANCE WITH OBC PART 7. COORDINATE ALL VENTS AND TERMINATION POINTS
- ALLOW FOR PIPING AND HEATING TRACING FOR ALL TRAP PRIMERS
- ALLOW FOR HEAT TRACING FOR ALL SUMP PUMP DISCHARGE PIPING

GENERAL NOTES FOR SNOW MELTING SYSTEM:

- THE SIX PIPE BRANCHES (THREE SUPPLY & THREE RETURN) ARE ECOFLEX PIPES WITH ACCESSORIES TO CONNECT TO THE STEEL PIPES AS SHOWN
- EACH ECOFLEX PIPE WILL CONNECT TO EACH MANIFOLD LOCATION AS SHOWN IN THE DWG# M-100





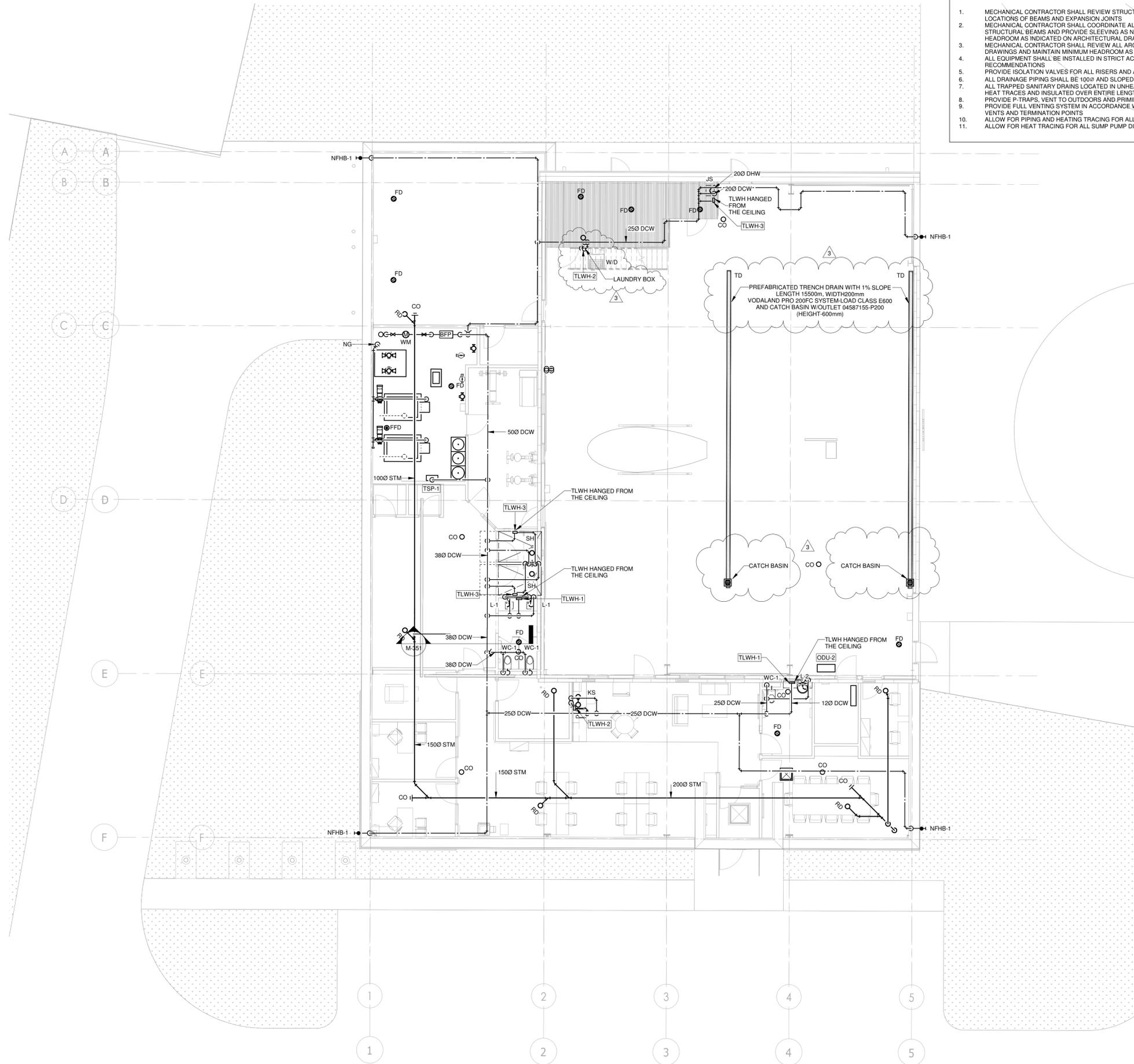
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Plan

GENERAL NOTES

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- ALL TRAPPED SANITARY DRAINS LOCATED IN UNHEATED SPACE SHALL BE ELECTRICALLY HEAT TRACES AND INSULATED OVER ENTIRE LENGTH
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Sheet
 Title:
**PLUMBING NEW WORK -
 LEVEL 1**

Drawing
 No.
M-251



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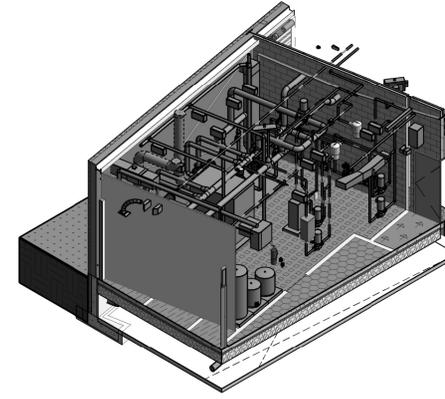
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Do not scale drawings

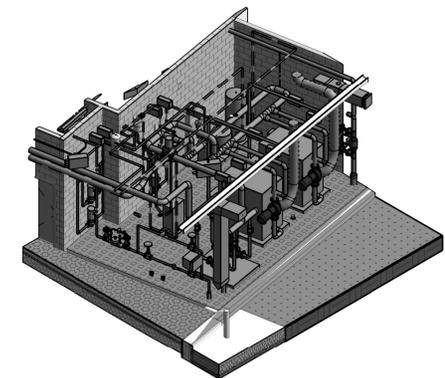
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Original Issue Date: 2024-07-31
Project No: TT-24-005
Scale: 1 : 50

Sheet
Title:
**MECHANICAL ROOM
PIPING**

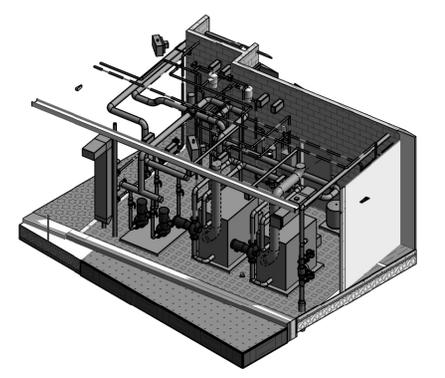
Drawing
No.
M-252



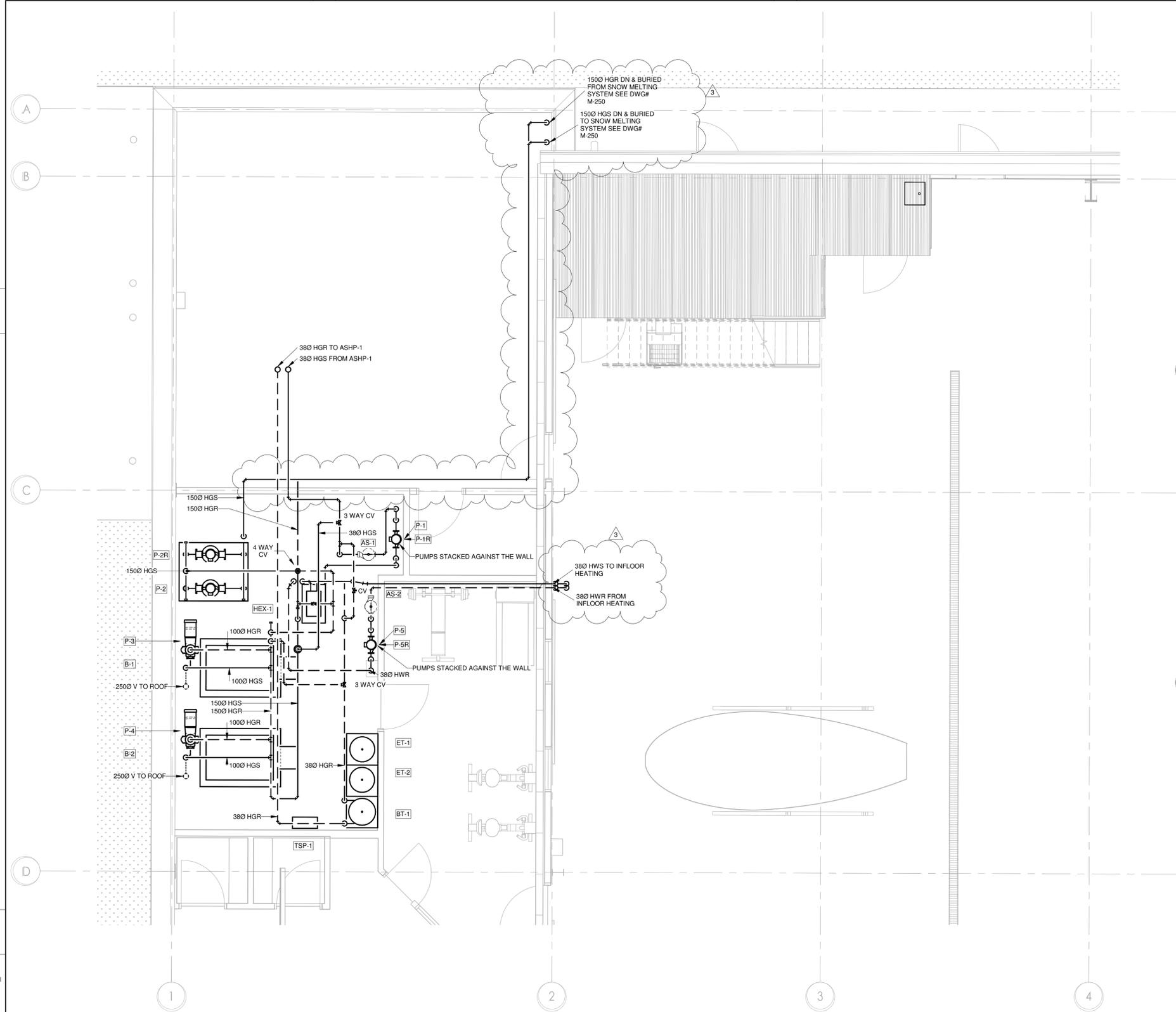
2 **MECH ROOM 3D VIEW 1**
SCALE:



3 **MECH ROOM 3D VIEW 2**
SCALE:



4 **MECH ROOM 3D VIEW 3**
SCALE:



1 **MECHANICAL ROOM PIPING**
SCALE: 1 : 50

GENERAL NOTES:

- CONTRACTOR TO PROVIDE ALL MANIFOLDS AND CONNECTIONS AND PIPING FOR INFLOOR HEATING
- CONTRACTOR TO PROVIDE PROPOSED MANIFOLD LOCATIONS AND SHOP DRAWING FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.



