REFRIGERANT CHARGE COMPLIANCE TABLE

MARK				ROOM AREA	CLG. HT	ROOM VOL. (Veff)	CONCENTRATION FACTOR	MAX PERMISSIBLE REFRIGERANT CHARGE PER OCCUPIED SPACE			CALCULATED EQUIPMENT REFRIGERANT CHARGE	REFRIGERANT MONITORING
INDOOR UNIT	OUTDOOR UNIT	SERVICE	LOCATION	SQFT	FT	CUFT	CF	LFL	Focc	EDVC LB.	LB.	
IDU-1	HP-1	HP-1	105 - OFFICE	193	9	1,737	0.5	18.5	1.0	16.1	6.3	NOT REQUIRED
IDU-2	HP-1	HP-1	104 - ENTRY	85	9	765	0.5	18.5	1.0	7.1	6.3	NOT REQUIRED

NOTES:

1. CALCULATED REFRIGERANT TYPE: R-454B WHERE USED WITH MITSUBISHI EQUIPMENT, R-454B IS ACCEPTABLE FOR ALL OTHER MANUFACTURERS.
2. CALCULATED SYSTEM REFRIGERANT CHARGE INCLUDES A 0% OVERSIZING FACTOR BECAUSE THE DEVELOPED REFRIGERANT LINE LENGTH INCLDUING ANY ANTICIPATED REFRIGERANT LENGTH INCREMENTS ON SITE IS LESS THAN MANUFACTURER'S RECOMMENDED PIPE LENGTH AND EQUIPMENT'S FACTORY BASE CHARGE WOULD BE SUFFICIENT TO MEET THE RATED EQUIPMENT COOLING/HEATING CAPACITY.
3. MAX PERMISSIBLE REFRIGERANT CHARGE/EFFECTIVE DISPERSAL VOLUME CHARGE (EDVC) CALCULATED IN ACCORDANCE WITH ASHRAE 15 2022 INCLUDING ALL PERTINENT ADDENDA.
4. Focc IS CALCULATED USING 1.0 FOR NON-INSTITUTIONAL OCCUPANCIES.

HP-1/IDU-1/2 VENTILATION OUTDOOR AIR COMPLIANCE TABLE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per IMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per IMC Table 403.3 (Peoplе/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per IMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Zone Design Outside Airflow (Vpz)	Code Required Exhaust Airflow (cfm)	Zone Design Exhaust Airflow (cfm)
101 - OFFICE	Office space	195	0.06	12	5	1	5	5	17	0.8	22	55	-	-
A03 - TOILET	Toilet rooms-public	35	0	0	0	0	0	0	0	0.8	0	-	50	75
A02 - ADA TOILET	Toilet rooms-public	55	0	0	0	0	0	0	0	0.8	0	-	50	75
A01 - ENTRY	Main entry lobbies	85	0.06	5	10	1	5	5	10	0.8	13	50	-	-
Totals		**370**		**17**		**2**		**10**	**27**	**0.8**	**35**	**105**	**100**	**150**

System Population (Ps)		Occupant Diversity D = Ps/∑all zones Pz	Uncorrected O.A. Vou = D ∑all zones RpPz + ∑all zones RaAz	Total Required Outdoor Air
Diversity →	2	1.000	27	34

Total Supply Outdoor Air: 105

EF-1/MAKEUP AIR VENTILATION OUITDOOR AIR COMPLIANCE TABLE

Room Number	Description	Area (ft²) (Az)	Area Outdoor Air Rate per IMC Table 403.3 (Ra)	Area Outdoor Air (RaAz)	Occupant Load Rate per IMC Table 403.3 (Peoplе/ 1000 ft2)	Occupancy C x F/1000 (Pz)	Occupant Outdoor Air Rate per IMC Table 403.3 (Rp)	Occupant Outdoor Air (RpPz)	Breathing Zone Outdoor Air (Vbz = RpPz + RaAz)	Zone Air Distribution Effectiveness (Ez)	Zone Outdoor Air (Voz = Vbz / Ez)	Zone Design Outside Airflow (Vpz)	Code Required Exhaust Airflow (cfm)	Zone Design Exhaust Airflow (cfm)
104 - MACHINE SHOP	Wood/metal shop	510	0.18	92	20	11	10	110	202	0.8	253	260	255	260
102 - OPEN WORKSPACE	Warehouses	740	0.06	44	0	0	10	0	44	0.8	55	60	-	-
103 - VEHICLE BAYS	Repair garages, enclosed...	1710	0	0	0	0	0	0	0	0.8	0	-	1,283	1,300
A04 - JANITOR'S CLOSET	Janitor closets, trash rooms...	10	0	0	0	0	0	0	0	0.8	0		10	25
Totals		**2,970**		**136**		**11**		**110**	**246**	**0.8**	**308**	**320**	**1,538**	**1,585**

System Population (Ps)		Occupant Diversity D = Ps/∑all zones Pz	Uncorrected O.A. Vou = D ∑all zones RpPz + ∑all zones RaAz	Total Required Outdoor Air
Diversity →	11	1.000	246	308

