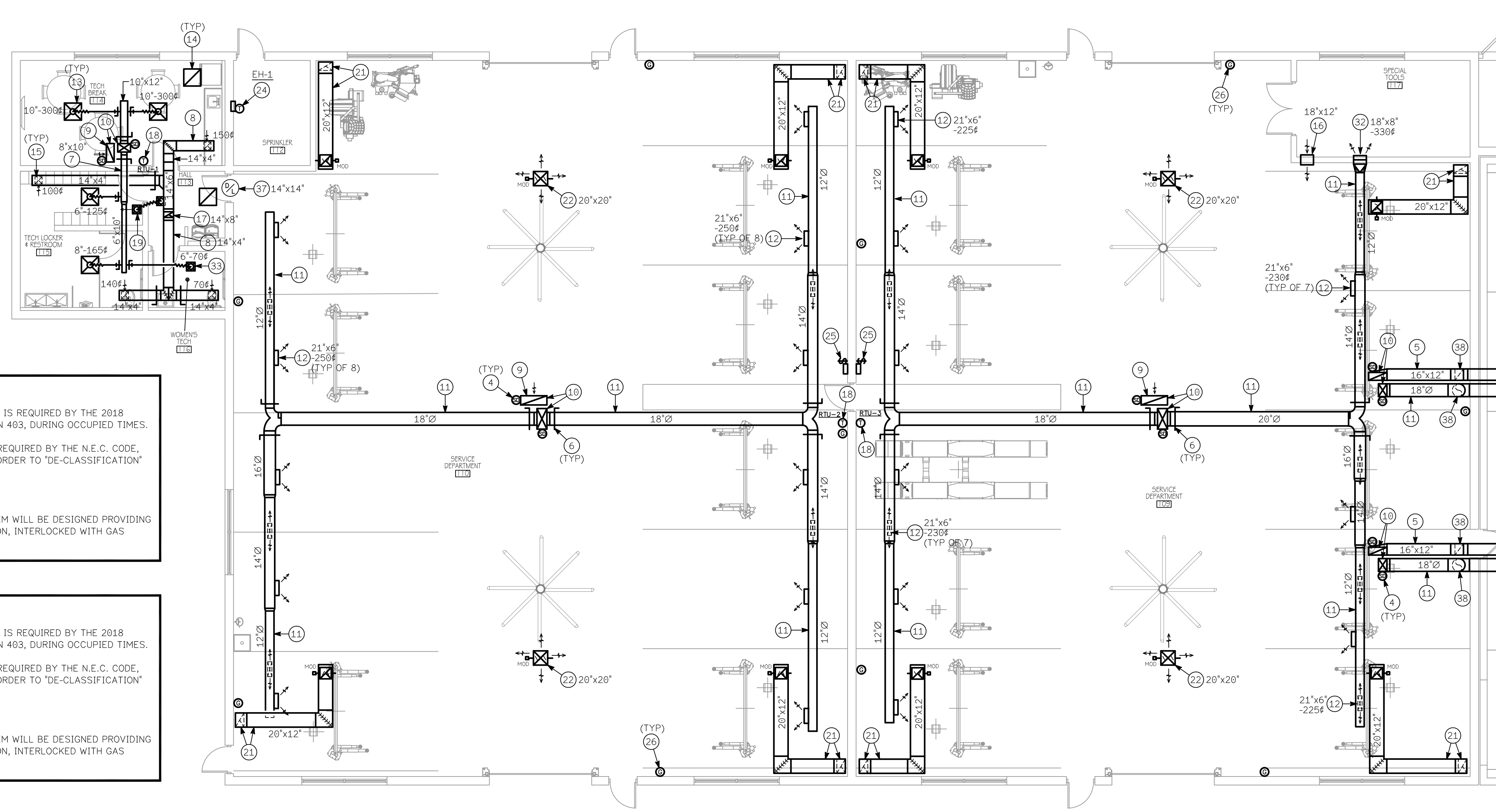


DRAWING NOTES

- EXISTING WALL LOUVER TO REMAIN.
- EXISTING EXHAUST FAN TO REMAIN.
- EXISTING SUPPLY AND RETURN AIR DUCTWORK TO REMAIN.
- PHOTOELECTRIC DUCT MOUNTED SMOKE DETECTOR WITH 12"x12" ACCESS DOOR FOR TUBE INSPECTION. UNIT SHALL BE SYSTEM SENSOR INNOVAIRFLEX SERIES, PHOTOELECTRIC MODEL D4120 (4 WIRE) OR APPROVED EQUAL. PROVIDE WALL MOUNTED SYSTEM SENSOR MODEL APA151 OR APPROVED EQUAL WITH REMOTE AUDIBLE/VISUAL ALARM DEVICE NEXT TO THERMOSTAT (TYPICAL).
- RETURN AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).
- MANUAL BALANCING DAMPER (TYPICAL).
- SUPPLY AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).
- EXHAUST AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).
- FULL SIZE OPEN END SOUND LINED RETURN AIR DUCTWORK WITH ELBOW AND 1"x1" WIRE MESH TO COVER OPENING.
- DUCTWORK UP THRU ROOF. TRANSITION IN VERTICAL AS REQUIRED FOR CONNECTION TO UNIT CURB OPENING.
- LINK ROUND SPIRAL SUPPLY AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE WITH AIR CRAFT CABLING OR AS RECOMMENDED BY MANUFACTURER. DUCTWORK SHALL BE DOUBLE WALL, INSULATED WITH SELF-SEALING/GASKETED CONNECTIONS.
- SUPPLY AIR REGISTER MOUNTED IN SIDE/BOTTOM OF ROUND DUCTWORK WITH NECK SIZE AND AIR QUANTITY INDICATED. LINK RGS-3 OR APPROVED EQUAL WITH INTEGRAL VOLUME CONTROL AND DOUBLE DEFLECTION LOUVERS SET AT 80° LEFT/RIGHT.
- 24"x24" CEILING MOUNTED SUPPLY AIR DIFFUSER WITH NECK SIZE AND AIR QUANTITY INDICATED (TYPICAL). PROVIDE RIGID/FLEXIBLE DUCTWORK BACK TO MAIN WITH AIR-TITE FITTING AND MANUAL VOLUME DAMPER.
- 24"x24" CEILING MOUNTED RETURN AIR GRILLE WITH FULL SIZE NECK (TYPICAL).
- 10"x10" CEILING MOUNTED EXHAUST AIR REGISTER WITH AIR QUANTITY INDICATED (TYPICAL).
- AIR TRANSFER GRILLE HIGH IN WALL, SIZE AS INDICATED.
- EXHAUST AIR DUCTWORK UP THRU ROOF TO FAN.
- WALL MOUNTED THERMOSTAT MOUNTED 48" ABOVE FLOOR WITH LOCKABLE COVER AND INTERLOCKED WITH UNIT INDICATED.
- 12"x12" CEILING MOUNTED AIR TRANSFER GRILLES WITH 8"Ø CONNECTING DUCTWORK (TYPICAL).
- AIR TRANSFER OPENING IN WALL 12" ABOVE FLOOR, SIZE AS INDICATED, WITH FULL SIZE SLEEVE AND 1"x1" WIRE MESH TO COVER OPENINGS ON BOTH SIDES.
- EXHAUST DUCTWORK SUPPORTED HIGH AND UP THRU ROOF TO FAN WITH LOW-LEAKAGE MOTORIZED DAMPER. EXTEND DUCTWORK DOWN ALONG WALL TO 12" ABOVE FLOOR WITH 1"x1" WIRE MESH OVER OPENING. COORDINATE ALL DROPS WITH EXISTING PIPING IN THE AREA.