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Scale: 1 : 100

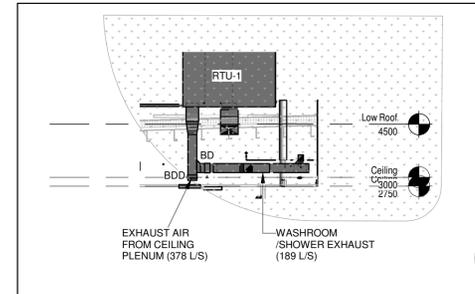
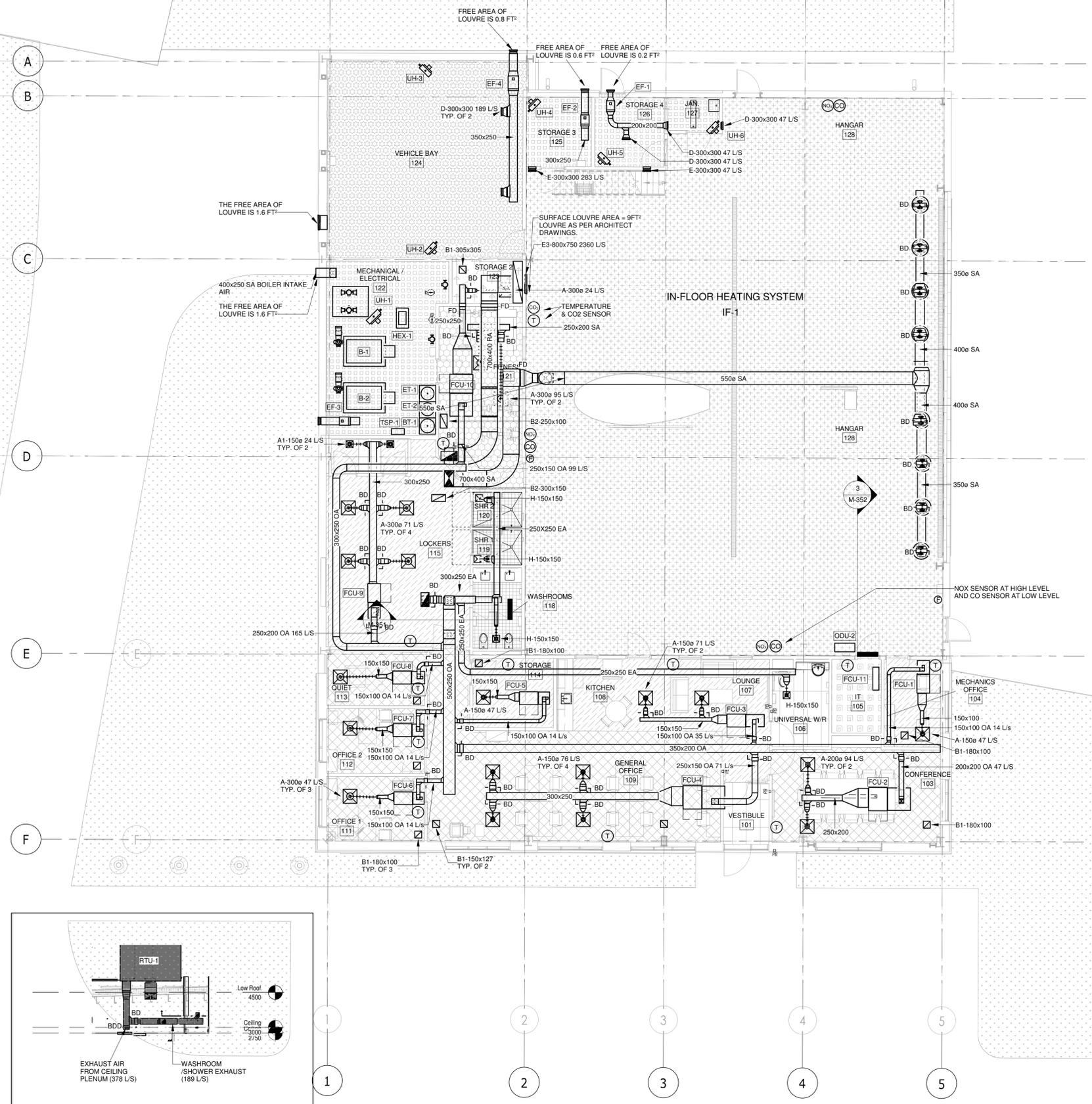
Sheet
Title:

VENTILATION NEW
WORK - LEVEL 1

Drawing
No.
M-351

- 1. SEQUENCE OF OPERATION RTU-1**
- 1.1. General**
- 1.1.1. The rooftop unit provides heating, cooling and ventilation air to the spaces via the fan coils. The unit exhaust fan is used to exhaust air from the washrooms. Scheduling should be coordinated with the washroom exhaust fan.
- 1.1.2. The unit is a constant volume unit and consists of supply fan, an exhaust fan, a heat wheel with bypass dampers, a gas fired burner and a DX cooling coil.
- 1.2. Safeties and Limits**
- 1.2.1. A freestat is hardwired to shutdown the fans and close the dampers when the sensed temperature drops below 2 Deg C. A 5 minute time delay is provided on start-up to bypass the limit and allow time for the heating system to come under control. Once the timer has expired the unit will trip if it detects an air temperature of less than 2 Deg C. Once tripped the limit must be reset manually. Provide a reset button on the control panel. Protection will work when the fan is in either "hand" or "auto".
- 1.2.2. Supply air temperature control is disabled until fan run status is received.
- 1.2.3. Simultaneous heating and cooling is prohibited.
- 1.2.4. Minimum on/off run times are provided for both the DX staging and gas burner. Coordinate with manufacturer to ensure proper time delays.
- 1.2.5. If the heat wheel is off for more than 1 day the controller will rotate the wheel at minimum speed for a minimum of 5 minutes.
- 1.3. Modes of Operation**
- 1.3.1. The occupied and unoccupied modes are determined by a time of day schedule.
- 1.4. Occupied Mode**
- 1.4.1. Overview: The unit will provide heating, cooling and ventilation to the spaces via the fan coil units. The unit will control to maintain the supply air temperature at setpoint.
- 1.4.2. Supply Air Temperature Setpoint: The unit delivers neutral air for the fan coils. The setpoint will be set to 16 Deg C (heating) and 18 Deg C (cooling).
- 1.4.3. Supply Fan + OA Damper: The outside air damper is open, and the supply fan runs continuously.
- 1.4.4. Exhaust Fan + EA Damper: The exhaust air damper is open, and the exhaust fan runs continuously.
- 1.4.5. Heat Wheel + Bypass Dampers: When the outdoor air temperature is below 12 Deg C the heat wheel will modulate to either maintain the supply air temperature at setpoint or to provide frost control. When the outdoor air temperature is more than 2 Deg C above the return air temperature the heat wheel will operate at maximum speed. Otherwise when the outdoor air temperature is above 12 Deg C and less than the exhaust air temperature the heat wheel will be off. When the heat wheel is rotating the bypass dampers will be closed. When the heat wheel is off the dampers will be fully open. The controller will provide frost protection for the heat wheel. The controller will slow the wheel down and stop if necessary to maintain the frost temperature slightly above the frost setpoint which varies with the exhaust air humidity and outdoor air temperature as shown in the table below.
- | OUT (C) | SETPOINT RH% (DPS) | OUT (C) | SETPOINT RH% (DPS) | OUT (C) | SETPOINT RH% (DPS) |
|---------|--------------------|---------|--------------------|---------|--------------------|
| 25 | -15.5C | -19.4 | -11.1C | -15.6 | -8.2C |
| 26.1 | -11.7C | -20.3 | -7.8C | -16.1 | -4.9C |
| 28.3 | -4.3C | -22.2 | -4.4C | -17.2 | -1.9C |
| 32.2 | -0.4C | -25 | -1.5C | -19.4 | 0.8C |
| 35 | -0.3C | -27.2 | -0.6C | -20.6 | 2.3C |
| 40 | -0.3C | -31.1 | -0.3C | -23.3 | 3.3C |
- 1.4.6. DX System: DX cooling will be controlled to maintain the supply air temperature at setpoint.
- 1.4.7. Gas Burner: The gas burner will be controlled to maintain the supply air temperature at setpoint.
- 1.5. Unoccupied Mode**
- 1.5.1. Overview: The unit is off.
- 1.5.2. Supply Fan + OA Damper: The damper is closed and the supply fan is off.
- 1.5.3. Exhaust Fan + EA Damper: The damper is closed and the exhaust fan is off.
- 1.5.4. DX System: DX cooling is off.
- 1.5.5. Gas Burner: The gas burner is off.
- 1.6. Urgent Alarms**
- 1.6.1. Low temperature safety alarm is tripped.
- 1.7. Non-Urgent Alarms**
- 1.7.1. Fan is commanded on and status is not received (2 minute delay).
- 1.7.2. The unit is running and the supply air temperature is below 8 Deg C or above 24 Deg C.
- 1.7.3. Fan is commanded off and status is received (10 minute delay).
- 1.8. Maintenance Alarms**
- 1.8.1. Filter differential is above setpoint.
- 1.8.2. Manual overrides are placed on the system.
- 1.9. Operational Trends (5-minute intervals, 7-days)**
- 1.9.1. All inputs and outputs.
- 1.9.2. Supply air temperature setpoint.
- 1.10. Performance Trends (daily intervals, 5-years)**
- 1.10.1. Supply Air Temperature Index: Daily average of the percentage of time the supply air temperature is within normal limits (between the cooling setpoint (plus 1 Deg C) and heating setpoint (minus 1 Deg C)).
- 1.10.2. Airflow Cooling Intensity: Daily average of the amount of time in the cooling mode.
- 1.10.3. Airflow Heating Intensity: Daily average of the amount of time in the heating mode.
- 1.10.4. Daily Airflow Hours: The total number of hours the unit operated during the day.

