HEATING VENTILATING AND AIR CONDITIONING

GENERAL

A. QUALIFICATIONS OF INSTALLERS: ALL WORK SHALL BE PERFORMED BY THOROUGHLY TRAINED AND EXPERIENCED WORKMEN COMPLETELY FAMILIAR WITH THE ITEMS REQUIRED AND WITH MANUFACTURER'S RECOMMENDED METHODS AND PROCEDURES.

B. CODES: ALL WORK SHALL COMPLY WITH APPLICABLE STATE AND LOCAL CODES. ALL DUCTWORK SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST SMACNA DUCT MANUAL.

C. ELECTRICAL: ALL ELECTRICAL EQUIPMENT SHALL BE UL LISTED AND APPROVED. ELECTRICAL CONTRACTOR TO PROVIDE ALL HIGH VOLTAGE ELECTRICAL WIRING, CONDUIT, DISCONNECT SWITCHES, FUSES, ETC. TO HVAC EQUIPMENT. ALL FINAL ELECTRICAL CONNECTIONS ARE BY ELECTRICAL CONTRACTOR.

D. RECORD DRAWINGS: CONTRACTOR SHALL MAINTAIN AN ACCURATE RECORD OF ALL AS-BUILT CONDITIONS DURING THE PROGRESS OF THE WORK AND TURN THEM OVER TO THE OWNER AT COMPLETION.

E. OPERATING MANUALS: CONTRACTOR SHALL FURNISH OWNER WITH 3 SETS OF INSTALLATION, OPERATION AND MAINTENANCE MANUALS WITHIN 15 CALENDAR DAYS OF ACCEPTANCE OF THE SYSTEM.

F. GUARANTEE: PROVIDE ONE YEAR GUARANTEE ON ALL MATERIALS, EQUIPMENT AND WORK PERFORMED, BEGINNING ON THE DAY THE SYSTEM IS COMPLETELY OPERATIONAL AND ACCEPTABLE BY THE OWNER. PROVIDE 5 YEAR GUARANTEE ON ALL COMPRESSORS.

G. CONTRACTOR SHALL SECURE AND PAY FOR ALL NECESSARY PERMITS, LICENSES, INSPECTIONS, APPROVALS, FEES, ETC REQUIRED BY STATE, MUNICIPAL AND LOCAL CODES.

H. DRAWINGS SHOW GENERAL ARRANGEMENT OF EQUIPMENT AND SYSTEMS AND SHOULD BE FOLLOWED AS CLOSE AS PRACTICAL. CONTRACTOR SHALL COORDINATE WITH OTHER CONTRACTORS PRIOR TO STARTING WORK AND PROVIDE ALL NECESSARY OFFSETS, BENDS, ETC. REQUIRED TO PROVIDE A COMPLETE PROJECT WITH NO EXTRA CHARGES TO THE CONTRACT. DO NOT SCALE DRAWINGS FOR MEASUREMENTS. SEE ARCHITECTURAL DRAWINGS AND REFLECTED CEILING PLANS (IF PROVIDED) FOR EXACT LOCATIONS OF DOORS, WINDOWS, CEILING DIFFUSERS, ETC. COORDINATE LOCATION AND TYPE OF AIR DISTRIBUTION WITH ARCHITECTURAL REFLECTED CEILING PLAN PRIOR TO STARTING WORK.

PRODUCTS

EQUIPMENT

A. ALL EQUIPMENT SHALL BE OF THE CAPACITY AND TYPES SHOWN ON THE EQUIPMENT SCHEDULES AND SHALL BE THE LISTED MANUFACTURER AND MODEL NUMBER. CONTRACTOR MAY BID "OR EQUAL" EQUIPMENT AT HIS OWN RISK. ENGINEER WILL BE THE SOLE JUDGE WHETHER EQUIPMENT IS "EQUAL" TO THAT SPECIFIED. IF DETERMINED TO NOT BE EQUAL, CONTRACTOR WILL FURNISH EQUIPMENT SCHEDULED AT NO EXPENSE TO THE OWNER.

B. THE MECHANICAL CONTRACTOR SHALL PROVIDE LOW VOLTAGE CONTROL LINES TO THE HVAC EQUIPMENT. COORDINATE ROUTING AND INSTALLATION WITH THE GENERAL CONTRACTOR.

DUCTWORK

A. CONSTRUCT METAL DUCTWORK IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION MANUAL INCLUDING REQUIRED THICKNESS, BRACING, JOINTS AND FITTINGS AS APPLICABLE. ALL METAL DUCT SHALL BE EITHER ASTM A653 GALVANIZED STEEL OR ASTM B209 ALUMINUM. ALL SUPPLY AND EXHAUST DUCTS SHALL COMPLY WITH SMACNA DUCT CONSTRUCTION STANDARDS FOR PRESSURE CLASS 1"W.G. AND LEAKAGE CLASS 6 CFM/100 S.F. ALL RETURN AND OUTSIDE AIR DUCTS SHALL COMPLY WITH SMACNA PRESSURE CLASS 1"WG AND LEAKAGE CLASS 6CFM/100S.F.

B. PROVIDE SPLITTER DAMPERS OR VOLUME DAMPERS WHERE REQUIRED FOR PROPER BALANCING OF THE SYSTEM.

C. INSTALL FLEXIBLE CONNECTIONS BETWEEN HVAC UNITS, FANS AND DUCTWORK.

D. INSTALL TURNING VANES AT ALL TEES & ELBOWS.

E. ALL DUCT DIMENSIONS GIVEN ARE INSIDE CLEAR DIMENSIONS.

F. THE FIRST 15' FROM THE EQUIPMENT SHALL BE INTERNALLY LINED.

G. RUNOUTS FROM MAIN/BRANCH DUCTS MAY BE FLEXIBLE DUCT CONFORMING TO THE REQUIREMENTS OF UL 181 FOR CLASS 1 FLEXIBLE AIR DUCTS. REFER TO SMACNA STANDARDS, SECTION III FOR INSTALLATION OF FLEXIBLE DUCTS. DUCTS SHALL BE CONTINUOUS, SINGLE PIECES NOT OVER 6 FEET LONG, AS STRAIGHT AND SHORT AS FEASIBLE, FORMALDEHYDE-FREE, AND ADEQUATELY SUPPORTED PER SMACNA STANDARDS. CENTERLINE RADIUS OF BENDS SHALL BE NOT LESS THAN TWO DUCT DIAMETERS. MAKE CONNECTIONS WITH CLAMPS AS RECOMMENDED BY SMACNA. CLAMP PER SMACNA S3.33 AND S3.34 WITH ONE CLAMP ON THE CORE DUCT AND ONE ON THE INSULATION JACKET. FLEXIBLE DUCTS SHALL NOT PENETRATE FLOORS, OR ANY CHASE OR PARTITION DESIGNATED AS A FIRE OR SMOKE BARRIER, INCLUDING CORRIDOR PARTITIONS FIRE RATED ONE HOUR OR TWO HOUR. PROVIDE JM QUIET FLEX OR EQUAL.

H. ALL SUPPLY AND RETURN DUCT SHALL BE INSULATED PER SECTION 503.2.7 OF THE LATEST NC ENERGY CODE. CONCEALED SHEET METAL DUCT MAY BE EXTERNALLY INSULATED WITH MINERAL FIBER BOARD OR BLANKET OR MAY BE INTERNALLY INSULATED WITH DUCT LINER (R-VALUE = 6 MINIMUM). ALL RECTANGULAR SUPPLY AND RETURN DUCTWORK SHALL BE LINED WITH A MINIMUM OF 1" THICK DUCT LINER OR WRAPPED WITH A MINIMUM OF 1" THICK DUCT WRAP WITH VAPOR BARRIER. ROUND DUCTWORK SHALL BE WRAPPED WITH A MINIMUM OF 1" THICK DUCT WRAP WITH VAPOR BARRIER. INTERNALLY LINED INSULATION SHALL MEET BACTERIOLOGICAL STANDARD ASTM C 665.

TEST AND ADJUSTING

A. PROVIDE ALL NECESSARY PERSONNEL, EQUIPMENT AND SERVICES NECESSARY TO DEMONSTRATE INTEGRITY OF THE COMPLETE INSTALLATION. ALL WORK SHALL BE IN ACCORDANCE WITH AABC STANDARDS.

B. PROVIDE AN INDEPENDENT TEST AND BALANCE REPORT BY A CERTIFIED TEST AND BALANCE CONTRACTOR. TEST AND REGULATE ALL COMPONENTS TO CONFORM TO QUANTITIES SHOWN ON THE DRAWINGS. PROVIDE LARGER OR SMALLER PULLEYS AS REQUIRED AT NO ADDITIONAL COST. PROVIDE NEW AIR FILTERS FOR EQUIPMENT. FOR EACH SYSTEM SUBMIT AS A MINIMUM THE FOLLOWING:

1. AIR VOLUMES AT EACH SUPPLY, RETURN, AND EXHAUST OUTLET.
2. AIR TEMPERATURES AT HVAC UNIT, LEAVING AND RETURNING.
3. AIR VOLUMES AND STATIC PRESSURE SUPPLIED, RETURNED, OR EXHAUSTED BY EACH FAN, INCLUDING AT HVAC UNIT.
4. MOTOR SPEED, FAN SPEED, AND AMP READING FOR EACH FAN.
5. AVERAGE VELOCITY ON INTAKE OF EACH FAN.
6. AVERAGE VELOCITY, EAT, LAT, AND PRESSURE DROP ACROSS EACH COIL.

C. IF BALANCING DAMPERS ARE NOT PROVIDED IN RETURN DUCTWORK, CONTRACTOR SHALL BALANCE SUPPLY SIDE TO AIR QUANTITIES INDICATED ON PLANS AND SHALL BALANCE OUTSIDE AIR AND RETURN AIR FLOWS AT THE EQUIPMENT TO AIR QUANTITIES INDICATED IN THE SCHEDULE.

D. IF CONTRACTOR'S INDEPENDENT TAB SUBCONTRACTOR FAILS TO PERFORM THE ABOVE TESTS TO THE SATISFACTION OF THE ENGINEER, THE ENGINEER MAY RETAIN THE SERVICES OF AN OUTSIDE CONSULTANT TO PERFORM SAID SERVICES AT THE SOLE EXPENSE OF THE CONTRACTOR AND WITHOUT ANY EXPENSE TO THE OWNER.

E. UPON COMPLETION OF ALL WORK AND BALANCING, THOROUGHLY TRAIN AND INSTRUCT OWNER'S PERSONNEL IN ALL ASPECTS OF THE OPERATION AND MAINTENANCE OF THE INSTALLED SYSTEMS.

INSULATION

DUCT - EXTERNAL

FLEXIBLE GLASS FIBER; MINIMUM 1½" THICK, ANSI/ASTM C553, TYPE 1; COMMERCIAL GRADE; 1.0 PCF; 'K' VALUE OF 0.29 BTU-IN./HR. FT2-F AT 75 DEGREES F. CERTAINTEED STANDARD DUCT WRAP WITH FSK FACING, OR EQUAL. FACING SHALL HAVE MAXIMUM VAPOR TRANSMISSION RATE OF 0.02 PERMS. ADHESIVES: WATERPROOF FIRE RETARDANT TYPE. LAGGING ADHESIVE: FIRE RESISTIVE TO ASTM E84. IMPALE ANCHORS: GALVANIZED STEEL, 12 GAGE, SELF-ADHESIVE PAD OR WELDED PINS. JOINT TAPE: GLASS FIBER CLOTH, OPEN MESH. R=6 MINIMUM. JM MICROLITE XG OR EQUAL.

DUCT - INTERNAL

MINIMUM 1" THICK, 2# DENSITY MEETING FS HH-1-545 TYPE II AND NFPA 90-A. APPLY FLAME-RETARDENT BLACK PLASTIC COATING ON AIR SIDE SURFACE. APPLY INSULATION WITH EC-1128 ON INSIDE SURFACE OF CLEAN DUCT. FIRMLY BUTT ALL JOINTS AND SEAL WITH ADHESIVE TO FORM CONTINUOUS SMOOTH SEALED LINER. INSTALL STICK-CLIPS OR WELD-PINS @ 12" ON CENTER EACH WAY IN ADDITION TO ADHESIVE. INCREASE DUCT SIZE AS NECESSARY TO PROVIDE CLEAR AIR STREAM AS INDICATED ON DRAWINGS. R-VALUE = 6 MINIMUM. JM LINACOUSTIC RC OR EQUAL.

EXECUTION

INSTALLATION

A. COORDINATE AND AVOID INTERFERENCE WITH STRUCTURE AND WITH WORK OF OTHER TRADES. PRESERVE ADEQUATE HEAD ROOM AND SERVICE ROOM. PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND MECHANICAL EQUIPMENT FOR MAINTENANCE, PERFORMANCE, AND FILTER/COIL REMOVAL. THE M.C. SHALL COORDINATE THE REQUIRED OPENINGS IN ROOF STRUCTURE WITH THE G.C. IN ORDER TO PROVIDE ADEQUATE SPACE, ACCESS AND SUPPORT FOR THE MECHANICAL UNIT. SERVICE REQUIREMENTS FOR ANY EQUIPMENT SHALL COMPLY WITH ALL CODES AND AUTHORITY HAVING JURISDICTION. PROVIDE ALL NECESSARY ACCESS PANELS, PLATFORMS, HANDRAILS, ETC. AS REQUIRED BY STATE AND LOCAL CODES. ALL SUSPENDED MATERIALS AND EQUIPMENT SHALL BE INDIVIDUALLY SUPPORTED FROM THE BUILDING STRUCTURE. DO NOT SUSPEND ITEMS FROM THE CEILING OR ITS SUPPORT SYSTEM.

B. VERIFY LOCATION OF ROOF AND WALL PENETRATIONS FOR RELIEF AND OUTSIDE AIR OPENINGS WITH ARCHITECT, STRUCTURAL, AND OWNER PRIOR TO INSTALLATION. ALL PENETRATIONS THROUGH EXTERIOR WALLS AND ROOF SHALL BE FLASHED AND COUNTERFLASHED IN A WATERPROOF, CODE APPROVED MANNER. COORDINATE COLOR, LOCATION, AND ELEVATION WITH ARCHITECT/OWNER PRIOR TO STARTING WORK FOR ALL EQUIPMENT LOCATED ON ROOF AND EXTERIOR WALL. RELIEF AND INTAKE OPENINGS SHALL MAINTAIN A MINIMUM OF 10' FROM EACH OTHER.

C. ALL CUTTING AND PATCHING OF WALLS, FLOORS, AND ROOF WHICH ARE NECESSARY FOR THE MECHANICAL SYSTEM IN THE BUILDING SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. IT IS THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE SIZES AND LOCATION OF ALL OPENINGS WITH THE GENERAL CONTRACTOR.