- MAKEUP AIR DUCTWORK UP THRU ROOF TO GOOSENECK WITH LOW-LEAKAGE MOTORIZED DAMPER. EXTEND DOWN TO 24" BELOW BOTTOM OF ROOF STRUCTURE WITH 1"x1" WIRE MESH OVER OPENING.
- ELECTRIC UNIT HEATER SUPPORTED FROM STRUCTURE AT 8'-0" ABOVE FLOOR. INTERLOCK WITH REVERSE-ACTING THERMOSTAT MOUNTED ON WALL 48" ABOVE FLOOR, SET AT 60°F. REFER TO SCHEDULE.
- WALL MOUNTED ELECTRIC HEATER INTERLOCKED WITH THERMOSTAT. REFER TO SCHEDULE.
- GAS DETECTOR MAIN CONTROL PANEL MOUNTED ON WALL 48" ABOVE FLOOR WITH MANUAL OVERRIDE SWITCH. INTERLOCK PANEL WITH REMOTE CO SENSORS, MAKEUP DAMPER AND EXHAUST SYSTEM FANS/DAMPER. REFER TO CONTROL SEQUENCE OF OPERATION.
- REMOTE CARBON MONOXIDE AND TOXIC/EXPLOSIVE GAS SENSORS MOUNTED ON WALL 48" ABOVE FLOOR AND INTERLOCKED WITH GAS CONTROL PANEL (TYPICAL).
- EXHAUST DUCTWORK SUPPORTED HIGH AND UP THRU ROOF TO FAN. EXTEND DOWN TO 18'-0" ABOVE FLOOR WITH OPEN END AND 1"x1" WIRE MESH TO COVER OPENING. REFER TO FAN SCHEDULE FOR MORE INFORMATION.
- SUPPLY AIR DUCTWORK SUPPORTED AS HIGH AS POSSIBLE EXPOSED, WITH 1" INTERNAL LINING AND NO EXTERNAL DUCT WRAP.
- SUPPLY AIR REGISTER MOUNTED IN SIDE AND/OR BOTTOM OF DUCTWORK WITH NECK SIZE AND AIR QUANTITY INDICATED (TYPICAL). REGISTER SHALL HAVE DOUBLE DEFLECTION LOUVERS WITH OPPOSED BLADE DAMPER.
- SUPPLY AIR DUCTWORK EXTENDED OUT TO GRILLE ON FACE OF WALL, SIZE AS INDICATED.
- EXISTING INFRA-RED HEATER TO REMAIN.
- SUPPLY AIR REGISTER MOUNTED ON THE END OF THE DUCTWORK WITH NECK SIZE AND AIR QUANTITY INDICATED. DUCTWORK THRU BLOCK WALL TO REGISTER.
- 12"x12" CEILING MOUNTED SUPPLY AIR DIFFUSER WITH NECK SIZE AND AIR QUANTITY INDICATED. PROVIDE RIGID/FLEXIBLE DUCTWORK BACK TO MAIN WITH AIR-TITE FITTING AND MANUAL VOLUME DAMPER.
- SUPPLY AIR DUCTWORK DROPPING DOWN TO BELOW MEZZANINE LEVEL.
- SUPPLY AIR DUCTWORK UP TO UNIT ABOVE.
- SUPPLY AIR DUCTWORK SUPPORTED HIGH ABOVE (BELOW MEZZANINE LEVEL) EXPOSED, WITH 1" INTERNAL LINING AND NO EXTERNAL DUCT WRAP.
- DOOR LOUVER, SIZE AS INDICATED.
- SUPPLY AND RETURN AIR DUCTWORK SUPPORTED HIGH FROM STRUCTURE ABOVE DROPPING DOWN AND THRU WALL TO HIGH IN EXISTING SERVICE DEPARTMENT CEILING.
- RETURN AIR GRILLE MOUNTED IN BOTTOM OF DUCTWORK, SIZE AS INDICATED ON DRAWING.
- RETURN AIR DUCTWORK DROPPING DOWN TO ABOVE 102 PARTS DEPARTMENT CEILING. FULL SIZE OPEN END SOUND LINED RETURN AIR DUCTWORK WITH ELBOW AND 1"x1" WIRE MESH TO COVER OPENING.



