	ABBREVI	ATI	ONS
AAV	AUTOMATIC AIR VENT	ΗW	HOT WATER
AB V AC	ABOVE AIR CURTAIN	HWR HWS	HW RECIRC/HEATING WATE
ACU Aff	AIR CONDITIONING UNIT	НХ	HEAT EXCHANGER
AHU	AIR HANDLING UNIT	ΗZ	HERTZ
@ AFMS	AT AIR FLOW MEASURING STATION	IEER I	INTEGRATED ENERGY EFFIC
AS	AIR SEPARATOR	ISP	INTERNAL STATIC PRESSU
ATG AV	ADC TRANSFER GRILL	IRH	INFRARED RADIANT TUBE
B	BOILER	КЕF кн	KITCHEN EXHAUST FAN
BAS	BUILDING AUTOMATION SYSTEM	KW	KILOWATT
BDD	BRANCH CONTROLLER BACKDRAFT DAMPER (GRAVITY)	L	LOUVER
BDR	BASEBOARD RADIATOR	LA I LB	POUNDS
BEL BEP	BELOW BACKELOW PREVENTION DEVICE	LBS/HR	POUNDS PER HOUR
BHP	BRAKE HORESPOWER	LF	LINEAR FOOT
BLDG	BUILDING	LPR	LOW PRESSURE STEAM RE
BOD	BOTTOM OF PIPE	LPS	LOW PRESSURE STEAM SU
BTUH	BRITISH THERMAL UNITS PER HOUR	MAT	MIXED AIR TEMPERATURE
CA CC	COMPRESSED AIR COOLING COIL	MAU	MAKEUP AIR UNIT
CD	CEILING DIFFUSER /CONDENSATE DRAIN	ΜΑΥ ΜΑΧ	MANUAL AIR VENT Maximum
CFM		MBH	THOUSANDS OF BTU PER H
CHR	CHILLER WATER RETURN	MCA	MINIMUM CURRENT AMPAC
CHS	CHILLED WATER SUPPLY	MIN M.O.D.	MINIMUM MOTOR OPERATED DAMPER
CLG C	CEILING CENTER LINE	MOCP	MAXIMUM OVERCURRENT F
€ COND	CONDENSATE		NOISE CRITERIA
COP	COEFFICIENT OF PERFOMANCE	NIC.	NOT IN CONTRACT
CT CU	COOLING TOWER CONDENSING UNIT	N.O.	NORMALLY OPEN
CUH	CABINET UNIT HEATER	NTS OA	NOT TO SCALE OUTDOOR AIR
CV CW	CONSTANT VOLUME / CONTROL VALVE	OBD	OPPOSED BLADE DAMPER
CR	CONDENSER WATER RETURN	OED	OPEN END DUCT
CS	CONDENSER WATER SUPPLY	P PBD	POMP PARALLEL BLADE DAMPER
DC DB	DRY BULB TEMPATURE DRY COOLER	PD	PRESSURE DROP
°F	DEGREE FAHRENHEIT	PDH PH	POOL ROOM DEHUMIDIFIER
DH		PPM	PARTS PER MILLION
DOAS	DEDICATED OUTDOOR AIR SYSTEM	PRV	PRESSURE RELIEF VALVE
DP	DIFFERENTIAL PRESSURE	PS PSI	POUNDS PER SQUARE INCH
DX EA	DX COOLING COIL EXHAUST AIR	PSIA	POUNDS PER SQUARE INCH
EA.	EACH	PSIG PTAC	POUNDS PER SQUARE INCH PACKAGED TERMINAL AIR
EAT FER	ENTERING AIR TEMPERATURE	RA	RETURN AIR
EF	EXHAUST FAN	RF	RETURN AIR FAN / RELIEF
EFF		RH	RELATIVE HUMIDITY
EG	EXHAUST GRILLE (LESS DAMPER) ELEVATION	RHC	REHEAT COIL
ER	EXHAUST REGISTER	RLA RPM	RUNNING LOAD AMPS REVOLUTIONS PER MINUTE
ERV FSP	ENERGY RECOVERY VENTILATOR	RLFA	RELIEF AIR
ET	EXPANSION TANK	RM.	ROOM
EUH	ELECTRIC UNIT HEATER	RTU	ROOFTOP AIR HANDLING U
ewh EWT	ENTERING WATER TEMPERATURE	RX	REMOVE EXISTING
ΕX	EXISTING	SA SAF	SUPPLY AIR SUPPLY AIR FAN
EXT FCU	EXTERNAL FAN COIL UNIT	SD	SUPPLY DIFFUSER/SMOKE
FD	FIRE DAMPER	SEER	SEASONAL ENERGY EFFICI
FLA	FULL LOAD AMPS	SPEC.	PROJECT SPECIFICATIONS
FL FLEX	FLOOR FLEXIBLE	SPF	STAIR PRESSURIZATION F
FO	FLAT OVAL	SG SR	SUPPLY GRILLE SUPPLY REGISTER
FPM FPMB	FEET PER MINUTE	STRUCT.	STRUCTURAL
FSD	FIRE SMOKE DAMPER	TEMP TF	TEMPERATURE
FT	FEET	TOD	TOP OF DUCT
FTF FTR	SQUARE FEET FINNED TUBE RADIATOR	TOP	TOP OF PIPE
GAL	GALLON	TSP	THERMOSTAT
GC GIH	GENERAL CONTRACTOR	ΤΥΡ	TYPICAL
GPM	GALLONS PER MINUTE	UH UON	UNIT HEATER
GR	GLYCOL RETURN	UV	UNIT VENTILATOR
GKH GS	GAS RADIANT HEATER GLYCOL SUPPLY	V	VOLT
GUH	GAS UNIT HEATER	VAU	VARIABLE AIR VOLUME TE
GV Н	HUMIDIFIER	VD	VOLUME DAMPER
HC HCWR	HEATING COIL DUAL TEMPERATURF RFTURN	VEH VFD	VEHICLE EXHAUST
HCWS	DUAL TEMPERATURE SUPPLY	VP	VELOCITY PRESSURE
HGRH HP	HOT GAS REHEAT HEAT PUMP / HORSEPOWER	VRF	VARIABLE REFRIGERANT F
HPR	HIGH PRESSURE STEAM RETURN	w W/	WATTS WITH
HPS HR	HUR	W/0	WITHOUT
	HEAT RECOVERY COIL	WB WG	WET BULB WATER GAUGE
1 11 X V	THE AT ALLO VENT VENTLEATOR	WSHP	WATER SOURCE HEAT PUM
		L	

