

24. ALL DUCT MOUNTED MOTORIZED DAMPERS SHALL BE INSULATED LOW LEAKAGE TYPE TO TAMCO 9000 OR EQUAL.
25. PROVIDE VIBRATION ISOLATORS FOR ALL MECHANICAL EQUIPMENT, INCLUDING PUMPS, UTILITY FANS, AND VENT SETS, AIR HANDLERS, ROOF-TOPS UNITS, CONDENSING UNITS, COMPRESSED, ETC. AS APPLICABLE. SUBMIT SHOP DRAWINGS PRIOR TO INSTALLATION.
26. BACK-DRAFT DAMPERS SHALL BE PROVIDED WITH THE FOLLOWING MINIMUM REQUIREMENTS:
- 26.1. 16 GA. GALVANIZED STEEL OR ALUMINUM CHANNEL FRAME; 16 GA. GALVANIZED BLADES C/W STIFFENERS, FULL BLADE-LENGTH SHAFT; BRASS, BALL OR NYLON BUSHING; FELT OR NEOPRENE ANTI-CHATTER BLADE STRIPS; ADJUSTABLE COUNTER-BALANCE.
16. CHIMNEYS AND BREECHING SHALL BE LABORATORY TESTED AND LISTED BY THE UNDERWRITERS LABORATORIES INC. FOR USE WITH BUILDING HEATING EQUIPMENT BURNING NATURAL GAS OR PROPANE GAS, AS DESCRIBED IN NFPA 211, SECTION 6.0. THE DOUBLE WALL STACK SHALL HAVE AN OUTER JACKET OF GALVANIZED STEEL CONFORMING TO ASTM A525. THERE SHALL BE AN AIR SPACE BETWEEN THE WALLS. THE INNER GAS CONVEYING PIPE SHALL BE AN ALUMINUM ALLOY - JOINTS TO BE SECURED WITH SHEET METAL SCREWS.
17. PROVIDE CHIMNEYS AND/OR BREECHING FOR:
- 17.1. GAS-FIRED DOMESTIC WATER HEATERS.
- 17.2. GAS-FIRE UNIT HEATERS.
18. PROVIDE BASE TEE WITH CLEANOUT, ROOF FLASHING AND VENT CAP FOR ALL EQUIPMENT AS REQUIRED.
19. ALL AIR AND WATER SYSTEMS SHALL BE BALANCED AND TESTED BY A CERTIFIED A.A.B.C. INDEPENDENT BALANCING AGENCY TO PROVIDE QUANTITIES AS SHOWN. PROVIDE THREE(3) SETS OF BALANCE REPORTS FOR REVIEW BY THE CONTRACT ADMINISTRATOR. ALL BALANCE REPORTS SHALL INCLUDE FIRE DAMPER TESTING AND CERTIFICATION.

**15900 - CONTROLS**

THE POINTS BELOW DESCRIBE THE CONTROL SEQUENCE OF THE H.V.A.C. EQUIPMENT SPECIFIED IN THE SCHEDULES. ALL CONTROLS TO BE SUPPLIED BY DIV. 15 AND WIRED BY DIV.15. CONTROLS CONTRACTOR SHALL BE A SUBCONTRACTOR OF THE MECHANICAL SUB-CONTRACTOR. PROVIDE LOCKABLE COVERS FOR ALL THERMOSTATS, NEW OR EXISTING.