- 1.0 SEQUENCE OF OPERATIONS RTU-2**
- 1.1. General**
- 1.1.1. The rooftop unit provides heating, cooling (free cooling only), and ventilation to the hangar. When gas detection sensors (CO/NOx) detect the presence of gas, the unit will operate at full volume and 100% outside air regardless of the mode of operation, until gas levels drop to suitable levels.
- 1.1.2. The unit consists of a supply fan, exhaust fan, mixing dampers, energy recovery wheel, and a gas fired burner.
- 1.1.3. The unit is a variable volume unit and the supply and exhaust fans have been provided with variable frequency drives.
- 1.1.4. Provide an alarm strobe/horn in the space for local high gas alarm annunciation.
- 1.1.5. Provide an occupied mode push button at the main entrance.
- 1.2. Safeties and Limits**
- 1.2.1. The DDC controller will shutdown and lockout the unit if the supply air temperature drops below 4 Deg C when the unit is running. Once shutdown the operator must correct the problem and manually restart the unit. Low temperature protection is hardwired to the starter and will work when the fans are being controlled in either hand or auto.
- 1.2.2. Fan speed modulation is disabled until fan run status is received.
- 1.2.3. The minimum speed for the VFD is 50% (30 hz - confirm min speed with balancer).
- 1.2.4. Supply air temperature control is disabled until fan run status is received.
- 1.2.5. Damper control is disabled until fan run status is received.
- 1.2.6. Simultaneous heating and cooling is not permitted.
- 1.2.7. If the heat wheel is off for more than 1 day the controller will rotate the wheel for a minimum of 5 minutes.
- 1.3. Modes of Operation**
- 1.3.1. The occupied and unoccupied modes of operation are determined by a time-of-day schedule or via the occupancy button located at the main entrance. When pressed, the occupancy button will set the occupied mode for 4 hours (adjustable).
- 1.4. Occupied Mode**
- 1.4.1. Overview: The unit will provide heating, cooling (free cooling only), and ventilation to the space. The unit will control to maintain the space temperature at setpoint.
- 1.4.2. Space Temperature Setpoints: The heating setpoint will be set to 22 Deg C and the cooling setpoint set to 24 Deg C.
- 1.4.3. Gas Detection Setpoints: The CO setpoint is 25 ppm. The NOx setpoint is 1 ppm.
- 1.4.4. Supply Fan: The supply fan runs continuously at full speed.
- 1.4.5. Exhaust Fan: The power exhaust fan runs in conjunction with the fresh air damper. Once the damper is open above 30% the power exhaust fan will start and it's speed will be set in accordance with the amount of fresh air being provided.
- 1.4.6. Mixed Air Dampers: The dampers will control to maintain the minimum amount of fresh air to the space, gas detection sensors below setpoint and free cooling when available and required. The minimum fresh air limit is set to 20% (balancer to confirm). If any gas detection sensor is above setpoint, the dampers will be set to 100% outdoor air (gas detection overrides all other control strategies). Free cooling will provide the only stage of cooling for the unit. When free cooling is available the mixed air dampers will modulate to maintain the space temperature at setpoint. Free cooling will be available when the outdoor air temperature is below 18 Deg C.
- 1.4.7. Gas Burner: The gas burner will be controlled to maintain the space temperature at setpoint.
- 1.4.8. Heat Wheel + Bypass Dampers: When the outdoor air temperature is below 12 Deg C the heat wheel will modulate to either maintain the space temperature at setpoint or to provide frost control. When the outdoor air temperature is more than 2 Deg C above the return air temperature the heat wheel will operate at maximum speed. Otherwise when the outdoor air temperature is above 12 Deg C and less than the return air temperature the heat wheel will be off. When the heat wheel is rotating the bypass dampers will be closed. When the heat wheel is off the dampers will be fully open. The control system will provide frost protection for the heat wheel. The controller will slow the wheel down and stop if necessary to maintain the frost temperature slightly above the frost setpoint.
- 1.4.9. Frost Temperature Setpoint: The frost temperature setpoint varies with the exhaust air humidity and outdoor air temperature as shown in the table below.
- | OAT (C) | SETPOINT RH% (DPS) | OAT (C) | SETPOINT RH% (DPS) | OAT (C) | SETPOINT RH% (DPS) |
|---------|--------------------|---------|--------------------|---------|--------------------|
| -25 | -15.6C | -19.4 | -11.1C | -15.6 | -8.2C |
| -26.1 | -11.7C | -20.3 | -7.8C | -16.1 | -4.9C |
| -28.3 | -4.3C | -22.2 | -4.4C | -17.2 | -1.9C |
| -32.2 | -0.4C | -25 | -1.5C | -19.4 | 0.8C |
| -35 | -0.3C | -27.2 | -0.6C | -20.6 | 2.3C |
| -40 | -0.3C | -31.1 | -0.3C | -23.3 | 3.3C |
- 1.5. Unoccupied Mode**
- 1.5.1. Overview: The rooftop unit is off. During the unoccupied mode the RTU will start up to provide heating/cooling as required to maintain the space temperature at the unoccupied setpoints and for gas detection ventilation. If the space temperature drops below the heating setpoint or rises above the cooling setpoint the unit will be enabled to provide unoccupied heating/cooling. A deadband of 2 Deg C is applied to return the unit to the off state. If the gas detection sensors (either CO or NOx) rise above setpoint, the unit will be engaged to ventilate the space.
- 1.5.2. Space Temperature Unoccupied Setpoints: The unoccupied heating setpoint is set to 18 Deg C. The unoccupied cooling setpoint is set to 28 Deg C.
- 1.5.3. Gas Detection Setpoints: The CO setpoint is 25 ppm. The NOx setpoint is 1 ppm.
- 1.5.4. Supply Fan: When the outdoor air temperature is below 5 Deg C, the fan will run continuously at 50% speed, otherwise the fan is off (5 Deg C differential). During unoccupied cooling or heating, the fan will run at 100% speed. During unoccupied gas detection ventilation, the fan will run at 100% speed.
- 1.5.5. Exhaust Fan: The exhaust fan controls as per the occupied mode.
- 1.5.6. Mixed Air Dampers: The fresh air damper is closed and the return damper is open at all points in time except: 1) When gas is detected - dampers go to 100% fresh air, 2) The unit is running for temperature control and free cooling is permitted and required.
- 1.5.7. Gas Heating: Controlled as per the occupied mode. Heating is off when the unit is off.
- 1.5.8. Heat Wheel Control: Controlled as per the occupied mode. The heat wheel is off when the unit is off and/or when the unit is simply circulating air.
- 1.6. Urgent Alarms**
- 1.6.1. Low temperature limit.
- 1.6.2. Low space temperature.
- 1.6.3. CO level above 50 ppm. Alarm strobe/horn in space is activated.
- 1.6.4. NOx level above 3 ppm. Alarm strobe/horn in space is activated.
- 1.7. Non-Urgent Alarms**
- 1.7.1. Fan is commanded on and status is not received (2 minute delay).
- 1.7.2. The supply air temperature drops below 7 Deg C.
- 1.7.3. The supply air temperature rises above 43 Deg C.
- 1.7.4. Fan is commanded off and status is not received (10 minute delay).
- 1.8. Maintenance Alarms**
- 1.8.1. Filter alarm.
- 1.8.2. Manual overrides are placed on the system.
- 1.9. Operational Trends (5-minute intervals, 7-days)**
- 1.9.1. All inputs and outputs.
- 1.9.2. Supply air temperature setpoint.
- 1.10. Performance Trends (daily intervals, 5-years)**
- 1.10.1. Space Temperature Index: Daily average of the percentage of time the space temperature is within normal limits (between the cooling setpoint (plus 1 Deg C) and heating setpoint (minus 1 Deg C)).
- 1.10.2. Airflow Heating Intensity: Daily average of the amount of time in the heating mode.
- 1.10.3. Daily Airflow Hours: The total number of hours the unit operated during the day.