D. AS REQUIRED BY LOCAL CODES AND AUTHORITY HAVING JURISDICTION, MECHANICAL CONTRACTOR SHALL PROVIDE U.L. LISTED DYNAMIC FIRE DAMPERS AND/OR SEAL ALL PENETRATIONS OF RATED WALLS WHERE REQUIRED FOR FIRE PROTECTION REQUIREMENTS OF THE HVAC SYSTEM & THE UL ASSEMBLY WHETHER SHOWN ON THE PLANS OR NOT. PENETRATIONS OF RATED WALLS, PARTITIONS AND FLOORS OF NON-COMBUSTIBLE CONSTRUCTION SHALL BE FIRESTOPPED WITH NONCOMBUSTIBLE MATERIALS. PENETRATIONS OF NONRATED WALLS, PARTITIONS AND FLOOR OF COMBUSTIBLE CONSTRUCTION SHALL BE FIRESTOPPED WITH MATERIALS EQUIVALENT TO TWO INCHES OF WOOD. FIRESTOPPING SHALL COMPLY WITH ASTM E-814. M.C. SHALL COORDINATE CLOSELY WITH ARCHITECT PLANS.

E. WHEN OBSTRUCTIONS REQUIRE A CHANGE IN THE DUCT SHAPE, MAINTAIN THE EQUIVALENT AREA AND PRESSURE DROP OF ORIGINAL DUCT. WHEN CHANGING FROM RECTANGULAR TO EXPOSED ROUND OR OVAL DUCT, M.C. SHALL MAINTAIN A MAXIMUM VELOCITY OF 700 FPM. ALL SIZES SHOWN ARE NET INSIDE DIMENSIONS OF CLEAR AIRSTREAM. MAKE ALL DUCT ELBOWS RIGHT ANGLES WITH ELBOW TURNS OR TURNING BLADES OR CONSTRUCT WITH A RADIUS OF 1.5 TIMES THE DUCT WIDTH. INSTALL FLAT BRAIDED WIRE GROUND STRAP ACROSS FLEXIBLE CONNECTS AT AHU'S AND DUCTS. SECURELY ANCHOR ALL GRILLES, REGISTERS AND DIFFUSERS AND SEAL WITH RUBBER GASKETS TO PREVENT LEAKAGE.

F. THOROUGHLY CLEAN ALL DUCTS, EQUIPMENT, PARTS, ETC. FREE FROM ALL DIRT, GREASE, OIL AND FOREIGN SUBSTANCES.

G. DO NOT CLOSE-IN ANY WORK UNTIL IT HAS BEEN INSPECTED, TESTED AND APPROVED BY AUTHORITIES HAVING JURISDICTION.

SEISMIC

A COMPLETE SYSTEM OF SEISMIC RESTRAINTS SHALL BE DESIGNED BY MASON INDUSTRIES AND SEALED BY THEIR REGISTERED ENGINEER AND INSTALLED BY THIS CONTRACTOR AS REQUIRED BY APPLICABLE CODES FOR THE LOCALE OF THIS PROJECT.

GENERAL CONDITIONS

AIA DOCUMENT A201 "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION" (LATEST VERSION) IS HEREBY MADE A PART OF THESE DOCUMENTS.

COORDINATION NOTES

1. THE CONTRACTOR SHALL REVIEW THE ENTIRE SET OF DOCUMENTS INCLUDING BUT NOT LIMITED TO ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND THE ENTIRE PROJECT MANUAL. THE CONTRACTOR SHALL ACKNOWLEDGE AND INCLUDE IN THE SCOPE OF WORK (CONTRACT) ALL CONDITIONS PERTINENT TO THE COMPLETIONS OF HIS WORK. THE CONTRACTOR SHALL FULLY COORDINATE HIS WORK WITH THE INSTALLATION OF WORK BY ALL OTHER TRADES AND MAKE NECESSARY FIELD ADJUSTMENTS AS REQUIRED TO ACCOMMODATE THE INSTALLATION. ALL OF THE ABOVE SHALL BE INCLUDED IN THE SCOPE OF WORK AT NO ADDITIONAL COST TO THE OWNER.

2. THE CONTRACTOR SHALL CAREFULLY EXAMINE THE DRAWINGS AND SPECIFICATIONS, VISIT THE SITE OF THE WORK AND FULLY INFORM HIMSELF AS TO ALL CONDITIONS AND MATTERS THAT CAN, IN ANY WAY AFFECT THE WORK OR THE COST THEREOF. SHOULD THE CONTRACTOR FIND DISCREPANCIES IN, OR OMISSIONS FROM THE DRAWINGS, SPECIFICATIONS OR OTHER DOCUMENTS OR BE IN DOUBT AS TO THEIR INTENT, HE SHALL NOTIFY THE ARCHITECT/ENGINEER AT ONCE IN WRITING OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND NEW WORK, OR BETWEEN HIS WORK AND THE WORK OF OTHER TRADES PRIOR AND OBTAIN CLARIFICATION PRIOR TO SUBMITTING BID. LACK OF SUCH NOTIFICATION SHALL BE CONSTRUED TO INDICATE NO DISCREPANCIES OR CONFLICTS. ADDITIONAL COMPENSATION WILL NOT BE GRANTED AFTER AWARD OF CONTRACT FOR ANY WORK REQUIRED TO COMPLY WITH THESE REQUIREMENTS.

NORTH CAROLINA STATE BUILDING CODE

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT
METHOD OF COMPLIANCE:

PRESCRIPTIVE ☒ ENERGY COST BUDGET ☐

THERMAL ZONE 3A

EXTERIOR DESIGN CONDITIONS	
winter dry bulb	18° F.
summer dry bulb	95° F.
INTERIOR DESIGN CONDITIONS	
winter dry bulb	72° F.
summer dry bulb	75° F.
relative humidity	50% R.H.
BUILDING HEATING LOAD	447.5 MBH
BUILDING COOLING LOAD	508.5 MBH
MECHANICAL SPACING CONDITIONING SYSTEM	
UNITARY	
description of unit	SEE SCHEDULES
heating efficiency	SEE SCHEDULES
cooling efficiency	SEE SCHEDULES
heat output of unit	SEE SCHEDULES
cooling output of unit	SEE SCHEDULES
BOILER	
total boiler output of unit	N/A
CHILLER	
total chiller capacity	N/A
LIST EQUIPMENT EFFICIENCIES	
Equipment schedules with motors (mechanical systems)	
motor horsepower	SEE SCHEDULES
number of phases	SEE SCHEDULES
minimum efficiency	SEE SCHEDULES
motor type	SEE SCHEDULES
# of poles	SEE SCHEDULES

DESIGNER STATEMENT: 1

To the best of my knowledge and belief, the design of this building complies with the mechanical systems, service systems and equipment requirements of the North Carolina State Building Code.

SIGNED: Scott Howard

NAME: Scott Howard

TITLE: MECHANICAL DESIGNER

SPLIT SYSTEM GAS FURNACE SCHEDULE

UNIT TAG	TRANE FURNACE MODEL NO. (CF)	TRANE COOLING COIL MODEL NO.	TONNAGE	TOTAL CFM	TOTAL OA	SERVING	MAX. FAN HP	ESP	MBH TOT. COOL.	MBH SEN. COOL.	MBH INPUT	MBH OUTPUT	ELECTRICAL DATA			WEIGHT (LBS)	UNIT TAG	TRANE COND UNIT MODEL NO. (CU)	TONNAGE	MIN. SEER RATING	ELECTRICAL DATA			WEIGHT (LBS)	ACCESSORIES
													VOLTS	MCA	MOCP						VOLTS	MCA	MOCP		
CF-1	TUH1D120A9H5	MATCHING	5.0	2000	140	SEE PLAN	0.75	0.5	58.3	44.6	110	104	120v/1ø	12.9	20	250	CU-1	4TTR4060L1	5.0	14	208v/1ø	31	50	350	1 THRU 14
CF-2	TUH2B080A9V3	MATCHING	3.0	1200	100	SEE PLAN	0.33	0.5	34.2	24.8	80	76.8	120v/1ø	10.2	15	250	CU-2	4TTR4036L1	3.0	14.25	208v/1ø	18	30	350	1 THRU 13
CF-3	TUH2C100A9V4	MATCHING	4.0	1600	175	SEE PLAN	0.50	0.5	46.6	34.6	100	96	120v/1ø	12.5	20	250	CU-3	4TTR4048L1	4.0	14	208v/1ø	24	40	350	1 THRU 13
CF-4	TUH2C100A9V4	MATCHING	3.5	1400	100	SEE PLAN	0.50	0.5	41.5	31.4	100	96	120v/1ø	12.5	20	250	CU-4	4TTR4048L1	3.5	14.5	208v/1ø	22	35	350	1 THRU 13
CF-5	TUH2C100A9V4	MATCHING	4.0	1600	160	SEE PLAN	0.50	0.5	46.6	34.6	100	96	120v/1ø	12.5	20	250	CU-5	4TTR4048L1	4.0	14	208v/1ø	24	40	350	1 THRU 13
CF-6	TUH2C100A9V4	MATCHING	4.0	1600	??	SEE PLAN	0.50	0.5	46.6	34.6	100	96	120v/1ø	12.5	20	250	CU-6	4TTR4048L1	4.0	14	208v/1ø	24	40	350	1 THRU 13

NOTES & ACCESSORIES:

1. COOLING CAPACITIES ARE RATED IN ACCORDANCE WITH ARI STANDARD 210/290 AT 95°F AMBIENT OUTDOOR AIR TEMP., 80°F DRY BULB, 67°F WET BULB ENTERING AIR TEMP., AND NOMINAL AIR QUANTITY LISTED.
2. AGA CERTIFIED UL LISTED AND LABELED.
3. PROVIDE WITH LOW AMBIENT KIT.
4. REFRIG. PIPING TO BE R-410A, SIZED PER TOTAL INSTALLED EQUIVALENT LENGTH. LONG-LINE APPLICATION TO BE PROVIDED WHENEVER MFG. RECOMM. LENGTHS ARE EXCEEDED, INCL. LIQUID LINE SOLENOID VALVES, ACCUMULATOR, AND OTHER SPECIAL PRECAUTIONS PER MANUFACTURER'S RECOMMENDATIONS. MAX T.E.L. IS 100'.
5. PROVIDE SINGLE POINT ELECTRICAL CONNECTION WITH FACTORY ELECTRIC DISCONNECT KIT FOR BOTH INDOOR AND OUTDOOR UNIT.
6. PROVIDE MANUFACTURERS 7-DAY PROGRAMMABLE TOUCHSCREEN THERMOSTAT WITH AUTO-CHANGEOVER, CONTROL WIRING AND ASSOCIATED ACCESSORIES REQUIRED TO MEET SEQUENCE OF OPERATION. PROVIDE THERMOSTAT CLEAR LOCKING COVER.
7. PROVIDE NEW FILTERS IN UNIT WHEN BUILDING IS TURNED OVER TO OWNER/TENANT.
8. CONDENSING UNIT TO BE INSTALLED LEVEL ON 4" UTILITY PAD.
9. PROVIDE CONDENSATE OVERFLOW SENSOR IN DRAIN PAN TO DE-ENERGIZE UNIT SHOULD A CLOGGED CONDENSATE DRAIN CONDITION OCCUR.
10. WARRANTY - 10 YA HEAT EXCHANGER / 5YR COMPRESSOR / 3 YR CONTROLLER
11. PROVIDE FACTORY INSTALLED NON-BLEED TXV, EVAPORATOR DEFROST CONTROLS AND AIR TIGHT CABINET CONSTRUCTION FOR INDOOR UNIT.
12. INDOOR UNIT SHALL BE PROVIDED WITH VIBRATION ISOLATION.
13. WARRANTY - 10 YR HEAT EXCHANGER / 5 YR COMPRESSOR / 3 YR CONTROLLER.
14. PROVIDE IONIZED TYPE SMOKE DETECTOR IN RETURN AIR DUCT.

MECHANICAL LEGEND

SYMBOL	ABBREVIATION	SERVICE
10x10	RET / SUP EXH / OSA	RECTANGULAR DUCT - RETURN / SUPPLY / EXHAUST / OUTSIDE AIR
8ø	RET / SUP EXH / OSA	ROUND DUCT - RETURN / SUPPLY / EXHAUST / OUTSIDE AIR
──	-	SUPPLY/RETURN TAP DUCT
◸	-	TURNING VANES
☒ ⧄ ⧅	-	NEW SUPPLY/RETURN/EXHAUST GRILLE
▣	EF	CEILING EXHAUST FAN
▭	CF	CONDENSING FURNACE
◎	CU	CONDENSING UNIT
(SD)	SD	SMOKE DUCT DETECTOR
(T)	T-STAT	THERMOSTAT
(TS)	-	TEMPERATURE SENSOR
→	-	AIRFLOW DIRECTION
(UC)	UC	UNDERCUT DOOR 3/4", BY G.C.
⊟	MVD	MANUAL VOLUME DAMPER
⊥	-	GAS PRESSURE REGULATOR, 2.0 PSI - 0.5 PSI
⋈	-	GAS SHUT-OFF VALVE
M	-	MOTOR OPERATED DAMPER

FAN SCHEDULE

SYMBOL	SERVICE	TYPE	CFM	APPROX. S.P.	DRIVE	RPM	ELECTRICAL DATA			SONES	WEIGHT (LBS)	MANUFACTURER	GREENHECK	CONTROL	ACCESSORIES
							WATTS	H.P.	VOLTAGE						
EF-1	SEE PLAN	EXHAUST	100	0.15	DIRECT	950	100	-	120v/1ø	1.5	20	GREENHECK	SP-B110	D	1 2 6 9 14
EF-2	SEE PLAN	EXHAUST	100	0.15	DIRECT	950	100	-	120v/1ø	1.5	20	GREENHECK	SP-B110	D	1 2 6 9 14
EF-3	SEE PLAN	EXHAUST	100	0.15	DIRECT	950	100	-	120v/1ø	1.5	20	GREENHECK	SP-B110	D	1 2 6 9 14
EF-4	SEE PLAN	EXHAUST	100	0.15	DIRECT	950	100	-	120v/1ø	1.5	20	GREENHECK	SP-B110	C	1 2 6 9 14
EF-5	SEE PLAN	EXHAUST	300	0.15	DIRECT	1000	121	-	120v/1ø	3.0	20	GREENHECK	SP-A410	D	1 2 6 9 14
EF-6	SEE PLAN	EXHAUST	300	0.15	DIRECT	1000	121	-	120v/1ø	3.0	20	GREENHECK	SP-A410	D	1 2 6 9 14

ACCESSORIES

1: INTEGRAL DISCONNECT SWITCH
2: BACKDRAFT DAMPER
3: MFG. PREFAB. ROOF CURB
4: BIRDSCREEN
5: ACOUSTICAL LINING
6: HANGING BRACKETS WITH VIBRATION ISOLATION
7: DISCHARGE HOOD
8: MFG. WALL LOUVER, COLOR BY ARCH MFG. RECOMMENDED SIZE
9: MFG. ROOF CAP, COLOR BY ARCH MFG. RECOMMENDED SIZE
10: WALL MOUNTING COLLAR
11: MOTORSIDE FAN GUARD
12: 2" WASHABLE ALUMINUM FILTERS
13: DUCT ADAPTER
14: EXHAUST GRILLE (COLOR BY ARCH)
15: U.L. 762
16: PROVIDE WITH FACTORY MOUNTED RADIATION DAMPER (GREENHECK MODEL CRD-310)
17: SPEED CONTROLLER

CONTROL:

A: WALL MOUNTED PUSH BUTTON SWITCH/STARTER
B: WALL MOUNTED SWITCH (TIMER, 0-4 HOUR)
C: WALL MOUNTED THERMOSTAT
D: INTERLOCK WITH ROOM LIGHT SWITCH/SENSOR
E: CONTINUOUS
F: INTERLOCK WITH HOOD CONTROL BOARD

NOTES:

1. ALL FANS SHALL BE U.L. LISTED AND LABELED AND SHALL BE AMCA CERTIFIED.
2. ALL FANS SHALL BE SUPPLIED BY ONE MANUFACTURER UNLESS NOTED OTHERWISE.
3. MECHANICAL CONTRACTOR SHALL PROVIDE MAGNETIC STARTER WITH AUXILLARY CONTACTS AS REQUIRED.
4. PROVIDE INTERNAL THERMAL PROTECTION.
5. BACKDRAFT DAMPER ON ROOF SUPPLY FANS SHALL BE MOTORIZED.
6. WHEN A SPEED CONTROLLER IS REQUIRED AND MOUNTED TO EXHAUST FAN, SPEED SHALL BE ADJUSTED TO PROVIDE LISTED AIRFLOW PRIOR TO CEILING BEING INSTALLED.