	GENERAL	NOTES		MECHANICAL S	(MBOL	S LIST
			SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
JPPLY	 <u>GENERAL MECHANICAL REQUIREMENTS</u> Materials, equipment, and systems shall meet all pertinent requirements of the Underwriters Laboratory (UL), the American Society for Testing Materials (ASTM), American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). Sheet Metal and Air Conditioning 	23. All supply and return and outside air ducts inside the building thermal envelope shall be insulated with 1.5" fiberglass duct insulation. All supply and return ductwork outside the building thermal envelope shall be insulated with 3" fiberglass duct insulation (minimum R-8 "installed" value). Insulation outside the building shall either be weatherproof or wrapped with a	20x12 10"Ø	RECTANGULAR DUCT		4- WAY BLOW SUPPLY AIR DIFFUSEF NON-4 WAY DIFFUSER AIR PATTERN
Y EFFICIENCY RATIO	Contractors National Association (SMACNA), American Gas Association (AGA), National Fire Protection Association (NFPA)and other nationally recognized agencies as well as the latest adopted edition of state and local code procedures, methods, and requirements, including the	weatherproof layer. Insulation shall be fiberglass wrap with scrim-reinforced foil backing. Seal all joints and punctures to preserve vapor barrier.	τ 12x8φ τ	FLAT OVAL DUCT		LINEAR SUPPLY AIR DIFFUSER ROUND SUPPLY AIR DIFFUSER
TUBE HEATER	most stringent of health and safety standards as required and as interpreted by the authority having jurisdiction. Applicable codes and standards include, but are not limited to the following: "international plumbing, building, energy, mechanical, and fuel gas codes" applicable local and municipal codes and ordinances.	24. Duct smoke detectors and accessories shall be UL tested and listed. Equipment and installation shall meet all pertinent requirements of the mechanical code and NFPA 72. Duct smoke detectors located more than 10 ft above the finished floor, or located such that the detector's alarm indicator is not visible to responding personnel, shall be provided with remote alarm		VOLUME DAMPER		RETURN AIR GRILLE
HOOD	 Bidders shall be licensed contractors in accordance with local and state laws. Bidders shall thereughly acquaint themselves with the conditions under which the work is to be 	indicators. Each remote indicator shall be clearly labeled as to function and air handling unit served, with an acrylic engraved nameplate.		FIRE DAMPER W/ACCESS DOOR		CEILING EXHAUST FAN
ERATURE	performed. They shall examine all services, equipment, surfaces, etc., which this work is in any way dependent upon, and bring any discrepancies determined or omissions found in the drawings to the owner's attention before submitting bid. Verify all dimensions by field	fire dampers shall be permitted where the air handling system is automatically shut down in the event of fire. Provide and install duct access panel with acrylic engraved nameplate for each fire damper.		STATIC PRESSURE SENSOR	<+-	DIRECTION OF AIR FLOW
	4. The systems shown on the drawings shall be provided to serve all fixtures, equipment, and areas	26. All diffusers and grille finishes shall be verified by the Architect.		MOTOR OPERATED DAMPER	٩	DEMOLISH TO THIS LOCATION
EAM RETURN EAM SUPPLY	within the Contract Limit Lines as set forth by the Architectural solution for the project. The bidding and contract requirements, general requirements, and general provisions shall apply to this section. Systems shall include all equipment, appurtenances, safety devices, and controls necessary for the intended service.	27. All mechanical equipment shall have vibration isolators, as well as flexible duct connectors. Flexible connectors shall be UL 181 tested and labeled. Mechanical fasteners and sealants shall be used to connect ducts to mechanical equipment.		FLEXIBLE CONNECTION	T) T) _R	THERMOSTAT REVERSE ACTING THERMOSTAT
ATURE	 All permits and fees required for this work shall be secured and paid for by the mechanical contractor and included in bid price. 	28. All duct coverings, linings, tape and vibration isolation connectors shall have a maximum flame spread rating of 25, and a maximum smoke generation rating of 50.		SOUND LINED DUCTWORK	®	HUMIDISTAT
	6. Anything drawn or specified on these plans shall not be construed to conflict with any local, municipal or state law, regulation or ordinance which governs the installation of any mechanical	 All duct dimensions listed on plans are inside clear dimensions. Where internally lined ductwork is specified, adjust sheet metal dimensions to accommodate liner. Elswible ducts shell not evened (' in length, per shell they be installed where they must be 	ς	CAPPED DUCTWORK	S) 99	SENSOR SMOKE DETECTOR
U PER HOUR AMPACITY	applicable laws, ordinances, regulations and codes, this contractor shall make all changes required by the enforcing authorities in a manner approved by the owner and without additional cost to the owner. Where plan requirements are more stringent than code, the installation shall	flattened. Flexible ducts shall he UL 181 tested and labeled, and must be fastened per SMACNA standards. If job conditions do not permit proper installation of flexible duct, rectangular galvanized steel duct with equal free area shall be used instead. Flexible ducts shall not be used		DUCTWORK TRANSITIONS	Ø	PRESSURE SENSOR
DAMPER RRENT PROTECTION	be in accordance with the plans.7. Where job conditions require changes from the contract documents that do not change the scope	where exposed, or where concealed above drywall or plaster ceilings. 31. Provide volume dampers at each branch off of a trunk duct to a supply diffuser.		ROUND TO RECTANGULAR TRANSITION	\$	ON/OFF SWITCH
)	of installation or nature of work required, the contractor shall make such changes without additional cost to the owner. No other changes may be made without written permission of the owner.	32. Ductwork is shown in schematic form. All required duct risers and drops to allow general routing depicted may not be shown. Provide offsets as required to meet space requirements and to avoid interference with other trades and field conditions. Exact location of the ductwork may vary	∽ →∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽∽	DUCTWORK TRANSITION	\$ ^v ©	VARIABLE SPEED SWITCH CUBIC FEET PER MINUTE (CFM)
	8. All equipment shall be new and unused, UON, and shall bear the label of an approved agency. All equipment shall be installed in strict conformance to manufacturer's instructions, except where these specifications require a higher quality installation than recommended by	according to the coordinated space requirements. Each trade shall be totally responsible for coordination with other trades. Notify engineer of conditions representing significant changes to the designed routing		RISE AND DROP IN DUCTWORK	ø	DIAMETER
AMPER	manufacturer. All mechanical equipment shall be provided with installation instructions, which shall be made available at the job site.	 Coordinate size, quantity, and location of all openings required for duct and pipe penetrations through walls, floors, and roofs, with contractor responsible for rough framing. Coordinate 		TURNING VANES	ф (1)	FLAT OVAL DRAWING NOTE
AMPER	9. All installed systems, devices and related items shall be tested in place on site. Replace any and all contractor-supplied defective devices, items or systems at contractor's own expense before completion of the project. Report any problems with existing to remain (ETR) items to owner for resolution.	location of air intakes with exhaust and plumbing vents so that intakes are a minimum of 10 feet from exhaust openings or plumbing vents. Exhaust vents shall be three feet from doors and operable windows.		RADIUS ELBOW		REVISION SYMBOL
IDIFIER	10. Contractor shall warranty all work for which materials are furnished, fabricated or field erected, all factory assembled equipment for which no specific manufacturer's guarantee is furnished,	34. Install ducts with fewest changes of direction and transitions as possible and fewest possible joints. Install fabricated fittings for changes in directions, changes in size and shape, and connections		SUPPLY DUCT DOWN	R R	DOOR LOUVER
N VALVE	warranty shall exist for a period of one (1) year from the date of final owner acceptance of the work and shall apply to defects in material and to defective workmanship of any kind.	35. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs unless specifically indicated on drawings	₹IX	SUPPLY DUCT UP	$\langle \underline{1} \rangle$	EQUIPMENT IDENTIFIER
RE INCH RE INCH ABSOLUTE	11. Contractor shall replace at contractor's own expense any contractor-supplied materials, equipment, and related items that fail or are found to be defective within the warranty period.	36. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated		RETURN DUCT DOWN		
RE INCH GAUGE AL AIR CONDITIONER	12. Arrange for chases, slots, and openings in other building components to allow for mechanical installations. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed. Scans shall be provided for repar concrete to avoid repar locations. Coordinate the cutting and patching of	 37. All mechanical equipment supported from floor structure shall be mounted on 6 thick concrete housekeeping pads unless noted otherwise. 38. Air filters shall be replaced in all air handling equipment employing such prior to final 		EXHAUST DUCT DOWN		
RELIEF AIR ESS DAMPER)	building components to accommodate installation of mechanical equipment and materials. 13. Sequence, coordinate, and integrate installations of mechanical materials and equipment for	completion and owner occupancy 39. Basis of design mechanical equipment is as scheduled on the drawings. Contractor assumes	ł K	EXHAUST DUCT UP		
Y >S	efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.	responsibility for coordinating physical space requirements of equivalent capacity mechanical equipment deemed acceptable by the engineer		AIR TITE FITTING W/INTEGRAL VOLUME DAMPER		
MINUTE	Coordinate the installation of mechanical materials installation with other building components. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.	 40. Mechanical equipment factory minimulanaged during the course of construction shall be restored to original condition prior to final acceptance 41. Coordinate mechanical ceiling devices such as diffusers and registers with light fixtures, 	<u>ج</u> ے۔۔۔ج	TOP AIR TITE FITTING CONNECTION		
(WITH DAMPER) DLING UNIT	15. Equipment locations, roof & wall openings are approximate: verify size and coordinate with G.C., equipment supplier, and owner. Provide steel framing around roof opening(s) where required and around wall opening(s) where required.	speakers, sprinkler heads, etc. 42. Electrical equipment spaces: Route ductwork to avoid passing through transformer vaults and		DOUBLE LINE FLEXIBLE DUCT		
	16. Do not endanger or damage installed Work through procedures and processes of cutting and patching. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.	43. Non-Fire-Rated Partition Penetrations: where ducts pass through interior partitions and are				
SMOKE DAMPER	17. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.	exposed to view in mechanical rooms, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. overlap opening on four sides by at least 1-1/2 inches unless indicated otherwise				
ATIONS TION FAN	18. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.	44. Fire-Rated Partition Penetrations: where ducts pass through interior partitions, install appropriately rated fire damper. Fire damper installation must strictly adhere to manufacturer's written instructions	NOTE: • ALL SYMBOLS ARE : USED, AS WELL AS	SHOWN FOR REFERENCE ONLY. CONTRACTO	DR SHALL NOTE . REFER TO PRO	THAT NOT ALL SYMBOLS MAY BE JECT SPECIFIC NOTES FOR
	19. For all air systems: adjust fans, supply register dampers, and duct volume dampers as needed to balance all systems to match listed airflows (+/- 10%), and provide a written summary report. Replace fan drive if required to achieve design airflows. Air balance shall be performed by an	45. All air handlers, condensers, control devices and other mechanical apparatus shall be clearly marked for easy identification and owner Use black plastic or bakelite name plate engraved with white letters 2" high minimum. Punched tape is not acceptable.	ADDITIONAL INFOR			
	independent AABC or NEBB certified firm. Summary report shall include design, preliminary and final airflow data, and shall include a list of deficiencies.	46. Mechanical contractor shall furnish record set of drawings with any deviations marked in red ink, within 90 days of system acceptance.		WORK - HEAVY AND SOLID LINES	12	
SSURE	20. For all water systems: adjust ball valves, balance valves, pumps, etc, as needed to balance all piping to match GPM (+/- 5%) and pressure and temperature ranges shown, and provide a written summary report. Water system balance shall be performed by an independent AABC or NEBB certified firm. Summary report shall include design, preliminary and final flow data, and shall include a list of deficiencies.	47. Mechanical contractor shall furnish manuals for all new equipment within 90 days of system acceptance, including, at a minimum: equipment input and output capacity and required maintenance actions, 0&M manuals, controls maintenance and calibration information (including wiring diagrams and controls set points), and a complete written narrative of how each system is	EXIS	STING TO REMAIN - LIGHT AND SOLID LINES	5	
E NOTED	21. The entire installation, including the gauges of ductwork, shall be in strict compliance with SMACNA standards, except where these specifications require a stricter installation standard. System is 2" pressure class, UON. Constant volume and single zone VAV supply, all return and exhaust ductwork shall be SMACNA Class B. Multi-zone VAV supply ducts shall be sealed to meet SMACNA Class A requirements, and all ductwork shall be supported at intervals not exceeding 10' Sealant shall be UL-181A or 181B certified.	 48. All submittals shall be sent in pdf format, hard copies will not be reviewed. Submittals shall be highlighted or redlined to indicate equipment ID from schedules, model number, performance data, electrical data, dimensions, weights, options and accessories, and shall be emailed to the Architect. Provide control sequences and control products for all relevant mechanical equipment. 	NOT	ICE TO CONTRA	CTORS	5
NG CURRENT UME TERMINAL NCY DRIVE	22. All 90 degree turns in supply and return ductwork shall be mitered elbows with single wall turning vanes at 2" spacing extended in the direction of airflow, or smooth radius elbows with a radius-to-width ratio of 1.0 or greater. Mitered elbows without turning vanes, square-throat radiused-heel elbows, and radiused-throat square-heel elbows are NOT acceptable. All duct transitions shall be smooth (30 degree taper maximum), not abrupt.	49. Ductwork systems in areas with drywall ceilings/bulkheads shall be balanced prior to closing of the ceiling. All air devices mounted in drywall ceiling to have trim panels. Where access to manual balancing dampers will not be easily accessible, provide cable controlled damper at neck of diffuser or at duct main takeoff. Metropolitan air technology "roto-twist" model RT-150 or equal.	ALL CONTRACTOF WORK SITE AND F DIFFER FROM THA ARCHITECT/ENGI MAY BE ISSUED. CONTRACTORS NE THE CONTRACTOF	RS PRIOR TO BID SUBMISSION PROCESS SH TIELD VERIFY ALL EXISTING CONDITIONS. AT SHOWN ON THESE PLANS SHALL BE REF NEER SO THAT NEW AND REVISED BID DRA MODIFICATIONS TO SCOPE OF WORK WHIC EGLECT TO VISIT THE SITE PRIOR TO SUBM RS SOLE RESPONSIBILITY.	ALL VISIT PROF ANY CONDITION ORTED TO WINGS OR INFOF CH RESULT FROM 1ITTING BID, SH	POSED S THAT RMATION 1 ALL BE
RE RANT FLOW			NOT (TICE TO CONTRA	CTORS _ITY	 S:
AT PUMP			EXISTING FACILI INTERRUPTIONS O BEFORE SERVICE ACCESS SHALL B BE GIVEN 48 HOL	TY IS PARTIALLY OCCUPIED. CONTRACTOR OF SERVICE WITH OWNER AND NOTIFY OCC INTERRUPTION. IF ACCESS TO OCCUPIED E COORDINATED WITH OWNER AND OCCUP. IRS NOTICE	SHALL COORDIN UPANTS 48 HOU SPACE IS REQUI ANTS AFFECTED	JATE RS IRED, SHALL





