STANDARD HVAC ABBREVIATIONS

AAV	AUTOMATIC AIR VENT
ACCESS	ACCESSORIES
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AMP	AMPERE
AP	ACCESS PANEL
APD	AIR PRESSURE DROP
ARI	AIR CONDITIONING AND REFRIGERATION INSTITUTE
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
BAS	BUILDING AUTOMATION SYSTEM
BD	BACKDRAFT DAMPER
BHP	BRAKE HORSEPOWER
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CI	CAST IRON
CLG	COOLING
CO	CARBON MONOXIDE
CO2	CARBON DIOXODE
COP	COEFFICIENT OF PERFORMANCE
CV	CONSTANT VOLUME
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
DB	DECIBELS
DB	DRY-BULB TEMPERATURE
DC	DISCONNECT
DDC	DIRECT DIGITAL CONTROLS
DEG	DEGREE DELTA(CHANGE IN TEMPERATURE)
DIA	DIAMETER
DIW	DEIONIZED WATER
DP	DEW POINT TEMPERATURE
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATIO
EG	EXHAUST GRILLE
EMERG	EMERGENCY POWER
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
EX.	EXISTING
F	FAHRENHEIT
F&T	FLOAT AND THERMOSTATIC
FA	FREE AREA
FD	FIRE DAMPER
FLA	FULL LOAD AMPERES
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
FURN	FURNISHED
GA	GAUGE
GAL	GALLONS
GPM	GALLONS PER MINUTE
HD	HEAD
HOA	HAND/OFF/AUTOMATIC
HP	HORSEPOWER
HPR	HIGH PRESSURE RETURN (STEAM CONDENSATE)
HSTAT	HUMIDISTAT
HTG	HEATING
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
HZ	HERTZ
I/O	INPUT/OUTPUT
IAQ	INDOOR AIR QUALITY
IN HG	INCHES OF MERCURY
IN WC	INCH WATER COLUMN
IN WG	INCH WATER GAUGE
IPLV	INTERGRATED PART LOAD VALUE
INST	INSTALLED
KW	KILOWATT
KWH	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LBS/HR	POUNDS PER HOUR
LF	LINEAR FOOT (FEET)
LPR	LOW PRESSURE RETURN (STEAM CONDENSATE)
LPS	LOW PRESSURE STEAM
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	1000 BTUH
MCA	MINIMUM BRANCH CIRCUIT AMPACITY
MERV	MINIMUM EFFICIENCY REPORTING VALUE
MIN	MINIMUM
MOD	MOTOR OPERATED DAMPER
MPR	MEDIUM PRESSURE RETURN (STEAM CONDENSATE)
MPS	MEDIUM PRESSURE STEAM
MRI	MAGNETIC RESONANCE IMAGING
MVD	MANUAL VOLUME DAMPER
NA	NOT APPLICABLE
NC	NOISE CRITERIA
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OCP	OVER CURRENT PROTECTION
PD	PRESSURE DROP
PPM	PARTS PER MILLION
PRS	PRESSURE REGULATING (VALVE) STATION
PRV	PRESSURE REGULATING VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH – ABSOLUTE
PSIG	POUNDS PER SQUARE INCH – GAGE
RA	RETURN AIR
RAT	RETURN AIR TEMPERATURE
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID LINE
RLA	RUN LOAD AMPERE
RO	REVERSE OSMOSIS
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
SA	SUPPLY AIR
SAT	SUPPLY AIR TEMPERATURE
SC	SHADING COEFFICIENT
SCD	SMOKE CONTROL DAMPER
SD	SMOKE DETECTOR
SENS	SENSIBLE HEAT
SP	STATIC PRESSURE
TAB	TESTING, ADJUSTING, BALANCE
TDH	TOTAL DYNAMIC HEAD
TDS	TOTAL DISSOLVED SOLIDS
TSP	TOTAL STATIC PRESSURE
TSTAT	THERMOSTAT
UL	UNDERWRITERS LABORATORY
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
WB	WET-BULB (TEMPERATURE)
WG	WATER GAGE
WPD	WATER SIDE PRESSURE DROP
WIRE	WIRED

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
DRAWING SET APPEARANCE	
TO BETTER COMMUNICATE SCOPE TO PERMIT AGENCIES AND CONTRACTORS, EACH DRAWING IN THIS DRAWING SET HAS BEEN CREATED IN BOTH "COLOR" AND "BLACK AND WHITE". THERE EXISTS A COLOR LAYER WITHIN EACH DRAWING WHERE VISIBILITY IS CONTROLLED THROUGH THE PDF LAYER MANAGER. THIS LAYER VISIBILITY CAN BE TOGGLED DISPLAYING EITHER "COLOR" OR "BLACK AND WHITE", TO MAINTAIN SCOPE BASED SHADING WHEN PRINTING TO PAPER, BLACK AND WHITE NEEDS TO BE VISIBLE. FOR FURTHER INSTRUCTIONS, REFER TO CONTRACTOR RESOURCES ON OUR WEBSITE AND DOWNLOAD "DRAWING COLOR INSTRUCTIONS". WWW.KLHENGRS.COM - CONTRACTOR RESOURCES (RIGHT HAND SIDE OF PAGE).	
PIPING LINE TYPES	
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
MECHANICAL AIR DEVICES	
SR	SUPPLY REGISTER
RG	RETURN GRILLE
CD	CEILING DIFFUSER
MECHANICAL DUCTWORK	
UP	SUPPLY DUCT WITH ELBOW TURNED UP
DN	SUPPLY DUCT WITH ELBOW TURNED DOWN
UP	RETURN DUCT WITH ELBOW TURNED UP
DN	RETURN DUCT WITH ELBOW TURNED DOWN
UP	EXHAUST DUCT WITH ELBOW TURNED UP
DN	EXHAUST DUCT WITH ELBOW TURNED DOWN
24X12 SA	SUPPLY DUCT
24X12 RA	RETURN DUCT
24X12 EA	EXHAUST DUCT
24X12 OA	OUTSIDE AIR DUCT
	FLEXIBLE DUCTWORK CONNECTION
	BRANCH TAKEOFF
	REDUCER, CONCENTRIC
	REDUCER, NONCONCENTRIC

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
MECHANICAL DUCTWORK ACCESSORIES	
	DUCT WITH MANUAL VOLUME DAMPER
S	DUCT MOUNTED SMOKE DETECTOR (HARD WIRE INTERLOCK TO FAN MOTOR BY E.C.) FURNISHED BY E.C., INSTALLED BY M.C.
	ROUND ELBOW WITH TURNING VANES
	ELBOW WITH TURNING VANES
MK	MOTOR OPERATED DAMPER - LOW VOLTAGE
BD	BAROMETRIC DAMPER
MECHANICAL STATS & SENSORS	
TS	TEMPERATURE SENSOR
T	LOW VOLTAGE THERMOSTAT
MECHANICAL MISCELLANOUS	
UC 0'-1"	1" DOOR UNDERCUT

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KRIS T. SCHNITGEN
E-77432
REGISTERED PROFESSIONAL ENGINEER
STATE OF OHIO
9/2/2022

KLH ENGINEERS
KOHRS LONNEMANN HEIL ENGINEERS, INC.
MECHANICAL/ELECTRICAL ENGINEERS
WWW.KLHENGRS.COM
1538 ALEXANDRIA PIKE, SUITE
11 FT. THOMAS, KENTUCKY
41075 800-354-9783
859-442-8050
859-442-8058 FAX
LEXINGTON, KENTUCKY
LOUISVILLE, KENTUCKY
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NEW YORK, NEW YORK