GENERAL NOTES

1. ALL PIPING, DUCTS, VENTS, ETC. EXTENDING THROUGH WALLS AND ROOF SHALL BE FLASHED AND COUNTERFLASHED IN A WATERPROOF MANNER.

2. PENETRATIONS OF NONRATED WALLS, PARTITIONS, AND FLOORS OF NON-COMBUSTIBLE CONSTRUCTION SHALL BE FIRESTOPPED WITH NONCOMBUSTIBLE MATERIALS. PENETRATIONS OF NONRATED WALLS, PARTITIONS AND FLOORS OF COMBUSTIBLE CONSTRUCTION SHALL BE FIRESTOPPED WITH MATERIALS EQUIVALENT TO TWO INCHES OF WOOD. FIRESTOPPING SHALL COMPLY WITH ASTM E-814. SEAL ALL PENETRATIONS OF RATED WALL WITH FIRE DAMPER, SEALANT MATERIAL APPROVED BY LOCAL CODE.

3. CONDENSATE DRAIN PIPING SHALL BE SCHEDULE 40 PVC PIPE AND FITTINGS. IN PLENUM APPLICATIONS, DRAIN LINES SHOULD BE CAST IRON. DRAINS SHALL BE TRAPPED. TERMINATE ROOFTOP UNIT DRAINS ON A CONCRETE SPLASHBLOCK.

4. THE FOLLOWING NOTE APPLIES TO ANY TYPE OF CONTROL DEVICE, INCLUDING, BUT NOT LIMITED TO: THERMOSTAT, SENSOR, SWITCH, TIME CLOCK, ETC. INSTALL 4'-0" ABOVE FINISHED FLOOR, UNLESS OTHERWISE NOTED ON PLAN. PROVIDE THE REQUIRED DEVICE(S) FOR ALL SYSTEMS WHETHER LOCATED ON THE PLANS OR NOT. ALL CONTROL DEVICES SHALL BE LABELED ACCORDING TO THE EQUIPMENT THEY CONTROL. ANY THERMOSTAT LOCATED IN A PUBLIC AREA SHALL BE PROVIDED WITH A LEXAN LOCKABLE COVER. ANY THERMOSTAT OR SENSOR LOCATED ON AN EXTERIOR WALL SHALL BE PROVIDED WITH AN INSULATED BASE. RELOCATE ANY EXISTING CONTROL DEVICE(S) TO LOCATION SHOWN ON PLAN.

5. MECHANICAL CONTRACTOR SHALL PAINT ALL RELIEF AND INTAKE HOODS PER ARCHITECT. EXHAUST AND INTAKE OPENINGS SHALL MAINTAIN A MINIMUM OF 10' FROM EACH OTHER.

6. THE EXTERNAL STATIC PRESSURE FOR ALL FANS, HVAC UNITS, ETC. IS BASED ON DUCT ROUTING AS INDICATED ON PLANS. THE MECHANICAL CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DEVIATIONS IN THE FIELD AS AIR QUANTITIES MAY BE AFFECTED.

7. CONTRACTOR SHALL NOTIFY ENGINEER OF RECORD A MINIMUM OF TEN BUSINESS DAYS IN ADVANCE FOR COMPLETION OF FIELD INSPECTION FOR APPENDIX 5 OF THE LATEST NC ENERGY CODE, IF ENFORCED BY LOCAL JURISDICTION.

ELECTRIC WALL HEATER SCHEDULE

EWH-1 MARKEL E3322TTD-RP
1 KW; 120V-1ø; 3413 BTUH; 175 CFM; WITH:
BUILT-IN DISCONNECT SWITCH AND THERMOSTAT,
PENCIL-PROOF LOUVERS, CABINET FOR SURFACE
MOUNTING.

GRILLE / DIFFUSER SCHEDULE

SYMBOL	SERVICE	CFM RANGE	FACE SIZE	NECK SIZE	TYPE	OBD	PRICE
A	SUPPLY	0 - 100	12x12	6"ø	LOUVER	NO	SMD
B	SUPPLY	0 - 100	24x24	6"ø	LOUVER	NO	SMD
C	SUPPLY	105 - 175	24x24	8"ø	LOUVER	NO	SMD
D	SUPPLY	180 - 270	24x24	10"ø	LOUVER	NO	SMD
E	SUPPLY	275 - 390	24x24	12"ø	LOUVER	NO	SMD
F	SUPPLY	395 - 535	24x24	14"ø	LOUVER	NO	SMD
G	SUPPLY	155 - 175	24x24	16"ø	LINEAR	NO	SDS
H	RETURN	0 - 175	(2) 1" SLOTS x 48"	--	PERFORATED	NO	PDDR
J	RETURN	180 - 270	24x24	10"ø	PERFORATED	NO	PDDR
K	RETURN	275 - 390	24x24	12"ø	PERFORATED	NO	PDDR
L	RETURN	395 - 500	24x24	12x12	PERFORATED	NO	PDDR
M	RETURN	505 - 885	24x24	16x16	PERFORATED	NO	PDDR
N	RETURN	890 - 1800	24x24	22x22	PERFORATED	NO	PDDR

NOTES:

1. ALL DEVICES SHALL BE FINISHED WITH AN ENAMEL PAINT TO MATCH CEILING OR COLOR SELECTED BY ARCHITECT
2. ALL DEVICES SHALL BE FURNISHED WITH FRAMES SUITABLE FOR TYPE OF INSTALLATION REQUIRED.
3. ALL LINEAR DIFFUSERS SHALL BE FURNISHED WITH END CAPS.
4. DIFFUSERS AT RATED CEILINGS SHALL BE ALL STEEL CONSTRUCTION WITH RADIATION DAMPER. PROVIDE RADIATION INSULATION BLANKET ON TOP SIDE OF DIFFUSER AS REQUIRED TO MAINTAIN RATING OF CEILING.

BI-POLAR IONIZATION SCHEDULE

SYMBOL	LOCATION	SA FLOW CFM	OSA FLOW CFM	QUANTITY	PRESSURE DROP	VOLTAGE	WATTS	MANUFACTURER/MODEL	REMARKS
								GLOBAL PLASMA SOLUTIONS	
BPI-1	CF-3	1600	175	1	0.05"W.C.	24VAC	0.12	GPS-RN	1-8
BPI-2	CF-5	1600	160	1	0.05"W.C.	24VAC	0.12	GPS-RN	1-8
BPI-3	CF-6	1600	160	1	0.05"W.C.	24VAC	0.12	GPS-RN	1-8
BPI-4	AH-1	4000	365	2	0.05"W.C.	24VAC	0.12	GPS-RN	1-8
BPI-5	AH-2	3000	350	2	0.05"W.C.	24VAC	0.12	GPS-RN	1-8
BPI-6	AH-3	3000	350	2	0.05"W.C.	24VAC	0.12	GPS-RN	1-8

NOTES & ACCESSORIES:

1. PROVIDE AUTO-ELECTRONIC FLOW SENSING.
2. PROVIDE IAQ-2 CALCULATION. PRESCRIPTIVE PROCEDURE WILL NOT BE ALLOWED.
3. OZONE DETECTABLE SYSTEM WILL NOT BE ALLOWED.
4. SYSTEM WILL BE MAINTENANCE FREE. NO REPLACMENT COMPONENT SYSTEMS ALLOWED.
5. ALL MANUFACTURERS MUST PASS UL 867-2007 OZONE CHAMBER TESTING BY EITHER UL OR ETL.
6. POWERED PATICULATE FILERS, POLARIZED MEDIA FILTERS, UNI-POLAR ION GENERATORS, PLASMA PARTICULATE FILTERS WITH UV SYSTEMS, AND BI-POLAR IONIZATION SYSTEMS REQUIRING PERISHABLE GLASS TUBES WILL NOT BE ACCEPTABLE.
7. PROVIDE TRANSFORMER AS REQUIRED FOR VOLTAGE REQUESTED. COORDINATE WITH ELECTRICAL CONTRACTOR.
8. PROVIDE WITH MANUFACTURER'S DUAL ENDED POWER CABLE, MODEL PC2, TO CONNECT UNITS FROM ONE POWER SUPPLY.

EQUAL PRODUCTS: AIRGENICS & BIOXYGEN

BGA BRIAN GADDIS ARCHITECTS
1900 Abbott Street / Suite 103
Charlotte, North Carolina 28203
704-335-1292
www.begarchitect.com

ALLIED CONSULTING ENGINEERS
709 Catawba St.
Belmont, NC 28012
P: (704) 399-3943
www.allied-engineers.com
North Carolina COA #P-0342
ALLIED #22319

J. David Hood
SEAL 030549
J. DAVID HOOD
3-2-23

NEW EDUCATION BUILDING

PALISADES EPISCOPAL SCHOOL

13120 GRAND PALISADES PARKWAY
CHARLOTTE, NORTH CAROLINA

Date: 03.02.23 BGa Project 21122

Issue Dates:

No: Date: Description:

MECHANICAL SPECIFICATIONS AND SCHEDULES

M001

VENTILATION CALCULATIONS CF-1

1.) CALCULATIONS (Table 403.3)

TYPE OF ROOM	OCCUPANCY CLASSIFICATION	AREA (FT²), A_Z	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON), R_P	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/FT²), R_A	OCCUPANT LOAD (PER 1000/FT²)	NUMBER OF PEOPLE, P_Z	REQUIRED TOTAL CFM OSA, V_{bz}
	Office spaces	371	5	0.06	5	2	32
	Main entry lobbies	872	5	0.06	10	9	96
	Storage rooms	90	--	0.12	-	-	11

2.) ZONE AIR DISTRIBUTION EFFECTIVENESS (Table 403.3.1.2)

Ceiling supply of warm air and ceiling return 0.8 $= E_Z$

3.) ZONE OUTDOOR AIRFLOW (Section 403.3.1.3)

OFFICE

$V_{oz} = V_{bz} / E_z =$ 39 CFM

LOBBY

$V_{oz} = V_{bz} / E_z =$ 120 CFM

STORAGE

$V_{oz} = V_{bz} / E_z =$ 14 CFM

4.) SYSTEM CLASSIFICATION (Section 403.2.3.1)

AREA OF WORK IS CONSIDERED A MULTIPLE ZONE RECIRCULATING SYSTEM

OFFICE

$Z_P = V_{OZ} / V_{PZ} =$ 0.07 CFM

where, $V_{PZ} =$ 540 CFM = primary airflow of zone

LOBBY

$Z_P = V_{OZ} / V_{PZ} =$ 0.09 CFM

where, $V_{PZ} =$ 1,290 CFM = primary airflow of zone

STORAGE

$Z_P = V_{OZ} / V_{PZ} =$ 0.14 CFM

where, $V_{PZ} =$ 100 CFM = primary airflow of zone

5.) SYSTEM VENTILATION EFFICIENCY (Table 403.3.2.3.2)

Per Table 403.3.2.3.2, Max Z_P is the largest value of Z_P among all the zones served by the system.

Max Z_P	E_V
≤ 0.15	1.0

6.) OCCUPANT DIVERSITY (Section 403.3.2.3.3)

$P_S =$ 11 = maximum # of occupants expected to be concurrently in all zones served by the system

$D = P_S / \Sigma_{ALL\ ZONES} P_Z =$ 1 = occupant diversity

where, $P_Z = P_S$

$V_{OU} = D\, \Sigma_{ALL\ ZONES} R_P P_Z + \Sigma_{ALL\ ZONES} R_A A_Z =$ 138 CFM

7.) **ODA INTAKE FLOW RATE** (Section 403.3.2.3.4)

$V_{OT} = V_{OU} / E_V =$ 138 CFM 140 CFM PROVIDED

VENTILATION CALCULATIONS CF-2

1.) CALCULATIONS (Table 403.3)

TYPE OF ROOM	OCCUPANCY CLASSIFICATION	AREA (FT²), A_Z	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON), R_P	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/FT²), R_A	OCCUPANT LOAD (PER 1000/FT²)	NUMBER OF PEOPLE, P_Z	REQUIRED TOTAL CFM OSA, V_{bz}
	Corridors	816	--	0.06	-	-	49

2.) ZONE AIR DISTRIBUTION EFFECTIVENESS (Table 403.3.1.2)

Ceiling supply of warm air and ceiling return 0.8 $= E_Z$

3.) ZONE OUTDOOR AIRFLOW (Section 403.3.1.3)

CORRIDOR

$V_{oz} = V_{bz} / E_z =$ 61 CFM

4.) SYSTEM CLASSIFICATION (Section 403.2.2.1)

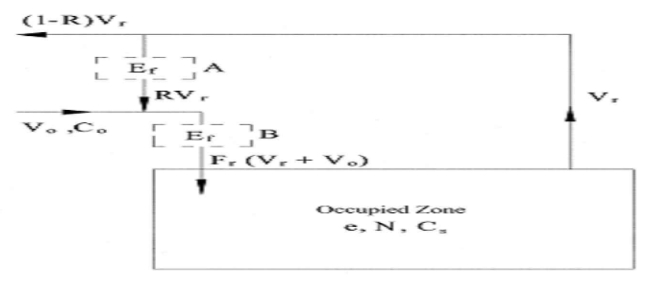
AREA OF WORK IS CONSIDERED A SINGLE ZONE SYSTEM

$V_{OT} = V_{OZ} =$ 61 CFM 100 CFM DELIVERED

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
CF-3	Educational Facilities	Classrooms (AGE 9 +)	1,018.0	35.0	10.0	0.12	350	122	0.8	590 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	175
Supply Air (Vs)	1,600
Return Air (Vr)	1425
Recirc. Flow Factor (R)	0.89
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant

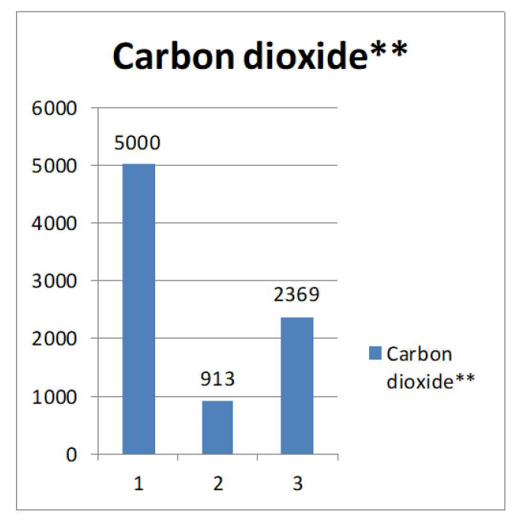


Air Changes Per Hour	10.5	VRP OA CFM per person	16.9
Outside Air Per VRP	590 CFM	IAQ OA CFM per person	5.0
Outside Air Per IAQ	175 CFM		
Outside Air Savings	415 CFM	Winter Heating Savings	
OA Summer Drybulb	94.0	OA Winter Design DB (F)	45
OA Summer Wetbulb	76.0	Supply Air DB Setpoint (F)	85
Coil Leaving Air Drybulb (F	55.0	MBH Saved Winter	18.0
Coil Leaving Air Wetbulb (F	55.0	KW Saved Winter	5.3
OA MBH Saved Summer*	#NAME?		
OA Tons Saved Summer*	#NAME?		