RTU-1 SCHEMATIC CONCEPT
SCALE: 1 : 100

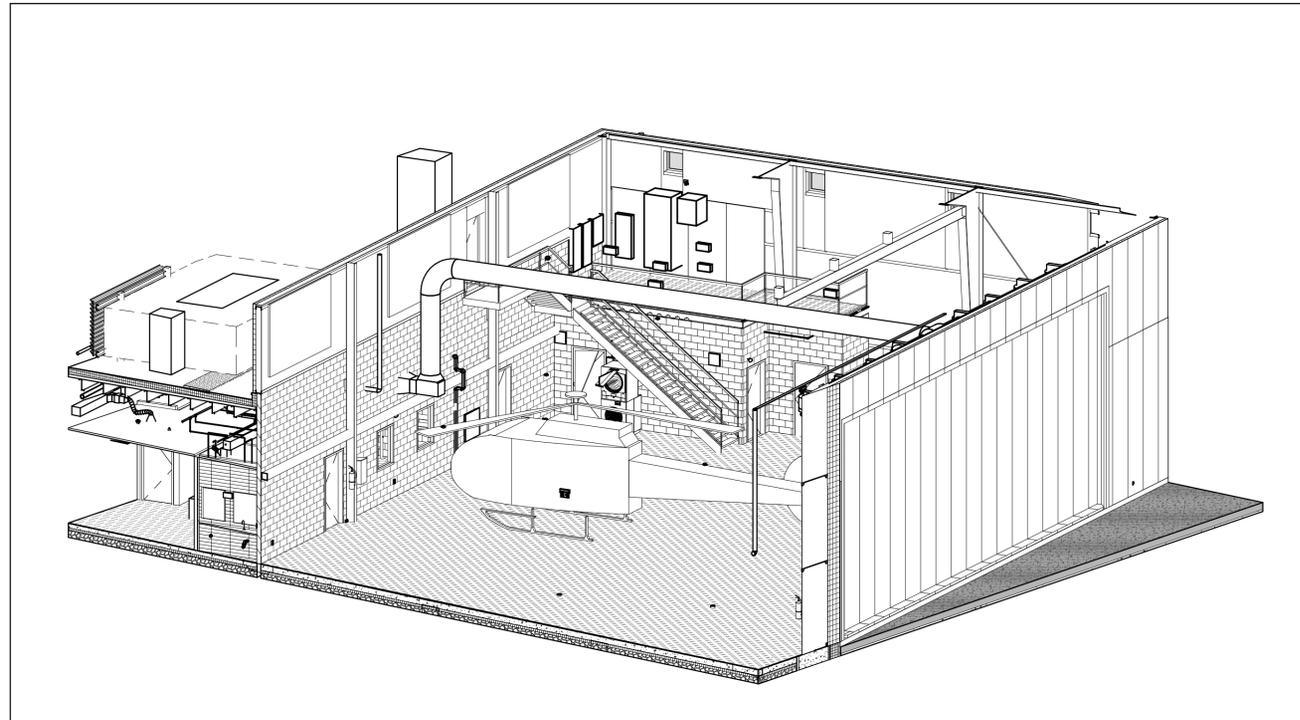


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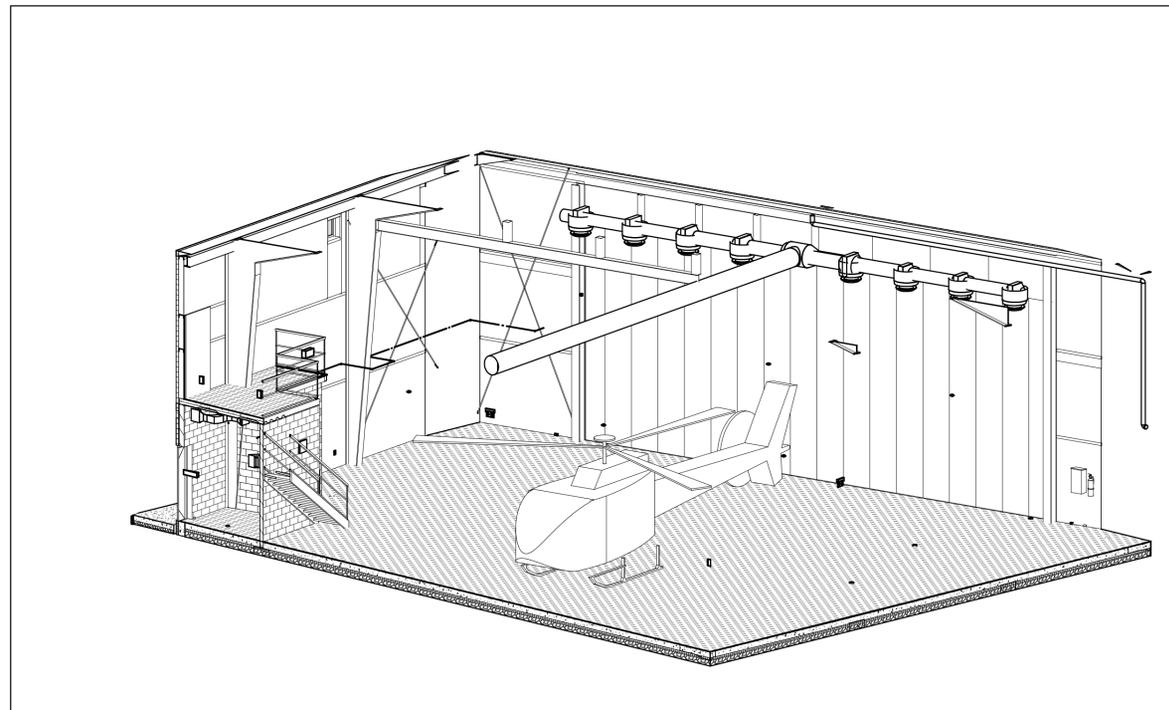
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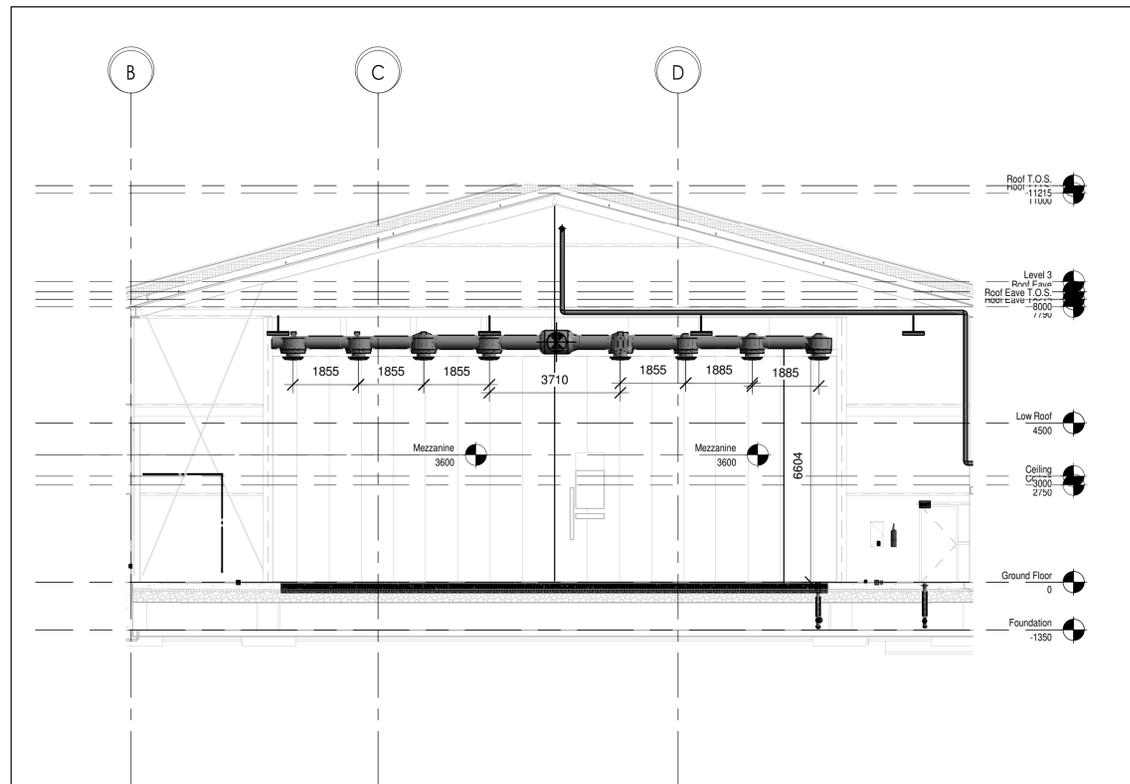
Key
Plan



2 HANGAR VENTILATION ISOMETRIC 2
SCALE:



1 HANGAR VENTILATION ISOMETRIC
SCALE:



3 HANGAR VENTILATION SECTION VIEW
SCALE: 1 : 100

NO.	ISSUED FOR ADDENDUM 3	ISSUED	DATE
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Checked by: Ali Nakhaei-Zadeh
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Sheet
Title:
**VENTILATION NEW
WORK - ISOMETRIC
VIEWS**

Drawing
No.
M-352



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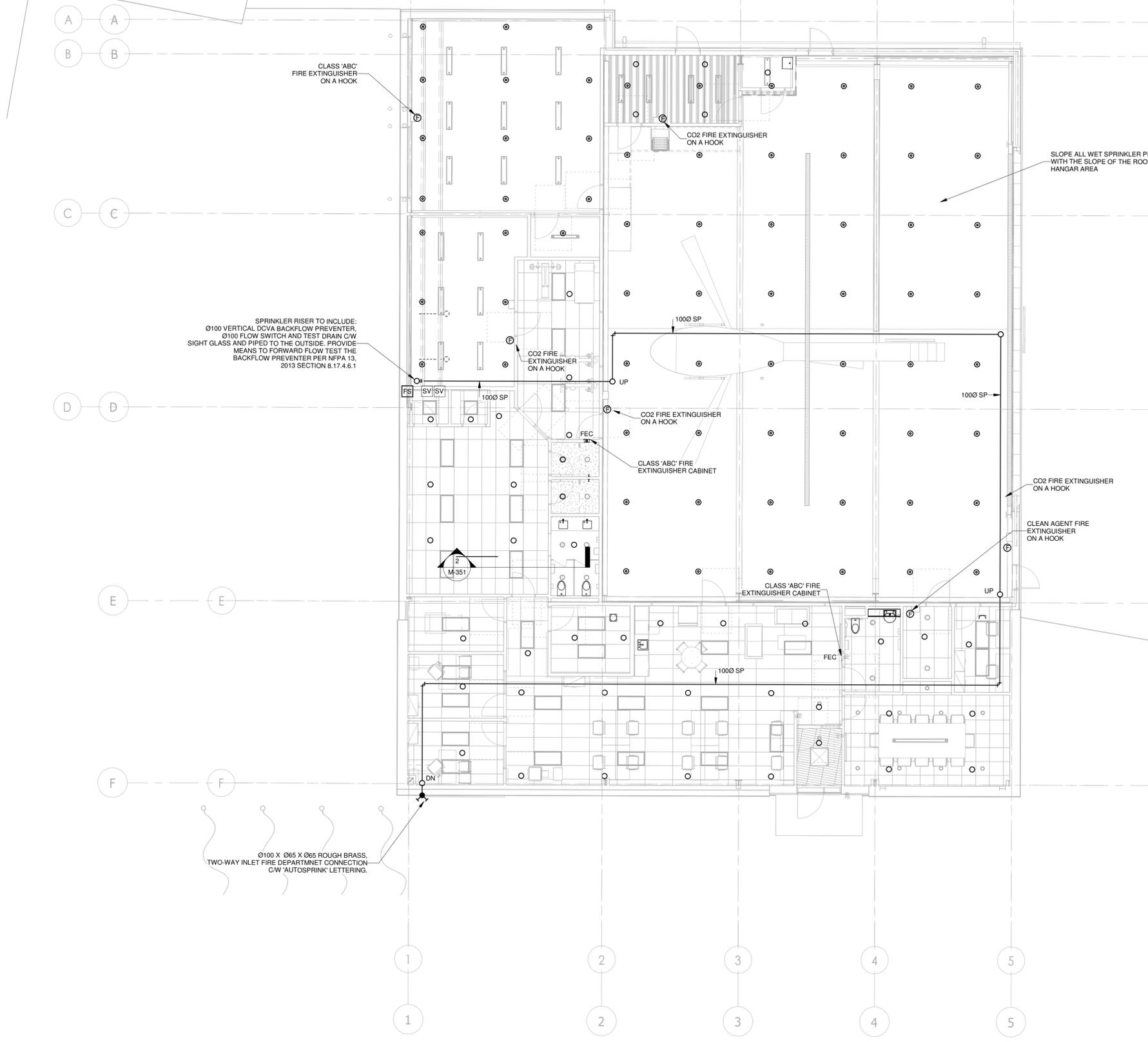
350 GARFIELD WRIGHT
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Plan