MECHANICAL PLAN-NEW WORK

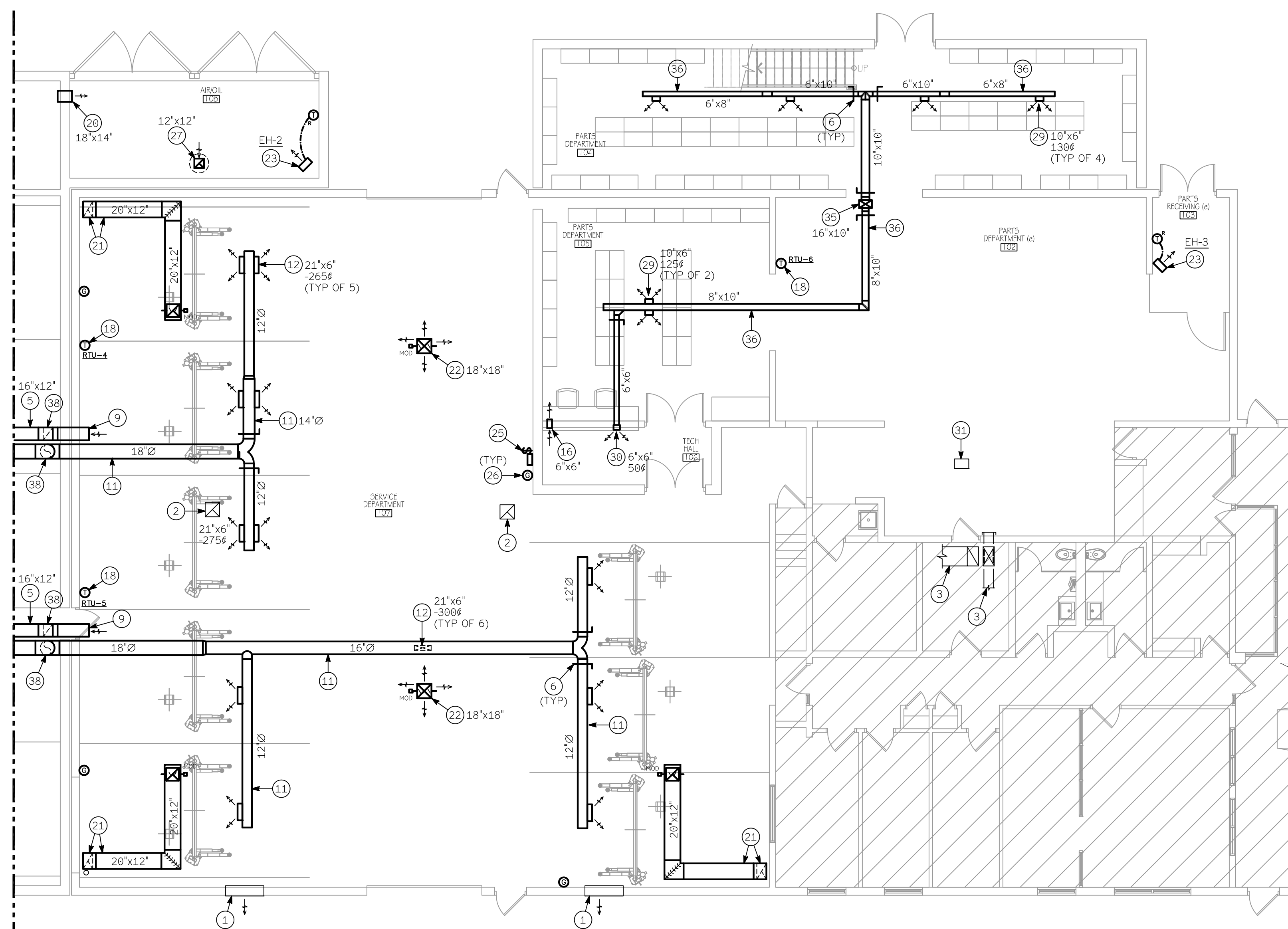
SCALE: 1/8" = 1'-0"

THE VEHICLE EXHAUST SYSTEM WILL BE DESIGNED AND INSTALLED BY THE OWNERS VENDOR UNDER A SEPARATE PERMIT SUBMISSION

110 SERVICE SHOP VENTILATION ANALYSIS:
0.75 CFM/SQ.FT. OF "MECHANICAL" EXHAUST IS REQUIRED BY THE 2018 INTERNATIONAL MECHANICAL CODE, SECTION 403, DURING OCCUPIED TIMES.
1 CFM/SQ.FT. OF VENTILATION EXHAUST IS REQUIRED BY THE N.E.C. CODE, SECTION 511, DURING OCCUPIED TIMES, IN ORDER TO "DE-CLASSIFICATION" THE SPACE.
TOTAL FLOOR AREA = 5,960 SQ.FT.
THEREFORE, A MECHANICAL EXHAUST SYSTEM WILL BE DESIGNED PROVIDING (4) FANS AT 1,490 CFM EACH OF VENTILATION, INTERLOCKED WITH GAS DETECTION SYSTEM.