Total Supply Outdoor Air: 320

MECHANICAL LEGEND

- TEMPERATURE & HUMIDITY SENSOR WITH SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.
- TEMPERATURE SENSOR WITH SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.
- TEMPERATURE & HUMIDITY SENSOR WITHOUT SET POINT CONTROL, 48" AFF. COORDINATE EXACT LOCATION WITH A/E PRIOR TO ROUGH-IN.
- LINE-VOLTAGE THERMOSTAT
- CARBON MONOXIDE SENSOR
- DIRECTION OF FLOW INSIDE PIPE
- DIRECTION OF DOWNWARD PITCH

PIPING

- CD — CONDENSATE DRAIN
- RL(X) — REFRIGERANT LINES

FITTINGS

- CAP
- CONNECTION, BOTTOM
- CONNECTION, TOP
- ELBOW, 90° TURNED UP
- ELBOW, 90° TURNED DOWN
- UNION

VALVES

- BALL
- BUTTERFLY
- BALANCING VALVE
- AUTOMATIC BALANCING FLOW CONTROL CHECK VALVE
- CHECK
- PRESSURE REDUCING
- FLOW SETTING

PIPING SPECIALTIES

- AIR SEPARATOR
- PRESSURE GAUGE
- THERMOMETER
- A/M — AIRVENT, AUTOMATIC/MANUAL
- CW-1 — PUMP
- STRAINER
- BACKFLOW PREVENTER

DUCTWORK

- X/X — RECTANGULAR DUCT, FIRST DIMENSION IS SIDE SHOWN. DIMENSION IN INCHES
- X"Ø — ROUND DUCT, DIMENSION IN INCHES
- X/X"Φ — FLAT OVAL DUCT, DIMENSION IN INCHES
- FLEXIBLE CONNECTION
- ACOUSTICAL LINING, UNO. REFER TO GENERAL NOTES FOR DOUBLE WALL DUCT REQUIREMENTS FOR ERU, AHU, AND RTU
- FLEXIBLE DUCT
- FABRIC DUCT
- TRANSITION, SLOPE NOT TO EXCEED 4-TO-1. FOT = FLAT ON TOP, FOB = FLAT ON BOTTOM
- CHANGE OF ELEVATION IN DIRECTION OF AIR FLOW (R = RISE, D = DROP)
- TURNING VANES
- STANDARD BRANCH, SUPPLY OR RETURN, NO SPLITTER
- MANUAL VOLUME DAMPER
- MOTORIZED DAMPER
- FIRE DAMPER WITH SLEEVE. PROVIDE ACCESS DOOR.
- SD — SMOKE DETECTOR
- SP — STATIC PRESSURE SENSOR
- AD — DUCT ACCESS DOOR
- RECTANGULAR DUCT SECTION (SUPPLY)
- RECTANGULAR DUCT SECTION (RETURN)
- RECTANGULAR DUCT SECTION (EXHAUST)
- RECTANGULAR ELBOW TURNING UP (SUPPLY)
- RECTANGULAR ELBOW TURNING UP (RETURN)
- RECTANGULAR ELBOW TURNING UP (EXHAUST)
- RECTANGULAR ELBOW TURNING DOWN (SUPPLY)
- RECTANGULAR ELBOW TURNING DOWN (RETURN)
- RECTANGULAR ELBOW TURNING DOWN (EXHAUST)
- ROUND DUCT SECTION (SUPPLY)
- ROUND DUCT SECTION (RETURN)
- ROUND DUCT SECTION (EXHAUST)
- ROUND ELBOW TURNING UP (SUPPLY)
- ROUND ELBOW TURNING UP (RETURN)
- ROUND ELBOW TURNING UP (EXHAUST)
- ROUND ELBOW TURNING DOWN (SUPPLY)
- ROUND ELBOW TURNING DOWN (RETURN)
- ROUND ELBOW TURNING DOWN (EXHAUST)
- RETURN GRILLE, TYPE AS INDICATED
- EXHAUST GRILLE, TYPE AS INDICATED
- RECTANGULAR CEILING SUPPLY DIFFUSER, ROUND CONNECTION, TYPE AS INDICATED
- SIDEWALL SUPPLY REGISTER
- SIDEWALL RETURN GRILLE