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

MECHANICAL PLAN-EXISTING CONDITIONS/DEMOLITION

DRAWING NOTES 1#

- 1. REMOVE ALL EXISTING VEHICLE EXHAUST AND ALL ASSOCIATED APPURTENANCES.
- 2. REMOVE EXISTING VEHICLE EXHAUST DUCTWORK THRU THE WALL, PATCH AND SEAL OPENING WATERTIGHT.
- REMOVE EXISTING WALL LOUVER AND ALL ASSOCIATED APPURTENANCES. PATCH AND SEAL OPENING WATERTIGHT.
- 4. EXISTING WALL LOUVER TO REMAIN.
- 5. REMOVE EXISTING STRUCTURE MOUNTED GAS FIRED UNIT HEATER AND ALL ASSOCIATED APPURTENANCES.
- 6. EXISTING EXHAUST FAN TO REMAIN.
- 7. REMOVE EXISTING SUPPLY AIR DUCTWORK AND ALL AIR DEVICES IN THIS AREA BACK TO POINT INDICATED ON DRAWING.
- 8. EXISTING SUPPLY AND RETURN AIR DUCTWORK TO REMAIN.
- 9. CAP AND SEAL EXISTING SUPPLY AIR DUCTWORK WHERE INDICATED.
- 10. EXISTING INFRA-RED HEATER TO REMAIN.











8"-2500

X

8"-250¢

- DRAWING.
 - 40. RETURN AIR DUCTWORK DROPPING DOWN TO ABOVE 102 PARTS DEPARTMENT CEILING. MESH TO COVER OPENING.