FACTORY 52
JENI'S SPLENDID ICE CREAMS
2755 PARK AVENUE
NORWOOD, OH 45212

NO.	DATE	ISSUED / REVISION
1	09/02/2022	100% SET

PROJECT NO. **21163.00**

DRAWING TITLE:
MECHANICAL
COVER SHEET

M0.0

KLH PROJECT NO: 22552.23

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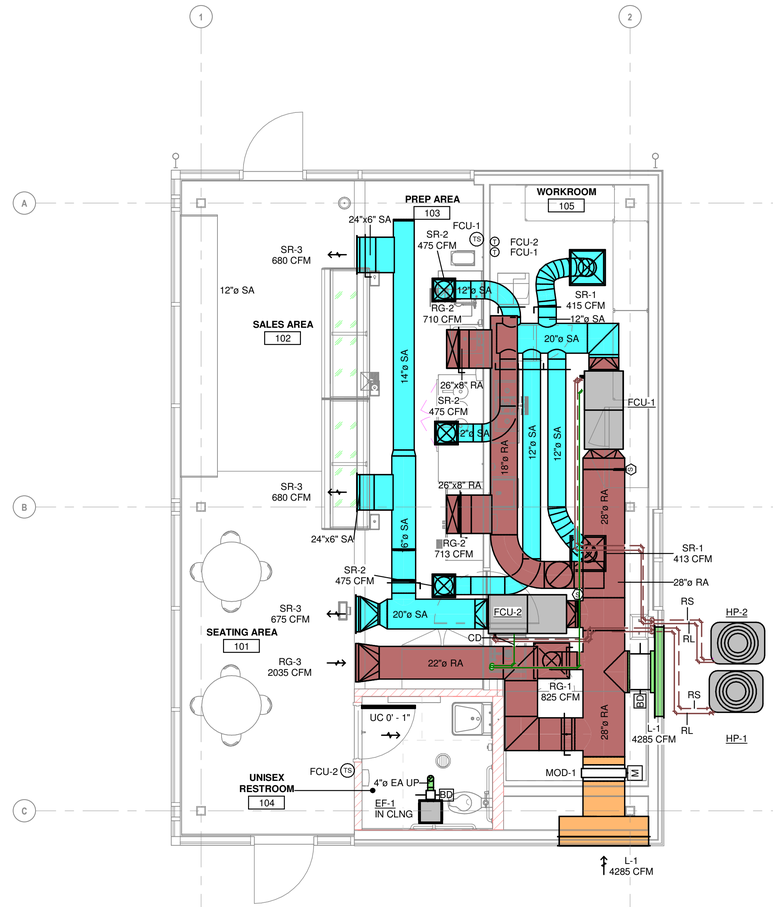

MECHANICAL PLAN

1/4" = 1'-0"

N

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KRIS T. SCHNITGEN
E-77432
REGISTERED PROFESSIONAL ENGINEER
STATE OF OHIO
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FACTORY 52

JENI'S SPLENDID ICE CREAMS

2755 PARK AVENUE
NORWOOD, OH 45212

NO.	DATE	ISSUED / REVISION
1	09/02/2022	100% SET

PROJECT NO. **21163.00**

DRAWING TITLE:

MECHANICAL
DUCTWORK
FINISHED FLOOR
PLAN OVERALL

M2.0

KLH PROJECT NO: 22552.23

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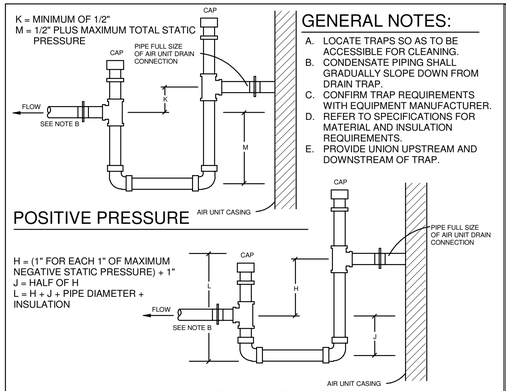


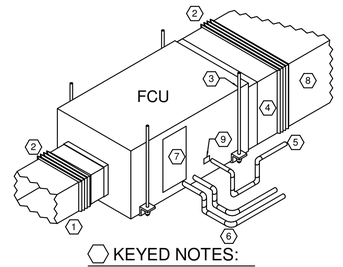
GENERAL NOTES:

A. LOCATE TRAPS SO AS TO BE ACCESSIBLE FOR CLEANING.
B. CONDENSATE PIPING SHALL GRADUALLY SLOPE DOWN FROM DRAIN TRAP.
C. CONFIRM TRAP REQUIREMENTS WITH EQUIPMENT MANUFACTURER.
D. REFER TO SPECIFICATIONS FOR MATERIAL AND INSULATION REQUIREMENTS.
E. PROVIDE UNION UPSTREAM AND DOWNSTREAM OF TRAP.

NOTE: OUTDOOR UNITS AND UNITS LOCATED IN UNCONDITIONED SPACES WHICH PROVIDE COOLING IN THE WINTER MUST HAVE HEAT TRACE ON THE CONDENSATE PIPING.

232113.23-05 - CONDENSATE DRAIN TRAP POSITIVE & NEGATIVE

SCALE: NONE

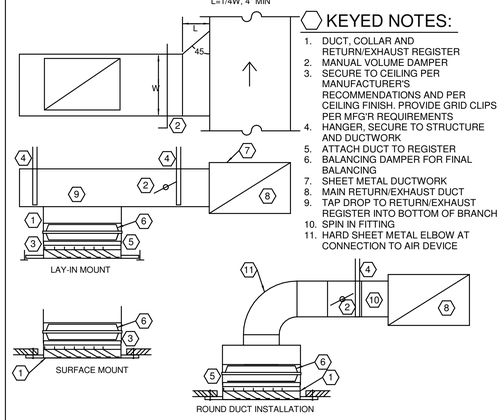


KEYED NOTES:

1. INSULATED SUPPLY DUCT
2. FLEXIBLE CONNECTION
3. GALVANIZED ALL-THREAD ROD WITH VIBRATION ISOLATOR (TYPICAL) ATTACHED TO STRUCTURE
4. FILTER RACK AND ACCESS DOOR
5. CONDENSATE LINE WITH TRAP
6. REFRIGERANT LINES, SUCTION LINE INSULATED WITH 3/4" ARMAFLEX
7. SERVICE ACCESS PANEL
8. RETURN DUCT 1/2" ACOUSTIC LINING (MINIMUM OF 10')
9. HIGH WATER ALARM IN CONDENSATE DRAIN PAN. WIRE TO BREAK 24 VOLT CONTROL POWER IN THE CASE OF A HIGH WATER EVENT.

238126.00-05 - FAN COIL DX

SCALE: NONE

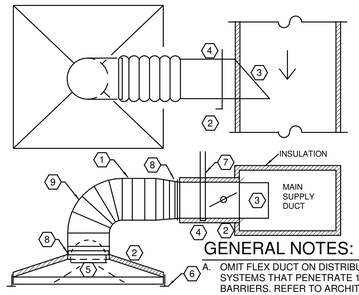


KEYED NOTES:

1. DUCT, COLLAR AND RETURN/EXHAUST REGISTER
2. MANUAL VOLUME DAMPER
3. SECURE TO CEILING PER MANUFACTURER'S RECOMMENDATIONS AND PER CEILING FINISH. PROVIDE GRID CLIPS PER MFG'R REQUIREMENTS
4. HANGER, SECURE TO STRUCTURE AND DUCTWORK
5. ATTACH DUCT TO REGISTER
6. BALANCING DAMPER FOR FINAL BALANCING
7. SHEET METAL DUCTWORK
8. MAIN RETURN/EXHAUST DUCT
9. TAP DROP TO RETURN/EXHAUST REGISTER INTO BOTTOM OF BRANCH
10. SPIN IN FITTING
11. HARD SHEET METAL ELBOW AT CONNECTION TO AIR DEVICE

233713.00-21 - RETURN/EXHAUST REGISTER INSTALLATION

SCALE: NONE



GENERAL NOTES:

A. OMIT FLEX DUCT ON DISTRIBUTION SYSTEMS THAT PENETRATE 1-HR FIRE BARRIERS. REFER TO ARCHITECTURAL PLANS FOR LOCATIONS OF FIRE BARRIERS.