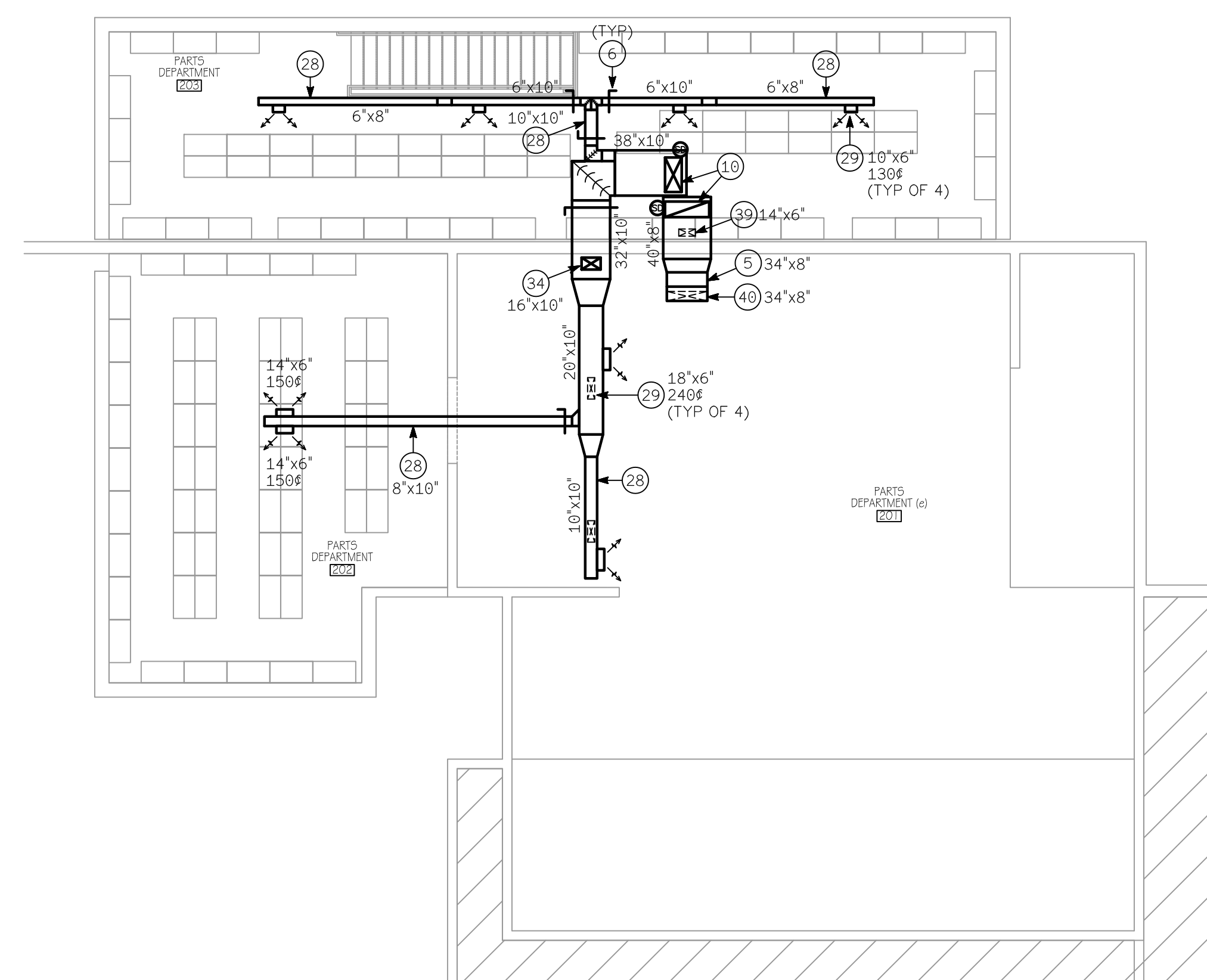
109 SERVICE SHOP VENTILATION ANALYSIS:
0.75 CFM/SQ.FT. OF "MECHANICAL" EXHAUST IS REQUIRED BY THE 2018 INTERNATIONAL MECHANICAL CODE, SECTION 403, DURING OCCUPIED TIMES.
1 CFM/SQ.FT. OF VENTILATION EXHAUST IS REQUIRED BY THE N.E.C. CODE, SECTION 511, DURING OCCUPIED TIMES, IN ORDER TO "DE-CLASSIFICATION" THE SPACE.
TOTAL FLOOR AREA = 5,800 SQ.FT.
THEREFORE, A MECHANICAL EXHAUST SYSTEM WILL BE DESIGNED PROVIDING (4) FANS AT 1,450 CFM EACH OF VENTILATION, INTERLOCKED WITH GAS DETECTION SYSTEM.

107 SERVICE SHOP VENTILATION ANALYSIS:
0.75 CFM/SQ.FT. OF "MECHANICAL" EXHAUST IS REQUIRED BY THE 2018 INTERNATIONAL MECHANICAL CODE, SECTION 403, DURING OCCUPIED TIMES.
1 CFM/SQ.FT. OF VENTILATION EXHAUST IS REQUIRED BY THE N.E.C. CODE, SECTION 511, DURING OCCUPIED TIMES, IN ORDER TO "DE-CLASSIFICATION" THE SPACE.
TOTAL FLOOR AREA = 4,530 SQ.FT.
THEREFORE, A MECHANICAL EXHAUST SYSTEM WILL BE DESIGNED PROVIDING (3) FANS AT 1,510 CFM EACH OF VENTILATION, INTERLOCKED WITH GAS DETECTION SYSTEM.



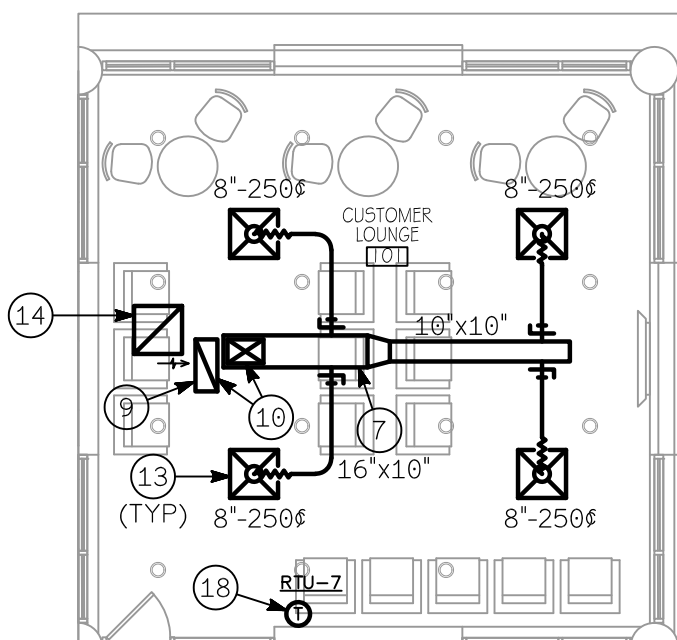
MECHANICAL PLAN-NEW WORK

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



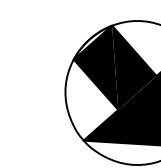
MEZZANINE PLAN-NEW WORK

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



MECHANICAL PLAN-NEW WORK

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



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



2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-1

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
113 HALL	75	0.06	5	0	0	0	0	7	0.8	0	0	0
114 TECH BREAKROOM *	305	0.06	19	30	12	5	60	79	0.8	99	600	0.17
115 TECH LOCKER/RESTROOM	235	0	0	0	0	0	0	0	0.8	0	290	0
116 WOMEN TECH R.R.	60	0	0	0	0	0	0	0	0.8	0	70	0
TOTAL	675		24		12		60	86		108	960	0.17
NOTES:											System Ventilation Efficiency E _v = 0.98	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 84	
2) THE ROOFTOP UNIT WILL BE SET AT 110 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 86 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-2