8"-250¢

18 <u>RTU-7</u>

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

MECHANICAL PLAN-NEW WORK

- FULL SIZE OPEN END SOUND LINED RETURN AIR DUCTWORK WITH ELBOW AND 1"x1" WIRE
- 39. RETURN AIR GRILLE MOUNTED IN BOTTOM OF DUCTWORK, SIZE AS INDICATED ON
- 38. SUPPLY AND RETURN AIR DUCTWORK SUPPORTED HIGH FROM STRUCTURE ABOVE DROPPING DOWN AND THRU WALL TO HIGH IN EXISTING SERVICE DEPARTMENT CEILING.
- WITH 1" INTERNAL LINING AND NO EXTERNAL DUCT WRAP. 37. DOOR LOUVER, SIZE AS INDICATED.
- 35. SUPPLY AIR DUCTWORK UP TO UNIT ABOVE. 36. SUPPLY AIR DUCTWORK SUPPORTED HIGH ABOVE (BELOW MEZZANINE LEVEL) EXPOSED,
- 34. SUPPLY AIR DUCTWORK DROPPING DOWN TO BELOW MEZZANINE LEVEL.
- 33. 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.
- 32. SUPPLY AIR REGISTER MOUNTED ON THE END OF THE DUCTWORK WITH NECK SIZE AND AIR QUANTITY INDICATED. DUCTWORK THRU BLOCK WALL TO REGISTER.
- 31. EXISTING INFRA-RED HEATER TO REMAIN.
- 30. SUPPLY AIR DUCTWORK EXTENDED OUT TO GRILLE ON FACE OF WALL, SIZE AS INDICATED.
- 29. 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.
- 28. SUPPLY AIR DUCTWORK SUPPORTED AS HIGH AS POSSIBLE EXPOSED, WITH 1" INTERNAL LINING AND NO EXTERNAL DUCT WRAP.
- 27. EXHAUST DUCTWORK SUPPORTED HIGH AND UP THRU ROOF TO FAN. EXTEND DOWN TO 10'-0" ABOVE FLOOR WITH OPEN END AND 1"x1" WIRE MESH TO COVER OPENING. REFER TO FAN SCHEDULE FOR MORE INFORMATION.
- 26. REMOTE CARBON MONOXIDE AND TOXIC/EXPLOSIVE GAS SENSORS MOUNTED ON WALL 48" ABOVE FLOOR AND INTERLOCKED WITH GAS CONTROL PANEL (TYPICAL).
- 25. 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.
- 24. WALL MOUNTED ELECTRIC HEATER INTERLOCKED WITH THERMOSTAT, REFER TO SCHEDULE
- 23. 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.
- MESH OVER OPENING.
- AREA. 22. 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
- SLEEVE AND 1"x1" WIRE MESH TO COVER OPENINGS ON BOTH SIDES. 21. 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
- 20. AIR TRANSFER OPENING IN WALL 12" ABOVE FLOOR, SIZE AS INDICATED, WITH FULL SIZE
- (TYPICAL).
- 19. 12"x12" CEILING MOUNTED AIR TRANSFER GRILLES WITH 8"Ø CONNECTING DUCTWORK
- 18. WALL MOUNTED THERMOSTAT MOUNTED 48" ABOVE FLOOR WITH LOCKABLE COVER AND INTERLOCKED WITH UNIT INDICATED.

- 16. AIR TRANSFER GRILLE HIGH IN WALL, SIZE AS INDICATED. 17. EXHAUST AIR DUCTWORK UP THRU ROOF TO FAN.
- 15. 10"x10" CEILING MOUNTED EXHAUST AIR REGISTER WITH AIR QUANTITY INDICATED
- 14. 24"x24" CEILING MOUNTED RETURN AIR GRILLE WITH FULL SIZE NECK (TYPICAL).

AIR-TITE FITTING AND MANUAL VOLUME DAMPER.

DRAWING NOTES 1#

3. EXISTING SUPPLY AND RETURN AIR DUCTWORK TO REMAIN.

ALARM DEVICE NEXT TO THERMOSTAT (TYPICAL).

4. PHOTOELECTRIC DUCT MOUNTED SMOKE DETECTOR WITH 12"x12" ACCESS DOOR FOR TUBE INSPECTION. UNIT SHALL BE SYSTEM SENSOR INNOVAIRFLEX SERIES,

5. RETURN AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).

7. SUPPLY AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).

8. EXHAUST AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE CEILING (TYPICAL).

9. FULL SIZE OPEN END SOUND LINED RETURN AIR DUCTWORK WITH ELBOW AND 1"x1" WIRE

10. DUCTWORK UP THRU ROOF. TRANSITION IN VERTICAL AS REQUIRED FOR CONNECTION TO

11. LINX ROUND SPIRAL SUPPLY AIR DUCTWORK SUPPORTED FROM STRUCTURE ABOVE WITH AIR CRAFT CABLING OR AS RECOMMENDED BY MANUFACTURER. DUCTWORK SHALL BE

12. SUPPLY AIR REGISTER MOUNTED IN SIDE/BOTTOM OF ROUND DUCTWORK WITH NECK SIZE AND AIR QUANTITY INDICATED. LINX RGS-3 OR APPROVED EQUAL WITH INTEGRAL VOLUME CONTROL AND DOUBLE DEFLECTION LOUVERS SET AT 30° LEFT/RIGHT.

13. 24"x24" CEILING MOUNTED SUPPLY AIR DIFFUSER WITH NECK SIZE AND AIR QUANTITY

INDICATED (TYPICAL). PROVIDE RIGID/FLEXIBLE DUCTWORK BACK TO MAIN WITH

DOUBLE WALL, INSULATED WITH SELF-SEALING/GASKETED CONNECTIONS.

PHOTOELECTRIC MODEL D4120 (4 WIRE) OR APPROVED EQUAL. PROVIDE WALL MOUNTED

SYSTEM SENSOR MODEL APA151 OR APPROVED EQUAL WITH REMOTE AUDIBLE/VISUAL

1. EXISTING WALL LOUVER TO REMAIN.

2. EXISTING EXHAUST FAN TO REMAIN.

6. MANUAL BALANCING DAMPER (TYPICAL).

MESH TO COVER OPENING.

UNIT CURB OPENING.

- (TYPICAL).





DRAWING NOTES (1)(#)

- 1. ROOF MOUNTED EXHAUST FAN ON 14" FACTORY CURB. REFER TO SCHEDULE. 2. GAS FIRED ROOFTOP UNIT ON 14" FACTORY CURB. COORDINATE EXACT LOCATION WITH STRUCTURAL DRAWINGS. REFER TO SCHEDULE.
- 3. MAKEUP AIR DUCTWORK UP THRU ROOF TO GOOSENECK.
- 4. EXISTING EXHAUST AIR FAN TO REMAIN.
- 5. EXISTING ROOFTOP UNIT TO REMAIN.









8. IT IS VERY IMPORTANT TO RESPECT THE RELAY CAPACITY.

WIRING DIAGRAM-MULTIPLE GAS DETECTION SYSTEM NO SCALE

CONSTANT VOLUME ROOFTOP UNIT SEQUENCE OF OPERATIONS

- 1. DURING OCCUPIED PERIOD AS PROGRAMMED ON ASSOCIATED ROOFTOP THERMOSTAT, BLOWER FAN SHALL RUN CONTINUOUSLY AND OUTSIDE AIR DAMPERS SHALL OPEN TO MINIMUM.
- 2. ON A CALL FOR HEATING, UNIT HEAT EXCHANGER SHALL BE ENERGIZED AND SHALL RUN UNTIL SETPOINT IS SATISFIED.
- 3. ON A CALL FOR COOLING FROM THERMOSTAT, SYSTEM SHALL ENERGIZE (MECHANICAL COOLING) IN STAGES. WHEN OUTDOOR ENTHALPY (AS SENSED BY UNIT MOUNTED CONTROLS) IS BELOW ITS SETTING AND FREE COOLING IS AVAILABLE, UNIT MOUNTED ECONOMIZER SHALL BE ENABLED AND SHALL MODULATE DAMPERS BEYOND THEIR MINIMUM POSITIONS TO SATIFY THE SETTING OF (55°F ADJUSTABLE). DURING THIS CYCLE, MECHANICAL COOLING SHALL BE DISABLED. ENTHALPY CONTROLLER SHALL RESET THE OUTSIDE AIR DAMPERS TO MINIMUM AND SHALL ENERGIZE THE MECHANICAL COOLING WHEN THE SETTING IS EXCEEDED.
- 4. DURING NIGHT SETBACK PERIOD AS PROGRAMMED ON ASSOCIATED ROOFTOP UNIT THERMOSTAT, BLOWER FAN SHALL BE OFF AND OUTSIDE AIR DAMPERS CLOSED. ON A CALL FOR HEATING OR COOLING, THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED AND THE FAN OR ASSOCIATED HEAT EXCHANGER OR COMPRESSOR SHALL CYCLE UNTIL SPACE SETPOINTS ARE SATISFIED.
- 5. UNIT SHALL BE DE-ENERGIZED IF SMOKE DETECTOR SENSES SMOKE OR ANY SAFETY/CONTROL EXCEEDS ITS LIMITS.