KEYED NOTES:

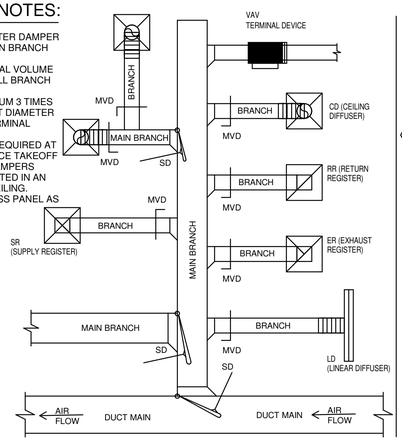
1. MAXIMUM LENGTH OF INSUL. FLEX DUCT EQUALS 5 FEET. FLEX NOT PERMITTED IN INACCESSIBLE CEILINGS
2. INSULATED DUCT, COLLAR AND DIFFUSER BY HVAC CONTRACTOR
3. SCOOP
4. SPIN IN FITTING WITH MANUAL VOLUME DAMPER
5. INTERNAL BUTTERFLY DAMPER FOR DRYWALL APPLICATIONS ONLY. (PROVIDE KEY FOR ADJUSTMENT)
6. SECURE TO CEILING PER MANUFACTURER'S RECOMMENDATIONS AND PER CEILING FINISH. PROVIDE GRID CLIPS PER MFG'R REQUIREMENTS. PROVIDE FRAMING FOR DRYWALL INSTALLATION.
7. HANGER, SECURE TO STRUCTURE AND DUCTWORK
8. PEEL BACK INSULATION AND PROVIDE STRAPPING AND SHEET METAL SCREWS AT FLEX CONNECTION TO DUCT. THEN PROVIDE STRAPPING AROUND INSULATION
9. SUPPORT FLEX TO PREVENT COLLAPSING

233713.00-04 - DIFFUSER INSTALLATION TYPICAL

SCALE: NONE

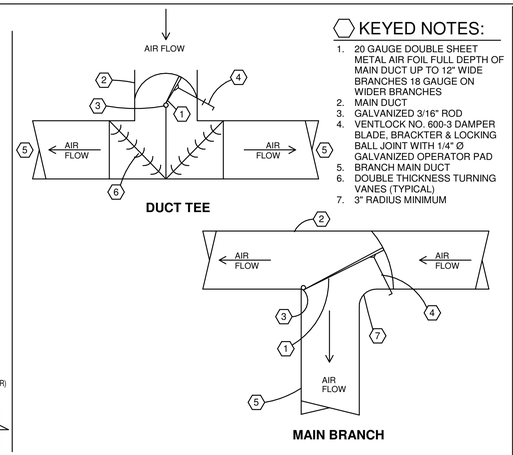
GENERAL NOTES:

1. PROVIDE SPLITTER DAMPER (SD) AT ALL MAIN BRANCH TAKEOFFS
2. PROVIDE MANUAL VOLUME DAMOERS AT ALL BRANCH TAKEOFFS
3. PROVIDE MINIMUM 3 TIMES STRAIGHT INLET DIAMETER TO ALL VAV TERMINAL DEVICES
4. DAMPER NOT REQUIRED AT TERMINAL DEVICE TAKEOFF
5. ALL MANUAL DAMPERS SHALL BE LOCATED IN AN ACCESSIBLE CEILING. PROVIDE ACCESS PANEL AS REQUIRED.



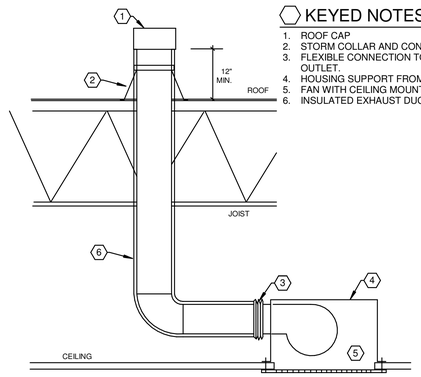
233300.00-01 - MANUAL DAMPER DETAIL

SCALE: NONE



KEYED NOTES:

1. 20 GAUGE DOUBLE SHEET METAL AIR FOIL FULL DEPTH OF MAIN DUCT UP TO 12" WIDE BRANCHES 18 GAUGE ON WIDER BRANCHES
2. MAIN DUCT
3. GALVANIZED 3/16" ROD
4. VENTLOCK NO. 600-3 DAMPER BLADE, BRACKTER & LOCKING BALL JOINT WITH 1/4" Ø GALVANIZED OPERATOR PAD
5. BRANCH MAIN DUCT
6. DOUBLE THICKNESS TURNING VANES (TYPICAL)
7. 3" RADIUS MINIMUM

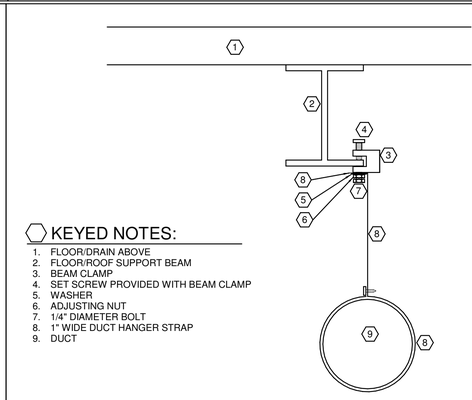


KEYED NOTES:

1. ROOF CAP
2. STORM COLLAR AND CONE FLASHING
3. FLEXIBLE CONNECTION TO FAN OUTLET.
4. HOUSING SUPPORT FROM JOIST.
5. FAN WITH CEILING MOUNTED GRILLE.
6. INSULATED EXHAUST DUCTWORK.

233423.00-15 - CEILING EXHAUST FAN

SCALE: NONE



KEYED NOTES:

1. FLOOR/DRAIN ABOVE
2. FLOOR/ROOF SUPPORT BEAM
3. BEAM CLAMP
4. SET SCREW PROVIDED WITH BEAM CLAMP
5. WASHER
6. ADJUSTING NUT
7. 1/4" DIAMETER BOLT
8. 1" WIDE DUCT HANGER STRAP
9. DUCT

233113.00-02 - DUCT SUPPORT DETAIL

SCALE: NONE

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KRIS T. SCHNITGEN
E-77432
REGISTERED PROFESSIONAL ENGINEER
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FACTORY 52

JENI'S SPLENDID ICE CREAMS

2755 PARK AVENUE
NORWOOD, OH 45212

NO.	DATE	ISSUED / REVISION
1	09/02/2022	100% SET

PROJECT NO. **21163.00**

DRAWING TITLE:
MECHANICAL - DETAILS

M5.0

KLH PROJECT NO: 22552.23

COMcheck Software Version 4.1.5.1

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2010) Standard
Project Title:	FACTORY 52
Location:	Cincinnati, Ohio
Climate Zone:	4a
Project Type:	New Construction

Construction Site:
2755 PARK AVE
NORWOOD, OH 45212

Owner/Agent:

Designer/Contractor:
KLH Engineers
1538 Alexandria Pike
Fort Thomas, KY 41075

Mechanical Systems List

Quantity **System Type & Description**

2 HVAC System 1 (Single Zone):
Split System Heat Pump
Heating Mode: Capacity = 35400 kBtu/h,
Proposed Efficiency = 9.00 COP, Required Efficiency = 3.20 COP
Cooling Mode: Capacity = 59400 kBtu/h, , Air Economizer
Proposed Efficiency = 11.00 EER, Required Efficiency: 9.50 EER → 9.6 IEER
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 1600 CFM, 0.5 motor nameplate hp

1 EWH1:
Electric Storage Water Heater, Capacity: 40 gallons
Proposed Efficiency: 0.92 SL, Btu/h (if > 12 kW), Required Efficiency: 241.36 SL, Btu/h (if > 12 kW)

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2010) Standard requirements in COM*check* Version 4.1.5.1 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Kris Schnitgen - P.E. | Signature | 09/01/2022
Name - Title | Date