GENERAL NOTES - FIRE PROTECTION

- SPRINKLER SYSTEM DESIGN AND INSTALLATION TO BE IN ACCORDANCE WITH NFPA 13-2013, THE ONTARIO BUILDING CODE-2012, THE ONTARIO FIRE CODE-2012, AND LOCAL AUTHORITY REQUIREMENTS.
- ADHERE TO AND OBTAIN ALL PERMITS, LICENSES AND GOVERNMENT REQUIREMENTS, IF APPLICABLE.
- CUTTING OF STRUCTURAL AND/OR ARCHITECTURAL MEMBERS TO BE DONE ONLY WITH THE WRITTEN APPROVAL OF THE ARCHITECT AND/OR STRUCTURAL ENGINEER.
- ALL ELECTRICAL WIRING OF SPRINKLER DEVICES IS BY OTHERS. COORDINATE ALL ELECTRICAL ITEMS WITH ELECTRICAL CONTRACTOR AND ENSURE PROPER COORDINATION.
- PROVIDE STOCK OF EXTRA SPRINKLERS IN ACCORDANCE WITH NFPA 13, 6.2.9.
- COORDINATION IS TO TAKE PLACE BETWEEN THE SPRINKLER CONTRACTOR AND ALL OTHER TRADES.
- THE SPRINKLER CONTRACTOR IS TO FIELD SURVEY THE SITE, INCLUDING STRUCTURAL STEEL AND MECHANICAL/ELECTRICAL SERVICES PRIOR TO FABRICATION AND INSTALLATION. CONFLICTS OR DISCREPANCIES ARE TO BE REPORTED IMMEDIATELY TO THE DESIGN CONSULTANTS.
- INSTALL HIGH TEMPERATURE SPRINKLERS AROUND ALL HEAT SOURCES IN ACCORDANCE WITH NFPA 13-2013.
- INSTALL GUARDS ON SPRINKLERS IN WAREHOUSE, MECHANICAL, ELECTRICAL AND STORAGE ROOMS.
- INSTALL LOW POINT DRAINS ON ALL TRAPPED SECTIONS OF PIPING IN ACCORDANCE WITH NFPA 13-2013.
- PROVIDE TAGS AND SIGNAGE AS PER NFPA 13-2013.
- SPRINKLER SYSTEMS ARE TO BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH NFPA 13-2013.
- CONTRACTOR SHALL VERIFY FLOWS AND PRESSURES VIA A FIRE HYDRANT FLOW TEST PERFORMED BY A LICENSED COMPANY, AT THE SITE PRIOR TO ANY DESIGN, HYDRAULIC CALCULATIONS AND INSTALLATION OF ANY FIRE PROTECTION SYSTEMS.
- CONTRACTOR SHALL PROVIDE AND INSTALL NEW FIRE EXTINGUISHERS ON HOOKS OR IN CABINETS AS SHOWN ON THE DRAWINGS.
- CONTRACTOR SHALL INSTALL THE FOLLOWING TYPES OF FIRE EXTINGUISHERS OR EQUIVALENT:
 - FIRE EXTINGUISHER CABINETS-BOH AND OFFICE AREAS: NATIONAL FIRE EQUIPMENT LTD OR EQUIVALENT, MODEL 102F C/W A CLASS 'ABC' 5LB DRY CHEM FIRE EXTINGUISHER
 - FIRE EXTINGUISHER ON HOOK-VEHICLE BAY: NATIONAL FIRE EQUIPMENT LTD OR EQUIVALENT, MODEL SF-ABC680, 10LB CLASS 'ABC' DRY CHEM FIRE EXTINGUISHER
 - CLEAN AGENT FIRE EXTINGUISHER ON HOOK-IT ROOM: NATIONAL FIRE EQUIPMENT LTD OR EQUIVALENT, MODEL CA07, 7.5LB CLEANGUARD FK-5-1-12 CLEAN AGENT FIRE EXTINGUISHER
 - CO2 FIRE EXTINGUISHER ON HOOK-MECHANICAL ROOMS, HANGER AREA, PAINT ROOM: NATIONAL FIRE EQUIPMENT LTD OR EQUIVALENT, STRIKE FIRST, MODELS SF-10CO2A (MECH. RM & PAINT RM) AND SF-20CO2A (HANGER BAY) CO2 FIRE EXTINGUISHER

- LEGEND
- UPRIGHT SPRINKLER HEAD
 - CONCEALED PENDANT SPRINKLER HEAD



NO.	ISSUED	DATE
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2	ISSUED FOR TENDER	2024-09-09
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Issues

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 Drawn by: Fizzah Khan/ Iulian Turiga
 Checked by: Ali Nakhaei-Zadeh
 Original Issue Date: 2024-07-31
 Project No: TT-24-005
 Scale: As indicated

Sheet
 Title:
**FIRE PROTECTION NEW
 WORK - LEVEL 1**

Drawing
 No.
M-551

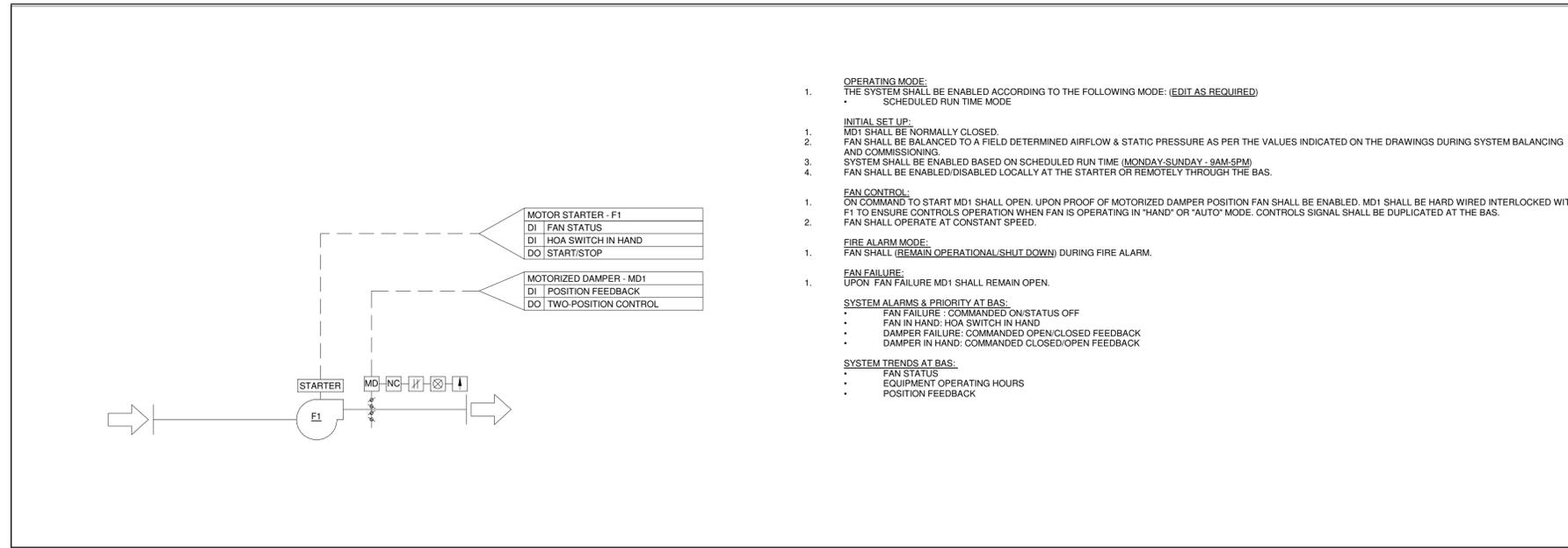


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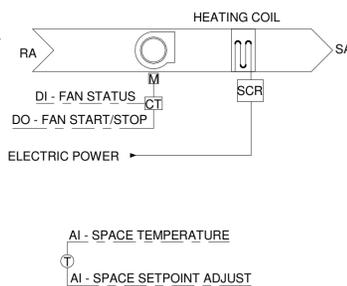


- OPERATING MODE:**
THE SYSTEM SHALL BE ENABLED ACCORDING TO THE FOLLOWING MODE: (EDIT AS REQUIRED)
- SCHEDULED RUN TIME MODE
- INITIAL SET UP:**
MD1 SHALL BE NORMALLY CLOSED.
FAN SHALL BE BALANCED TO A FIELD DETERMINED AIRFLOW & STATIC PRESSURE AS PER THE VALUES INDICATED ON THE DRAWINGS DURING SYSTEM BALANCING AND COMMISSIONING.
SYSTEM SHALL BE ENABLED BASED ON SCHEDULED RUN TIME (MONDAY-SUNDAY - 8AM-5PM)
FAN SHALL BE ENABLED/DISABLED LOCALLY AT THE STARTER OR REMOTELY THROUGH THE BAS.
- FAN CONTROL:**
ON COMMAND TO START MD1 SHALL OPEN. UPON PROOF OF MOTORIZED DAMPER POSITION FAN SHALL BE ENABLED. MD1 SHALL BE HARD WIRED INTERLOCKED WITH F1 TO ENSURE CONTROLS OPERATION WHEN FAN IS OPERATING IN "HAND" OR "AUTO" MODE. CONTROLS SIGNAL SHALL BE DUPLICATED AT THE BAS.
FAN SHALL OPERATE AT CONSTANT SPEED.
- FIRE ALARM MODE:**
FAN SHALL (REMAIN OPERATIONAL/SHUT DOWN) DURING FIRE ALARM.
- FAN FAILURE:**
UPON FAN FAILURE MD1 SHALL REMAIN OPEN.
- SYSTEM ALARMS & PRIORITY AT BAS:**
- FAN FAILURE: COMMANDED ON/STATUS OFF
 - FAN IN HAND: HOA SWITCH IN HAND
 - DAMPER FAILURE: COMMANDED OPEN/CLOSED FEEDBACK
 - DAMPER IN HAND: COMMANDED CLOSED/OPEN FEEDBACK
- SYSTEM TRENDS AT BAS:**
- FAN STATUS
 - EQUIPMENT OPERATING HOURS
 - POSITION FEEDBACK

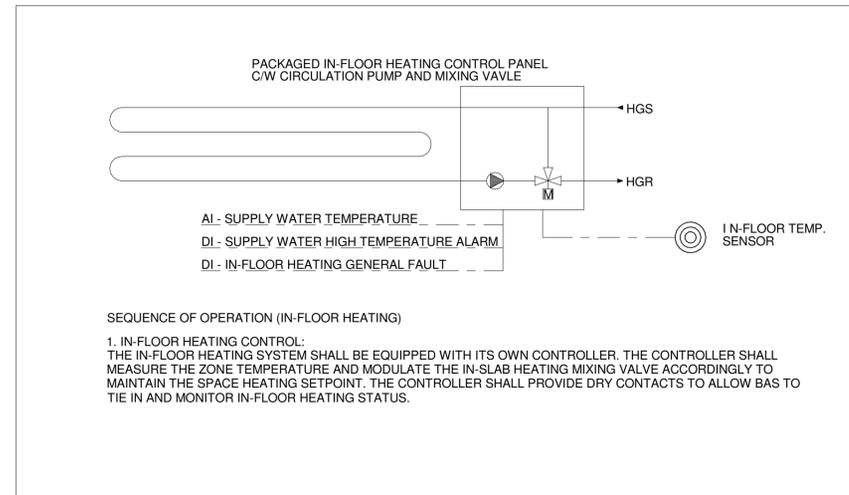
3 **CONSTANT SPEED FAN - DAMPER INTERLOCK CONTROL SEQUENCE**
SCALE: N.T.S.