MISCELLANEOUS EQUIPMENT SEQUENCE OF OPERATIONS

- MISCELLANEOUS HEAT
- FACTORY MOUNTED INTEGRAL THERMOSTAT. HEATER SHALL BE ENERGIZED UPON A CALL FOR HEAT AND DE-ENERGIZED ONCE TEMPERATURE SET POINT IS SATISFIED.
- EXHAUST FANS
- 1. ROOF MOUNTED TOILET ROOM EXHAUST FANS SHALL BE INTERLOCKED AND OPERATE CONTINUOUSLY DURING OCCUPIED TIMES. DURING UNOCCUPIED TIMES, THE FANS SHALL BE DE-ENERGIZED.
- TO RUN CONTINUOUSLY 24/7.
- 3. VENTILATION FANS FOR SERVICE SHOP SHALL BE INTERLOCKED WITH GAS CONTROL PANEL SHALL OPEN MOTORIZED DAMPERS AT MAKEUP AIR INTAKES AND AT ROOF FANS, AND ALSO ENERGIZE ROOF MOUNTED EXHAUST FANS TO VENTILATE THE ENTIRE SHOP. WHEN GAS LEVELS CLOSE MOTORIZED DAMPERS.

AIR TITE FITTING. PROVIDE

GAS DETECTION SENSOR OPERATION AND SPECIFICATION

- 1. GAS DETECTION SYSTEM CONTROL PANEL
- A. PROVIDE A HONEYWELL E3-POINT MODEL VA-301C CONTROL PANEL (WITH VA301R RELAY MODULE) CAPABLE OF DETECTING A WIDE RANGE OF TOXIC AND FLAMMABLE/COMBUSTIBLE GASES.
- B. THE CONTROL PANEL SHALL MEET THE FOLLOWING CRITERIA: CONTROL PANEL MUST BE CAPABLE OF COMMUNICATING DIGITALLY THROUGH (2) RS-485 COMMUNICATION BUSES WITH THE NETWORKED TRANSMITTERS. EACH COMMUNICATION BUS MUST BE CAPABLE OF ACCEPTING UP TO (32) ADDRESSABLE TRANSMITTERS AT A MAXIMUM DISTANCE OF 2,000 FEET. ONE POWER SUPPLY (BRINGING EITHER 17-27 VAC OR 24-38 VDC) WILL BE SUFFICIENT TO POWER THE ENTIRE GAS DETECTION NETWORK: CONTROLLER AND SENSORS. CONTROL PANEL WILL ACTIVATE (2) INTERNAL DPDT RELAYS AT FULLY PROGRAMMABLE ALARM LEVELS (AND WITHIN PROGRAMMABLE TIME DELAYS) AND BE CAPABLE OF ACTIVATING UP TO (8) EXTERNAL RELAYS PER TRANSMITTER AT FULLY PROGRAMMABLE ALARM SET POINTS (AND WITHIN PROGRAMMABLE TIME DELAYS). CONTROLLER MUST BE CAPABLE OF HANDLING UP TO (32) SEPARATE RELAY MODULES. RELAY RATING WILL BE NO LOWER THAN 1/6 HP AT 240 VAC, 5A AT 24VDC.
- C. THE CONTROL PANEL WILL INDICATE THE EXACT CONCENTRATION OF GAS, THE GAS DETECTED AND THE LOCATION OF THE SENSOR BY SWEEPING THROUGH THE NETWORK AND DISPLAYING THE DETECTED LEVELS AT EACH POINT ON AN ALPHANUMERIC DISPLAY. THE DISPLAY WILL INDICATE TWO ALARM LEVELS FOR EACH SENSING POINT. THE LED WILL ALSO PROVIDE VISUAL FEEDBACK IN THE FOLLOWING MANNER:
- NORMAL OPERATION: GREEN LED - ALARM LEVEL 1: RED LED
- ALARM LEVEL 2: RED LED - FAILURE: YELLOW LED
- D. THE STANDARD (2) HIGH/LOW ALARM LEVELS W1LL BE COMPLIMENTED WITH AN OPTIONAL THIRD LEVEL THAT CAN BE PROGRAMMED INTO THE PANEL AT A LATER DATE.
- E. PANEL WILL HAVE AN INCORPORATED AUDIBLE ALARM, RATED AT NO LESS THAN 65 DB AT 3 FEET, THAT WILL BE ACTIVATED AT FULLY PROGRAMMABLE LEVELS.
- F. CONTROL PANEL WILL LEAVE THE FACTORY FULLY PROGRAMMED AND WILL BE ADJUSTABLE IN THE FIELD BY KEYING INSTRUCTIONS ON THE KEYPAD OR VIA A LAPTOP.
- G. THREE LEVELS OF CONTINUOUS SELF DIAGNOSTICS WILL VERIFY THE READING OF EACH TRANSMITIER FOR ABNORMAL SENSING BEHAVIOR. LOSS OF COMMUNICATION WITH THE TRANSMITTERS AND PROGRAM CORRUPTION ANALYSIS.
- H. UNIT WILL BE MANUFACTURED TO U.L. 61010-1 LABEL AND CSA 22.2. CERTIFICATIONS.
- 2. GAS (FLAMMABLE/COMBUSTIBLE AND TOXIC) SENSORS:
- A. PROVIDE A HONEYWELL E3-POINT (NETWORK).
- B. PROVIDE GAS SENSORS TO DETECT CO, NO2 AND FLAMMABLE/ COMBUSTIBLE (C3H8) USING ELECTROCHEMICAL AND/OR CATALYIC SENSORS AND MEET THE FOLLOWING REQUIREMENTS. COMBUSTIBLE SENSOR SHALL BE CALIBRATED FOR OCTANE (GASOLINE VAPORS): SENSOR WILL BE POWERED BY THE CONTROL PANEL POWER OUTPUT RATED AT 17-27 VAC OR BY AN EXTERNAL POWER SUPPLY RATED AT 17-27 VAC OR 24-38 VOC. FULLY ADDRESSABLE GAS SENSOR MUST BE CAPABLE OF COMMUNICATING DIGITALLY WITH CONTROL PANEL THROUGH AN RS-485 COMMUNICATION PORT. GAS SENSORS MUST BE INSTALLED IN A TRUE DAISY CHAIN WITH AN END OF THE LINE RESISTOR ON THE LAST SENSOR. THE GAS MONITOR WILL INCORPORATE EITHER AN ELECTROCHEMICAL CELL OR CATALYTIC BEAD TECHNOLOGY.
- D. WHEN PLACED INTO A NETWORK CONFIGURATION THE SENSOR WILL BE CAPABLE OF TWO ALARM LEVELS.
- E. A (10) STEP LED DISPLAY, WITH THE POSSIBILITY OF ADDING AN OPTIONAL LCD, WILL PROVIDE READING OF CONCENTRATION OF GAS. NORMAL OPERATION WILL BE INDICATED BY A GREEN LED; FAULT OPERATION WILL BE INDICATED BY A YELLOW LED. SENSOR MUST ALSO BE CAPABLE OF INCORPORATING AN AUDIBLE ALARM (RATED AT NO LESS THAN 65 DB AT A DISTANCE OF 3 FEET) WHICH WILL BE ACTIVATED AT FULLY PROGRAMMABLE LEVELS ON THE CONTROL PANEL.
- F. SENSOR WILL BE CAPABLE OF OPERATING WITHIN RELATIVE HUMIDITY RANGES OF 0-90% RH AND TEMPERATURE RANGES OF -40 DEGREES F TO I22 DEGREES F.
- G. UNIT WILL BE MANUFACTURED TO U.L. 61010-1 LABEL AND CSA 22.2. CERTIFICATIONS.