COMcheck Software Version 4.1.5.1

Inspection Checklist

Energy Code: 90.1 (2010) Standard

Requirements: 100.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2,6.4, 4.2.1,6.7.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2,7.7.1,10.4.2 [PR3][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water system sized per manufacturer's sizing guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
4.2.2,8.4.1,1.8,4.1.2,8.7 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.4 [PR5][1]	Detailed instructions for HVAC systems commissioning included on the plans or specifications for projects >=50,000 ft2.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.8 [FO9][3]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
7.4.4.1 [PL2][3]	Temperature controls installed on service water heating systems (<=120ºF to maximum temperature for intended use).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
7.4.6 [PL4][3]	Heat traps installed on non-circulating storage water tanks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4,6.4.1.5 [ME1][2]	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency:____	Efficiency:____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
6.4.3.4.1 [ME3][3]	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.2, 6.4.3.4.3 [ME4][3]	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.4.5 [ME39][3]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.4 [ME5][3]	Ventilation fans >0.75 hp have automatic controls to shut off fan when not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.9 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >40 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.10 [ME40][2]	Single zone HVAC systems with fan motors >=5 hp have variable airflow controls. Air conditioning equipment with a cooling capacity >=110,000 Btu/h has variable airflow controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.4.4.1.1 [ME7][3]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.2 [ME8][2]	HVAC ducts and plenums insulated. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.3 [ME9][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	____ in.	____ in.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.4 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.2.1 [ME10][2]	Ducts and plenums sealed based on static pressure and location.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.1,6.5.1.1,6.5.1.3 [ME12][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut-off, integrated economizer control, and provide a means to relieve excess outside air during operation.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
6.5.2.3 [ME19][3]	Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.4.1 [ME25][3]	HVAC pumping systems >10 hp designed for variable fluid flow.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.6.1 [ME56][1]	Exhaust air energy recovery on systems meeting Table 6.5.6.1.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.5.7.1.1 [ME32][2]	Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.2 [ME46][3]	Conditioned supply air to space with a kitchen hood shall not exceed the greater of a) supply flow required to meet space heating or cooling, or b) hood exhaust flow minus the available air transfer from available spaces.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.1.5 [ME49][1]	Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.2 [ME33][1]	Fume hoods exhaust systems >=15,000 cfm have VAV hood exhaust and supply systems, direct make-up air or heat recovery.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1 High Impact (Tier 1) 2 Medium Impact (Tier 2) 3 Low Impact (Tier 3)

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KRIS T. SCHNITGEN
E-77432
REGISTERED PROFESSIONAL ENGINEER
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KOHRS LONNEMANN HEIL ENGINEERS, INC.
MECHANICAL/ELECTRICAL ENGINEERS
WWW.KLHENGRS.COM
1538 ALEXANDRIA PIKE, SUITE
11 FT. THOMAS, KENTUCKY
41075 800-354-9783
859-442-8050
859-442-8058 FAX

LEXINGTON, KENTUCKY
LOUISVILLE, KENTUCKY
COLUMBUS, OHIO
NEW YORK, NEW YORK

FACTORY 52
JENI'S SPLENDID ICE CREAMS
2755 PARK AVENUE
NORWOOD, OH 45212

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COMCHECK

M5.2

KLH PROJECT NO: 22552.23

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.8.1 [ME34][2]	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
7.4.2 [ME36][2]	Service water heating equipment meets efficiency requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10][2]	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
10.4.1 [EL9][2]	Electric motors meet requirements where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [FI3][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.2 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.1 [FI21][3]	HVAC systems equipped with at least one automatic shutdown control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.3.2 [FI22][3]	Setback controls allow automatic restart and temporary operation as required for maintenance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.5 [FI5][3]	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.3.7 [FI6][3]	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.2 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.3 [FI9][1]	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft2 of conditioned area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.7.2.4 [FI10][1]	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☑Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
7.4.4.3 [FI11][3]	Public lavatory faucet water temperature <=110°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
10.4.3 [FI24][2]	Elevators are designed with the proper lighting, ventilation power, and standby mode.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
7.4.3 [FI45][2]	First 8 ft of outlet piping is insulated	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Additional Comments/Assumptions:

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M5.3

KLH PROJECT NO: 22552.23

HVAC AIR COOLED CONDENSING UNIT SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

Equipment Mark	DESCRIPTION	LOCATION	STATUS	FED FROM	WEIGHT (lbs)	MANUFACTURER	MODEL	EER	SEER	NOMINAL TONS	CLG MBH (mbh)	CLG SENS (mbh)	EMERGENCY	ELECTRIC CONNECTION SUMMARY	AVAILABLE FAULT CURRENT
HP-1	AIR SOURCE OUTDOOR HEAT PUMP	OUTDOOR	NEW	FCU-1	150 lb	TRANE	4TWA3060B3	11.0	13.0	5	61	51	NO	(HP-1) A - 208V/3PH, 21 MCA, 35A OCP	8706
HP-2	AIR SOURCE OUTDOOR HEAT PUMP	OUTDOOR	NEW	FCU-2	150 lb	TRANE	4TWA3060B3	11.0	13.0	5	56	47	NO	(HP-2) A - 208V/3PH, 21 MCA, 35A OCP	8848

HVAC LOUVER SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	MODEL	FACE SIZE	FREE AREA	MATERIAL	FINISH
L-1	INTAKE LOUVER	RUSKIN	ELF6811D	60"x48"	8.94 SF	ALUMINUM	METALESCENT ALUM. BAKED ENAMEL
L-1	INTAKE LOUVER	RUSKIN	ELF6811D	60"x48"	8.94 SF	ALUMINUM	METALESCENT ALUM. BAKED ENAMEL

HVAC DIFFUSERS AND REGISTERS SCHEDULE

TAG	MANUFACTURER	MODEL	FACE	MOUNTING	MATERIAL	FINISH	DAMPER TYPE	BORDER STYLE
RG-1	TITUS	PAR-AA	24"x24"	CEILING	ALUMINUM	STANDARD WHITE	OPPOSED BLADE	LAY IN MOUNTING
RG-2	TITUS	350RL	26"x8"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	LAY IN MOUNTING
RG-3	TITUS	350RL	26"x24"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT
SR-1	TITUS	TMS	22"x22"	CEILING	STEEL	STANDARD WHITE	BUTTERFLY	LAY IN MOUNTING
SR-2	TITUS	MCD	14"x14"	CEILING	STEEL	STANDARD WHITE	OPPOSED BLADE	LAY IN MOUNTING
SR-3	TITUS	300RL	24"x6"	SIDEWALL	STEEL	STANDARD WHITE	OPPOSED BLADE	SURFACE MOUNT

HVAC FANS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	LOCATION	STATUS	MANUFACTURER	MODEL	CFM (cfm)	ESP (in WC)	FAN RPM (rpm)	EMERGENCY	ELECTRIC CONNECTION SUMMARY	AVAILABLE FAULT CURRENT
EF-1	CEILING-MOUNTED VENTILATOR	UNISEX RR 104	NEW	GREENHECK	SP-B90	25	0.125	700	NO	(EF-1) A - 120V/1PH, 5 Watts	3264

HVAC FAN COIL UNITS SCHEDULE

Equipment shall be braced and labeled by the equipment manufacturer to withstand the minimum scheduled available fault current value for listed equipment.

EQUIPMENT MARK	DESCRIPTION	STATUS	WEIGHT (lbs)	MANUFACTURER	MODEL	CFM (cfm)	OACFM (cfm)	NOMINAL TONS	MAT CLG DB (Deg F)	MAT CLG WB (Deg F)	CLG MBH (mbh)	CLG SENS (mbh)	LAT CLG DB (Deg F)	LAT CLG WB (Deg F)	MAT HTG (Deg F)	HTG MBH (mbh)	LAT HTG (Deg F)	EMERGENCY	ELECTRIC CONNECTION SUMMARY	AVAILABLE FAULT CURRENT
FCU-1	FAN COIL UNIT (DX HEAT PUMP)	NEW	145 lb	TRANE	TEM3A0C60	2250	248	5	78	65	61	51	55	55	64 °F	44	90	NO	(FCU-1) A - 208V/1PH, 30 MCA, 3.6 HKW, 30 OCP	7073
FCU-2	FAN COIL UNIT (DX HEAT PUMP)	NEW	145 lb	TRANE	TEM3A0C60	2105	232	5	78	65	56	47	55	55	64 °F	52	90	NO	(FCU-2) A - 208V/1PH, 30 MCA, 3.6 HKW, 30 OCP	8463