*OA = Outside Air

***OSHA, NIOSH & WHO most conservative values used http://www.cdc.gov/niosh/npg/npgsyn-a.html

Indoor Contaminants Generated By People & From Outdoors	Maximum Threshold Value (PPM)	Steady State Using the VRP* (Prescribed OA) Plasma Off	Steady State Using the IAQ Method (Reduced OA) Plasma On	Is Steady State Level Acceptable at Reduced OA Levels?	Contaminant Generation Rate (PPM)	Filtration Effectiveness	Cognizant Authority***
Acetaldehyde	100.0	0.01111	0.00111	Yes	0.00032	50%	OSHA
Acetone	250.0	0.00158	0.00034	Yes	0.00433	50%	NIOSH
Ammonia	25.00	0.01226	0.00718	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00025	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00005	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	913	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00011	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00004	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00532	0.00053	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00009	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00023	Yes	0.00000	50%	OSHA



1 = ASHRAE & NIOSH C02 Limit

2 = C02 Level at Ventilation Rate OA Flow Rate

3 = C02 Level at IAQ Procedure OA Flow Rate

**Carbon dioxide has been provided for reference only for gathering demand control ventilation (DCV) setpoints. The National Research Council was commissioned by the US Navy to prove C02 is not a contaminant of concern when using air purification to control the other contaminants of concern, as found on submarines.

Building materials and furnishings assumed to have no VOCs and off-gassing is complete

All yellow shaded boxes require user input or review

Is IAQ acceptable at reduce outside air levels?	Yes

VENTILATION CALCULATIONS CF-4

1.) CALCULATIONS (Table 403.3)

TYPE OF ROOM	OCCUPANCY CLASSIFICATION	AREA (FT²), A_Z	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/PERSON), R_P	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE (CFM/FT²), R_A	OCCUPANT LOAD (PER 1000/FT²)	NUMBER OF PEOPLE, P_Z	REQUIRED TOTAL CFM OSA, V_{bz}
	Corridors	1,203	--	0.06	-	-	72

2.) ZONE AIR DISTRIBUTION EFFECTIVENESS (Table 403.3.1.2)

Ceiling supply of warm air and ceiling return 0.8 $= E_Z$

SPLIT SYSTEM AIR HANDLING UNIT SCHEDULE

TAG	TRANE AIR HANDLER MODEL NO.	NOMINAL TONS	LOCATION	WEIGHT (LBS.)	TOTAL CFM	OA CFM	MAX. FAN HP	ESP	MBH TOT. COOL	MBH SEN. COOL	MIN. IEER	VOLTS /PHASE	MCA	MOCP	TAG	TRANE CONDENSING MODEL NO.	LOCATION	WEIGHT (LBS.)	VOLTS /PHASE	MCA	MOCP	NOTES
AH–1	TWE12041	10.0	SEE PLAN	480	4000	365	2.0	0.40	120.2	98.5	14.8	208v/1ø	13	20	ACC–1	TTA12043	GROUND	500	208v/3ø	41	50	1 THRU 16
AH–2	TWE09041	7.5	SEE PLAN	390	3000	350	1.5	0.40	98.0	76.3	14.8	208v/1ø	9	15	ACC–2	TTA09043	GROUND	350	208v/3ø	36	60	1 THRU 16
AH–3	TWE09041	7.5	SEE PLAN	390	3000	350	1.5	0.40	98.0	76.3	14.8	208v/1ø	9	15	ACC–3	TTA09043	GROUND	350	208v/3ø	36	60	1 THRU 16

NOTES & ACCESSORIES:

1. COOLING CAPACITIES ARE RATED IN ACCORDANCE WITH ARI STANDARD 210/290 AT 95°F AMBIENT OUTDOOR AIR TEMP., 80°F DRY BULB, 67°F WET BULB ENTERING AIR TEMP., AND NOMINAL AIR QUANTITY LISTED.
2. AGA CERTIFIED UL LISTED AND LABELED.
3. PROVIDE WITH LOW AMBIENT KIT.
4. REFRIG. PIPING TO BE R–410A, SIZED PER TOTAL INSTALLED EQUIVALENT LENGTH. LONG–LINE APPLICATION TO BE PROVIDED WHENEVER MFG. RECOMM. LENGTHS ARE EXCEEDED, INCL. LIQUID LINE SOLENOID VALVES, ACCUMULATOR, AND OTHER SPECIAL PRECAUTIONS PER MANUFACTURER'S RECOMMENDATIONS. MAX T.E.L. IS 100'.
5. PROVIDE SINGLE POINT ELECTRICAL CONNECTION WITH FACTORY ELECTRIC DISCONNECT KIT FOR BOTH INDOOR AND OUTDOOR UNIT.
6. PROVIDE HONEYWELL VISION PRO 8000 WI–FI ENABLED THERMOSTAT/HUMIDITY SENSOR. PROVIDE THERMOSTAT CLEAR LOCKING COVER.
7. PROVIDE NEW FILTERS IN UNIT WHEN BUILDING IS TURNED OVER TO OWNER/TENANT.
8. CONDENSER TO BE INSTALLED LEVEL ON 4" UTILITY PAD.
9. PROVIDE CONDENSATE OVERFLOW SENSOR IN DRAIN PAN TO DE–ENERGIZE UNIT SHOULD A CLOGGED CONDENSATE DRAIN CONDITION OCCUR.
10. PROVIDE A CONDENSATE PUMP IN DRAIN PAN. CONDENSATE PUMP SHALL BE WIRED TO DE–ENERGIZE UNIT SHOULD A CLOGGED CONDENSATE DRAIN CONDITION OCCUR.
11. PROVIDE SMOKE DUCT DETECTOR IN RETURN AIR DUCT.
12. MANUFACTURER'S DE–HUMIDISTAT, FACTORY INSTALLED APR VALVE, AS WELL AS EQUIPMENT AND CONTROLS AS REQUIRED FOR A COMPLETE WORKING SYSTEM.
13. PROVIDE FACTORY INSTALLED NON–BLEED TXV, EVAPORATOR DEFROST CONTROLS AND AIR TIGHT CABINET CONSTRUCTION FOR INDOOR UNIT.
14. INDOOR UNIT SHALL BE PROVIDED WITH VIBRATION ISOLATION.
15. WARRANTY – 10 YR HEAT EXCHANGER / 5 YR COMPRESSOR / 3 YR CONTROLLER.
16. 2 STAGE SCROLL COMPRESSOR.

EQUAL PRODUCTS: CARRIER, YORK, & LENNOX

GAS FIRED DUCT FURNACE SCHEDULE

SYMBOL	CFM	TEMP RISE	PRESS DROP	VOLTAGE	EFF,	HEATING CAPACITY INPUT (BTUH)	HEATING CAPACITY OUTPUT (BTUH)	MANUFACTURER REZNOR
DF–1	4000	–	.2"	120V/1ø	80%	200,000	160,000	SC–200
DF–2	3000	–	.2"	120V/1ø	80%	175,000	140,000	SC–175
DF–3	3000	–	.2"	120V/1ø	80%	175,000	140,000	SC–175

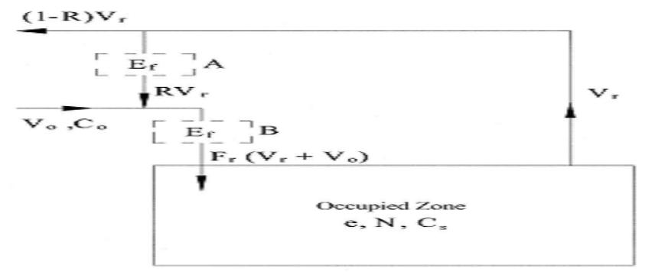
NOTES:

1. PROVIDE UNITS WITH: 24 V CONTROL TRANSFORMER, SEPERATE VENTING OPTION, SEALED FLUE COLLECTOR, ELECTRONIC MODULATION GAS CONTROL, ELECTRONIC SPARK IGNITION.

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
CF-5	Educational Facilities	Classrooms (AGE 9 +)	900.0	32.0	10.0	0.12	320	108	0.8	535 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	160
Supply Air (Vs)	1,600
Return Air (Vr)	1440
Recirc. Flow Factor (R)	0.90
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant

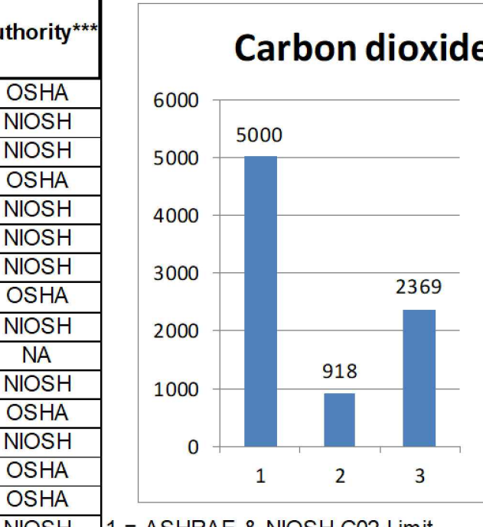


Air Changes Per Hour	11.9	VRP OA CFM per person	16.7
Outside Air Per VRP	535 CFM	IAQ OA CFM per person	5.0
Outside Air Per IAQ	160 CFM		
Outside Air Savings	375 CFM	Winter Heating Savings	
OA Summer Drybulb	94.0	OA Winter Design DB (F)	45
OA Summer Wetbulb	76.0	Supply Air DB Setpoint (F)	85
Coil Leaving Air Drybulb (F	55.0	MBH Saved Winter	16.3
Coil Leaving Air Wetbulb (F	55.0	KW Saved Winter	4.8
OA MBH Saved Summer*	#NAME?		
OA Tons Saved Summer*	#NAME?		

*OA = Outside Air

***OSHA, NIOSH & WHO most conservative values used http://www.cdc.gov/niosh/npg/npgsyn-a.html

Indoor Contaminants Generated By People & From Outdoors	Maximum Threshold Value (PPM)	Steady State Using the VRP* (Prescribed OA) Plasma Off	Steady State Using the IAQ Method (Reduced OA) Plasma On	Is Steady State Level Acceptable at Reduced OA Levels?	Contaminant Generation Rate (PPM)	Filtration Effectiveness	Cognizant Authority***
Acetaldehyde	100.0	0.01111	0.00102	Yes	0.00032	50%	OSHA
Acetone	250.0	0.00159	0.00031	Yes	0.00433	50%	NIOSH
Ammonia	25.00	0.01235	0.00662	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00023	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00005	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	918	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00010	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00003	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00533	0.00049	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00008	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00021	Yes	0.00000	50%	OSHA



1 = ASHRAE & NIOSH C02 Limit

2 = C02 Level at Ventilation Rate OA Flow Rate

3 = C02 Level at IAQ Procedure OA Flow Rate

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Building materials and furnishings assumed to have no VOCs and off-gassing is complete

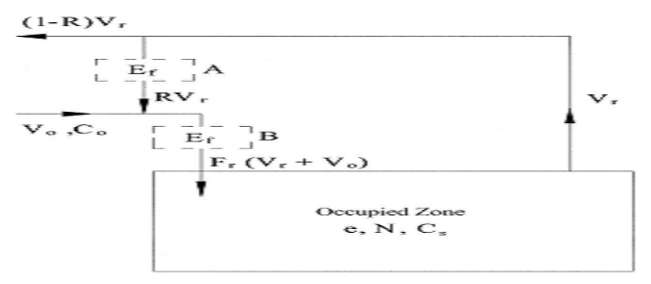
All yellow shaded boxes require user input or review

Is IAQ acceptable at reduce outside air levels?	Yes

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
CF-6	Educational Facilities	Classrooms (AGE 9 +)	900.0	32.0	10.0	0.12	320	108	0.8	535 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	160
Supply Air (Vs)	1,600
Return Air (Vr)	1440
Recirc. Flow Factor (R)	0.90
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant

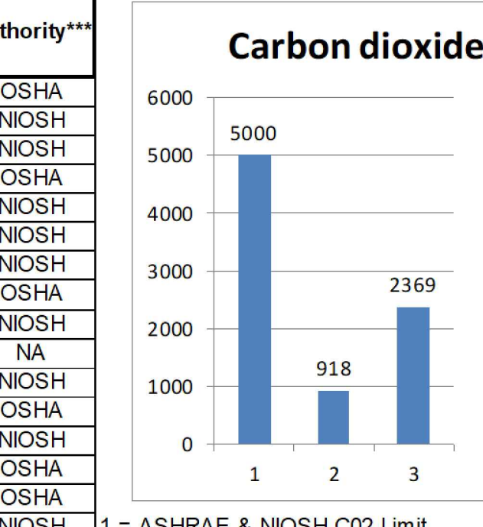


Air Changes Per Hour	11.9	VRP OA CFM per person	16.7
Outside Air Per VRP	535 CFM	IAQ OA CFM per person	5.0
Outside Air Per IAQ	160 CFM		
Outside Air Savings	375 CFM	Winter Heating Savings	
OA Summer Drybulb	94.0	OA Winter Design DB (F)	45
OA Summer Wetbulb	76.0	Supply Air DB Setpoint (F)	85
Coil Leaving Air Drybulb (F	55.0	MBH Saved Winter	16.3
Coil Leaving Air Wetbulb (F	55.0	KW Saved Winter	4.8
OA MBH Saved Summer*	#NAME?		
OA Tons Saved Summer*	#NAME?		