1. FAN FORCED ELECTRIC WALL/UNIT HEATERS SHALL BE CONTROLLED IT'S

WITH THE BUILDING "H.V.A.C." TIME CLOCK SO THAT FANS ARE ENERGIZED

2. OIL STORAGE ROOM ROOF MOUNTED EXHAUST FAN SHALL BE INTERLOCKED

SENSOR CONTROL PANEL AND ON/OFF SWITCH OVERRIDE. WHEN REMOTE SENSORS DETECT LEVELS HIGHER THEN SET POINT (ADJUSTABLE), GAS DROP TO BELOW SET POINT THE SYSTEM SHALL DE-ENERGIZE FANS AND



AIR-	-TITE SI	ZE C
DUCTSIZE	CONNECTION RING	DUCT
5"	8"	9
6"	9"	10
7"	10"	11
8"	11"	12



GOOSENECK THRU ROOF

COMcheck Software Version COMcheckWeb Mechanical Compliance Certificate

Project Information Energy Code: Project Title: Location: Climate Zone: Project Type:

2018 IECC CMA HONDA WINCHESTER EXPANSION Winchester, Virginia 4a

Construction Site: 3985 Valley Pike Winchester, Virginia 22602 Addition Owner/Agent:

BelAir, Maryland 21014 443-787-4264

Designer/Contractor:

Jill Sparr

Mechanical Systems List Quantity System Type & Description

- 1 RTU-1 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 70 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 38 kBtu/h, Air-Cooled Condenser, Unknown Economizer Proposed Efficiency = 15.00 SEER, Required Efficiency = 14.00 SEER Proposed Part Load Efficiency = 0.00, Required Part Load Efficiency = 0.00
- 1 RTU-2 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 220 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 129 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 11.50 EER, Required Efficiency = 11.00 EER Proposed Part Load Efficiency = 14.60 IEER, Required Part Load Efficiency = 12.60 IEER
- 1 RTU-3 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 220 kBtu/h
- Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 129 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 11.50 EER, Required Efficiency = 11.00 EER Proposed Part Load Efficiency = 14.60 IEER, Required Part Load Efficiency = 12.60 IEER
- 1 RTU-4 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 112 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 55 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 15.40 SEER, Required Efficiency = 14.00 SEER Proposed Part Load Efficiency = 14.60, Required Part Load Efficiency = 0.00
- 1 RTU-5 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 112 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 56 kBtu/h, Air-Cooled Condenser, Air Economizer
- Proposed Efficiency = 15.40 SEER, Required Efficiency = 14.00 SEER Proposed Part Load Efficiency = 14.60, Required Part Load Efficiency = 0.001 RTU-6 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 125 kBtu/h
- Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 80 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 12.00 EER, Required Efficiency = 11.00 EER Proposed Part Load Efficiency = 16.00 IEER, Required Part Load Efficiency = 12.60 IEER Project Title: CMA HONDA WINCHESTER EXPANSION

Data filename:

Quantity System Type & Description

1 RTU-7 (Single Zone): Heating: 1 each - Central Furnace, Gas, Capacity = 70 kBtu/h Proposed Efficiency = 80.00% Et, Required Efficiency: 80.00 % Et or 80% AFUE Cooling: 1 each - Single Package DX Unit, Capacity = 39 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 15.00 SEER, Required Efficiency = 14.00 SEER Proposed Part Load Efficiency = 16.00 , Required Part Load Efficiency = 0.00

- 1 EH-1 (Unknown w/ PerimeterSystem): Heating: 1 each - Unit Heater, Electric, Capacity = 16378 kBtu/h
- No minimum efficiency requirement applies 1 EH-2 (Unknown w/ PerimeterSystem):
- Heating: 1 each Unit Heater, Electric, Capacity = 17065 kBtu/h No minimum efficiency requirement applies
- 1 EH-3 (Unknown w/ PerimeterSystem): Heating: 1 each - Unit Heater, Electric, Capacity = 17065 kBtu/h
- No minimum efficiency requirement applies 1 EWH-1:
- Electric Storage Water Heater, Capacity: 20 gallons Proposed Efficiency: 1.65 SL, %/h (if > 12 kW), Required Efficiency: 1.65 SL, %/h (if > 12 kW)
- 1 EWH-2: Electric Storage Water Heater, Capacity: 30 gallons Proposed Efficiency: 1.20 SL, %/h (if > 12 kW), Required Efficiency: 1.20 SL, %/h (if > 12 kW)

Mechanical Compliance Statement

Project Title: CMA HONDA WINCHESTER EXPANSION

Data filename:

Compliance Statement: The proposed mechanical specifications, and other calculations submitted wit designed to meet the 2018 IECC requirements in C mandatory requirements listed in the Inspection Ch	design represented in this document is consisten th this permit application. The proposed mechanic OMcheck Version COMcheckWeb and to comply v necklist.	t with the building plans, cal systems have been vith any applicable
Jill Sparr	Jill Sparr	July 26, 2023
Name - Title	Signature	Date

	GAS FIRED ROOFTOP UNIT SCHEDULE																				
	AREA SERVED	NOMINAL		F	AN DAT	A		R-410A COOLING DATA (BTUH)				HEATING DATA (BTUH)				ELEC	ELECTRICAL				
ITEM#		TONS	C.F.M.	OUTSIDE AIR	H.P.	E.S.P.	TYPE	TOTAL	SENSIBLE	ENTER: DB°F	ING AIR WB°F	EER/ IEER	INPUT	OUTPUT	TEMP. RISE °F	NO. STAGES	VOLTS/ PHASE	MCA/ FUSE	(LBS.)	MODEL #	MANUFACTURER
RTU-1	TECH AREA	3.0	960	110	2.4	1.0"	BELT	37,800	22,800	75.2	64.2	15.0 SEER/ 12.0 EER	70,000	56,000	54.0	2	480V/3Ø	12.9/15	627	ZYG04D	JOHNSON CONTOLS
RTU-2	110 SERVICE DEPARTMENT	10.0	4,000	895	5.25	1.0"	BELT	129,300	97,500	79.4	65.6	11.5 EER/ 14.6 IEER	220,000	176,000	40.7	2	480V/3Ø	27.8/30	1,113	ZYG12E	JOHNSON CONTOLS
RTU-3	109 SERVICE DEPARTMENT	10.0	4,000	905	5.25	1.0"	BELT	129,400	98,300	80.0	66.0	11.5 EER/ 14.6 IEER	220,000	176,000	40.7	2	480V/3Ø	27.8/30	1,113	ZYG12E	JOHNSON CONTOLS
RTU-4	107 SERVICE DEPARTMENT-SOUTH	4.0	1,600	340	2.9	1.0"	BELT	55,000	40,400	79.8	65.9	15.4 SEER/ 12.0 EER	112,000	90,000	52.1	2	480V/3Ø	14.2/20	718	ZYG05E	JOHNSON CONTOLS
RTU-5	107 SERVICE DEPARTMENT-NORTH	4.0	1,800	340	2.9	1.0"	BELT	56,600	42,900	79.8	65.9	15.4 SEER/ 12.0 EER	112,000	90,000	46.3	2	480V/3Ø	14.2/20	718	ZYG05E	JOHNSON CONTOLS
RTU-6	PARTS DEPARTMENT	6.0	2,600	700	2.9	1.0"	BELT	79,600	57,000	80.5	67.7	12.0 EER/ 16.0 IEER	125,000	100,000	35.6	2	480V/3Ø	19.5/25	909	ZYGA7E	JOHNSON CONTOLS
RTU-7	101 CUSTOMER LOUNGE	3.0	1,000	170	2.4	1.0"	BELT	38,500	23,900	76.2	64.7	15.0 SEER/ 12.0 EER	70,000	56,000	51.9	2	480V/3Ø	12.9/15	627	ZYG04E	JOHNSON CONTOLS

NOTES 1) UNITS SHALL BE COMPLETE WITH 14" HIGH FACTORY ROOF CURB, BAROMETRIC RELIEF DAMPER, ENTHALPY CONTROLLED LOW-LEAKAGE ECONOMIZER, POWERED CONVENIENCE OUTLET, SINGLE ZONE VFD (FOR UNITS THAT ARE 6 TON AND GREATER), SINGLE SPEED FAN (FOR UNITS THAT ARE 3-5 TON) AND DISCONNECT SWITCH. 2) UNITS 2,000 CFM SUPPLY AND GREATER SHALL BE PROVIDED WITH DUCT MOUNTED SUPPLY/RETURN SMOKE DETECTORS. 3) UNITS SHALL BE CONTROLLED BY 24 HOUR/7 DAY PROGRAMMABLE THERMOSTAT AND SHALL HAVE FAN SET TO 'ON' POSITION DURING OCCUPIED TIMES. 4) ALL UNITS TO COME CONDENSATE OVERFLOW SWITCH AND 2" MERV 8 FILTERS.