1. STORAGE GARAGE VENTILATION CONTROL:
- 1.1. PROVIDE GAS DETECTOR(S) AND ALARM, DAMPER OPERATOR(S) WITH END SWITCH(ES), DAMPERS, AIR FLOW SWITCHES, RELAYS, DEHUMIDISTAT, ETC.
- 1.2. UPON SENSING 12.5 PPM CO OR 3.0 PPM NO2:
- 1.2.1. SENSOR SHALL ENERGIZE OUTDOOR AIR DAMPER OPERATORS TO OPEN.
- 1.2.2. END SWITCHES SHALL ENERGIZE EXHAUST FAN.
- 1.2.3. SHOULD AIR FLOW NOT BE PROVEN AT EXHAUST FAN, THE SYSTEM SHALL DE-ENERGIZE AND AN AUDIBLE ALARM SHALL SOUND.
- 1.3. UPON SENSING ABOVE 25.0 PPM CO OR 5.0 PPM NO2:
- 1.3.1. SENSOR SHALL SOUND AUDIBLE ALARM.
- 1.4. UPON SENSING RELATIVE HUMIDITY ABOVE DEHUMIDISTAT SETPOINT:
- 1.4.1. SENSOR SHALL ENERGIZE OUTDOOR AIR DAMPER OPERATORS TO OPEN.
- 1.3.2. END SWITCHES SHALL ENERGIZE EXHAUST FAN.
- 1.3.3. SHOULD AIR FLOW NOT BE PROVEN AT EXHAUST FAN, THE SYSTEM SHALL DE-ENERGIZE AND AN AUDIBLE ALARM SHALL SOUND.
- 1.4. FAN SHALL DE-ENERGIZE AND MOTORIZED DAMPER SHALL CLOSE AS GAS LEVELS DROP BELOW SETPOINTS AND AS DE-HUMIDISTAT IS SATISFIED.

**MECHANICAL EQUIPMENT SCHEDULES:**

EQUIPMENT THAT IS SUPPLIED WITH A FACTORY-INSTALLED DISCONNECTING MEANS FOR THE CONNECTION OF THE SUPPLY SIDE FEEDER CONDUCTORS MUST BE CERTIFIED SO THAT THESE CONDUCTORS CAN BE OF EITHER ALUMINUM OR COPPER.

MECHANICAL AND ELECTRICAL SUB-CONTRACTORS ARE RESPONSIBLE FOR THE MUTUAL COORDINATION OF ALL ELECTRICAL REQUIREMENTS OF MECHANICAL EQUIPMENT. COORDINATION IS TO INCLUDE THE COMMUNICATION OF ALL FINAL ELECTRICAL NAMEPLATE INFORMATION FROM THE MECHANICAL SUB-CONTRACTOR TO THE ELECTRICAL SUB-CONTRACTOR, THE COMMUNICATION OF THE DETAILED CONTROL INFORMATION AS WELL AS ANY ANCILLARY INFORMATION REQUIRED FOR THE FINAL SYSTEMS TO OPERATE AS INTENDED BY THE CONTRACT ADMINISTRATOR. THE COORDINATION IS TO OCCUR PRIOR TO THE ORDERING OF EQUIPMENT BY EITHER TRADE. NO EXTRA COMPENSATION WILL BE ALLOWED DUE TO FAILURE TO CARRY OUT THIS COORDINATION. REPORT AT ONCE TO THE CONTRACT ADMINISTRATOR ANY DEFECT, DISCREPANCY, OMISSION OR INTERFERENCE AFFECTING THE SATISFACTORY COMPLETION OF WORK.

**1. DIFFUSERS AND GRILLES: (BASED ON E.H. PRICE)**

TAG	TYPE	DESCRIPTION	ACCESSORIES
S1	SUPPLY	520D/F/L/A/B12	SIZES ON DRAWINGS
R1	RETURN	80/TB/B12	SIZES ON DRAWINGS
R2	RETURN	530/F/L/A/B12	SIZES ON DRAWINGS
E1	RETURN	530/F/L/A/B12	SIZES ON DRAWINGS
E2	RETURN	80/TB/B12	SIZES ON DRAWINGS

**2. EXHAUST FANS (BASED ON GREENHECK):**

- EF-1 GREENHECK MODEL CSP-B110 DIRECT DRIVE INLINE CABINET FAN, 75 CFM @ 0.5" S.P., 89 WATTS, 115/60/1 SUPPLY VOLTAGE, 2.5 SONES. COORDINATE ELECTRICAL WITH DIVISION 26.
- EF-2 GREENHECK MODEL CSP-A250 DIRECT DRIVE INLINE CABINET FAN, 200 CFM @ 0.5" S.P., 60 WATTS, 115/60/1 SUPPLY VOLTAGE, 3 SONES. COORDINATE ELECTRICAL WITH DIVISION 26.
- EF-3 GREENHECK MODEL B50-100-3 BELT DRIVE CENTRIFUGAL INLINE FAN, 1,200 CFM @ 0.5" S.P., 1/3 H.P., 7.2 AMPS, 115/1/60 SUPPLY VOLTAGE, 14.5 SONES. COORDINATE ELECTRICAL WITH DIVISION 26.