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
110 SERVICE DEPARTMENT	5960	0.12	716	0	0	0	0	716	0.8	895	4,000	0.23
TOTAL	5960		716		0		0	716		895	4000	0.23
NOTES:											System Ventilation Efficiency E _v = 0.92	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 716	
2) THE ROOFTOP UNIT WILL BE SET AT 895 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 779 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-3

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
109 SERVICE DEPARTMENT	5800	0.12	696	0	0	0	0	696	0.8	870	3,670	0.24
117 SPECIAL TOOLS	230	0.12	28	0	0	0	0	28	0.8	35	330	0
TOTAL	6030		724		0		0	724		905	4000	0.24
NOTES:											System Ventilation Efficiency E _v = 0.91	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 724	
2) THE ROOFTOP UNIT WILL BE SET AT 905 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 796 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-4

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
107 SERVICE DEPARTMENT-SOUTH	2265	0.12	272	0	0	0	0	272	0.8	340	1600	0.22
TOTAL	2265		272		0		0	272		340	1600	0.22
NOTES:											System Ventilation Efficiency E _v = 0.93	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 272	
2) THE ROOFTOP UNIT WILL BE SET AT 340 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 293 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-5

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
107 SERVICE DEPARTMENT-NORTH	2265	0.12	272	0	0	0	0	272	0.8	340	1600	0.22
TOTAL	2265		272		0		0	272		340	1600	0.22
NOTES:											System Ventilation Efficiency E _v = 0.93	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 272	
2) THE ROOFTOP UNIT WILL BE SET AT 340 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 293 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-6

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
102/201 PARTS DEPARTMENT EX.	1470	0.12	177	0	0	0	0	177	0.8	222	960	0.24
104 PARTS DEPARTMENT	910	0.12	110	0	0	0	0	110	0.8	138	520	0.27
105 PARTS DEPARTMENT	575	0.12	69	0	0	0	0	69	0.8	87	250	0.35
106 TECH HALL	115	0.06	7	0	0	0	0	7	0.8	9	50	0.18
202 PARTS DEPARTMENT	670	0.12	81	0	0	0	0	81	0.8	102	300	0.34
203 PARTS DEPARTMENT	910	0.12	110	0	0	0	0	110	0.8	138	520	0.27
TOTAL	4650		554		0		0	554		696	2600	0.35
NOTES:											System Ventilation Efficiency E _v = 0.8	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 554	
2) THE ROOFTOP UNIT WILL BE SET AT 700 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 693 CFM	

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-7

SPACE NAME	A _z (FT ²)	R _a AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	P ₂ TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P ₂ OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	E _z ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Z _p OUTDOOR AIR FRACTION
101 CUSTOMER LOUNGE *	555	0.06	34	30	20	5	100	134	0.8	168	1000	0.17
TOTAL	555		34		20		100	134		168	1000	0.17
NOTES:											System Ventilation Efficiency E _v = 0.98	
1) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											Uncorrected Outdoor Air Intake = 134	
2) THE ROOFTOP UNIT WILL BE SET AT 170 CFM OUTSIDE AIR.											Total required Outdoor Air V _{o1} = 137 CFM	

MECHANICAL SPECIFICATIONS

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

- The work of each of the following sections includes furnishing and installing the material, equipment and systems complete as specified and/or indicated on the drawings. The installations, when finished, shall be complete and coordinated, ready for satisfactory service.
- All work under this contract shall be done in strict accordance with all applicable municipal, state, county, NFPA, International and local codes that govern each particular trade.
- The contractor shall make applications and pay all charges for all necessary permits, licenses and inspections as required under the above codes. Upon completion of the work, the customary certifications of approval shall be furnished. The contractor shall also coordinate and make all required submissions to the local utility companies as required.
- No materials or equipment shall be used in the work until approved. Before submission of the shop drawings, and not more than thirty (30) days after award of the contract, the contractor shall submit for approval, a complete list of all materials and equipment which he intends to furnish, giving manufacturer and catalog numbers. A complete list of proposed sub-contractors shall also be submitted.
- The contractor shall examine all drawings and specifications and shall visit the site and inspect the existing conditions in person. Certain areas may have been in-accessible at the time of the engineers survey and may only be visible during or after the demolition phase; therefore, those H.V.A.C. systems and coordination of those systems, shall become the responsibility of the contractors. Failure to comply with this requirement shall not relieve the contractors of their responsibilities for complying with the intent of the contract documents.
- The drawings indicate the general arrangement of the mechanical installations. Details of proposed departures due to actual field conditions or other causes shall be submitted for approval prior to installation. Reworking of completed items due to improper field coordination shall be at the contractor's expense.
- Provide sufficient access and clearance for all items of equipment requiring servicing and maintenance, such as valves, dampers, controls, drives, drains, vents, starters, switches, filters, traps and major items of equipment.
- The contractor shall perform all necessary cutting and patching as required to complete the installation of the all mechanical work. Patching of walls, floors, ceilings, roof, etc. shall match the adjacent surfaces.
- The contractor shall prepare three (3) copies of a record and information booklet. The booklet shall be bound in a three ring loose-leaf binder. Provide the following data in the booklet:
 - Catalog data on each piece of equipment furnished
 - Approved shop drawings on each piece of equipment furnished
 - Maintenance, operation and lubrication instruction on each piece of equipment furnished
 - Simplified temperature control diagrams of all H.V.A.C. systems
 - Manufacturer's and contractor's guarantees
 - Air balancing reports
 - Commissioning reports as required
 - Schedule/description of all service work/maintenance inspections required by the paragraphs of this section
- All parts of the heating, ventilating, air conditioning and exhaust systems shall be adjusted, checked, balanced and tested by an independent A.A.B.C. or N.E.B.B. certified testing and balancing contractor approved by the owner. The contractor shall put all systems and equipment into full operation, and shall test and balance all devices to within ten (10) percent of capacities indicated on the drawings. Submit copies of the balancing reports to the architect. Permanently mark the position of each balancing damper.
- Upon completion of the mechanical installations, the contractor shall provide a complete set of prints of the contract drawings which shall be legibly marked in red pencil to show all changes and departures of the installation as compared with the original design. They shall be suitable for use in preparation of as-built drawings.
- All new installations, including all materials and labor shall be guaranteed for a period of one (1) year from date of owner acceptance. The above shall not in any way void or abrogate equipment manufacturer's guarantee or warranty. Certificates of guarantee shall be delivered to the owner.
- Contractor shall also provide one (1) year free service to keep the equipment in operating condition. This service shall be provided and rendered upon request when notified of any equipment malfunction.
- In addition to the first year warranty period, the contractor shall provide, at no additional cost to the owner, a minimum of four (4) service calls and maintenance inspections. A complete outline of the required maintenance and the proposed schedule shall be included in a "record and information booklet", for review and acceptance by the owner/representative and engineer. The inspections are to be performed at three (3) month intervals for a total of four (4) service calls and inspections during the first year warranty period plus the original system start-up commissioning. The service work and inspections shall include, but not be limited to the following:
 - Replace all H.V.A.C. air filters before occupancy
 - Lubricate all motor and fan bearings as required
 - Clean drain pans and drain lines
 - Check and tighten all electrical connections as required
 - Inspect all belts for adjustment and condition, replace as required
 - Check operating pressures and refrigerant charge
 - Inspect all controls for correct operation and calibrate as required
 - Perform all maintenance as outlined in the equipment manufacturers operation and maintenance manuals. Upon completion of each scheduled inspection, the contractor shall deliver to the building owner or owners representative, within (48) hours of completion, two(2) copies of the completed inspection report for record purposes.
- The service contractor shall, at the ninth month, advise the owner of the termination date of the above services. This contractor shall also provide the owner with a detailed proposal, reflecting annual escalation, for the continuation of the services and inspections described above.