		TYDE	
IIEI™#	AREA SERVED	TTPE	C.F.M.
EH-1	112 SPRINKLER	WALL	100
EH-2	108 AIR/OIL ROOM	UNIT	350
EH-3	103 PARTS RECEIVING	UNIT	350

NOTE: UNIT SHALL BE COMPLETE WITH FAN AND SAFTEY CONTROLS, 24-VOLT TRANSFORMER AND WALL MOUNTED THERMOSTAT.

	EXHAUST FAN SCHEDULE														
ITEM#	AREA SERVED	C.F.M.	SONES	H.P./ WATTS	FAN TYPE	E.S.P.	DRIVE TYPE	R.P.M.	ELECTRICAL DATA	CONTROL	WEIGHT (LBS.)	MODEL #	MANUFACTURER		
EF-1	TECH AREA	460	7.4	1/6 H.P.	ROOF	0.5"	BELT	1,380	115V/1Ø	TIME CLOCK	50	100ACEB	СООК		
EF-2,3,4,5	110 SHOP VENTILATION	1,490	8.9	1/4 H.P.	ROOF	0.25"	BELT	1,574	115V/1Ø	GAS PANEL	75	135ACEB	СООК		
EF-6,7,8,9	109 SHOP VENTILATION	1,450	8.5	1/4 H.P.	ROOF	0.25"	BELT	1,574	115V/1Ø	GAS PANEL	75	135ACEB	COOK		
EF-10	108 AIR/OIL ROOM	560	8.9	1/6 H.P.	ROOF	0.25"	BELT	1,448	115V/1Ø	24/7	50	80ACEB	COOK		
EF-11,12,13	107 SHOP VENTILATION	1,510	9.1	1/4 H.P.	ROOF	0.25"	BELT	1,574	115V/1Ø	GAS PANEL	75	135ACEB	СООК		
NOTES:	TIME CLOCK SHALL ALLOW FAN TO RU		JUSI Y DUR		ED TIMES										

2) FANS <u>EF-2 THRU EF-9 & EF-11 THRU EF-13</u> SHALL BE INTERLOCKED WITH GAS SENSOR CONTROL PANEL AND MANUAL ON/OFF OVERRIDE SWITCH.

Integrated Design Consultants LLC 139 N. Main Street Suite 102

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	ELECTRIC HEATER SCHEDULE													
FAN DATA			HEATIN	IG DATA		ELECTRICAL	WEIGHT	MOUNTING		MANUFACTURER				
H.P.	R.P.M.	BTUH	KW	TEMP. RISE °F	NO. STAGES	DATA	(LBS.)	HEIGHT	MODEL #					
1/100	-	16,378	4.8	27.0	1	277V/1Ø	25	8" A.F.F.	AWH4507F	BERKO				
1/100	1,600	17,065	5.0	45.1	1	277V/1Ø	25	8'-0"	HUHAA527	BERKO				
1/100	1,600	17,065	5.0	45.1	1	277V/1Ø	25	8'-0"	HUHAA527	BERKO				

4
2
5

SPACE NAME	Æ
110 SERVICE DEPARTMENT	
	1
TOTAL	
NOTES:	
1) * OCCUPANCY LOAD IS HIGHE	R
2) THE ROOFTOP UNIT WILL BE S	SE

		2018 INT	ERNATIO	NAL MECH	ANICAL	CODE - VEI	NTILATION	CHART - F	RTU-3			
SPACE NAME	A _z (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a Az AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM∕ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOR AIR FRACTION
109 SERVICE DEPARTMENT	5800	0.12	696	Θ	Θ	0	Θ	696	0.8	870	3,670	0.24
117 SPECIAL TOOLS	230	0.12	28	Θ	Θ	0	Θ	28	0.8	35	330	0
TOTAL	6030		724		Θ		Θ	724		905	4000	0.24
NOTES:								System	Ventilation Efficie	ency E _v =	0.91	
L) * OCCUPANCY LOAD IS HIGHER THEN MINIMUM OCCUPANT LOAD.											724	
2) THE ROOFTOP UNIT WILL BE SET AT <u>905 CFM</u> OUTSIDE AIR. <u>Total required Outdoor Air V_{ot}=</u>											796	CFM

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-4														
SPACE NAME	A _z (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	RaAz AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _P OCCUPANT OUTDOOR AIR RATE (CFM∕ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	Voz ZONE OUTDOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOR AIR FRACTION		
107 SERVICE DEPARTMENT- SOUTH	2265	0.12	272	Θ	Θ	Θ	Θ	272	0.8	340	1600	0.22		
		0	Θ	Θ	Θ	Θ	Θ	Θ	0.8	\odot	Θ			
TOTAL	2265		272		0		Θ	272		340	1600	0.22		
NOTES: System Ventilation Efficiency E _v = 0														
L) * OCCUPANCY LOAD IS HIGHE		Uncorrected Outdoor Air Intake = 272												
2) THE ROOFTOP UNIT WILL BE 3	SET AT <u>34</u>	0 CEM OUTSIDE		Total required Outdoor Air Vot= 293 CFM										

2018 INTERNATIONAL MEC	HANICAL CODE - VEN	TILATION CHART - RTU-1

Az (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a A _z AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _P OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p P _z OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDO AIR FRACTI
75	0.06	5	Θ	Θ	Θ	Θ	7	0.8	9	Θ	0
305	0.06	19	30	12	5	60	79	0.8	99	600	0.17
235	Θ	Θ	Θ	Θ	Θ	Θ	Θ	0.8	Θ	290	0
60	Θ	Θ	Θ	Θ	Θ	Θ	Θ	0.8	Θ	70	0
675		24		12		60	86		108	960	0.17
		•					System	Ventilation Efficie	ency E _v =	0.98	
THEN M	INIMUM OCCUP	ANT LOAD.					Uncorre	ected Outdoor Air	r Intake =	84	
et at <u>11</u>	<u>.0 CFM</u> OUTSID	e air.					Total	86	CFM		

	2018 INT	ERNATIO	NAL MECH	ANICAL (CODE - VEI	NTILATION	CHART - F	RTU-2			
A _z (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a Az AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM∕ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	Voz ZONE OUTDOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOI AIR FRACTIO
5960	0.12	716	Θ	Θ	Θ	Θ	716	0.8	895	4,000	0.23
0	Θ	Θ	Θ	Θ	Θ	Θ	Θ	0.8	Θ	Θ	0
5960		716		0		Θ	716		895	4000	0.23
			•				System	Ventilation Efficie	ency $E_v =$	0.92	
THEN M	INIMUM OCCUP	ANT LOAD.					Uncorre	ected Outdoor Ai	^r Intake =	716	
et at <u>89</u>	<u>5 CFM</u> OUTSID	E AIR.					Total	required Outdoo	r Air V _{ot} =	779	CFM

2018 INTERNATIONAL MECHANICAL CODE VENTILATION CHART RTUZ

SPACE NAME	A _z (F⊤²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	RaAz AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	Rp OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	Voz ZONE OUTDOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOR AIR FRACTION
107 SERVICE DEPARTMENT- NORTH	2265	0.12	272	Θ	Θ	Θ	Θ	272	0.8	340	1600	0.22
		0	0	Θ	Θ	Θ	Θ	Θ	0.8	Θ	0	
TOTAL	2265		272		0		Θ	272		340	1600	0.22
OTES:	•					•	•	System	Ventilation Effici	ency E _v =	0.93	
) * OCCUPANCY LOAD IS HIGHE	ER THEN M	INIMUM OCCUP	ANT LOAD.					Uncorre	ected Outdoor Ai	r Intake =	272	
) THE ROOFTOP UNIT WILL BE SET AT <u>340 CFM</u> OUTSIDE AIR.									Total required Outdoor Air Vot=			CFM