**3. HEAT RECOVERY VENTILATORS:**

- HRV-1 NU-AIR MODEL NU500 (OR EQUIVALENT), 400 CFM SUPPLY AT 0.5" E.S.P., 400 CFM EXHAUST AT 0.5" E.S.P., TWO DIRECT DRIVE BLOWERS (128 WATTS TOTAL), POLYPROPYLENE CORE, C/W 1" PLEATED FILTER SECTION. COORDINATE ELECTRICAL REQUIREMENTS WITH DIVISION 26.

**4. PACKAGED ROOFTOP UNITS:**

- RTU-1 YORK MODEL Z0G06F1 OR EQUIVALENT (5-TON) PACKAGED GAS HEATING/ELECTRIC COOLING R410A ROOFTOP UNIT, 60 MBH NOMINAL COOLING CAPACITY, 142 MBH INPUT HEATING CAPACITY, 114 MBH OUTPUT HEATING CAPACITY, 14.1 SEER, 12.1 EER, 2000 CFM AT 0.8" E.S.P., 2.4 HP SUPPLY FAN MOTOR, COMPLETE WITH CO2 SENSOR, DOWN DISCHARGE, 100% MODULATING ECONOMIZER, POWER EXHAUST, 14" ROOF CURB, PROGRAMMABLE THERMOSTAT WITH LOCKABLE GUARD. COORDINATE ELECTRICAL REQUIREMENTS WITH DIVISION 26.

**5. CARBON MONOXIDE/NITROGEN DIOXIDE GAS DETECTOR:**

HONEYWELL ANALYTICS MODEL E3SA/E3P, STAND-ALONE MONITOR C/W REMOTE SENSOR.

THE MONITOR WILL INCORPORATE AN ELECTROCHEMICAL CELL FOR TOXIC GAS MONITORING. THE MONITOR WILL BE CAPABLE OF TRANSMITTING GAS CONCENTRATIONS TO A DDC SYSTEM THROUGH ITS 4-20 MA OUTPUT. FOR LOCAL ACTIVATION OF FANS OR LOUVERS (OR OTHER EQUIPMENT), TWO ON-BOARD DPDT RELAYS 5 A, 30 VDC OR 250 VAC (RESISTIVE LOAD) WILL BE ACTIVATED AT PROGRAMMABLE SET POINTS (AND PROGRAMMABLE BEFORE AND AFTER TIME DELAYS). AN 8 CHARACTER, 2 LINE BACKLIT LCD DISPLAY WILL PROVIDE LOCAL GAS CONCENTRATION READINGS. TRANSMITTER WILL BE CAPABLE OF OPERATING WITHIN RELATIVE HUMIDITY RANGES OF 5-95% MIN. HUMIDITY AND TEMPERATURE RANGES OF -40° F TO 122° F (-40° C TO 50°

C). THE TRANSMITTER WILL HAVE A PLUG-IN CAPABILITY FOR A GAS CARTRIDGE WITH A SMART SENSOR TECHNOLOGY WITH SELF-TESTING CAPABILITIES ACCURACY OF +/- 300F FULL SCALE @ 25 C. ENCLOSURE WILL BE POLYCARBONATE WITH RUBBERIZED SEALED COVER AND LED VISUAL INDICATIONS FOR POWER, ALARM & FAULT CONDITIONS. FOR LOCAL ACTIVATION OF AUDIBLE ALARMS, THE MONITOR SHALL HAVE AN ON-BOARD DEVICE ABLE TO GENERATE AN AUDIBLE OUTPUT OF 85 DBA @ 10 FT (3M). DEVICE TO BE C/W ON-BOARD TRANSFORMER.