HVAC VENTILATION SCHEDULE

NUMBER	NAME	AREA	LEVEL	CEILING HEIGHT	AIR CHGS	OA CHGS	PEOPLE	OA PER PERSON	OA PER SQ FT.	REQ SUP	ACT SUP	REQ OA	ACT OA	ACT RET	ACT EXH	CRIT OA	PRESSURE	PCT OPERABLE	NATURAL VENTILATION
101	SEATING AREA	193 SF	FINISHED FLOOR	14' - 3 1/2"	0	0	3	7.5	0.18	695	695	73	76	695	0	10.3	Neutral	0	
102	SALES AREA	134 SF	FINISHED FLOOR	14' - 6 1/2"	0	0	12	7.5	0.18	1355	1355	142	149	1355	0	10.5	Neutral	0	
103	PREP AREA	188 SF	FINISHED FLOOR	9' - 0"	0	0	13	7.5	0.12	1425	1425	148	157	1425	0	10.5	Neutral	0	
104	UNISEX RESTROOM	54 SF	FINISHED FLOOR	9' - 0"	0	0	0	0	0	25	0	0	0	0	80	0	Negative	0	
105	WORKROOM	245 SF	FINISHED FLOOR	7' - 7"	0	0	5	7.5	0.12	825	825	86	91	825	0	10.1	Neutral	0	
TOTAL		813 SF																	

HVAC ELECTRICAL COORDINATION SCHEDULE

ABBREVIATIONS

DC	LOCAL DISCONNECT
MC	MOTOR CONTROL (POWER)
SD	DUCT SMOKE DETECTOR
CN	CONTROLS
TS	TOGGLE SWITCH
C/B	H.A.C.R. CIRCUIT BREAKER AT SOURCE PANELBOARD
FUSE	FUSE AT LOCAL DISCONNECT (VERIFY FIELD RATING)
FLA	OPERATING FULL LOAD AMPS
MCA	MINIMUM CIRCUIT AMPACITY
CP	CORD AND PLUG CONNECTION
[BLANK]	HARD WIRED (WHEN INDICATED FOR DC TYPE)

CONTRACTOR TYPE

EC	ELECTRICAL CONTRACTOR
EX	EXISTING
FC	FIRE PROTECTION CONTRACTOR
GC	GENERAL CONTRACTOR
HC	HVAC CONTRACTOR
MFR	MANUFACTURER
PC	PLUMBING CONTRACTOR
OR	OWNER OR OTHERS

MOTOR CONTROL TYPE

CS	COMBINATION STARTER
MCC	MOTOR CONTROL STARTER
MG	MAGNETIC STARTER OR CONTACT
MS	MANUAL STARTER
VFD	VARIABLE FREQUENCY DRIVE
MSR	MANUAL STARTER W/ CONTROL RELAY
OV	OVERCURRENT PROTECTION

CONTROL TYPE

TC	TIMECLOCK
CPT	CONTROL POWER TRANSFORMER
BAS	BUILDING AUTOMATION SYSTEM
LOW	LOW VOLTAGE CONTROLS
LINE	LINE VOLTAGE CONTROLS
RLINE	REVERSE ACTING LINE VOLTAGE
MAN	THERMOSTAT
FA	MANUAL
CO	FIRE ALARM
INT	CARBON MONOXIDE SENSOR
ASD	INTEGRAL TO EQUIPMENT
DSD	AREA SMOKE DETECTOR...

SHORT CIRCUIT RATING

WHERE SHORT CIRCUIT RATING CODE REQUIRED VALUE INDICATES "YES" APPLICABLE EQUIPMENT'S SHORT CIRCUIT RATING SHALL EXCEED THE AVAILABLE FAULT CURRENT VALUE INDICATED.

CONNECTION MARK	DESCRIPTION	VOLTAGE	PHASE	EMERGENCY	HP	WATTS	HTG KW	FLA	MCA	OCP	FED FROM	DC TYPE	DC FURN	DC INST	DC WIRE	MC TYPE	MC FURN	MC INST	MC WIRE	CN TYPE	CN FURN	CN INST	CN WIRE	FA SHUTDOWN	SHORT CIRCUIT RATING CODE REQUIRED?	AVAILABLE FAULT CURRENT
FCU-2-A	FAN COIL UNIT (DX HEAT PUMP)	208 V	1						30	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	HC	HC	EC	NA	No	8463
FCU-1-A	FAN COIL UNIT (DX HEAT PUMP)	208 V	1						30	30			EC	EC	EC	MG	MFR	MFR	MFR	LOW	HC	HC	EC	NA	No	7073
HP-2-A	AIR SOURCE OUTDOOR HEAT PUMP	208 V	3						21	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	HC	HC	EC	NA	Yes	8848
HP-1-A	AIR SOURCE OUTDOOR HEAT PUMP	208 V	3						21	35			EC	EC	EC	MG	MFR	MFR	MFR	LOW	HC	HC	EC	NA	Yes	8706
EF-1-A	CEILING-MOUNTED VENTILATOR	120 V	1										EC	EC	EC	MG	MFR	MFR	MFR	LINE	EC	EC	EC	NA	No	3264

HVAC LOAD SCHEDULE

THE HEATING AND COOLING LOAD CALCULATIONS ARE BASED ON THE RTS (RADIANT TIME SERIES) METHOD. ASSUMPTIONS AND EXECUTION OF THESE METHODS ARE PER ASHRAE 183-2007 STANDARD FOR PEAK COOLING AND HEATING LOAD CALCULATIONS IN BUILDINGS EXCEPT LOW-RISE RESIDENTAL BUILDINGS.

COOLING LOAD BREAKDOWN

CROOF	SENSIBLE HEAT GAIN FROM ROOF
CWALL	SENSIBLE HEAT GAIN FROM EXTERIOR WALLS
CPART	SENSIBLE HEAT GAIN FROM PARITIONS
CGLASS	SENSIBLE HEAT GAIN FROM GLAZING
CSOLAR	SENSIBLE HEAT GAIN FROM SOLAR GAIN THROGH GLAZING
CLIGHTS	SENSIBLE HEAT GAIN FROM INTERIOR LIGHTING
CEQUIP	SENSIBLE HEAT GAIN FROM PLUG LOADS, COMPUTERS, ETC.
CPSENS	SENSIBLE HEAT GAIN FROM PEOPLE
CSSENS	TOTAL SENSIBLE HEAT GAIN TO SPACE
CFAN	SENSIBLE HEAT GAIN FROM AIR HANDLER FAN
COAS	SENSIBLE HEAT GAIN FROM OUTDOOR VENTILATION AIR
CTSENS	TOTAL SENSIBLE HEAT GAIN
CPLAT	LATENT HEAT GAIN FROM PEOPLE
COAL	LATENT HEAT GAIN FROM OUTDOOR VENTILATION AIR
CTLAT	TOTAL LATENT HEAT GAIN
CTOT	TOTAL HEAT GAIN (SENSIBLE + LATENT)

HEATING LOAD BREAKDOWN

HROOF	HEAT LOSS FROM ROOF
HWALL	HEAT LOSS FROM EXTERIOR WALLS
HPART	HEAT LOSS FROM PARTITIONS
HGLASS	HEAT LOSS FROM GLAZING
HSLAB	HEAT LOSS FROM SLAB
HSPACE	TOTAL HEAT LOSS FROM SPACE
HOA	HEAT LOSS FROM OUTDOOR VENTILATION AIR
HTOT	TOTAL HEAT LOSS

EQUIPMENT MARK	CROOF	CWALL	CPART	CGLASS	CSOLAR	CLIGHTS	CEQUIP	CPSENS	CSSENS	CFAN	COAS	CTSENS	CPLAT	COAL	CTLAT	CTOT	HROOF	HWALL	HPART	HGLASS	HSPACE	HSLAB	HOA	HTOT
FCU-1 - HP-1	0	1.02	0	6.9	22.3	2.21	9.14	4.5	46.07	0	4.5	50.57	3.6	6.57	10.17	60.75	0	3.12	0	23.42	44.11	1.02	16.56	44.11
FCU-2 - HP-2	0	0.46	0	10.07	25.95	1.67	0	3.75	41.9	0	4.1	46	3	5.99	8.99	54.98	0	1.4	0	34.16	51.42	0.77	15.08	51.42

HVAC ACCESSORIES

ACCESSORIES:

1. MOTOR DAMPER
2. ECONOMIZER
3. ROOF CURB
4. HAIL GUARDS
5. INTAKE HOOD
6. VIBRATION ISOLATION
7. FLAT FILTER
8. FILTER/MIXING BOX
9. ACCESS DOOR
10. FLEX CONNECTIONS
11. MOUNTING COLLAR
12. HOT GAS BYPASS
13. FACE/BYPASS DAMPER
14. CONDENSATE PUMP
15. MOTOR GUARD
16. GREASE TRAP
17. DUCT FLANGES
18. BASE RAIL
19. HUMIDIFIER
20. CO2 SENSORS
21. ECON POWERED EXHAUST
22. ECON BAROMETRIC RELIEF
23. HOT GAS REHEAT COIL
24. SHAFT GROUNDING BRUSHES

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MECHANICAL - SCHEDULES

M6.0

KLH PROJECT NO: 22552.23

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SECTION 23 05 01.00 – COMMON REQUIREMENTS FOR HVAC
General
General Provisions of the Contract including General and Supplementary Conditions and General Requirements apply to work of this section.
Scope
The base bid includes furnishing all materials, labor, tools, and equipment and the performance of all work required to install a complete heating and air conditioning system as outlined herein.
Guarantee
The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of owner's final acceptance and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.
Quality Assurance
Provide a complete installation in conformance with the following standards.
ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
NFPA: National Fire Protection Association
SMACNA: Sheet Metal and Air Conditioning Contractors National Association.
Statewide Building Code
IMC: International Mechanical Code
Permits, Fees, Inspections, Laws and Regulations
Permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges. Laws and regulations, which bear upon or affect the various branches of this work shall be complied with by this contractor and are hereby made a part of this contract. All work, which such laws require to be inspected, shall be submitted to the proper public official for inspection and a certificate of final approval must be furnished.
Tests and Adjustments
No ducts, piping, fixtures or equipment shall be concealed or covered until they have been inspected and approved by the Architect and the inspector who shall be notified by the contractor when the work is ready for inspection.
Work shall be completely installed, tested and leak tight before inspection is required. All tests shall be repeated to the satisfaction of those making the inspection.
Architectural coordination items
Cutting and Patching: Cut and drill all openings in walls and floors required for the installation. Secure approval of Engineer before cutting and drilling. Neatly patch all openings cut.
Fire Caulking: Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.
Access Panels and Pathways: Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls, cleanout doors, and sprinkler devices required by NFPA. Provide access panels for all fire and/or fire & smoke dampers. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.
project conditions
Where new HVAC systems are required to be connected to existing HVAC systems, it is the contractor's responsibility to verify the location, size, pressure, condition, and they shall verify that the existing HVAC system is indeed the correct and appropriate HVAC system before any work is done. Provide all necessary camera scoping and dye testing as necessary. If there is any need for concern, if it is determined that the existing HVAC system is not a correct or appropriate HVAC system or not connected to a correct or appropriate HVAC system, if the condition of the existing HVAC system is not viable for re-use, or any other condition that would not allow the proper functioning of the new HVAC system, the contractor shall notify the engineer in writing immediately via RFI and wait for direction before proceeding.
DELEGATED DESIGN
For equipment supports, this contractor shall retain a qualified professional engineer to provide support calculations of static and dynamic loading due to operating equipment weight. The signed and sealed calculations and details shall be submitted by the retained professional engineer.
MECHANICAL EQUIPMENT COMMON REQUIREMENTS
INSPECTION
Examine areas and conditions under which mechanical equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
Uncrate equipment and inspect for damage. Verify that nameplate data corresponds with unit designation.
INSTALLATION
General: Install mechanical equipment as indicated, and in accordance with manufacturer's installation instructions.
Location: Install each unit level/plum and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.
Coordinate with other trades to assure correct recess size for recessed units.
Protect interior mechanical equipment with protective covers during balance of construction.
For ducted equipment, connect ductwork to units with flexible duct connections. Provide transitions to exactly match unit duct connection size. Provide 1" acoustic duct lining on return air side a minimum of 10' from fan.
Piping: Restrictors or piping changes shall be made as necessary to achieve manufacturers recommended pressure drops. The findings shall be reported to the engineer at project closeout.
Provide trap at drain piping connection to unit sized per manufacturer's recommendations.
Access: Provide access space around and over mechanical equipment for service as indicated, but in no case less than that recommended by manufacturer or required by code in effect.
Access Panels: Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors, and sprinkler devices required by NFPA. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.
Indoor Suspended Equipment: Install suspended from structure with all threaded rod and vibration isolators.
ELECTRICAL COORDINATION ITEMS
Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
Install electric heating terminal units including components in accordance with equipment manufacturer's written instructions, and with recognized industry practices; complying with applicable installation requirements of NEC and NECA's "Standard of Installation".
Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.
Grounding: Provide equipment grounding connections for electric heating terminals as indicated. Tighten connections to comply with tightening torque values specified in UL Std 486A to assure permanent and effective grounding.
FIELD QUALITY CONTROL
Testing: After installation has been completed, test to demonstrate proper operation of mechanical equipment at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units, which cannot be satisfactorily corrected. Test controls and demonstrate compliance with requirements.
Cleaning: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean coils and inside of cabinets. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
START-UP
Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
TRAINING OF OWNER'S PERSONNEL
Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

SECTION 23 05 03.00 – SUBMITTALS FOR HVAC
General
Where submittals are required by the Contract Documents, they shall be prepared and supplied in accordance with the Contract Documents. In addition to Division 01, the Contractor is advised to review and comply with the requirements articulated within each Division and within each section of that Division.
Some Divisions may include a division-specific "Submittal Requirements for …" section. Where this section exists, it articulates additional requirements for submittals that apply to the work of that Division.
The following requirements help to identify, track and keep the project organized for all parties involved. They are necessary to ensure a timely turnaround and an appropriate technical review. Submittals that do not conform to the administrative requirements are rejected and returned, without technical review.
Requirements
Supply submittals for each section: Submittals shall be supplied on a section-by-section and type-by-type basis. For example, independent product data submittals shall be furnished for each section that requires product data submittals. Independent shop drawing submittals shall be furnished for each section that requires shop drawings.
Refer to the specifications for identification of which submittals are required for the project. Separate PDF file packages shall be supplied for each section, for each submittal type, where electronic submittals are required. Each PDF shall represent a single standalone submittal. Separately bound and identified submittals shall be provided where hardcopies are required.
Include a transmittal: Transmittals shall enumerate each submittal for each section of each type and iteration. Include cover sheet / title page: The cover sheet shall include the information identified in the contract documents. It shall be included as the first page of each electronic and/or hardcopy document-based submittal. An editable and printable PDF form created with editable fields and specification compliant appearance is available from KLH upon request. It is also downloadable from the KLH website at www.klhengrs.com.
Include an index: The index shall enumerate the contents of the submittal.
Include checklists: Where checklists are included with the specifications, complete and include them within the appropriate submittal. Supply complete submittals: Complete submittals of each type are required. Partial submittals will be rejected. Where a section requires a product data submittal, all product data for that section shall be supplied together, at one time, as one complete submittal. Do not send half the product data as one submittal and the other half as a separate one. When resubmittal is required (e.g. Revise and Resubmit) the revised submittal shall be more complete, more accurate and more contract-compliant than its rejected predecessor. The submittal number (for each section and type) shall increment for each subsequent submittal (00 – Original submission, 01 – First Resubmission, 02 – Second Resubmission, etc…). Resubmittals shall include a copy of the reviewer's comments supplied with the prior submittal rejection and shall be amended with a description of the specific action taken to comply with the reviewer's comments. The absence of this on resubmittal is cause for rejection.
Name electronic files to match the submittal ID and cover sheet. The electronic file name of submittals shall match the submittal ID included on the submittals cover page. For example: The original/first product data submittal for Section 234116 would be labeled as "234116.00-PD-00"; the first resubmittal of same shall be labeled "234116.00-PD-01". The original/first shop drawings submittal file for the same section would be labeled "234116.00-SD-00"; the first resubmittal of same shall be labeled "234116.00-SD-01".
Use of Electronic Drawings from the Owner's Design Team
Plan drawings for the Project were created with AutoCAD and Revit.
If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.
Upon request when available, electronic versions of standard-scale, Navisworks (.dwf) and (.nwc) or AutoCAD 36 (.dwg) files may be made available for coordination purposes.
Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG or similar non-editable electronic form, at the sole discretion of the Design Professional.
The Request Drawings form can be accessed, filled out and submitted at the following internet address (scroll down to bottom of home page): http://www.klhengrs.com.