TYPICAL ELECTRIC UNIT HEATER CONTROL SEQUENCE:

- RUN CONDITIONS:**
THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TEMPERATURE SETPOINT OF 22°C (72°F) (ADJUSTABLE).
ALARMS SHALL BE PROVIDED AS FOLLOWS:
 - LOW ZONE TEMPERATURE: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJUSTABLE).
- ZONE SETPOINT ADJUST:**
THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING SETPOINT AT THE ZONE SENSOR.
- FAN:**
THE FAN SHALL RUN ANYTIME THE ZONE TEMPERATURE DROPS BELOW HEATING SETPOINT, UNLESS SHUTDOWN ON SAFETIES.
- ELECTRIC HEATING COIL:**
THE SCR (SILICON CONTROLLED RECTIFIER) CONTROLLER SHALL MODULATE THE ELECTRIC POWER INPUT TO HEATING ELEMENT IN ORDER TO MAINTAIN ZONE HEATING SETPOINT.
THE HEATING SHALL BE ENABLED WHENEVER:
 - OUTSIDE AIR TEMPERATURE IS LESS THAN 18°C (68°F) (ADJUSTABLE).
 - AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.
 - AND THE FAN IS ON.
- FAN STATUS:**
THE BAS SHALL BE ABLE TO MONITOR THE FAN STATUS.
ALARM SHALL BE PROVIDED AS FOLLOWS:
 - FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 - FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.
 - FAN RUNTIME EXCEEDED; FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJUSTABLE)
 - LOW ZONE TEMPERATURE: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJUSTABLE)
- UNIT HEATER STOP:**
IN THE EVEN OF FIRE IN THE SPACE, THE FIRE ALARM SHALL TURN OFF THE UNIT HEATER.



2 **TYPICAL ELECTRIC UNIT HEATER CONTROLS**
SCALE: 1 : 1



SEQUENCE OF OPERATION (IN-FLOOR HEATING)

- IN-FLOOR HEATING CONTROL:**
THE IN-FLOOR HEATING SYSTEM SHALL BE EQUIPPED WITH ITS OWN CONTROLLER. THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE IN-SLAB HEATING MIXING VALVE ACCORDINGLY TO MAINTAIN THE SPACE HEATING SETPOINT. THE CONTROLLER SHALL PROVIDE DRY CONTACTS TO ALLOW BAS TO TIE IN AND MONITOR IN-FLOOR HEATING STATUS.

1 **IN-FLOOR HEATING CONTROLS**
SCALE: 1 : 1

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Sheet
Title:
**MECHANICAL CONTROL
SEQUENCES II**

Drawing
No:
M-751



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Issues

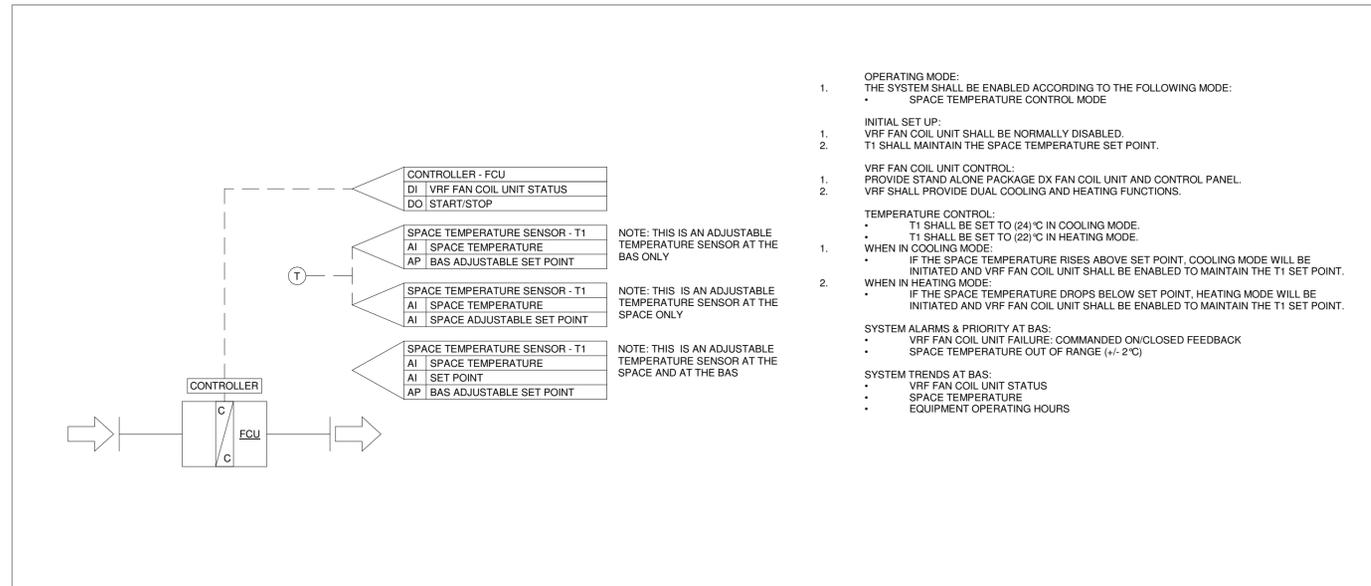
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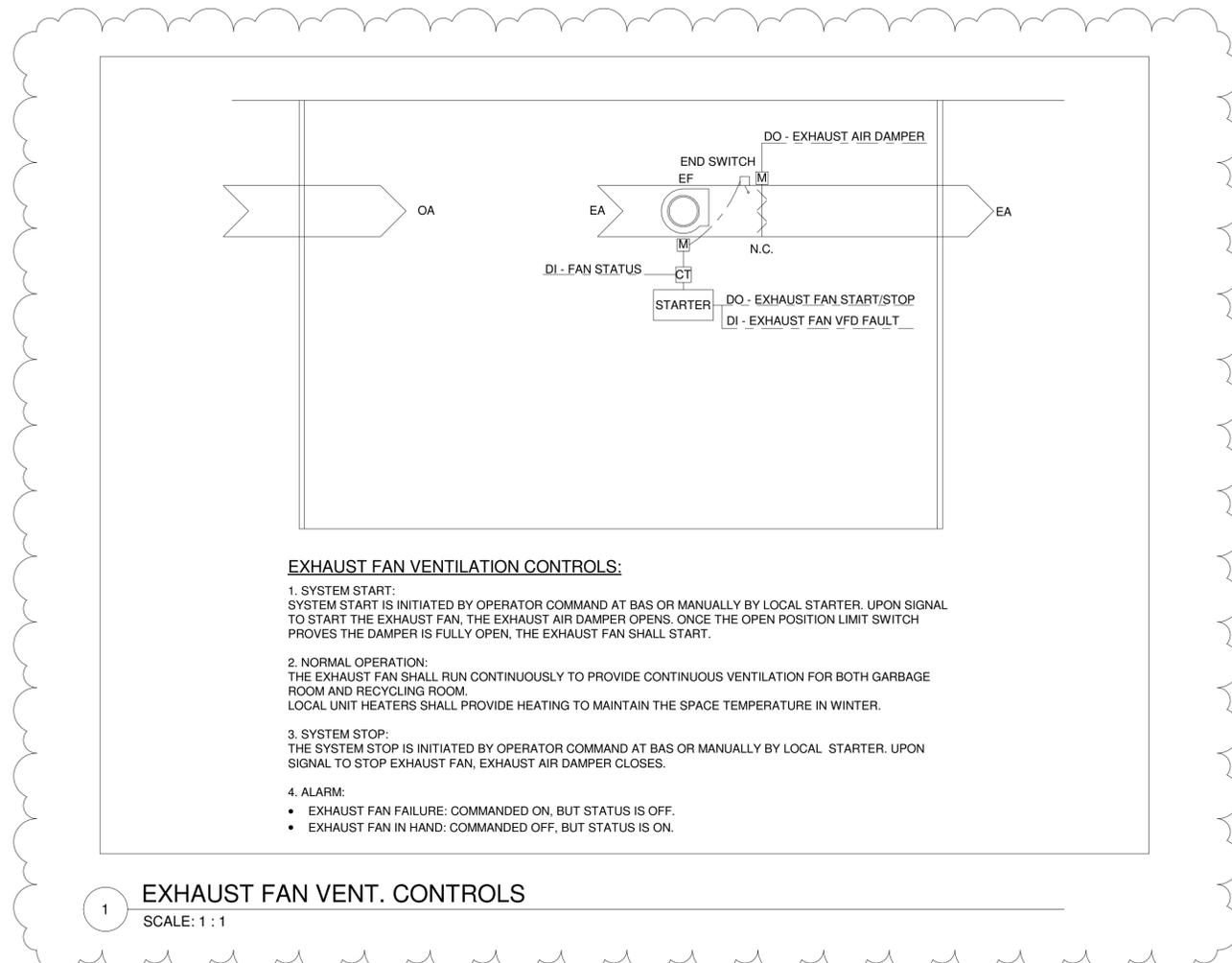
Sheet
Title:
**MECHANICAL CONTROL
SEQUENCES III**

Drawing
No:
M-752



2 VRF FAN COIL UNIT CONTROL SEQUENCE

SCALE:N.T.S.