MONITOR ALARM LEVELS ARE TO ACTIVATE AND THE UNIT IS TO BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING PARAMETERS:

**ALARM PANEL**

CARBON MONOXIDE  
FIRST ALARM SET POINT: 12.5 PPM  
SECOND ALARM SET POINT: 25.0 PPM  
SENSOR LOCATION: AS PER MANUFACTURER RECOMMENDATION RADIUS OF COVERAGE: 50'

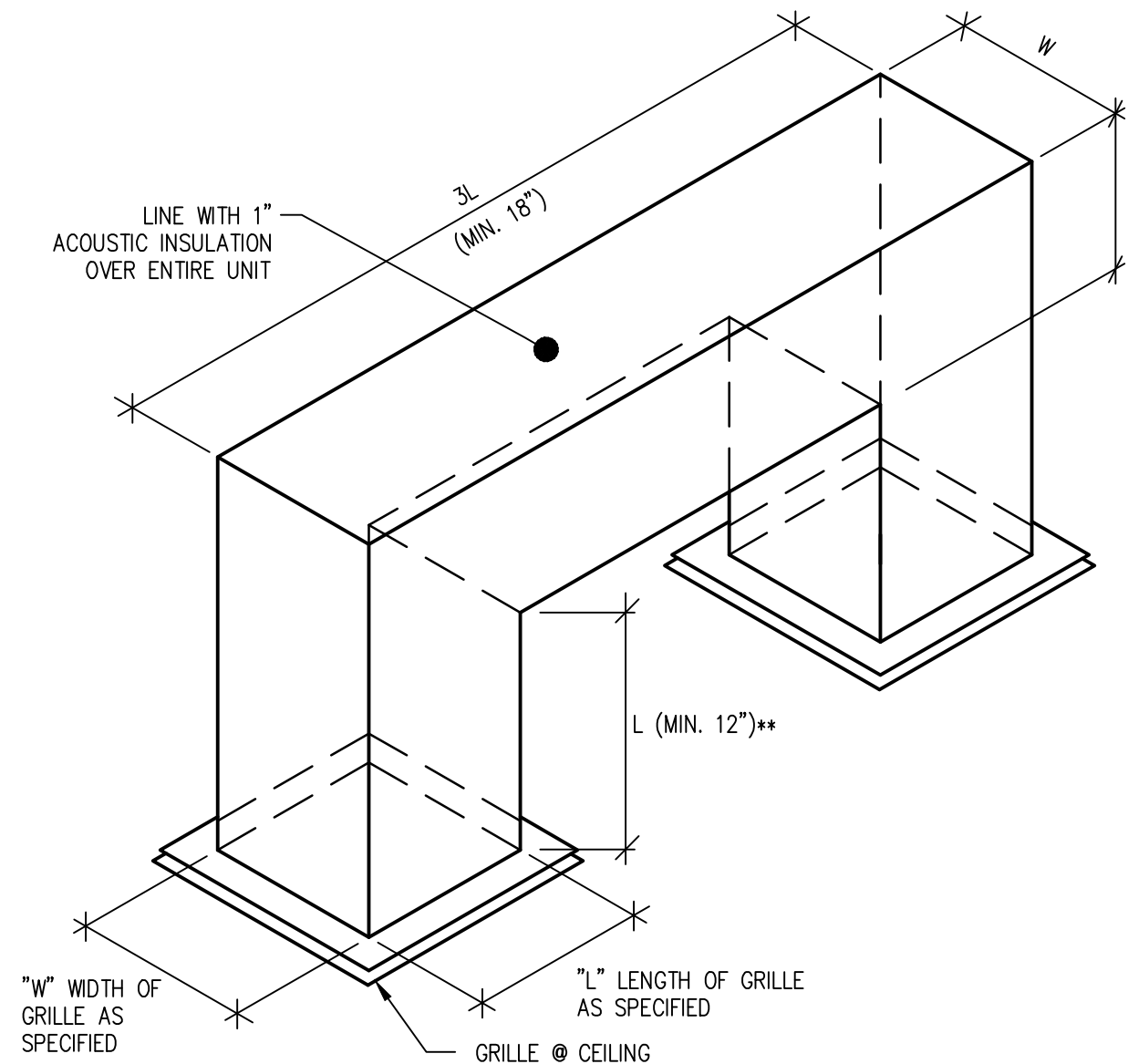
**REMOTE SENSOR**

NITROGEN DIOXIDE  
FIRST ALARM SET POINT: 3.0 PPM  
SECOND ALARM SET POINT: 5.0 PPM  
SENSOR LOCATION: AS PER MANUFACTURER RECOMMENDATION RADIUS OF COVERAGE: 50'