SECTION 23 05 29.00 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

Submittal Requirements
Product Data: For each type of product indicated.
Shop Drawings: Fabrication and installation details.

General
Support all piping, ductwork and equipment by hangers or brackets properly from the building structure. Support from decking above is prohibited. Furnish structural steel members where required to support piping and equipment. No portion of piping or valves shall be supported by equipment.
Ductwork - Support by means of hangers as follows:
Duct Width Hanger Size and Type Max. Spacing
30 or less (#16 gage) 8
A pair of hangers shall be located at every transverse joint and elsewhere according to the table.
Piping
Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.
Individual pipe hangers to be Anvil International Clevis Hanger Fig. 260, Elcen, or approved equal.
Rod sizes to conform to the following: 3/8" rods for 3/4"-2" pipe; 1/2" rods for 2-1/2"-3" pipe; 5/8" for 4"-5" pipe and 3/4" for 6" pipe.
Hangers shall be sized to allow insulation to pass through unobstructed, provide saddle support for insulation at all hanger.
Hanger spacing for steel piping unless otherwise noted is to be as follows: 1-1/4" or smaller to be 8' on center; 1-1/2"-2" to be 10' on center; 2-1/2" and larger to be 12' on center and at each change of direction. Hanger spacing for copper pipe to be as follows: 1" or smaller 6' on center; 1-1/4" or larger 8' on center.
Piping shall be also supported at each change in direction, at valves, and at equipment.

SECTION 23 05 93.00 – TESTING, ADJUSTING AND BALANCING FOR HVAC

Submittal Requirements
Shop Drawings: Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Final Report: Upon verification and approval prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final report to the landlord.

General
Test, adjust, and balance the following mechanical systems:
Supply air systems, all pressure ranges
Return air systems.
Exhaust air systems.
Test systems for proper sound and vibration levels.
Quality Assurance
Codes and Standards:
AABC: "National Standards for Total System Balance".
ASHRAE: ASHRAE Handbook, 2011 Applications, Chapter 38, Testing, Adjusting, and Balancing.
Qualifications
The contractor shall procure the services of an independent Balance and Testing Agency, approved by the Engineer, and a member of Associated Air Balance Council (AABC) or NEBB, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust and test all air and water systems and equipment as herein specified. All work by this agency shall be done under direct supervision of a qualified heating and ventilating Engineer employed by this agency. All instruments used by this agency shall be accurately calibrated and maintained in good working order.
Sequencing and Scheduling
Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems.
Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F wet bulb temperature of maximum summer design condition, and within 10 deg F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.
Check all filters for cleanliness, provide new as required.
Check dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans. Place outlet dampers in full open position. Lubricate all motors and bearings.
Check fan belt tension. Check fan rotation.
Open valves to full open position. Remove and clean all strainers. Set temperature controls so all coils are calling for full flow.
Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. The contractor shall submit within 30 days after receipt of contract, 8 copies of submittal data for the testing and balancing of the air conditioning, heating, and ventilating systems. The Air Balance and Testing Agency shall provide proof of having successfully completed at least five projects of similar size and scope.
The air balancing contractor shall include the additional cost to change every fan factory installed sheave, pulley and/or belt of in order to obtain the design air flows.
Performing Testing, Adjusting and Balancing
Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
Patch insulation, ductwork, and housings, using materials identical to those removed.
Seal ducts and piping, and test for and repair leaks.
Seal insulation to re-establish integrity of the vapor barrier.
Mark equipment settings, including damper control positions; valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

SECTION 23 07 13.00 – DUCT INSULATION

Submittal Requirements
Product Data: For each product indicated.
Shop Drawings: Include plans, elevations, sections, details and attachments to other work.

All liners, insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50. Insulation shall have a minimum installed thermal resistance value of R6 or code minimum, whichever higher.
Rigid Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
Flexible Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
Vapor Barrier Material for Ductwork: Paper-backed aluminum-foil, except as otherwise indicated; strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics:
High Puncture Resistance: Low vapor transmission (for ducts in exposed areas: Mech. Rooms, etc.)
Moderate Puncture Resistance: Medium vapor transmission (for ducts in concealed areas).
All ductwork shall be insulated except:
Double wall ductwork
Fabric ductwork
Metal ducts with duct liner of sufficient thickness to comply with energy code.
Factory insulated flexible ductwork
Factory insulated plenums and casings
Flexible connectors
Vibration control devices
Factory insulated access panels and doors
Supply ductwork exposed in conditioned spaces excluding mechanical rooms, server rooms and electric equipment rooms
Toilet exhaust, general exhaust and return ductwork in an insulated joist or attic space.

SECTION 23 07 19.00 – HVAC PIPING INSULATION

Submittal Requirements
Product Data: For each type of product indicated.

Provide 3/4" Armaflex on refrigerant piping.
Provide 1" fiberglass insulation on concealed condensate drain piping.
Insulation shall have a minimum thickness as required by Code.
All insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.

SECTION 23 09 93.00 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

Submittal Requirements
Product Data: Provide written sequences of operation for each controlled system and piece of equipment.

Exhaust Fans (Manual)
Exhaust fans shall be controlled by local manual switch furnished, installed and wired by electrical contractor.
When activated, exhaust fan motor damper shall open and fan shall start.
(Indicated by EC on HECS schedule)

Controls
Electrical contractor will provide power wiring. HVAC contractor shall provide all the low voltage wiring of HVAC units and controls, thermostats and controllers.
Thermostat shall be by the manufacturer of the HVAC unit (heat/cool/auto/off) with night setback. Provide plastic protective cover for all thermostats.

Low Voltage Thermostats
Low voltage thermostats shall be furnished, installed and wired by the HVAC contractor. The electrical contractor shall provide 4" square x 1- 1/2" deep wall outlet boxes (with single-gang rings) for all thermostats/sensors. The electrical contractor shall provide one 3/4" empty conduit from each thermostat/sensor location, turned out above accessible ceilings (in joist space or against overhead slab/deck). The HVAC/Temperature Control Contractor shall provide all other necessary conduit, raceway and wiring related work. Conduit shall be identified in ceiling cavity and shall be provided with sweep bends, bushings and dragline.
The HVAC/Temperature Control Contractor shall coordinate with the General Contractor to ensure thermal envelope is maintained at these locations.

120VAC BAS/Temperature Control Circuits
The Electrical Contractor shall provide a 120V control circuit (with local toggle disconnect switch and pilot light) installed to a junction box nearby units for Temperature Control Subcontractor use, only where specifically indicated on electrical drawings. These are shown on electrical drawings as junction boxes marked as "BAS". All other required 120VAC raceway and wiring related work shall be provided by the HVAC/Temperature Control Contractor.
The HVAC/Temperature Control Contractor shall coordinate with the General Contractor to ensure thermal envelope is maintained at these locations.

General Control Wiring Requirements and Installation Methods
Except where specifically indicated otherwise above, the HVAC/Temperature Control Contractor shall provide all electrical work as required for all temperature control related wiring (i.e. conduit, raceway, outlet boxes, junction boxes, wiring, etc.) in accordance with Electrical Specifications requirements. All conduit shall be 3/4" minimum.
Coordinate all thermostat/sensor locations in field (case by case) with architect, Owner and Electrical Contractor to ensure that they are placed in locations that will not interfere with furniture, equipment, artwork, wall-hung specialties, room finishes, etc. All thermostat/sensor wall locations indicated on HVAC drawings are schematic only and must be verified case-by-case prior to rough-in.
All electrical work as described in this specification shall be per the latest edition of the National Electrical Code (NEC) and per applicable state and local codes.
Where "free-air" installation methods (either exposed above the ceilings, in bridle rings or in cable trays) are permitted under Electrical Specifications above ceilings, provide plenum-rated cables wherever plenum ceilings (if any) exist and install as defined under Electrical Specifications. Install low voltage circuits, located in concrete slabs and masonry walls, in inaccessible locations, or exposed in occupied areas, in electrical conduit regardless of what wiring methods are permitted under Electrical Specifications.
Where cable trays or bridle rings are provided by the electrical contractor for low voltage cables, these raceways may be utilized for control wiring by this contractor (provide special color coded jackets, label cable jackets per Electrical Specifications and group control wiring cables together). Provide conduit drops from cable tray/bridle ring paths to wall outlet boxes and equipment unless directed otherwise under Electrical Specifications. Regardless of permitted methods in Electrical Specifications, all cables/wiring installed concealed by gypsum board, masonry or other inaccessible materials in walls or above ceilings shall be installed in conduit, 3/4" minimum.
All conduit, bridle rings, raceway, outlet boxes, etc. necessary for complete operational installation of control wiring shall be provided (furnished and installed) by the temperature control contractor in strict compliance with Electrical Specifications documents. Coordinate all work with all other applicable trades including the electrical contractor.
Provide all required conduit work to and between equipment in a manner compliant with that described above (i.e. between VAV boxes, to boilers, starters, condensing units, etc. as applicable).
Install control wiring without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code and per Electrical Specifications.
Install circuits over 25 volt with color-coded No. 12 wire in electrical metallic tubing, per Electrical Specifications.
Install circuits under 25 volt with color-coded No. 18 wire with 0.031" high temperature (105 degs. F) plastic insulation on each conductor and plastic sheath over all.
Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.