ZOTO INTENNATIONAL MEGNANICAL CODE - VENTILATION CHART - RTO-0													
SPACE NAME	A _z (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	R _a Az AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _p OCCUPANT OUTDOOR AIR RATE (CFM∕ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	Voz ZONE OUT DOOR AIR	V _{PZ} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOR AIR FRACTION	
102/201 PARTS DEPARTMENT EX.	1470	0.12	177	Θ	Θ	0	Ο	177	0.8	222	960	0.24	
104 PARTS DEPARTMENT	910	0.12	110	Θ	Θ	Θ	Θ	110	0.8	138	520	0.27	
105 PARTS DEPARTMENT	575	0.12	69	Θ	Θ	Θ	Θ	69	0.8	87	250	0.35	
106 TECH HALL	115	0.06	7	Θ	Θ	Θ	Θ	7	0.8	9	50	0.18	
202 PARTS DEPARTMENT	670	0.12	81	Θ	Θ	Θ	Θ	81	0.8	102	300	0.34	
203 PARTS DEPARTMENT	910	0.12	110	Θ	Θ	0	0	110	0.8	138	520	0.27	
TOTAL	4650		554		Θ		Θ	554		696	2600	0.35	
NOTES:								System	Ventilation Effici	ency E _v =	0.8		
1) * OCCUPANCY LOAD IS HIGHE	R THEN M	INIMUM OCCUP	ANT LOAD.					Uncorrected Outdoor Air Intake = 5					
2) THE ROOFTOP UNIT WILL BE	SET AT <u>70</u>	<u>)0 CFM</u> OUTSID	e air.					Total	required Outdoc	or Air V _{ot} =	693	CFM	

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2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-6

2018 INTERNATIONAL MECHANICAL CODE - VENTILATION CHART - RTU-7

PACE NAME	A _z (FT ²)	Ra AREA OUTDOOR AIR RATE (CFM/FT ²)	RaAz AREA OUTDOOR AIR (CFM)	OCCUPANT LOAD RATE (# PEOPLE / 1,000FT ²)	Pz TOTAL # OF PEOPLE	R _P OCCUPANT OUTDOOR AIR RATE (CFM/ PERSON)	R _p Pz OCCUPANT OUTDOOR AIR (CFM)	V _{bz} BREATHING ZONE OUTDOOR AIR (CFM)	Ez ZONE AIR DISTRIBUTION EFFECTIVENESS	V _{oz} ZONE OUTDOOR AIR	V _{pz} TOTAL SUPPLY AIR TO SPACE	Zp OUTDOOR AIR FRACTION
ISTOMER LOUNGE *	555	0.06	34	30	20	5	100	134	0.8	168	1000	0.17
		Θ	Θ	Θ	Θ	Θ	Θ	Θ	0.8	Θ	0	
TOTAL	555		34		20		100	134		168	1000	0.17
System Ventilation E										ency $E_v =$	0.98	
PANCY LOAD IS HIGHE	R THEN M	INIMUM OCCUP	ANT LOAD.					Uncorre	134			
OFTOP UNIT WILL BE S	SET AT <u>17</u>	<u>'O CFM</u> OUTSID	e air.					Total	137	CFM		

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

- 1. 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.
- 2. 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.
- 3. 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.
- 4. 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.
- 5. 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 responsiblity 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.
- 6. 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.
- 7. 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.
- 8. 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.
- 9. 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:
- 9.1. Catalog data on each piece of equipment furnished
- 9.2. Approved shop drawings on each piece of equipment furnished 9.3. Maintenance, operation and lubrication instruction on each piece of
- equipment furnished
- 9.4. Simplified temperature control diagrams of all H.V.A.C. systems 9.5. Manufacturer's and contractor's guarantees
- 9.6. Air balancing reports
- 9.7. Commissioning reports as required 9.8. Schedule/description of all service work/maintenance inspections required by the paragraphs of this section
- 10. 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.
- 11. 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.
- 12. 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.
- 13. 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.
- 14. 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:
- 14.1. Replace all H.V.A.C. air filters before occupancy 14.2. Lubricate all motor and fan bearings as required
- 14.3. Clean drain pans and drain lines
- 14.4. Check and tighten all electrical connections as required
- 14.5. Inspect all belts for adjustment and condition, replace as required 14.6. Check operating pressures and refrigerant charge
- 14.7. Inspect all controls for correct operation and calibrate as required 14.8. 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.
- 15. 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.

MECHANICAL SPECIFICATIONS

SECTION 15250 - MECHANICAL INSULATION

- 1. 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 then 25 and a smoke-developement index of not more then 50 when tested in accordance with ASTM F84.
- 2. 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 6.0 at 1-1/2" compressed thickness. Owens Corning "SOFTR" fiberglass type 100 with foil faced vapor barrier. Insulation shall be neatly installed and suitable for 40°F-250°F duct temperatures.
- 3. 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.
- 4. 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.
- 5. All internal 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 15500 - HEATING, VENTILATING & AIR CONDITIONING (HVAC)

- A. 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.
- B. 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, check/clean heating and cooling coils, lubricate, rebalance, etc. and verify proper operation to ensure maximum capacity.
- C. 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/blower 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.

. 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 then 2,000 cfm of air and shall be U.L. 268A, NFPA 90A, NFPA 72 and FM approved and listed. They shall contain an photoelectruc type detector and air sampling chamber with sampling tubes extending through the width of the air duct. Unit shall be System Sensor InnovairFlex 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 visable 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 contact configuration.

SECTION 15880 - AIR DISTRIBUTION

- A. 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.
- B. 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.
- C. 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".
- D. 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.
- E. 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 vaned. Vanes consisting of curved metal blades shall permit the air to make abrupt turns without turbulence.
- F. 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 SMANCA 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.
- G. 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, moisure 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 Solcoustic or approved equal.
- #26 off-white enamel. Titus model TMS, Metal-Aire, Krueger or approved equal.
- I. 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, Metal-Aire, Krueger or approved equal.
- J. 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.
- K. 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, Metal-Aire, Krueger or approved equal.
- L. 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, Metal-Aire, Krueger or approved equal.
- M. 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 Ruskin CD-50 or approved equal. Actuator shall be 120 VAC, with fail safe spring return and brushless DC motor
- N. 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

- A. 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.
- B. 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 auxillary contact for Honeywell econonmizer controls. Thermostat assembly shall be compatible with the air handling unit's economizer and/or accessory package as specified under section 15500. Coordinate control the proposed equipment. Dual heating/ cooling thermostats shall have a minimum 5 degree deadband.
- C. 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.

H. Supply air diffusers shall have all steel construction with louvered face and finished with

requirements with

SECTION 15990 - TESTING, ADJUSTING AND BALANCING

- A. 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.
- B. 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.
- C. Prior to beginning work, submit to Engineer the following.
- 1. Instrument Calibration Data showing instruments to be used in TAB work and date calibrated. Instruments shall be calibrated within 12 months of beginning work. 2. Sample forms if those being used are not standard forms of NEBB or AABC. 3. Certification certificates of NEBB or AABC certified professional signing the TAB report.
- D. Projects involves existing equipment and conditions. Contractor shall visit the site before beginning work to investigate issues with existing work.
- E. 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.
- F. 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.
- G. 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.
- H. The TAB report shall be submitted to the engineer for approval. The report shall include, at a minimum, the following information:
- 1. Deficiencies found during Testing, Adjusting, and Balancing 2. Equipment
- a. Installation Date For new equipment
- b. Equipment Tag/Name c. Capacity
- d. Model Number and Serial Number e. Electrical Data - Voltage, Amperage, Horsepower
- f. Area in Building Served
- a. Airflow h. Total Static Pressure / External Static Pressure
- i. RPM
- . Brake Horsepower / Amperes k. Entering Air Temperature
- l. Leaving Air Temperature m. Outdoor Air Temperature
- 3. Air outlets
- a. Plan with outlet identification marked up b. Room served
- c. Outlet identification d. Design and recorded velocities
- e. Design and recorded CFM's
- I. TAB Contractor shall assist in resolving deficiencies identified in TAB work and Engineer's review of TAB report.
- J. 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.