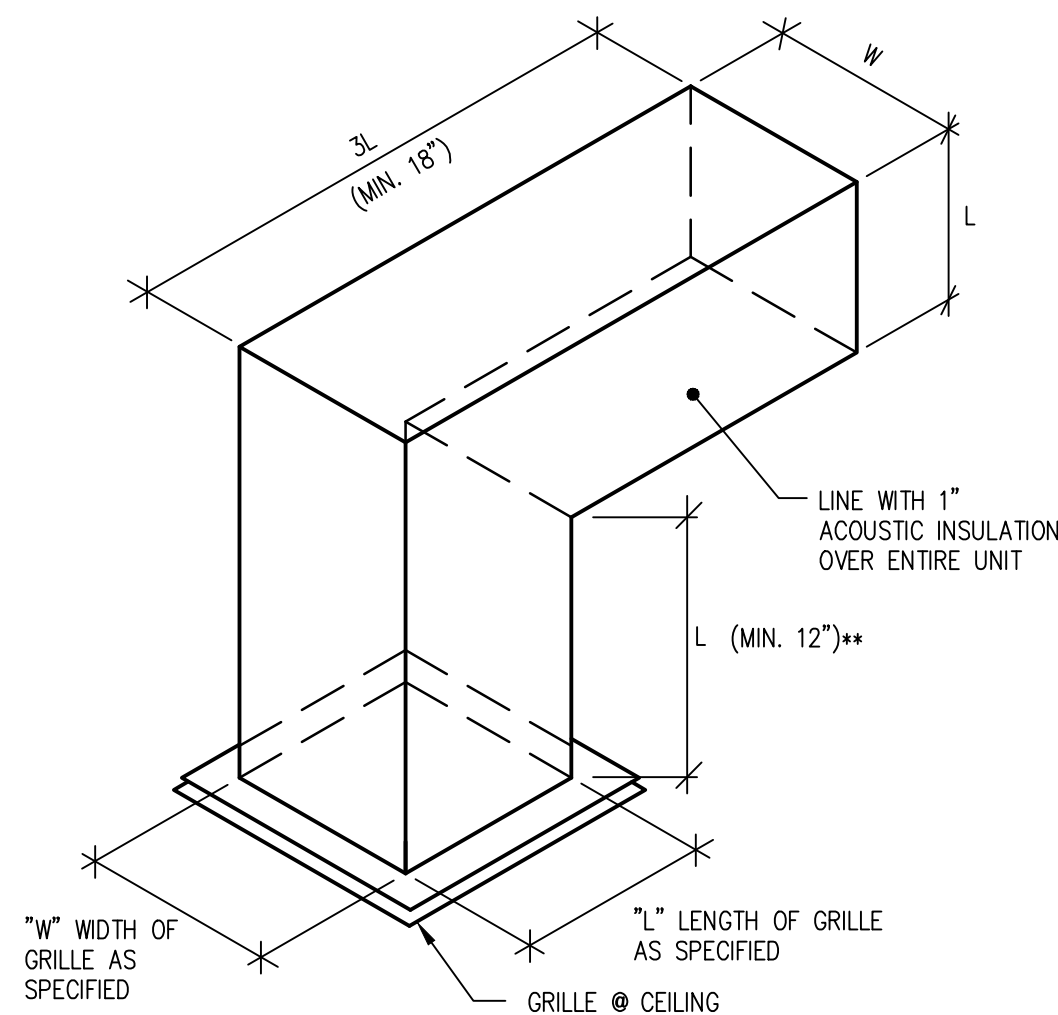
**3. GAS FIRED UNIT HEATERS:**

UH-1,2 REZNOR (OR EQUIVALENT) MODEL UDAS-125 DIRECT FIRED, SEPARATED COMBUSTION, NATURAL GAS FIRED UNIT HEATER, 125 MBH INPUT HEATING CAPACITY, 99.6 MBH OUTPUT HEATING CAPACITY, C/W VENT TERMINATION KIT & ISOLATION MOUNTS. COORDINATE ELECTRICAL REQUIREMENTS WITH DIVISION 26.

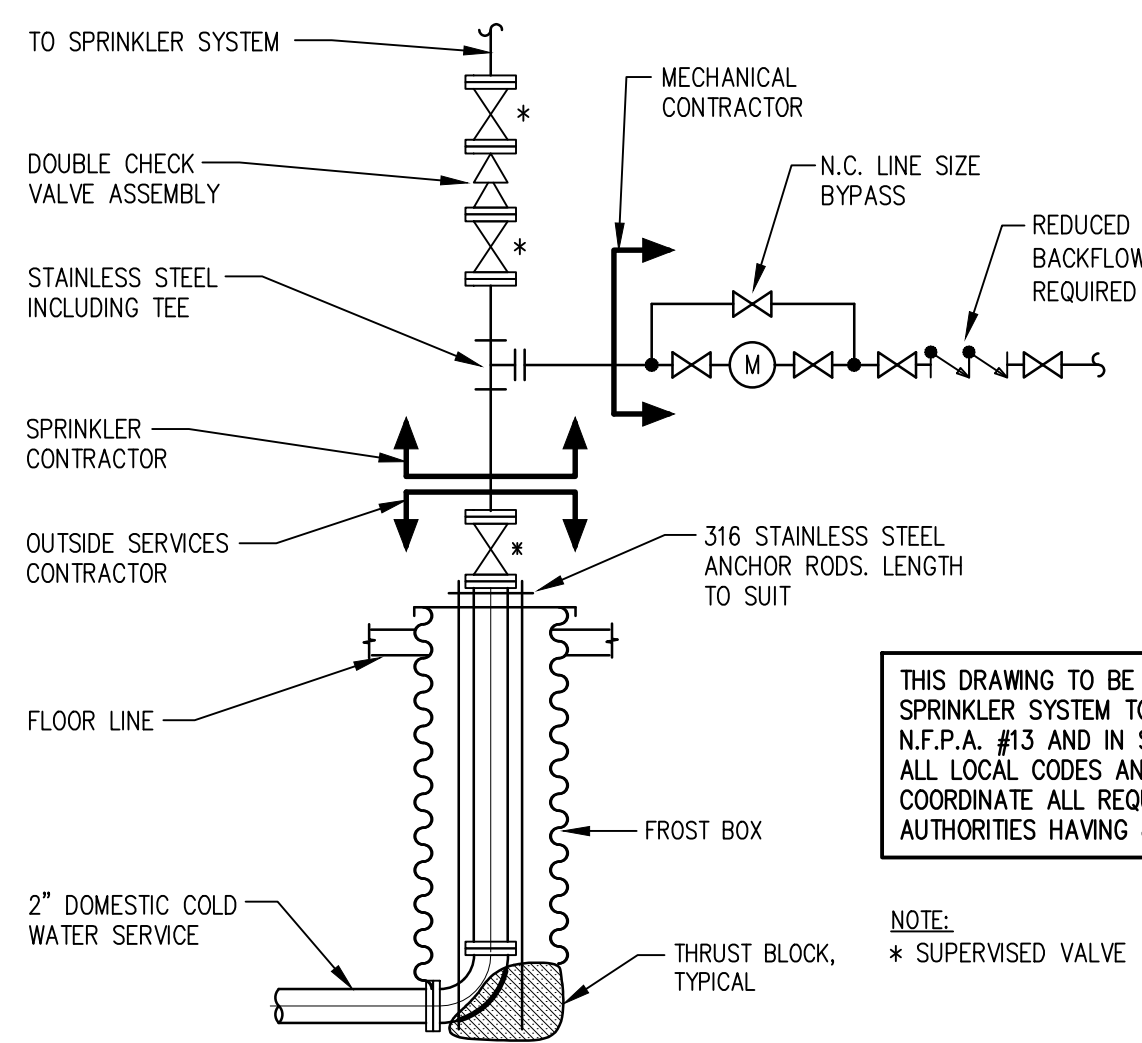
Ventilation Sizing Summary for RTU-1										
Project Name: 36-087 Kildonan Park Front Works Yard										
Prepared by: Nova 3 Engineering Ltd.										
<b>1. Summary</b>										
Ventilation Sizing Method		ASHRAE Std 62.1-2007								
Design Condition		Heating operation								