*OA = Outside Air

***OSHA, NIOSH & WHO most conservative values used http://www.cdc.gov/niosh/npg/npgsyn-a.html

Indoor Contaminants Generated By People & From Outdoors	Maximum Threshold Value (PPM)	Steady State Using the VRP* (Prescribed OA) Plasma Off	Steady State Using the IAQ Method (Reduced OA) Plasma On	Is Steady State Level Acceptable at Reduced OA Levels?	Contaminant Generation Rate (PPM)	Filtration Effectiveness	Cognizant Authority***
Acetaldehyde	100.0	0.01111	0.00102	Yes	0.00032	50%	OSHA
Acetone	250.0	0.00159	0.00031	Yes	0.00433	50%	NIOSH
Ammonia	25.00	0.01235	0.00662	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00023	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00005	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	918	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00010	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00003	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00533	0.00049	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00008	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00021	Yes	0.00000	50%	OSHA



1 = ASHRAE & NIOSH C02 Limit

2 = C02 Level at Ventilation Rate OA Flow Rate

3 = C02 Level at IAQ Procedure OA Flow Rate

**Carbon dioxide has been provided for reference only for gathering demand control ventilation (DCV) setpoints. The National Research Council was commissioned by

Building materials and furnishings assumed to have no VOCs and off-gassing is complete

Is IAQ acceptable at reduce

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ALLIED #22319

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3-2-23

NEW EDUCATION BUILDING

PALISADES
EPISCOPAL SCHOOL

13120 GRAND PALISADES PARKWAY
CHARLOTTE, NORTH CAROLINA

Date: 03.02.23 BGa Project: 21122

Issue Dates:

No: Date: Description:

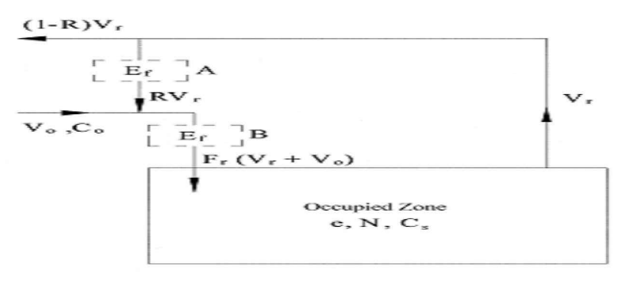
OUTDOOR AIR
CALCULATIONS

M002

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
AH-1	Educational Facilities	Classrooms (AGE 9 +)	2,182.0	73.0	10.0	0.12	730	262	0.8	1240 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	365
Supply Air (Vs)	4,000
Return Air (Vr)	3635
Recirc. Flow Factor (R)	0.91
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant



Air Changes Per Hour	12.2
Outside Air Per VRP	1240 CFM
Outside Air Per IAQ	365 CFM
Outside Air Savings	875 CFM
OA Summer Drybulb	94.0
OA Summer Wetbulb	76.0
Coil Leaving Air Drybulb (F	55.0
Coil Leaving Air Wetbulb (F	55.0
OA MBH Saved Summer*	63.9
OA Tons Saved Summer*	5.3

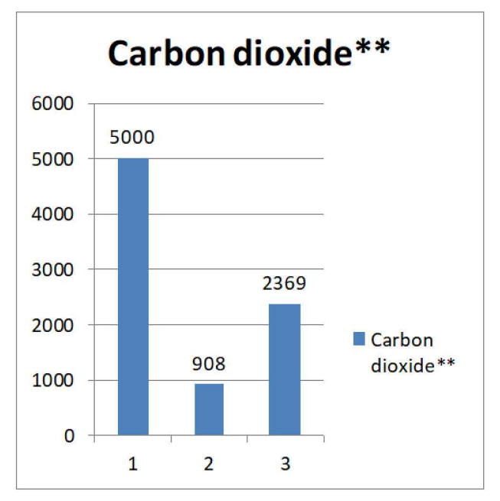
VRP OA CFM per person	17.0
IAQ OA CFM per person	5.0

Winter Heating Savings	
OA Winter Design DB (F)	45
Supply Air DB Setpoint (F)	85
MBH Saved Winter	38.0
KW Saved Winter	11.1

*OA = Outside Air

***OSHA, NIOSH & WHO most conservative values used http://www.cdc.gov/niosh/npg/npgsyn-a.html

Indoor Contaminants Generated By People & From Outdoors	Maximum Threshold Value (PPM)	Steady State Using the VRP* (Prescribed OA) Plasma Off	Steady State Using the IAQ Method (Reduced OA) Plasma On	Is Steady State Level Acceptable at Reduced OA Levels?	Contaminant Generation Rate (PPM)	Filtration Effectiveness	Cognizant Authority***
Acetaldehyde	100.0	0.01111	0.00094	Yes	0.00032	50%	OSHA
Acetone	250.0	0.00158	0.00029	Yes	0.00433	50%	NIOSH
Ammonia	25.00	0.01218	0.00609	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00022	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00005	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	908	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00009	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00003	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00532	0.00045	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00008	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00019	Yes	0.00000	50%	OSHA



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Building materials and furnishings assumed to have no VOCs and off-gassing is complete

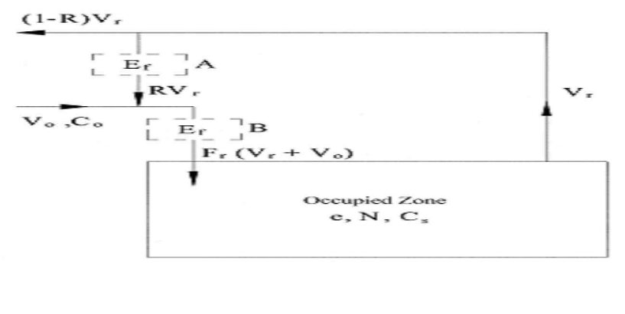
All yellow shaded boxes require user input or review

Is IAQ acceptable at reduce outside air levels?	Yes

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
AH-2	Educational Facilities	Classrooms (AGE 9 +)	2,016.0	70.0	10.0	0.12	700	242	0.8	1177 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	350
Supply Air (Vs)	3,000
Return Air (Vr)	2650
Recirc. Flow Factor (R)	0.88
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant



Air Changes Per Hour	9.9
Outside Air Per VRP	1177 CFM
Outside Air Per IAQ	350 CFM
Outside Air Savings	827 CFM
OA Summer Drybulb	94.0
OA Summer Wetbulb	76.0
Coil Leaving Air Drybulb (F	55.0
Coil Leaving Air Wetbulb (F	55.0
OA MBH Saved Summer*	60.4
OA Tons Saved Summer*	5.0

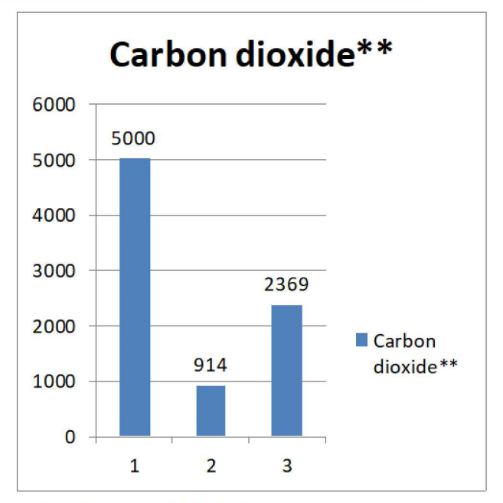
VRP OA CFM per person	16.8
IAQ OA CFM per person	5.0

Winter Heating Savings	
OA Winter Design DB (F)	45
Supply Air DB Setpoint (F)	85
MBH Saved Winter	35.9
KW Saved Winter	10.5

*OA = Outside Air

***OSHA, NIOSH & WHO most conservative values used http://www.cdc.gov/niosh/npg/npgsyn-a.html

Indoor Contaminants Generated By People & From Outdoors	Maximum Threshold Value (PPM)	Steady State Using the VRP* (Prescribed OA) Plasma Off	Steady State Using the IAQ Method (Reduced OA) Plasma On	Is Steady State Level Acceptable at Reduced OA Levels?	Contaminant Generation Rate (PPM)	Filtration Effectiveness	Cognizant Authority***
Acetaldehyde	100.0	0.01111	0.00118	Yes	0.00032	50%	OSHA
Acetone	250.0	0.00158	0.00036	Yes	0.00433	50%	NIOSH
Ammonia	25.00	0.01229	0.00760	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00027	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00006	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	914	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00011	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00004	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00533	0.00057	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00010	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00024	Yes	0.00000	50%	OSHA



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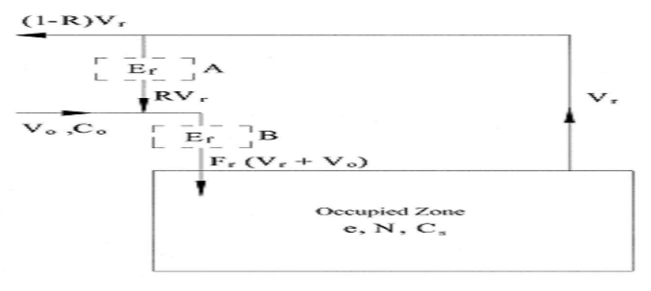
Is IAQ acceptable at reduce outside air levels?	Yes

ASHRAE OUTDOOR AIR CALCULATIONS PER ASHRAE 62

Zone Tag	Facility Type	Zone Use	Zone Floor Area (square ft) Az	Zone Max Occupancy Pz	Table 6.1 OA per Occupant Rp	Table 6.1 cfm/ft2 Ra	Pz * Rp Pz * Rp	Az * Ra Az * Ra	Table 6.2 Ventilation Effectiveness Ez	Outdoor Air to Zone (CFM) with Ez correction (Vbz/Ez)
AH-3	Educational Facilities	Classrooms (AGE 9 +)	2,016.0	70.0	10.0	0.12	700	242	0.8	1177 OA required per VRP

Zone Height (feet)	9.0
Desired Outside Air (Vo) IAQP	350
Supply Air (Vs)	3,000
Return Air (Vr)	2650
Recirc. Flow Factor (R)	0.88
Ventilation Effectiveness (Ez)	0.8
Level of Physical Activity	Sedentary
Filter Location	B
HVAC Flow Type	Constant
Outdoor Air Flow Type	Constant



Air Changes Per Hour	9.9
Outside Air Per VRP	1177 CFM
Outside Air Per IAQ	350 CFM
Outside Air Savings	827 CFM
OA Summer Drybulb	94.0
OA Summer Wetbulb	76.0
Coil Leaving Air Drybulb (F	55.0
Coil Leaving Air Wetbulb (F	55.0
OA MBH Saved Summer*	60.4
OA Tons Saved Summer*	5.0

VRP OA CFM per person	16.8
IAQ OA CFM per person	5.0

Winter Heating Savings	
OA Winter Design DB (F)	45
Supply Air DB Setpoint (F)	85
MBH Saved Winter	35.9
KW Saved Winter	10.5

*OA = Outside Air

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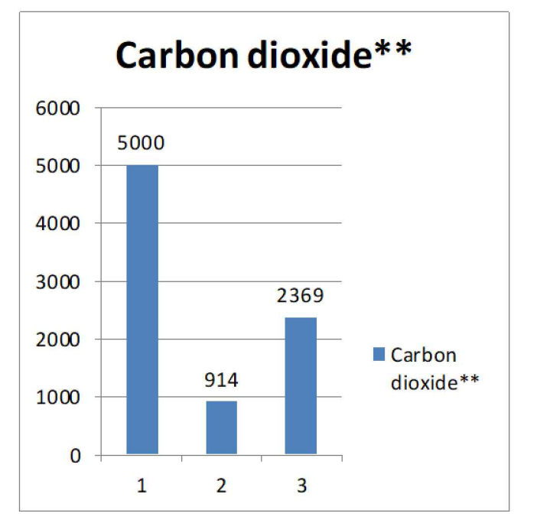
Ammonia	25.00	0.01229	0.00760	Yes	0.14210	50%	NIOSH
Benzene	1.0000	0.00252	0.00027	Yes	0.00015	50%	OSHA
2- Butanone (MEK)	200.0	0.00017	0.00006	Yes	0.00088	50%	NIOSH
Carbon dioxide**	5000	914	2369	Yes	292	0%	NIOSH
Chloroform	2.0000	0.00011	0.00001	Yes	0.00003	50%	NIOSH
Dioxane	100.0	0.00000	0.00000	Yes	0.00000	50%	OSHA
Hydrogen Sulfide	10.0	0.00000	0.00000	Yes	0.00000	50%	NIOSH
Methane	NA	1.68094	1.68094	Yes	0.00000	0%	NA
Methanol	200.0	0.00000	0.00000	Yes	0.00000	0%	NIOSH
Methylene Chloride	25.0	0.00075	0.00011	Yes	0.00080	50%	OSHA
Propane	1000.0	0.00998	0.00998	Yes	0.00000	0%	NIOSH
Tetrachloroethane	5.0000	0.00000	0.00000	Yes	0.00000	50%	OSHA
Tetrachloroethylene	100.0000	0.00037	0.00004	Yes	0.00001	50%	OSHA
Toluene	100.0000	0.00533	0.00057	Yes	0.00021	50%	NIOSH
1,1,1 - Trichloroethane	350.0000	0.00076	0.00010	Yes	0.00038	50%	NIOSH
Xylene	100.0000	0.00230	0.00024	Yes	0.00000	50%	OSHA



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Is IAQ acceptable at reduce outside air levels?	Yes

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NEW EDUCATION BUILDING

PALISADES
EPISCOPAL SCHOOL

13120 GRAND PALISADES PARKWAY
CHARLOTTE, NORTH CAROLINA

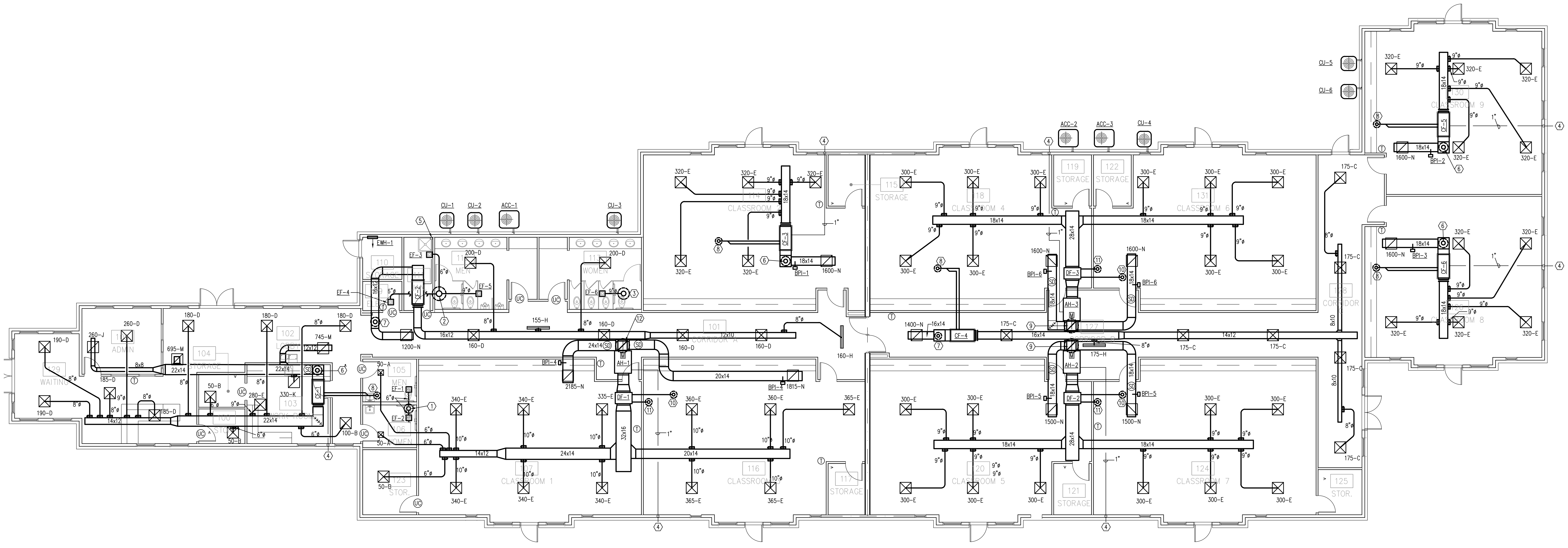
Date: 03.02.23
BGa Project: 21122

Issue Dates:

No:	Date:	Description:

OUTDOOR AIR CALCULATIONS

M003



MECHANICAL FLOOR PLAN

1
M101
SCALE: 1/8" = 1'-0"

REFERENCED NOTES

① 8"ø EXHAUST DUCT UP TO FAN MANUFACTURERS ROOF CAP. PROVIDE WITH ROOF CURB AND INSECT SCREEN

② 12"ø EXHAUST DUCT UP TO FAN MANUFACTURERS ROOF CAP. PROVIDE WITH ROOF CURB AND INSECT SCREEN

③ 9"ø EXHAUST DUCT UP TO FAN MANUFACTURERS ROOF CAP. PROVIDE WITH ROOF CURB AND INSECT SCREEN

④ 1" CONDENSATE DOWN IN WALL AND SPILL OUT AS 12" ABOVE GRADE. CONDENSATE SHALL DISCHARGE IN SUCH MANNER AS TO NOT CREATE A NUISANCE

⑤ 1" CONDENSATE DOWN TIGHT IN CORNER AND SPILL INTO MOP SINK

⑥ 8"ø OUTDOOR AIR DUCT UP TO GREENHECK MODEL GRS-8 ROOF CAP. PROVIDE WITH ROOF CURB AND INSECT SCREEN

⑦ 6"ø OUTDOOR AIR DUCT UP TO GREENHECK MODEL GRS-8 ROOF CAP. PROVIDE WITH ROOF CURB AND INSECT SCREEN

⑧ COMBINATION VENT/COMBUSTION AIR PIPING UP THROUGH ROOF TO CONCENTRIC ROOF CAP

⑨ 20x20 OUTDOOR AIR DUCT UP THROUGH ROOF TO GREENHECK GRSI-30. OUTDOOR AIR DUCT HAS BEEN SIZED TO ACCOMMODATE THE ECONOMIZER CYCLE. PROVIDE MOTORIZED OUTDOOR AIR DAMPER INTERLOCKED WITH ENTHALPY SENSOR. DAMPER SHALL BE SET TO MAINTAIN 350 CFM MIN. UPON ACTIVATION OF THE ENTHALPY SENSOR, THE DAMPER SHALL MODULATE TO FULL OPEN POSITION ALLOWING 100% OUTDOOR AIR.