1 EXHAUST FAN VENT. CONTROLS

SCALE: 1 : 1

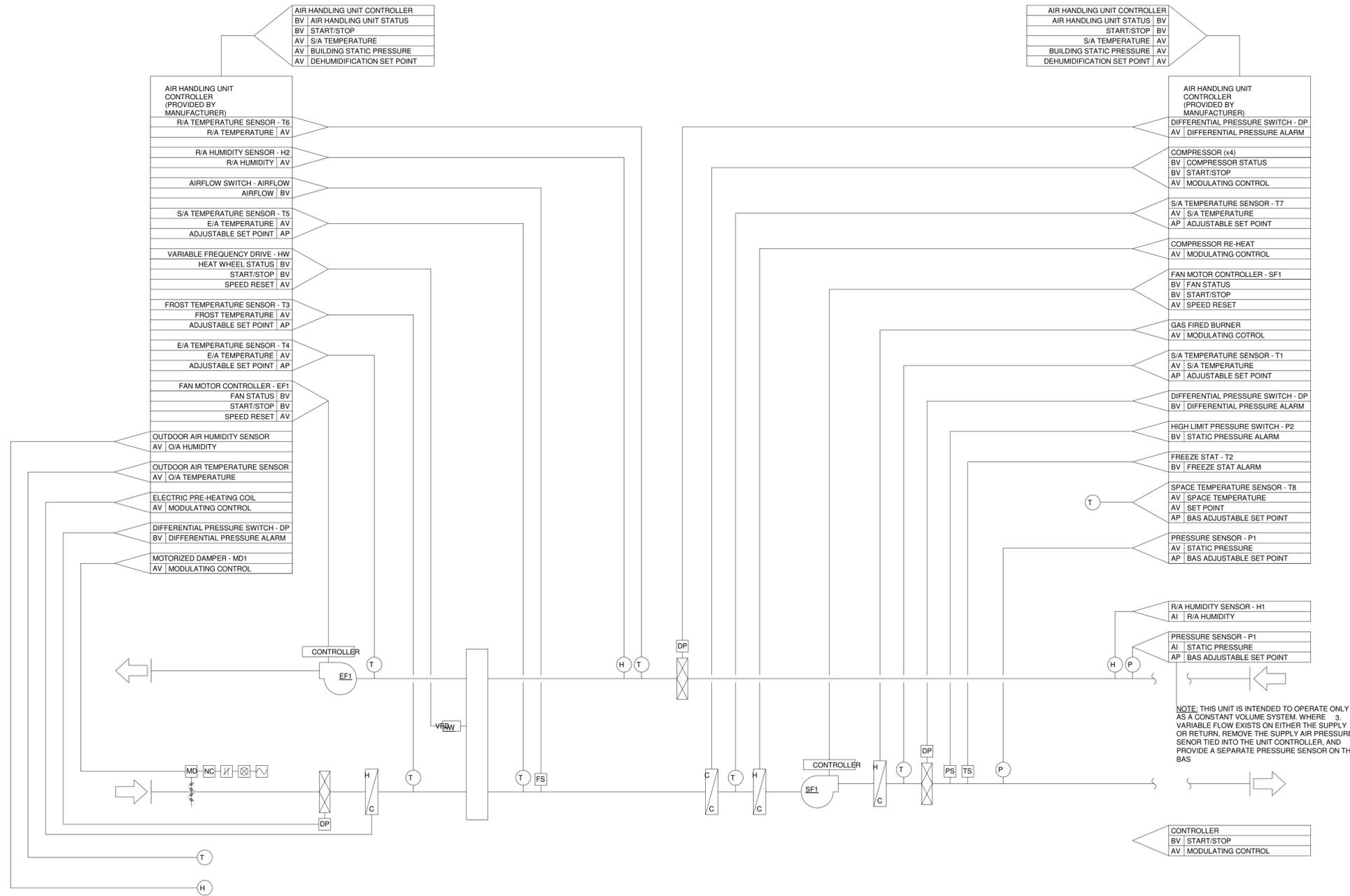


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1 ROOF TOP UNIT - 100% OUTDOOR AIR WITH HOT GAS RE-HEAT AND HEAT WHEEL - HANGAR SPACE NOT TO SCALE

OPERATING MODE:

- THE SYSTEM SHALL BE ENABLED BY THE BAS ACCORDING TO THE FOLLOWING MODE: (EDIT AS REQUIRED)

- CONTROL MODE (OFF, AUTO, COOL ONLY, FAN ONLY, HEAT ONLY)
- OCCUPANCY MODE (AUTO, TENANT, OVERRIDE, OCCUPIED, UNOCCUPIED)
- CHANGE OVER MODE (RETURN AIR, SPACE TEMPERATURE, NETWORK SIGNAL)
- COOLING AND HEATING DISCHARGE AIR TEMPERATURE CONTROL
- SCHEDULING
- BUILDING STATIC PRESSURE CONTROL

INITIAL SET UP:

- THE SYSTEM SHALL BE A 100% OUTDOOR AIR SYSTEM.
- THE ROOF TOP UNIT SHALL BE SUPPLIED WITH A BACNET/MSTP CONTROLLER CAPABLE OF INTERFACING WITH THE BAS.
- THE ROOF TOP UNIT SHALL BE CAPABLE OF PROVIDING THE FOLLOWING FUNCTIONS:
 - MECHANICAL COOLING VIA DX COOLING COIL AND CONDENSING UNIT.
 - MECHANICAL HEATING VIA GAS FIRED HEATING COIL AND BURNER.
 - MECHANICAL HOT GAS RECOVERY VIA COMPRESSOR RE-HEAT COIL.
 - ELECTRIC PRE-HEATING FOR FROST CONTROL. MODE OF OPERATION-HEAT SHALL BE AVAILABLE WHEN THERE IS A CALL FOR MECHANICAL COOLING.
- THE ROOF TOP UNIT SHALL BE PROVIDED WITH A MANUFACTURER SUPPLIED SPACE TEMPERATURE SENSOR (T8) CAPABLE OF MAINTAINING THE SPACE TEMPERATURE SET POINT. THE SPACE TEMPERATURE SENSOR (T1) SHALL INCLUDE THE FOLLOWING:
 - (DESCRIBE SPECIFIC FEATURES ABOUT THE SPACE TEMPERATURE SENSOR)
- MD1 SHALL BE NORMALLY CLOSED.
- HEAT WHEEL SHALL BE DISABLED.
- ELECTRIC PRE-HEATING COIL SHALL BE DISABLED.
- GAS FIRED BURNER SHALL BE DISABLED.
- COMPRESSOR SHALL BE DISABLED.
- GAS FIRED HUMIDIFIER SHALL BE DISABLED.
- FANS SHALL OPERATE AT A FIELD DETERMINED AIRFLOW & STATIC PRESSURE AS PER THE VALUES INDICATED ON THE DRAWINGS DURING SYSTEM BALANCING AND COMMISSIONING.
- AFTER THE SYSTEM BALANCING AND COMMISSIONING IS COMPLETE, OBTAIN THE AIRFLOW DIFFERENTIAL BETWEEN THE SUPPLY FAN AND THE EXHAUST FAN.
- P1 SHALL BE LOCATED APPROXIMATELY TWO-THIRDS DOWNSTREAM/UPSTREAM OF THE FAN. FINAL LOCATION SHALL BE COORDINATED WITH THE BALANCING CONTRACTOR.
- (SYSTEM SHALL BE ENABLED BASED ON COOLING AND HEATING DISCHARGE AIR TEMPERATURE CONTROL AND CHANGE OVER MODE BASED ON NETWORK SIGNAL FOR SUMMER COOLING MODE AND WINTER HEATING MODE COOLING)
- FANS SHALL BE ENABLED/DISABLED LOCALLY AT THE UNIT OR REMOTELY THROUGH THE BAS.

FAN CONTROL:

- ON COMMAND TO START MD1 SHALL OPEN. UPON PROOF OF MOTORIZED DAMPER POSITION FANS SHALL BE ENABLED.
- FAN SHALL MODULATE TO MAINTAIN THE STATIC PRESSURE SET POINT DETERMINED BY P1.
- EXHAUST FAN SHALL RUN AT CONSTANT SPEED.

ECONOMIZER (FREE COOLING) CONTROL:

- N/A
 - DEHUMIDIFICATION IS ENABLED WHEN:
 - O/A DEWPOINT IS GREATER THAN SET POINT.
 - O/A DEWPOINT SHALL BE SET TO (15°C DRY BULB, 15°C WET BULB)

HEAT WHEEL CONTROL:

- HEAT WHEEL IS ENABLED WHEN:
 - ROOF TOP UNIT IS IN OPERATION AND ECONOMIZER (FREE COOLING) CONTROL IS NOT REQUIRED OR AVAILABLE.

FROST PREVENTION CONTROL SEQUENCE:

- FIRST STAGE:
 - T3 SHALL BE SET TO (15°C DRY BULB).
 - ELECTRIC PRE-HEATING COIL SHALL BE ENABLED TO MAINTAIN THE T3 SET POINT.
- SECOND STAGE OF FROST PROTECTION:
 - N/A

COMPRESSOR RE-HEAT CONTROL SEQUENCE:

- COMPRESSOR RE-HEAT IS ENABLED WHEN:
 - DEHUMIDIFICATION SEQUENCE IS REQUIRED AND AVAILABLE.

TEMPERATURE CONTROL:

- THE AIR HANDLING SYSTEM SHALL MAINTAIN THE FOLLOWING S/A TEMPERATURE SET POINTS:
 - SUMMER COOLING MODE: (18°C DRY BULB). O/A TEMPERATURE IS GREATER THAN (20°C DRY BULB).
 - WINTER HEATING MODE: (24°C DRY BULB). O/A TEMPERATURE IS LESS THAN (18°C DRY BULB)
- O/A TEMPERATURE IS GREATER THAN (20°C DRY BULB):
 - T1 SHALL BE SET TO (18°C DRY BULB).
 - ELECTRIC PRE-HEATING COIL SHALL BE DISABLED.
 - GAS FIRED BURNER SHALL BE DISABLED.
 - GAS FIRED HUMIDIFIER SHALL BE DISABLED.
 - HEAT WHEEL CONTROL SHALL BE ENABLED, AND THE HEAT WHEEL SHALL MODULATE ITS SPEED TO MAINTAIN THE T1 SET POINT.
 - IF THE T1 SET POINT IS NOT SATISFIED AND ADDITIONAL COOLING IS REQUIRED, COMPRESSORS SHALL BE ENABLED TO MAINTAIN THE T1 SET POINT.
 - COMPRESSORS SHALL BE STAGED ON/OFF AS REQUIRED.
 - COMPRESSOR RE-HEAT SHALL BE ENABLED TO MAINTAIN THE T1 SET POINT.