Occupant Diversity (D)		1.000								
Uncorrected Outdoor Air Intake (V <sub>ou</sub> )		352 CFM								
System Ventilation Efficiency (E <sub>v</sub> )		0.176								
Outdoor Air Intake (V <sub>ot</sub> )		2002 CFM								
<b>2. Space Ventilation Analysis Table</b>										
Zone Name / Space Name	Mult.	Supply Air (CFM)	Space Floor Area (A <sub>f</sub> ) (ft <sup>2</sup> )	Area Outdoor Air Rate (CFM/ft <sup>2</sup> ) (R <sub>a</sub> )	Time Averaged Occupancy (Occupants) (P <sub>z</sub> )	People Outdoor Air Rate (CFM/person) (R <sub>p</sub> )	Air Distribution Effectiveness (E <sub>z</sub> )	Space Outdoor Air (CFM)	Breathing Zone Outdoor Air (CFM) (V <sub>bz</sub> )	Space Ventilation Efficiency (E <sub>vz</sub> )
<b>Zone 1</b>										
102 Office	1	266	325.0	0.06	3.0	5.00	0.80	43	35	1.014
103 Senior Foreman	1	150	205.0	0.06	2.0	5.00	0.80	28	22	0.990
104 Secure Storage	1	36	110.0	0.12	0.0	0.00	0.80	17	13	0.713
106 Staff MPR	1	981	1070.0	0.06	32.0	5.00	0.80	280	224	0.990
107 Service Entrance	1	389	155.0	0.06	0.0	5.00	0.80	12	9	1.146
109 Male Washroom	1	95	375.0	0.06	0.0	5.00	0.80	28	23	0.880
110 Female Washroom	1	75	300.0	0.06	0.0	5.00	0.80	23	18	0.877
Corridor	1	9	125.0	0.06	0.0	0.00	0.80	9	8	0.176
<b>Totals (incl. Space Multipliers)</b>		<b>2002</b>							<b>352</b>	<b>0.176</b>