⑩ 6"ø TYPE 'B' FLUE THROUGH ROOF TO CODE APPROVED ROOF CAP.

⑪ 6"ø COMBUSTION VENT UP THROUGH ROOF TO MANUFACTURERS ROOF CAP

⑫ 24x22 OUTDOOR AIR DUCT UP THROUGH ROOF TO GREENHECK GRSI-30. OUTDOOR AIR DUCT HAS BEEN SIZED TO ACCOMMODATE THE ECONOMIZER CYCLE. PROVIDE MOTORIZED OUTDOOR AIR DAMPER INTERLOCKED WITH ENTHALPY SENSOR. DAMPER SHALL BE SET TO MAINTAIN 365 CFM MIN. UPON ACTIVATION OF THE ENTHALPY SENSOR, THE DAMPER SHALL MODULATE TO FULL OPEN POSITION ALLOWING 100% OUTDOOR AIR.

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3-2-23

NEW EDUCATION BUILDING

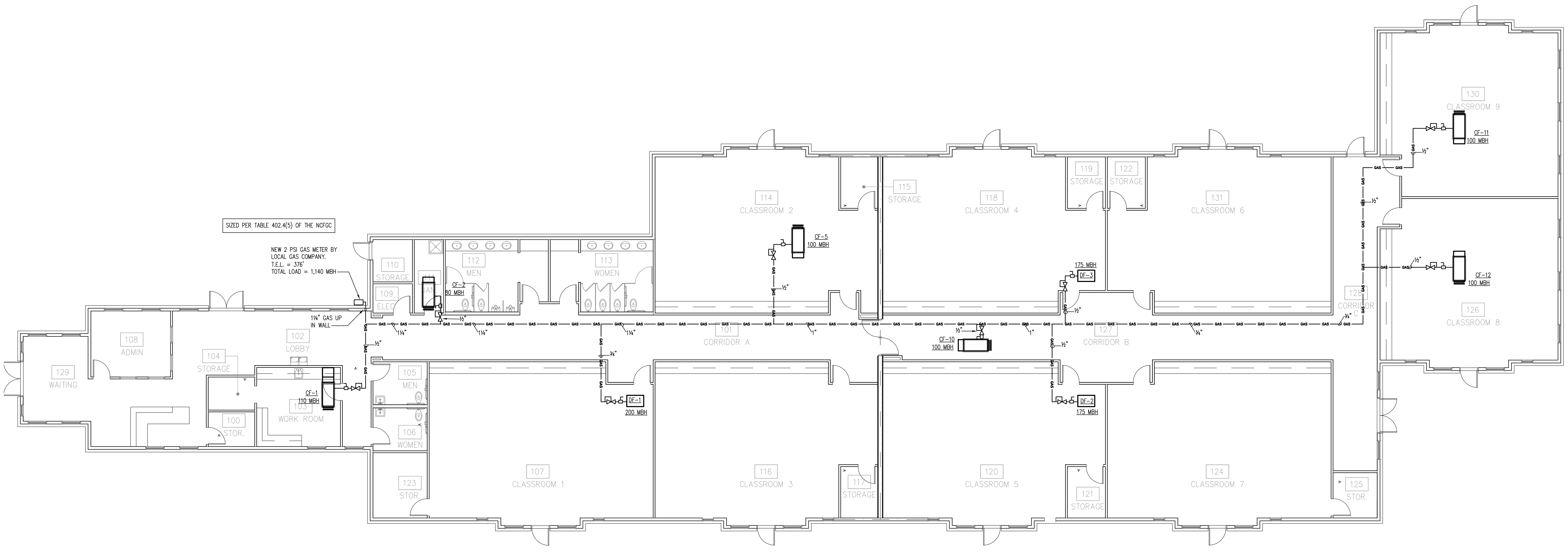
PALISADES
EPISCOPAL SCHOOL

13120 GRAND PALISADES PARKWAY
CHARLOTTE, NORTH CAROLINA

Date: 03.02.23 BGa Project: 21122
Issue Dates:
No: Date: Description:

MECHANICAL FLOOR PLAN

M101



1 / M102 **MECHANICAL GAS PLAN**
SCALE: 1/8" = 1'-0"

GAS PIPING NOTES:

1. WORK TO INCLUDE PIPING FROM GAS METER(S), OR EXISTING PIPING, TO ALL GAS-FIRED EQUIPMENT SERVING BUILDING, INCLUDING FINAL CONNECTIONS TO EQUIPMENT.
2. ALL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE LOCAL CODE REQUIREMENTS, AND THE REGULATIONS OF THE GAS COMPANY PROVIDING SERVICE.
3. THE INSTALLING SUBCONTRACTOR SHALL BE LICENSED BY THE STATE OF NC FOR THE INSTALLATION OF GAS PIPING.
4. GAS PIPING AND FITTINGS SHALL BE CLEAN AND FREE FROM CUTTING BURRS AND DEFECTS. IF THE EXISTING GAS LINE TIE-POINTS ARE NOT IN "LIKE NEW" CONDITION, THE CONTRACTOR SHALL NOTIFY THE OWNER BEFORE TAKING ACTION.
5. GAS PIPING SHALL BE SLOPED, AND SHALL BE PROVIDED WITH DRIP POCKETS OR DIRT LEGS IN ACCORDANCE WITH CODE REQUIREMENTS.
6. PROVIDE SHUT-OFF VALVE, UNION, VENTLESS GAS REGULATOR, DRIP LEG, AND TEST CONNECTION PER IFGC, SECTION 408 AND 410, AT EACH PIECE OF GAS-FIRED EQUIPMENT TO PROVIDE PRESSURE TO EQUIPMENT AS REQUIRED BY MANUFACTURER. SHUT-OFF VALVE SHALL BE PROVIDED AT ALL GAS EQUIPMENT BEFORE THE REGULATOR.
7. GAS EQUIPMENT SHALL BE AGA APPROVED.
8. EACH OUTLET SHALL BE CLOSED GAS TIGHT WITH A THREADED IRON PLUG UNTIL THE HVAC UNIT IS CONNECTED.
9. GAS PIPING SHALL BE ELECTRICALLY AND CONTINUOUSLY BONDED TO A GROUNDED ELECTRODE. GAS PIPING IS NOT TO BE USED FOR A GROUNDING ELECTRODE.
10. PRIME & TOPCOAT ALL GAS PIPING PER STATE AND LOCAL CODES. ALL PIPING EXPOSED TO THE OUTDOORS, RUN IN UNCONDITIONED SPACES, OR EXPOSED IN FINISHED SPACES SHALL BE PAINTED WITH TWO COATS OF ENAMEL PER STATE AND LOCAL CODES.
11. OUTDOOR NATURAL GAS PIPING: ASTM A 53/A 53M SCHEDULE 40 BLACK STEEL PIPE WITH MALLEABLE FITTINGS AND THREADED JOINTS.
12. INDOOR NATURAL GAS PIPING: ASTM A 53/A 53M SCHEDULE 40 BLACK STEEL PIPE WITH MALLEABLE FITTINGS AND THREADED JOINTS, OR ASTM B 88 TYPE 'K' SOFT COPPER TUBE WITH WROT COPPER FITTINGS AND BRAZED JOINTS.
13. VALVES SHALL BE GAS COCKS MANUFACTURED BY NIBCO.
14. CORRUGATED STAINLESS STEEL TUBING SHALL NOT BE USED WITHOUT WRITTEN APPROVAL. PIPING WILL LIKELY INCREASE IN SIZE IF CSST TUBING IS USED.
15. INSTALL TEST TEES NO LESS THAN 10 PIPE DIAMETERS DOWNSTREAM OF THE MP REGULATOR OUTLET IN COMPLIANCE WITH NCFGC

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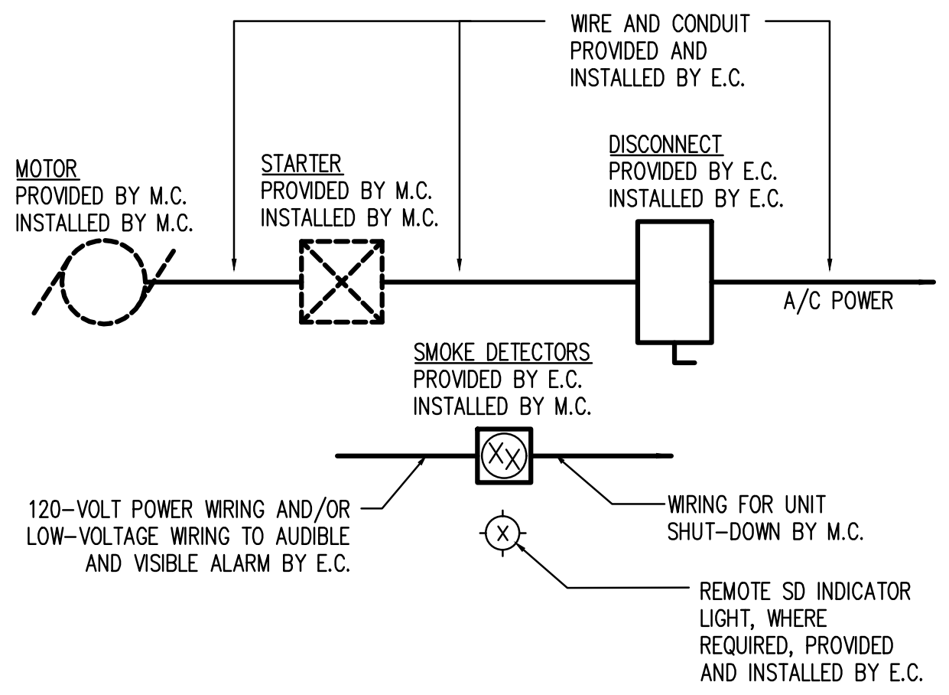
PALISADES
EPISCOPAL SCHOOL

13120 GRAND PALISADES PARKWAY
CHARLOTTE, NORTH CAROLINA

Date: 03.02.23 BGa Project 21122
Issue Dates:
No: Date: Description:

MECHANICAL GAS PLAN

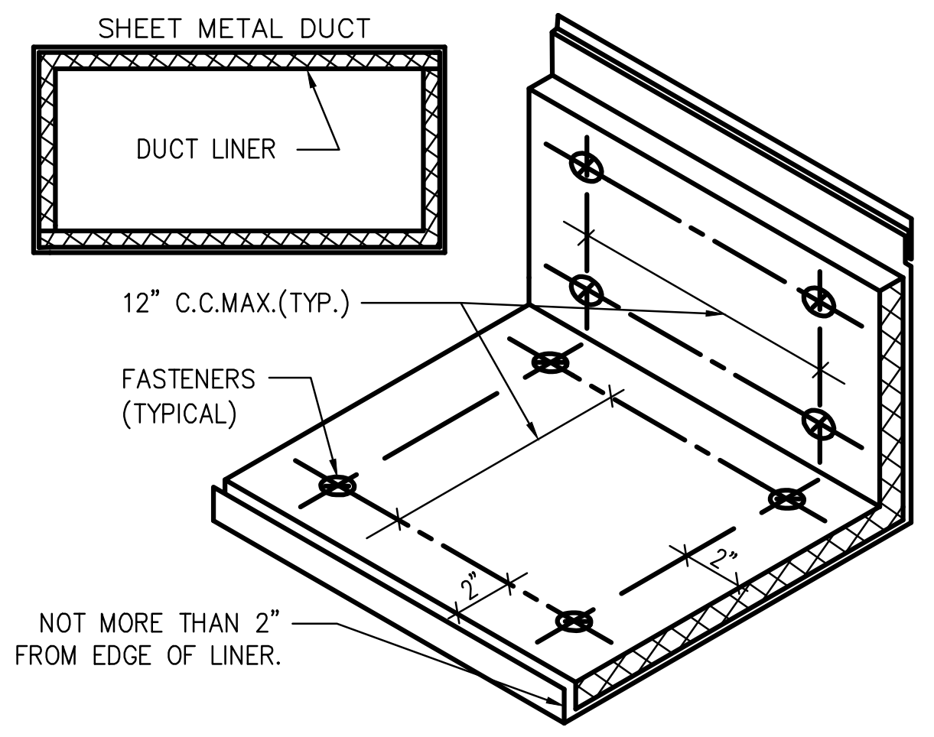


BUILDING IS NOT EQUIPPED WITH A FIRE ALARM SYSTEM, ACTIVATION OF SMOKE DETECTOR SHALL INITIATE A VISIBLE AND AN AUDIBLE SIGNAL IN AN APPROVED LOCATION – BY E.C. SAMPLING TUBES BY M.C.