SECTION 15250 - MECHANICAL INSULATION

- All rectangular supply and return air ductwork shall be insulated with fiberglass insulation. All insulation shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-development index of not more than 50 when tested in accordance with ASTM E84.
- Ductwork shall be wrapped with nominal 2" thick glass fiber blanket insulation with "installed" thermal conductivity "K" value of 0.25 at 75°F mean temperature and thermal resistance "R" value of 6.9 at 1-1/2" compressed thickness. Owens Corning "SOFTIR" fiberglass type 106 with foil faced vapor barrier. Insulation shall be neatly installed and suitable for 40°F-250°F duct temperatures.
- All exposed spiral supply air ductwork shall be Linx, double wall with standard 1" inner wall fiberglass insulation and self-sealing/gasketed joints, or approved equal.
- All refrigerant suction piping shall have 1" of armaflex insulation. Liquid line piping shall not require insulation. All insulation exposed to weather shall be 100% coated with a "UV" inhibitor for protection from solar radiation.
- All interior duct lining shall be as specified under section 15880. All interior rectangular ductwork exposed within condition spaces may be provided with internal lining only, with no external duct wrap. Refer to drawings for additional notes. Internal lining shall not be used for ductwork system conveying wet/moist air (ie: shower rooms, dishwasher hoods, etc.).

SECTION 15900 - HEATING, VENTILATING & AIR CONDITIONING (HVAC)

- The work to be performed shall include all labor, materials and equipment necessary to furnish and install complete, all H.V.A.C. mechanical equipment as shown on drawings and/or hereinafter specified. It is the intent that the systems be installed complete with all items necessary to provide satisfactory service.
- All existing H.V.A.C. units serving the project areas shall be fully serviced including but not limited to: check/charge refrigerant, check/replace belts, change filters, change heating and cooling coils, lubricate, rebalance, etc. and verify proper operation to ensure maximum capacity.
- All heating, ventilating and air conditioning equipment which contains compressors shall be provided with extended warranties covering the compressors for a minimum of four (4) years.

D. Packaged Rooftop Heating/Cooling Units:

All rooftop units shall be factory assembled, piped, internally wired and fully charged with R-410A refrigerant. Cooling and heating capacities shall be rated in accordance with AHRI standards and unit design shall be certified by the American Gas Association (AGA), specifically for outdoor applications using natural gas. All cooling units shall be Underwriters' Laboratory listed. All units shall be designed for outdoor rooftop level installation. Exterior surfaces of all units shall be phosphatized, zinc-coated steel with epoxy resin primer and baked enamel finish.

All casing panels shall be 20 gauge steel, gasketed and insulated with one (1) inch, one (1) pound density foil-faced glass fiber, insulation shall be on the heat exchanger and evaporation section. Cabinet construction shall allow for all maintenance on one side of the unit.

Refrigeration cycle controls shall include condenser fan, evaporator fan and compressor contractor. Compressor shall be equipped with a combination internal winding thermostat/current overload. Internal high pressure relief shall also be provided. All units shall have direct drive, hermetic sealed compressors. Compressors shall be equipped with over temperature, over current and high pressure controls. Crank case heaters shall be standard on all models.

Evaporator coil shall be seamless copper tubing mechanically bonded to aluminum fins and shall be factory pressure and leak tested at 225 psig.

Both evaporator and condenser coil shall have drain pans. Evaporator pan shall be internally sealed and insulated. Threaded drain connection shall be provided in evaporator section with a drain opening in condensing section.

Condenser coil shall be seamless copper tubing mechanically bonded to aluminum fins. Each coil shall be factory pressure and leak tested at 425 psig.

Indoor air fan shall be belt/direct drive, forward curved, centrifugal type. Motor shall have thermal overload protection and permanently lubricated fan and motor bearings. Motor/lower assembly shall be isolated from unit with rubber mounts. Fans shall be capable of 2-speeds.

Condenser fan shall be direct-drive, statically and dynamically balanced, upflow propeller type. Weatherproofed permanent split capacitor fan motor shall have built-in thermal overload and permanently lubricated sleeve bearings.

Gas-fired heating section shall be completely assembled, wired and piped. Design shall be certified by AGA, specifically for outdoor application.