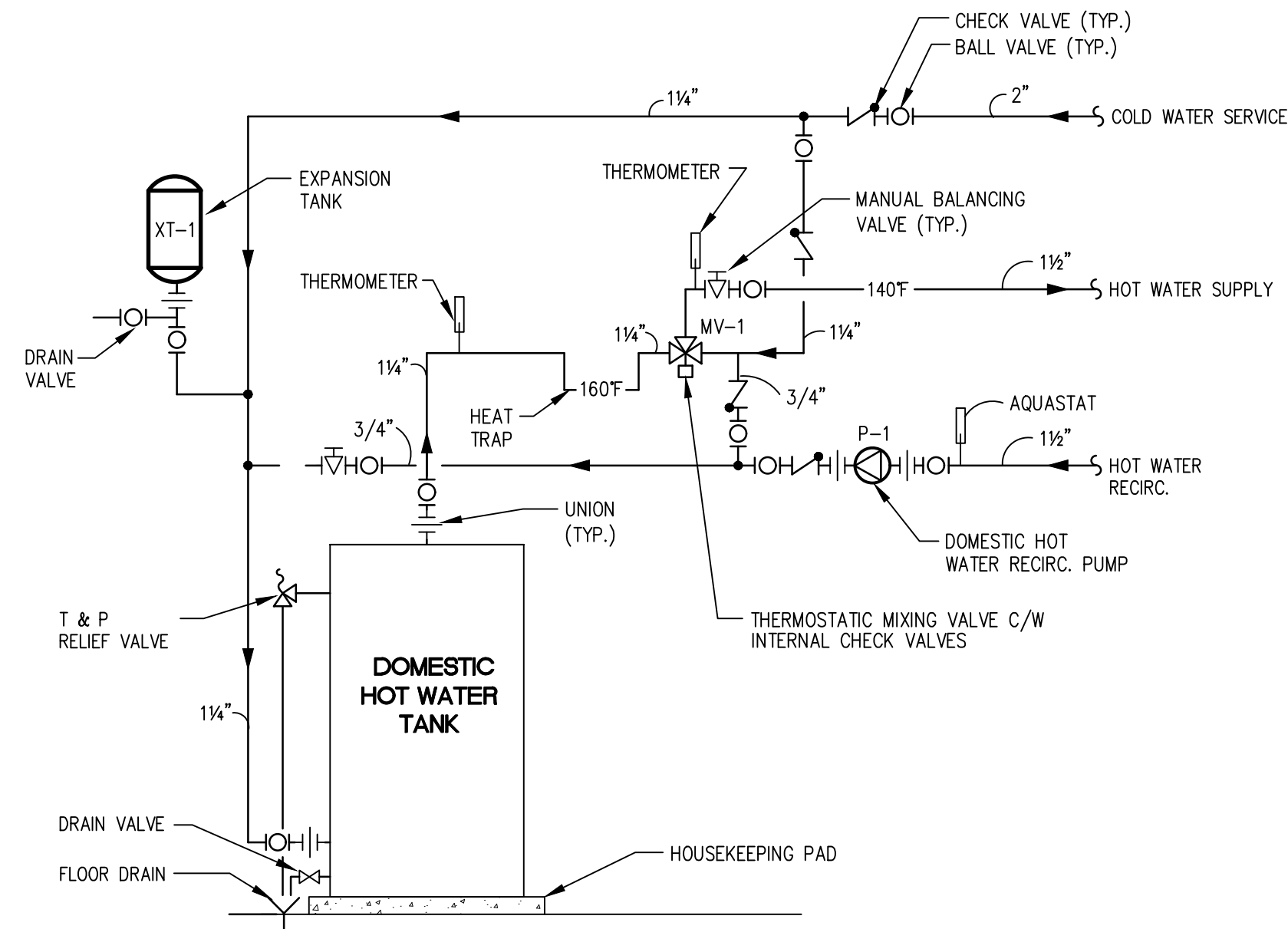
**180 DEGREE ACOUSTIC AIR TRANSFER ELBOW**  
N.T.S.



**90 DEGREE ACOUSTIC AIR TRANSFER ELBOW**  
N.T.S.



**INCOMING WATER SERVICE DETAIL**  
N.T.S.



**DOMESTIC HOT WATER TANK/MIXING VALVE SCHEMATIC**  
N.T.S. (ALL PIPING TO BE INSTALLED AS PER MANUFACTURERS RECOMMENDATION)

4	YY.MM.DD	-
3	YY.MM.DD	-
2	YY.MM.DD	-
1	YY.MM.DD	-
0	2017-07-06	ISSUED FOR CONSTRUCTION

No. DATE REVISION / ISSUANCE

Seal



Architect



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**BID OPPORTUNITY 450-2017**  
**KILDONAN PARK**  
**MAINTENANCE BUILDING**

Sheet Title

**DETAILS AND SPECIFICATIONS**

Project No.

1559

Date

JULY 6, 2017

**M6.0**