NO SCALE

MECH-ELEC COORDINATION

1

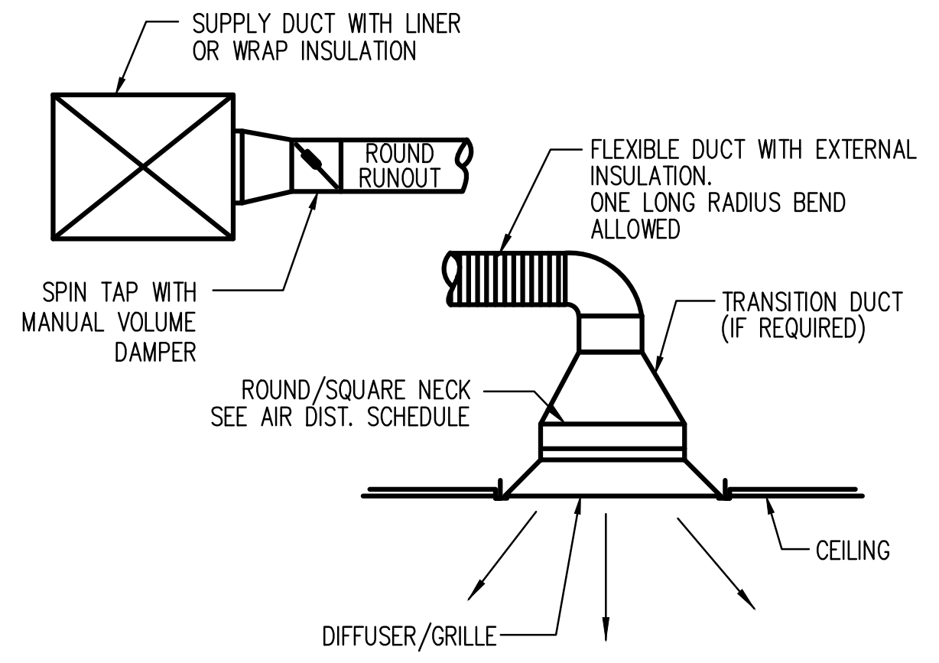


NOTE: ALL TRANSVERSE AND LONGITUDINAL ENDS OF LINER TO BE COATED WITH ADHESIVE.

NO SCALE

DUCT LINER

2

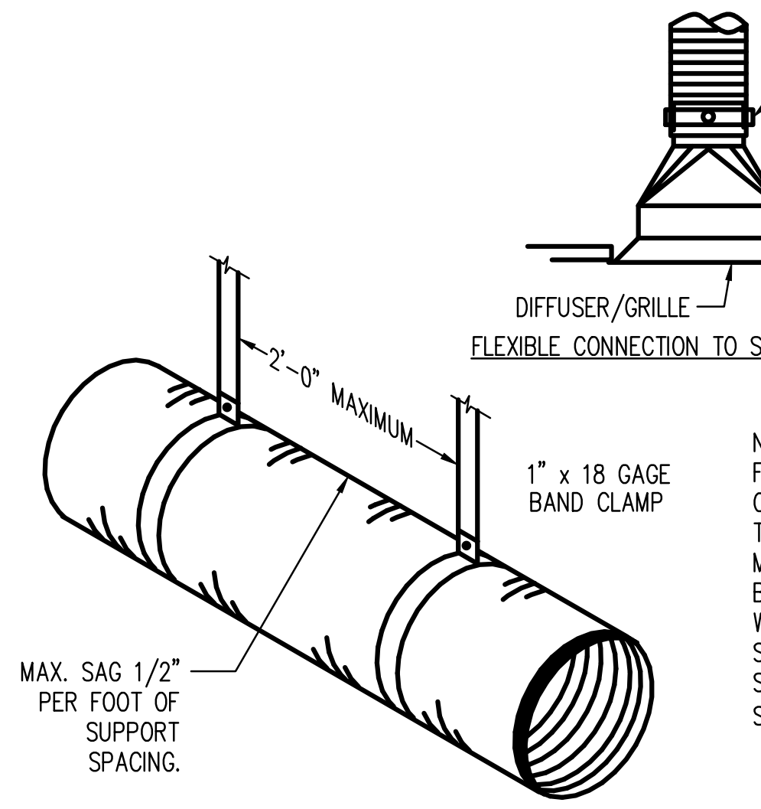


NOTES: THE ENTIRE DUCT SYSTEM SHALL BE INSULATED PER THE GENERAL NOTES AND/OR THE SPECIFICATIONS. TRANSITION DUCT AND BACK OF DIFFUSER SHALL BE INSULATED WITH 1½" THICK FIBERGLASS DUCT WRAP (TYPICAL FOR RETURN GRILLES AND SQUARE NECK AIR DISTIRBUTION DEVICES).

NO SCALE

TYPICAL DIFFUSER CONNECTION

3

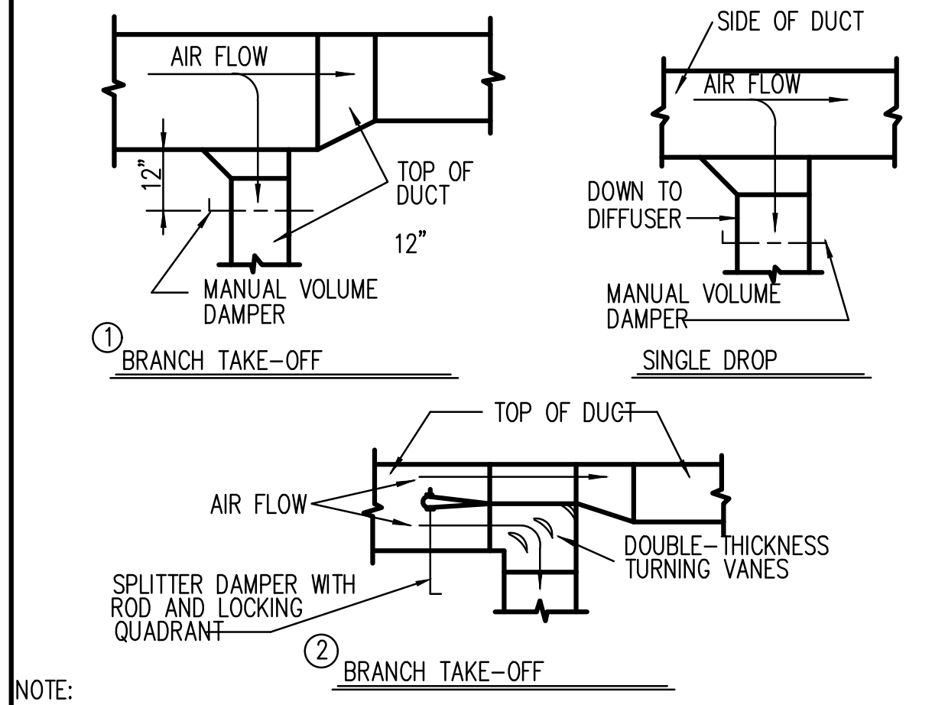


NOTE: ALL FLEXIBLE DUCT CONNECTIONS TO SHEET METAL SHALL BE SECURED WITH NYLON STRAP AND 2 SHEET METAL SCREWS (MIN.).

NO SCALE

FLEX DUCT CONNECTIONS + SUPPORT

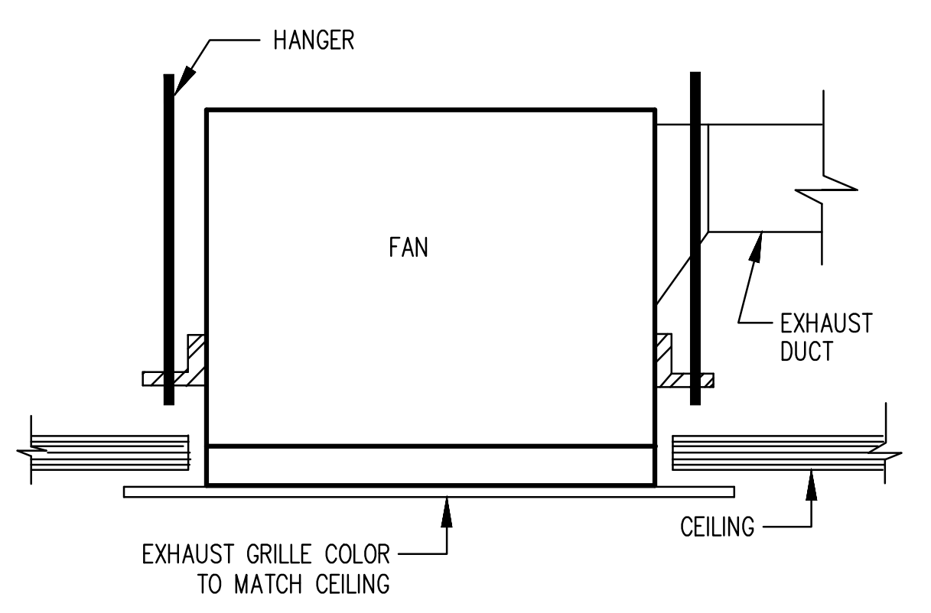
4



NOTE:
① USE BRANCH TAKE-OFF 1 WHEN MAIN AND BRANCH DUCTS ARE DIFFERENT DEPTHS
② USE BRANCH TAKE-OFF 2 WHEN MAIN AND BRANCH DUCTS ARE SAME DEPTHS

DUCTWORK DETAILS

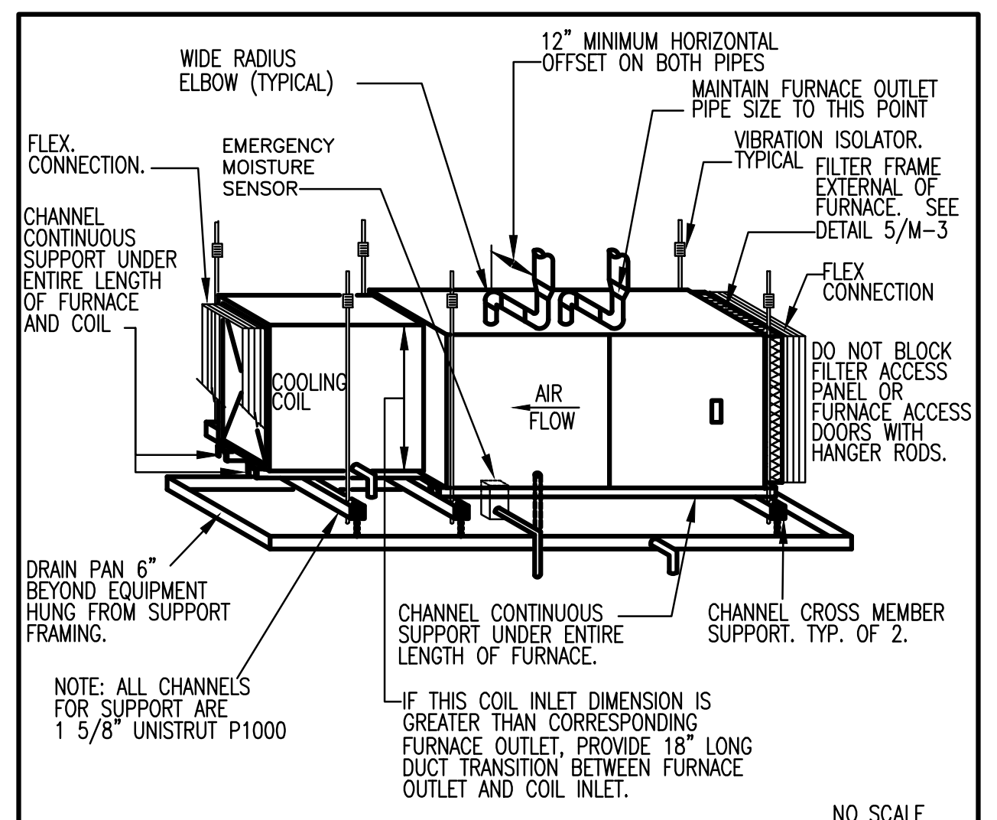
5



NO SCALE

CEILING EXHAUST FAN

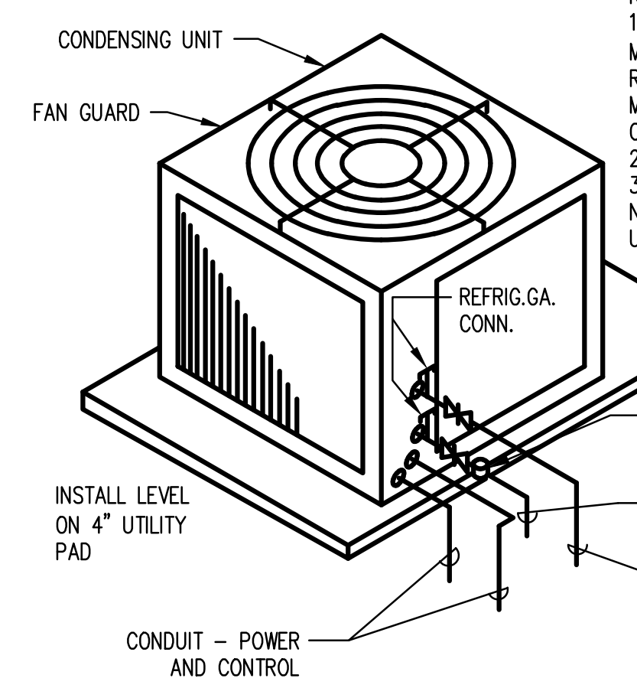
6



NO SCALE

HORIZONTAL FURNACE

7

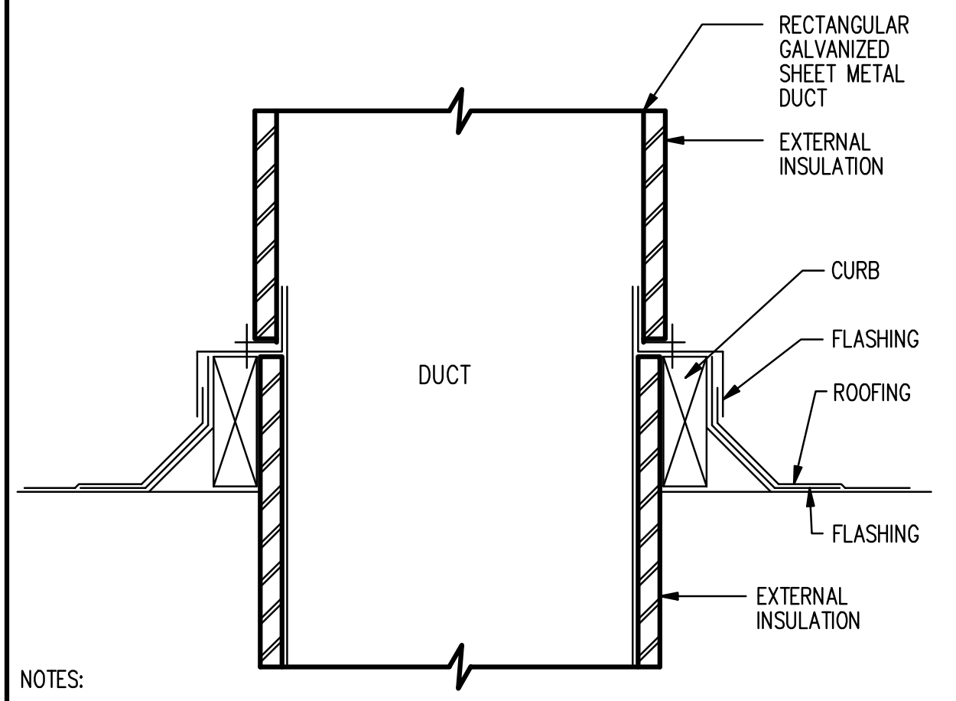


NOTES:
1. INSTALL PER MANUFACTURER'S RECOMMENDATIONS, MAINTAINING ALL SERVICE CLEARANCE REQUIREMENTS.
2. INSTALL LEVEL.
3. RUN-OFF WATER SHALL NOT POUR DIRECTLY ON UNIT.