O/A TEMPERATURE IS BETWEEN (12°C DRY BULB & 20°C DRY BULB):

- T1 SHALL BE SET TO (20°C DRY BULB).
- ELECTRIC PRE-HEATING COIL SHALL BE DISABLED.
- GAS FIRED BURNER SHALL BE DISABLED.
- COMPRESSOR SHALL BE DISABLED.
- GAS FIRED HUMIDIFIER SHALL BE DISABLED.
- HEAT WHEEL CONTROL SHALL BE ENABLED, AND THE HEAT WHEEL SHALL MODULATE ITS SPEED TO MAINTAIN THE T1 SET POINT IF AVAILABLE.
- IF THE T1 SET POINT IS NOT SATISFIED AND ADDITIONAL COOLING IS REQUIRED, COMPRESSORS SHALL BE ENABLED TO MAINTAIN THE T1 SET POINT.
- COMPRESSORS SHALL BE STAGED ON/OFF AS REQUIRED.
- COMPRESSOR RE-HEAT SHALL BE ENABLED TO MAINTAIN THE T1 SET POINT.

O/A TEMPERATURE LESS THAN (18°C DRY BULB):

- T1 SHALL BE SET TO (24°C DRY BULB).
- COMPRESSOR SHALL BE DISABLED.
- HEAT WHEEL CONTROL SHALL BE ENABLED, AND THE HEAT WHEEL SHALL MODULATE ITS SPEED TO MAINTAIN THE T1 SET POINT. SET POINT CAN BE OVERRIDDEN BY HEAT WHEEL FROST PROTECTION CONTROL SEQUENCE.
- IF THE T1 SET POINT IS NOT SATISFIED AND ADDITIONAL HEATING IS REQUIRED, THE GAS FIRED BURNER SHALL BE ENABLED TO MAINTAIN THE T1 SET POINT.

HUMIDITY CONTROL:

- H1 SHALL BE SET TO (30% R.H.).
- GAS FIRED HUMIDIFIER SHALL BE ENABLED TO MAINTAIN H1 AT/BELOW SET POINT.

FIRE ALARM MODE:

- FANS SHALL (SHUT DOWN) DURING FIRE ALARM.

SMOKE VENTING MODE:

N/A

100% RE-CIRCULATION MODE:

1. N/A

FAN FAILURE:

- UPON SUPPLY FAN OR EXHAUST FAN FAILURE THE FOLLOWING SHALL OCCUR:
 - REMAINING OPERATIONAL FAN SHALL BE DISABLED.
 - MD1 SHALL BE CLOSED.

SAFETY SHUT DOWN:

- HIGH LIMIT DUCT STATIC PRESSURE SENSOR P2 AT THE SUPPLY AIR MAIN SHALL BE INTERLOCKED WITH THE SUPPLY FAN AND THE EXHAUST FAN. FANS WILL BE DISABLED WHEN P2 EXCEEDS 3 IN.WC.
- FREEZE STAT T2 SHALL BE INTERLOCKED WITH THE SUPPLY AND EXHAUST FAN AND DISABLE THE FANS WHEN T2 DROPS BELOW 4°C. FANS MUST BE MANUALLY RESET PRIOR TO RESTARTING. CLOSE ALL DAMPERS.

HEAT WHEEL FAILURE:

1. N/A

OPTIMIZATION:

1. N/A

SYSTEM ALARMS & PRIORITY AT BAS:

- CONTRACTOR AND THE CONTROLS CONTRACTOR.
 - FAN FAILURE : COMMANDED ON STATUS OFF
 - HIGH SUPPLY AIR TEMPERATURE: T1 IS GREATER THAN 20°C FOR MORE THAN 30 MINUTES IN SUMMER COOLING MODE
 - LOW SUPPLY AIR TEMPERATURE: T1 IS LOWER THAN 22°C FOR MORE THAN 30 MINUTES IN WINTER HEATING MODE
 - FREEZE STAT: T2 IS EQUAL TO OR LOWER THAN 4°C
 - HIGH RETURN AIR TEMPERATURE: T3 IS GREATER THAN 26°F FOR MORE THAN 30 MINUTES IN SUMMER COOLING MODE
 - LOW RETURN AIR TEMPERATURE: T3 IS LOWER THAN 18°C FOR MORE THAN 30 MINUTES IN WINTER HEATING MODE
 - HIGH RETURN AIR HUMIDITY: H1 IS GREATER THAN 10% R.H. ABOVE DEHUMIDIFICATION MODE SET POINT FOR MORE THAN 30 MINUTES
 - LOW RETURN AIR HUMIDITY: H1 IS LOWER THAN 5% R.H. BELOW DEHUMIDIFICATION MODE SET POINT FOR MORE THAN 30 MINUTES

SYSTEM TRENDS AT BAS:

- ROOF TOP UNIT STATUS
- TEMPERATURE SET POINT
- BUILDING STATIC PRESSURE
- DEHUMIDIFICATION SET POINT

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Sheet
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MECHANICAL CONTROL SEQUENCES V

Drawing
No.
M-754



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MECHANICAL SCHEDULES II

Drawing
No.
M-901

PUMPS

TAG	MANUFACTURER	MODEL	DISCHARGE SIZE	VFD	FLOW (GPM)	HEAD (FT)	EFF. (%)	FLUID	POWER (HP)	SPEED @ 100% (RPM)	V/PH/HZ
P-1	ARMSTRONG	SERIES 4380	2 IN.	YES	20	140	18.3	WATER	10	4209	208/3/60
P-1R	ARMSTRONG	SERIES 4380	2 IN.	YES	20	140	18.3	WATER	10	4209	208/3/60
P-2	ARMSTRONG	V2A9A-RC	2 IN.	YES	170	180	60.4	WATER	20	3600	208/3/60
P-2R	ARMSTRONG	V2A9A-RC	2 IN.	YES	170	180	60.4	WATER	20	3600	208/3/60
P-3	ARMSTRONG	V2B7A-CC	4 IN.	YES	130	45	70.2	WATER	3	1800	208/3/60
P-4	ARMSTRONG	V2B7A-CC	4 IN.	YES	130	45	70.2	WATER	3	1800	208/3/60
P-5	ARMSTRONG	SERIES 4380	2 IN.	YES	20	90	41.4	WATER	2	3326	208/3/60
P-5R	ARMSTRONG	SERIES 4380	2 IN.	YES	20	90	41.4	WATER	2	3326	208/3/60

AIR SOURCE HEAT PUMP

TAG	REFRIGERANT	HEAT CAPACITY (KW)	FLUID TYPE	FLOW RATE (GPM)	R. TEMP (C)	S. TEMP (C)	P. DROP (PSI)	POWER (KW)	MCA	FLA	MOCP	V/PH/HZ
ASHP-1	R-507	48.7	40% PG	17.1	38	50	0.3	23	87.6	73.3	125	575/3/60

HEAT EXCHANGER

TAG	LOCATION	MODEL	HEAT EXCH. (KBTU/H)	HOT SIDE				COLD SIDE				PLATE MATERIAL
				FLOW RATE (L/S)	INLET TEMP (C)	OUTLET TEMP (C)	P. DROP (PSI)	FLOW RATE (L/S)	INLET TEMP (C)	OUTLET TEMP (C)	P. DROP (PSI)	
HEX-1	MECH RM	AQ2T-BFG	233.9	1.6	50	38	4.7	1.5	35	46	3.7	ALLOY 340/0.5 MM

CONDENSERS

TAG	LOCATION	MODEL	MANUFACTURER	COMB RATIO	AIRFLOW RATE (L/S)	COOLING		HEATING		REFRIGERANT	MCA	V/PH/HZ	WEIGHT (KG)
						AMB. TEMP (C)	CAPACITY (KW)	AMB. TEMP (C)	CAPACITY (KW)				
ODU-1	ROOF	RXYQ144AATJB	DAIKIN	92.6	-	35	40	-20	29.4	R-410A	47.8	230/3/60	350

GRILLES AND DIFFUSERS

TAG	BASIS OF DESIGN		TYPE	VOLUME CONTROL	DIMENSIONS			MATERIAL	NOTES
	MANUFACTURER	MODEL			LENGTH (mm)	WIDTH (mm)	DIAMETER (mm)		
A	EH PRICE	SPD	SQUARE PLAQUE DIFFUSER	YES	600	600		STEEL	
A1	EH PRICE	SPD	SQUARE PLAQUE DIFFUSER	YES	300	300		STEEL	REFER TO FLOOR PLANS
B	EH PRICE	80 DAL	EGG CRATE GRILLE	YES	1800	400		ALUMINUM	REFER TO FLOOR PLANS
B1	EH PRICE	80 DAL	EGG CRATE GRILLE	YES	300	300		ALUMINUM	
B2	EH PRICE	80 DAL	EGG CRATE GRILLE	YES	600	300		ALUMINUM	
D	EH PRICE	620 DAL	LOUVERED FACE SUPPLY GRILLE	YES	300	300		ALUMINUM	
D1	EH PRICE	620 DAL	LOUVERED FACE SUPPLY GRILLE	YES	600	300		ALUMINUM	
E	EH PRICE	630 DAL	LOUVERED FACE RETURN GRILLE	YES	300	300		ALUMINUM	
E3	EH PRICE	630 DAL	LOUVERED FACE RETURN GRILLE	YES	800	750		ALUMINUM	
F	NAILOR	RPLP	ROUND PUNJABI LOUVERJET NOZZLE		305	213	254		
H	EH PRICE	RECG	EGG CRATE EXHAUST GRILLE				200		

EXPANSION TANKS

TAG	LOCATION	SERVICE	BASIS OF DESIGN		VOLUME (L)	TANK ACCEPTANCE (L)	FILL PRESSURE (kPa)	REMARKS
			MANUFACTURER	MODEL				
ET-1	MECHANICAL ROOM	GLYCOL SYSTEM						
ET-2	MECHANICAL ROOM	INFLOOR HEATING						

OUTDOOR CONDENSERS

TAG	LOCATION	MODEL	MANUFACTURER	AIRFLOW RATE (L/S)	INDOOR CONDITIONS TEMP (C)		OUTDOOR CONDITIONS (TEMP C)		REFRIGERANT	MCA	V/PH/HZ	WEIGHT (KG)
					26.7 DB/19.4 WB	21.1 DB / 15.6 WB	35 DB/24 WB	8.3DB/6.1 WB				
ODU-2	HANGAR	FTX24WVJU9...	DAIKIN	1141	26.7 DB/19.4 WB	21.1 DB / 15.6 WB	35 DB/24 WB	8.3DB/6.1 WB	R-410A	18.8	230/1/60	60