Smoke Detector
All duct smoke detectors will be furnished by electrical contractor, installed by the HVAC contractor, and wired by the electrical contractor per local codes. HVAC contractor will interlock fan with smoke detector.

Motor Operated Dampers
All fresh air intakes and exhaust louvers shall have motor operated dampers. Dampers shall be low leak with blade and edge seals. All motor operated dampers shall be provided and wired by the mechanical contractor unless otherwise noted. Provide all necessary transformers, contactors, controls and wiring for interlocking equipment to motor operated dampers.

SECTION 23 31 13.00 – METAL DUCTS

Submittal Requirements
Product Data: For liners, adhesives, sealants and gaskets.
Shop Drawings: Sheet metal thickness, reinforcing details, duct layouts indicating sizes, configuration, liner material, elevation and static pressure class.

Ductwork Materials
Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting. Mechanical contractor shall confirm ductwork paint scope and color with architect.
Exposed ductwork which is to be painted shall have paint grip applied and be oil free.
Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel, lock forming quality; with G 90 zinc coating and mill phosphatized for exposed locations. Minimum gauge shall be 24.
Aluminum sheet: Where indicated, provide aluminum sheet, Alloy 3003, Temper H14.
Miscellaneous Ductwork Materials
Volume Dampers: Provide volume dampers in all branch ducts or as required for balancing to required air flows.
Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15 deg. change of direction per section. Unless specifically detailed otherwise, use 45 deg. laterals and 45 deg. elbows for branch takeoff connections. Where 90 deg. branches are indicated, provide conical type tees.
Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
For aluminum ductwork, provide aluminum support materials except where materials are electrolytically separated from ductwork.
Flexible Ducts
Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum. Unless specifically mentioned, the maximum length of flex duct on the supply equals 5 feet. Flex is not allowed for return, relief or exhaust applications. The flexible ducts indicated for use in the H.V.A.C. system shall conform to the requirements of UL 181 for Class 0 or Class 1 flexible air ducts and shall be so identified.
Where installed in unconditioned spaces other than return air plenums, provide 1" thick 1-1/2 lb. continuous flexible fiberglass sheath with vinyl vapor barrier jacket.
Installation is not permitted above drywall ceilings and inaccessible ceilings.
Fabrication
Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. All ductwork shall be Pittsburgh Construction with a minimum of thickness of 24 gauge. In addition, ductwork used in systems over 3" W.G. shall have cold sealant applied.
Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Construction Standards".
Lined Duct
Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners. Duct liner to be 3-lb density for acoustic requirements 1" thick or as noted. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.
Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.
Duct Liner: Fibrous glass of thickness indicated. 3-lb density. All liners, insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.
Duct Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards.
Installation of Metal Ductwork
General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.
Sealing: Seal all longitudinal seams, S's and drives and all joints with mastic or cement. Install according to SMACNA standards.
Balancing Dampers: The sheet metal contractor shall be fully responsible for installing balancing dampers in the ductwork, (whether shown on the drawing or not) in order to arrive at the intended air flow. The balancing sub-contractor shall provide direction and assistance in determining locations where dampers are required. Additional dampers, if required shall be installed at no additional cost to the owner.
Wall Penetrations: Seal and pack around all ducts and piping sleeves which pass through walls that extend to bottom side of structure and rated walls.
Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.
Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.
Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.
All dampers integral to or utilized as part of an engineered smoke control system shall be listed and comply with UL 555S.
All dampers shall be low leakage with edge and blade seals. Damper manufacturers are subject to specification compliance. Provide products by one of the following:
Greenheck Fan Corporation
Nailor Industries
Ruskin Company
Young Regulator Company
Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
Installation of Duct Liner
General: Install duct liner in accordance with SMACNA HVAC Duct Construction Standards. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used. Store internally lined ductwork up off of the floor. Protect internally lined ductwork from water and dust.
The following ductwork shall be lined in addition to that shown per plans:
Return from open ceiling plenum return to HVAC unit.
Supply and return ductwork 10 feet downstream of HVAC unit.
Transfer air ducts.
Butter the leading edge of all internal duct lining with the manufacturer's recommended adhesive.
Inspect and repair all damaged lining prior to installation of ductwork.
Installation of Flexible Ducts
Maximum Length: For any duct run using flexible ductwork, do not exceed 5' - 0" extended length.
Installation shall have smooth full radius turns down to diffuser.
Installation not permitted above inaccessible ceilings.

23 37 13.00 – DIFFUSERS, REGISTERS AND LOUVERS

Submittal Requirements
Product Data: For each type of product indicated.

DIFFUSERS, GRILLES AND REGISTERS
Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
Anemostat Products Div., Dynamics Corp. of America.
Metal-Aire
Titus Products Div., Philips Industries, Inc.
Tuttle and Bailey.
Price
Louvers and dampers
Provide louvers and dampers of size as noted.
Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
Aerolite
Prefco
Greenheck
Ruskin

C23 81 43.00 – SPLIT SYSTEM AIR CONDITIONERS

Submittal Requirements
Product Data: For each type of product indicated.

Split System Heat Pump Units
General: Provide factory-assembled and tested units as indicated, consisting of insulated casing, filter and rack, fan, motor and drive, fan and limit controls, and control transformer. Provide full cased evaporator coil and electric heat package.
Refrigeration Circuit: Provide refrigerant thermal expansion valve for refrigerant control. Provide access valves in suction and liquid lines.
Compressors: Provide welded shell, hermetic compressors, or serviceable hermetic compressors, 1750 RPM. Provide crankcase heaters. Provide 5 year extended warranty on compressor.
Evaporator Coil: Construct of copper tubing and aluminum fins, pressure and leak tested at 1.5 times working pressure. Provide full cased enclosure around evaporator coil for duct mounting.
Fans: Provide direct double-inlet, forward curved, centrifugal fans with drive. Provide permanently lubricated fan and motor bearings, and thermal overloads in motor.
Filters: Provide 1" thick throwaway filters.
Integral Air-Cooled Heat Pumps: Provide condenser coil constructed of copper tubes and aluminum fins.
Factory leak-test at 1.5 times working pressure, dehydrate and provide full charge of refrigerant. Provide subcooler and accumulator.
Low Ambient Control: Provide head pressure control, designed to operate at temperatures down to 0 deg. F (-18 deg. C).
Controls: Provide factory-installed and wired controls, with terminal strip. Provide connections for remote thermostat.
Provide the Following:
Motor with individual overload protection.
High and low refrigerant cutouts.
Fan-auto and heat-off-cool switches.
Time delay relay to prevent short cycling compressor.
Time/temperature defrost control.
Emergency heat relay.
Manual indoor change-over thermostat.
Two stage heat/cool for dual circuit units.
Outdoor thermostat.
Crankcase heater.
Low ambient control.
Electric resistance heater.
Moisture indicator.
Filter drier.
Refrigerant service valves.
Manufacturer: Subject to compliance with requirements, provide AC units of one of the following:
Bryant.
Trane Co.
Carrier.

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PROJECT NO. **21163.00**

DRAWING TITLE:
MECHANICAL - SPECIFICATIONS

M7.0

KLH PROJECT NO: 22552.23

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