NO SCALE

CONDENSING UNIT

8

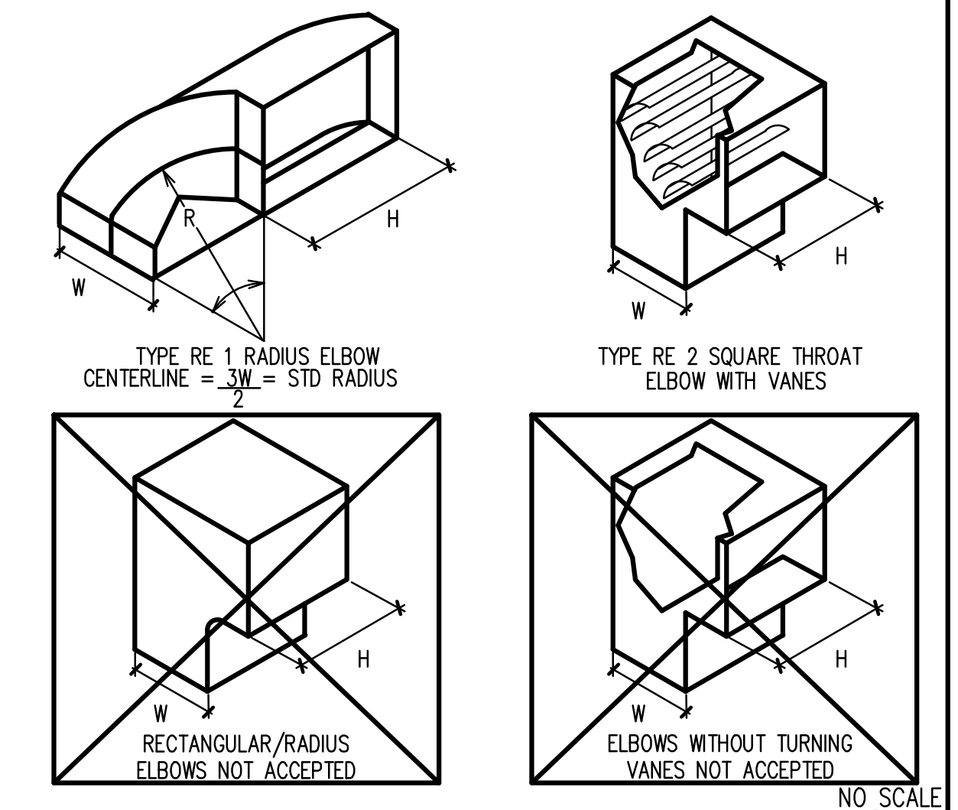


NOTES:
1. SECURE FLASHING AND SHEET METAL DUCT TO CURB.
2. SEAL ALL JOINTS WITH SILICONE TYPE SEALER.
3. ROOF PENETRATIONS BY BONDED ROOFER.

NO SCALE

DUCT PENETRATION OF ROOF

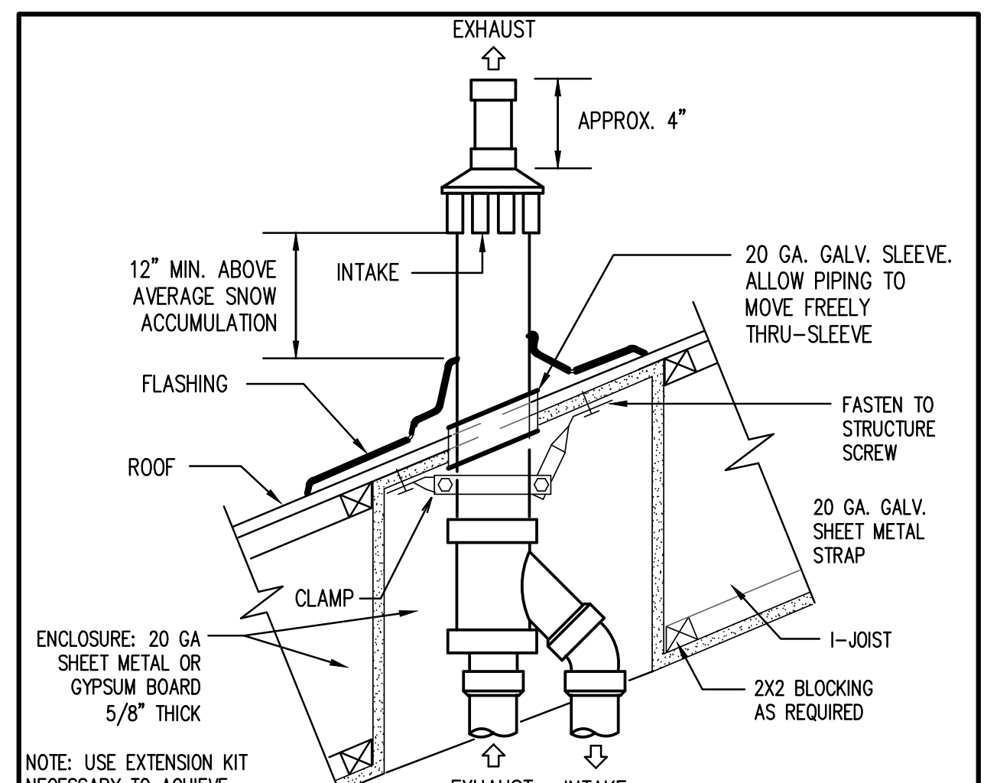
9



NO SCALE

RECTANGULAR SHEET METAL ELBOWS

10

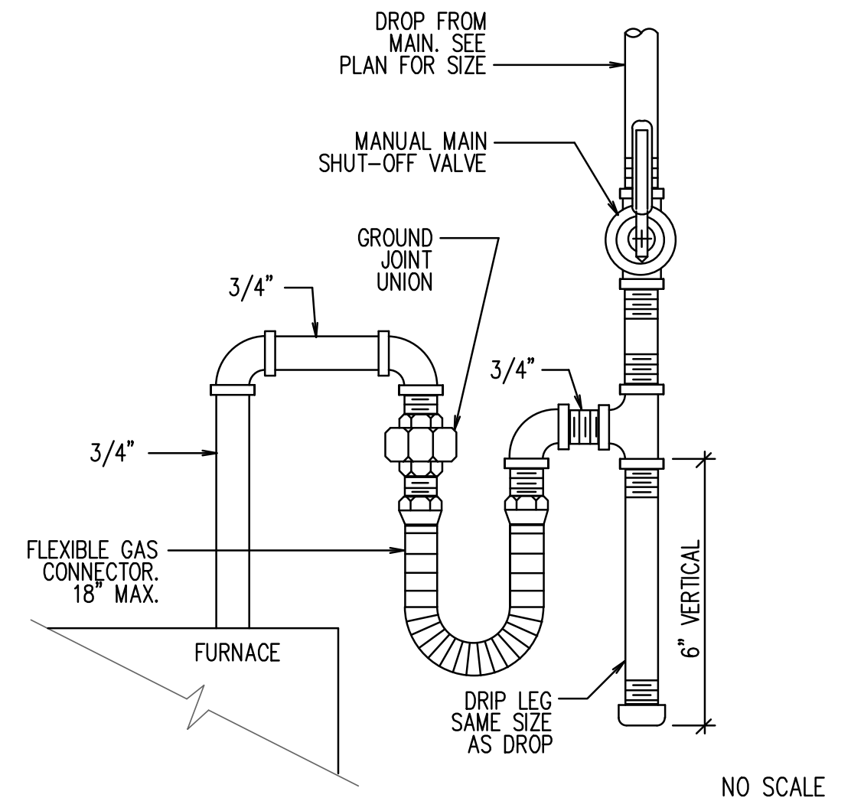


NOTE: USE EXTENSION KIT NECESSARY TO ACHIEVE CLEARANCE ABOVE SNOW LEVEL.

NO SCALE

CONCENTRIC SLOPED ROOF TERMINATION

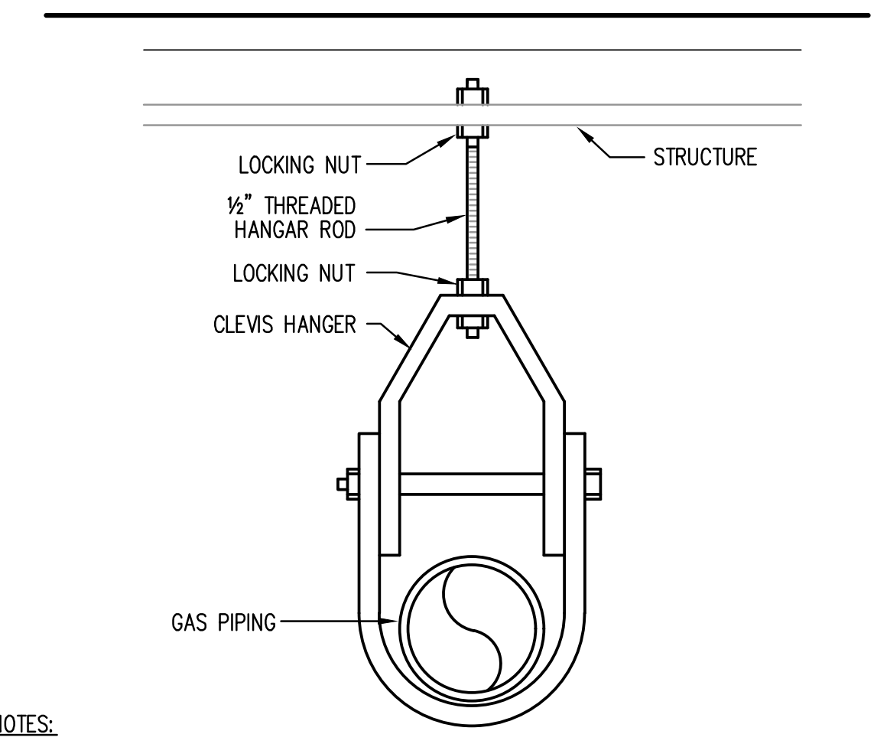
11



NO SCALE

GAS LINE CONNECTION DETAIL

12

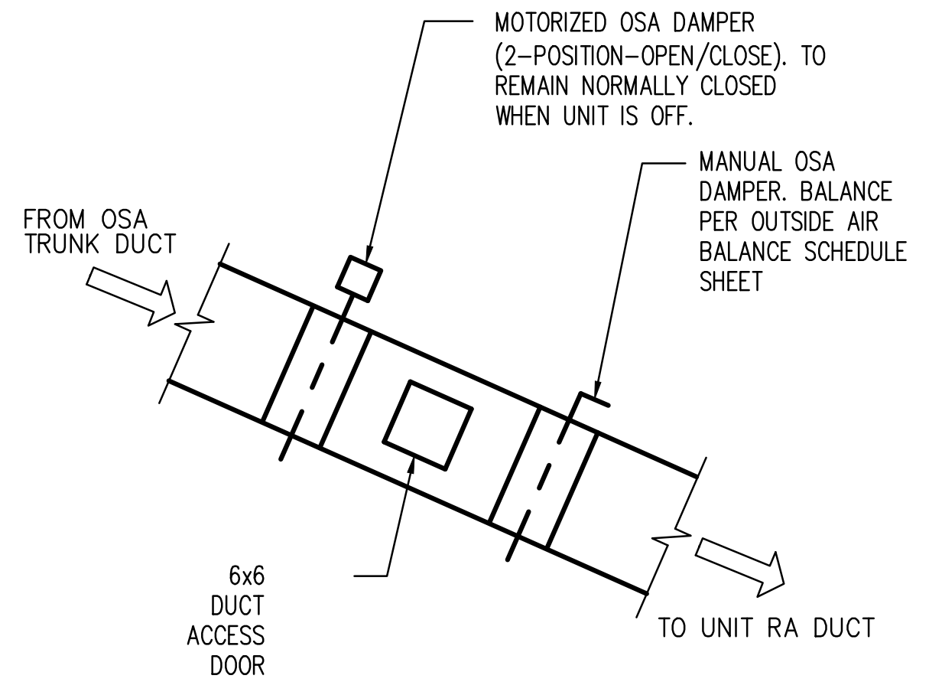


NOTES:
1. PROVIDE GAS SUPPORTS AT 8'-0" ON CENTER.
2. PROVIDE SEISMIC RESTRAINTS AS REQUIRED BY THE LOCAL BUILDING CODE.

NO SCALE

INDOOR GAS PIPING HANGER

13

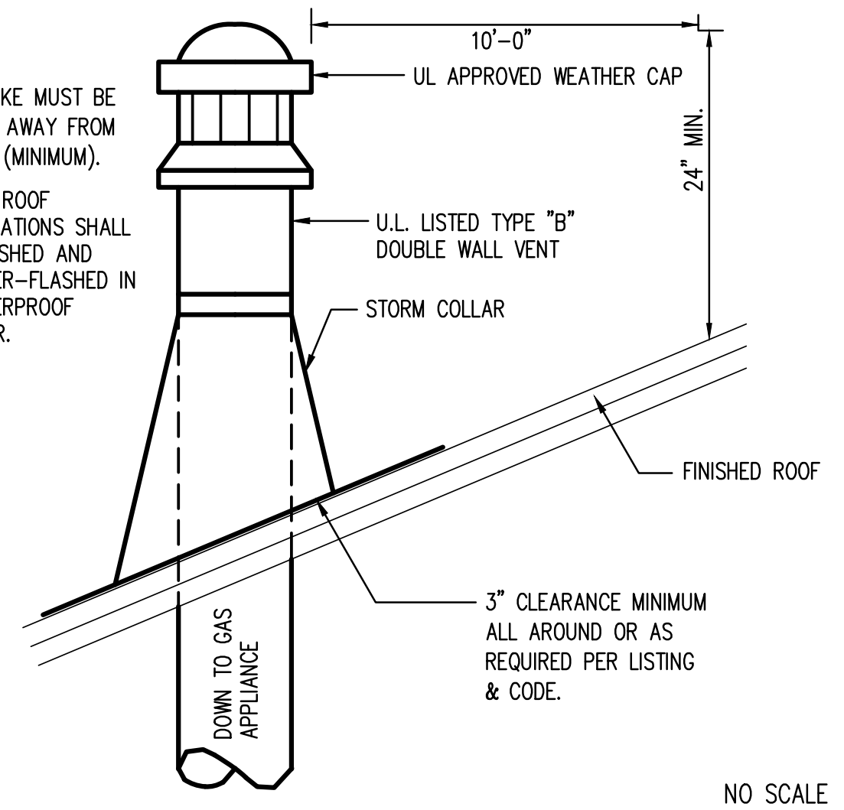


NO SCALE

TYPICAL OUTSIDE AIR DUCT DETAIL

14

NOTES:
1. INTAKE MUST BE 10'-0" AWAY FROM STACK (MINIMUM).
2. ALL ROOF PENETRATIONS SHALL BE FLASHED AND COUNTER-FLASHED IN A WATERPROOF MANNER.



NO SCALE

TYPE "B" FLUE DETAIL AT SLOPED ROOF

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NEW EDUCATION BUILDING

PALISADES™ EPISCOPAL SCHOOL

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M201