Electronic ignition system shall light pilot each time the thermostat calls for heat. Flame sensor shall prove pilot flame and turn on main burners. Should a loss of pilot flame occur the main valve shall close and the spark shall reoccur within 0.8 seconds. When the thermostat is satisfied, both pilot and main burner shall be extinguished.

Forced combustion blower shall insure flame stability under varying wind conditions and shall provide higher combustion efficiency and location flexibility.

Heat exchanger shall be aluminized steel. Heat exchanger shall be factory tested for leaks, stress relieved and of free floating design. Heat exchanger shall be located upstream of the cooling coil for minimum condensation. Design shall be certified by AGA specifically for outdoor application. Burners shall be stamped and seam-welded with 20 gauge aluminized steel.

Low ambient temperature operation shall be standard down to 40 degree F.

Each rooftop unit shall be complete with a factory supplied supply and return bottom discharge casing, full roof curb, convience outlet and enthalpy-controlled low-leakage economizer with barometer relief damper.

Units shall be as manufactured by York, Trane, Carrier or approved equal.

E. Electric wall heaters:
Wall heater shall be as manufactured by Berko or approved equal. Refer to drawings for capacities. Heater shall be complete with automatic reset thermal protection, metal sheath element, heavy duty concealed thermostat with disconnect, shaded 2-pole motor, anodized aluminum frame and shall be U.L. listed.

F. Electric unit heaters:
Unit heater shall be as manufactured by Berko or approved equal. Heaters shall be complete with automatic reset thermal protection, metal sheath element, heavy duty concealed thermostat with disconnect, shaded 2-pole motor, anodized aluminum frame and shall be U.L. Listed.

G. Smoke detectors:
Detectors shall be installed in the supply and return air ductwork for all system supplying equal or greater than 2,000 cfm of air and shall be U.L. 268A, NFPA 90A, NFPA 72 and FM approved and listed. They shall contain an photoelectric type detector and air sampling chamber with sampling tubes extending through the width of the air duct. Unit shall be System Sensor InnovalFlex series, photoelectric model D4120 (4 wire) or approved equal, with an ionization type detector and self-contained control unit.

Contractor shall provide and install a wall/ceiling mounted remote audible/visual alarm device with red trouble light and green power light, located in a public and visible location near the general area of the rooftop unit, which shall be System Sensor model APA151 or approved equal and compatible with smoke detector provided.

In areas where smoke detector maintenance and inspection is not easily accessible, contractor shall also provide a wall/ceiling mounted remote test/reset device (with key). Device shall be System Sensor model RTS151KEY or approved equal and compatible with smoke detector provided.

Coordinate installation of all detection devices with the controls contractor. Detectors connected to the building fire alarm system specified in Division 16-Electrical, shall be coordinated with the voltage and signal control configuration.

SECTION 15880 - AIR DISTRIBUTION

- Furnish all labor and materials necessary to complete the sheet metal work associated with the heating, ventilating, air conditioning and exhaust systems, and other miscellaneous items shown and required.
- All supply, return, make-up air and exhaust ductwork shall be constructed and installed in accordance with the sheet metal and air conditioning contractors national association (SMACNA) standards and ASHRAE standards.
- Flexible ductwork shall be Hart & Cooley type F216 or approved equal. Flexible duct shall comply with NFPA bulletin 90A and shall be U.L. Listed as class 1 air duct and connector, standard 181, with R-6 value insulation and microbial resistant. Maximum length of runout shall not exceed 6'-0".
- Support horizontal ducts with hangers spaced not more than six (6) feet apart. Use strap hangers for ducts up to thirty (30) inches wide, angle hangers or rods for ducts over thirty (30) inches wide. Strap hangers to be one (1) inch wide, 20 gauge minimum; fasten to sides and bottom of duct with sheet metal screws.
- Ducts shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be suspended from the construction and shall be free from vibration. Curved elbows shall have a center radius equal to one and one-half (1-1/2) times the width of the duct. All square turns shall be vanned. Vanes consisting of curved metal blades shall permit the air to make abrupt turns without turbulence.
- All joints, seams and connections in the heating, ventilating, and air conditioning and exhaust system ductwork shall be sealed air tight. Sealant shall be as manufactured by Hard Cast Inc. or approved equal and shall consist of a mineral impregnated woven fiber tape and an actuator adhesive. Sealant shall be SMACNA and U.L. approved, with a flame spread of 10 and a smoke developed of 0, non-toxic and non-flammable. Sealant shall be approved for operating temperatures from 0 degrees F. to 200 degrees F. Sealant system shall be installed in strict accordance with the manufacturer's recommendations and when applied shall provide a permanent seal without any deterioration.

All rectangular supply and return air ductwork within fifteen (15) feet of each air handling unit shall be lined on the interior for sound attenuation. Lining shall have a one (1) inch thickness and shall be glued with one hundred (100) percent coverage and additionally secured with pins. Increase duct sizes indicated two (2) inches direction to accommodate the interior lining. Dimensions shown on drawings are clear inside dimensions. Liner shall be a non-fibrous elastomeric thermal (and acoustical) material, closed cell, moisture resistant with anti-microbial agent. Material shall meet ASTM E84 25/50 fire rating (NFPA 90A & 90B), ASTM G 21 & 22, VOC guidelines, ASTM C 518, etc.. Lining shall be Nomaco K-Flex Gray, Evonikfoams Solocoustic or approved equal.

Supply air diffusers shall have all steel construction with louvered face and finished with #26 off-white enamel. Titus model TMS, Meta-Aire, Krueger or approved equal.

Supply air registers shall have all steel construction with 3/4" spaced, double deflection louvers, opposed blade damper and finished with #26 off-white enamel. Titus model 300F, Meta-Aire, Krueger or approved equal.

Exposed spiral supply air ductwork registers shall have all steel construction supply air registers with 3/4" spaced, double deflection louvers, internal volume damper and finished with #26 off-white enamel. Linx model RGS-3 or approved equal.

Return air grilles shall have all steel construction with 1/2" spaced louvers, 35 degree deflection and finished with #26 off-white enamel. Titus model 355R, Meta-Aire, Krueger or approved equal.

Exhaust air registers shall have all steel construction with 1/2" spaced louvers, 35 degree deflection, opposed blade damper and finished with #26 off-white enamel. Titus model 355R, Meta-Aire, Krueger or approved equal.

Motorized control dampers shall be low leakage extruded aluminum airfoil with a maximum of 3 cfm/sq.ft. leakage rate at 1" static pressure and shall be AMCA listed as a Class 1A damper. Damper shall be Rustin CD-50 or approved equal. Actuator shall be 120 VAC, with fail safe spring return and brushless DC motor

Roof mounted exhaust fans shall be designed for roof mounted applications with factory curb. Housing shall be spun aluminum with a non overloading backward inclined wheel. Motors shall be located out of air stream with positive cooling by ambient air. Unit shall be complete with disconnect switch, roof curb, back draft damper, starter and vibration isolators for entire motor and drive assembly. Unit shall be as manufactured by Cook or approved equal.

SECTION 15950 - CONTROLS

The controls contractor under this heading shall furnish and install all wiring and equipment necessary for a complete operational system including: automatic temperature controls, ventilation systems, exhaust systems, economizer systems, etc. as indicated on the drawings. The system shall include all necessary thermostats, relays, switches, transformers, contactors, etc. required for successful operation of all equipment as described in the sequence operations. Electrical work in connection with all control systems shall be performed by the controls contractor and coordinated with the electrical contractor as needed to provide a full and complete package.

Each rooftop unit shall be controlled by a wall mounted Honeywell model T-7350 heating/cooling thermostat with a (7) day/(24) hour program clock capable of (2) occupied/non-occupied periods, with (2) heating/(2) cooling setpoints, remote temperature sensor capability (up to 9) and auxiliary contact for Honeywell economizer controls. Thermostat assembly shall be compatible with the air handling unit's economizer and/or accessory package as specified under section 15500. Coordinate control requirements with the proposed equipment. Dual heating/cooling thermostats shall have a minimum 5 degree deadband.

The controls contractor shall be responsible for the commissioning of the project (as required) to assure a fully functional, fine-tuned H.V.A.C. system upon occupancy. The commissioning of the project shall be performed in accordance with ASHRAE guidelines and shall be defined as verification of the proper operation of all equipment, alarms, safeties, controls and any energy management systems serving the mechanical systems installed or modified on this project. Proper operation is defined as the activation of all controls, field or factory installed, to assure the correct sequencing of equipment and systems, including activation of all operating and safety controls, as hereinbefore described. The controls contractor shall report all system deficiencies to the general contractor, who shall instruct the proper trade to correct any deficiencies.

SECTION 15990 - TESTING, ADJUSTING AND BALANCING

- Perform testing, adjusting, and balancing, using the services of an independent testing and balancing agency regularly engaged in the testing and balancing of air and water systems and associated equipment and piping systems. The agency selected shall be a certified member of the associated Air Balance Council (AABC). The agency shall be independent of the installing personnel or equipment supplier for this project.
- Work shall be performed in accordance with the agenda specified herein. Procedures and methods specified herein shall be followed and, if not specifically specified herein, shall be performed in accordance with the AABC MN-1, NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems; SMACNA HVAC Systems Testing, Adjusting and Balancing; ASHRAE Handbook, HVAC Applications; and ASHRAE Handbook, HVAC Systems and Equipment.
- Prior to beginning work, submit to Engineer the following.
 - Instrument Calibration Data showing instruments to be used in TAB work and date calibrated. Instruments shall be calibrated within 12 months of beginning work.
 - Sample forms if those being used are not standard forms of NEBB or AABC.
 - Certification certificates of NEBB or AABC certified professional signing the TAB report.

Projects Involves existing equipment and conditions. Contractor shall visit the site before beginning work to investigate issues with existing work.

Prior to beginning TAB work, each piece of equipment shall be cleaned and filters replaced. Testing and balancing shall not begin until each system has been completed and is in full working order. Put all heating, ventilating, and air-conditioning systems and equipment, including controls, into full operation and continue the operation of the systems during each working day of testing and balancing.

Prior to beginning TAB work, inspect HVAC system installation. Note any issues or deficiencies that would prevent successful Testing, Adjusting, and Balancing of the HVAC systems and notify the Engineer.

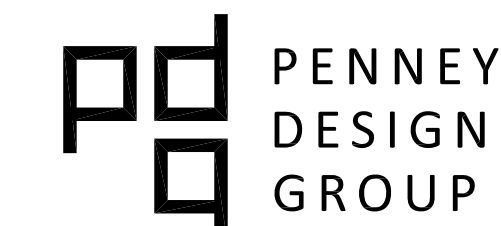
Airflows for supply air and return systems shall be adjusted to within +/- 10%. Airflows for outside air and Exhaust systems shall be adjusted to within +/-5% to +10%. Water flows for water systems shall be balanced to +/- 5%. Other quantities being adjusted shall be per NEBB or AABC standards.

The TAB report shall be submitted to the engineer for approval. The report shall include, at a minimum, the following information:

- Deficiencies found during Testing, Adjusting, and Balancing
- Equipment
 - Installation Date - For new equipment
 - Equipment Tag/Name
 - Capacity
 - Model Number and Serial Number
 - Electrical Data - Voltage, Amperage, Horsepower
 - Area in Building Served
 - Airflow
 - Total Static Pressure / External Static Pressure
 - RPM
 - Brake Horsepower / Amperes
 - Entering Air Temperature
 - Leaving Air Temperature
 - Outdoor Air Temperature
- Air outlets
 - Plan with outlet identification marked up
 - Room served
 - Outlet identification
 - Design and recorded velocities
 - Design and recorded CFMs

TAB Contractor shall assist in resolving deficiencies identified in TAB work and Engineer's review of TAB report.

Following final approval of Certified Reports by the Engineer, the settings of all valves, dampers, and other adjustment devices shall be permanently marked by the Contractor so that adjustment can be restored if disturbed at any time Devices shall not be marked until after final acceptance.



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Checked By: -

Plot Date: -

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Sheet Title

MECHANICAL
SPECIFICATIONS

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IDC #23-010

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