ABBREVIATIONS

A	AMPERE
ABV	ABOVE
A/E	ARCHITECT/ENGINEER
ACT	ACOUSTICAL CEILING TILE
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AFR	ABOVE FINISHED ROOF
AHU	AIR HANDLING UNIT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APD	AIR PRESSURE DROP
APPROX	APPROXIMATELY
ARCH	ARCHITECT
ARCH'L	ARCHITECTURAL
ARI	AMERICAN REFRIGERATION INSTITUTE
ASHRAE	AMERICAN SOCIETY OF HEATING AND REFRIGERATION AND AIR-CONDITIONING ENGINEERS
AUX	AUXILIARY
BAS	BUILDING AUTOMATION SYSTEM
BDV	BLOWDOWN VALVE
BFP	BACKFLOW PREVENTER
BLDG	BUILDING
BTUH	BRITISH THERMAL UNITS PER HOUR
CD	CEILING DIFFUSER, CONDENSATE DRAIN
CEG	CEILING EXHAUST GRILLE
CF	CIRCULATION FAN
CFM	CUBIC FEET PER MINUTE
CKT	CIRCUIT
CLG	CEILING
CO	CARBON MONOXIDE
CO2	CARBON DIOXIDE
CONC	CONCRETE
COND	CONDENSATE
CRG	CEILING RETURN GRILLE
CV	CONSTANT VOLUME
CW	COLD WATER
dB	DECIBELS
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DHW	DOMESTIC HOT WATER
DIA	DIAMETER
DP	DIFFERENTIAL PRESSURE
EA	EXHAUST AIR
EAD	EXHAUST AIR DUCT
EAL	EXHAUST AIR LOUVER
EAT	EXHAUST AIR TEMPERATURE
EF	EXHAUST FAN
EQPT	EQUIPMENT
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWH	ELECTRIC WALL HEATER
EWT	ENTERING WATER TEMPERATURE
F	DEGREE FAHRENHEIT
FLA	FULL LOAD AMPS
FLR	FLOOR
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FT	FEET OR FOOT
GAL	GALLON
GALV	GALVANIZED
GIH	GAS-FIRED INFRARED HEATERS
GPM	GALLONS PER MINUTE
HB	HOSE BIBB
HP	HORSEPOWER/HEAT PUMP
HVAC	HEATING, VENTILATION & AIR CONDITIONING
IN	INCH; INCHES
IU	INDOOR UNIT
LAT	LEAVING AIR TEMPERATURE
LBS, #	POUNDS
LBS/HR	POUNDS PER HOUR
LWT	LEAVING WATER TEMPERATURE
MA	MIXED AIR
MAX	MAXIMUM
MBH	THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPS
MFR	MANUFACTURE
MOP	MAXIMUM OVERCURRENT PROTECTION
MTD	MOUNTED
NTS	NOT TO SCALE
OA	OUTDOOR AIR
OAD	OUTSIDE AIR DUCT
OAL	OUTSIDE AIR LOUVER
OBD	OPPOSED BLADE DAMPER
OED	OPEN END DUCT W/ 1/2" WIRE MESH
NOM	NOMINAL
NPT	NATIONAL PIPE THREAD
PD	PRESSURE DROP
PI	PRESSURE INDEPENDENT
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
RAD	RETURN AIR DUCT
RCP	REFLECTED CEILING PLAN
RG	RETURN GRILLE
SA	SUPPLY AIR
SAD	SUPPLY AIR DUCT
SD	DUCT SMOKE DETECTOR
SENS	SENSIBLE
SIM	SIMILAR
SP	STATIC PRESSURE
SWRG	SIDEWALL RETURN GRILLE
SWSG	SIDEWALL SUPPLY GRILLE
SWTG	SIDEWALL TRANSFER GRILLE
TOD	TOP OF DUCT
TRNS	TRANSITION
TTL	TOTAL
TU	TERMINAL UNIT
TYP	TYPICAL
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
V-PH	VOLTAGE-PHASE
VFD	VARIABLE FREQUENCY DRIVE
W	WATT
WB	WET BULB
WC	WATER COLUMN
WPD	WATER PRESSURE DROP
WWM	WOVEN WIRE MESH, 1/2" UNO

GENERAL NOTES (NEW WORK)

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH CODES INDICATED.
2. PROVIDE SINGLE THICKNESS, 1.1/2 INCHES SPACED, TURNING VANES IN ALL MITERED DUCTWORK ELBOWS AND BULL HEAD DUCT TEES.
3. COORDINATE LOCATIONS OF ALL DEVICES, ACCESS PANELS, DIFFUSERS, GRILLES, & LOUVERS WITH ARCHITECTURAL REFLECTED CEILING PLANS, INTERIOR & EXTERIOR ELEVATIONS.
4. ALL DUCTWORK DIMENSIONS CITED ARE THE INSIDE CLEAR DIMENSIONS. CONTRACTOR SHALL MAKE ALLOWANCE FOR DOUBLE WALL AND DUCT LINER.
5. ALL PIPING AND CONTROL WIRING SHALL BE CONCEALED IN WALLS OR ABOVE CEILINGS OF FINISHED SPACES, UNLESS NOTED OTHERWISE. IN FINISHED SPACES WITH EXPOSED STRUCTURE CEILINGS, CONTRACTOR SHALL CLOSELY COORDINATE ROUTING WITH OTHER TRADES.
6. CONTRACTOR SHALL COORDINATE LOCATION OF ALL EQUIPMENT, PIPING AND DUCTWORK WITH OTHER TRADES. MAINTAIN REQUIRED SERVICE ACCESS.
7. ALL EXPOSED DUCTWORK, PIPING AND ASSOCIATED COMPONENTS (EXCLUDING MECHANICAL AND STORAGE SPACES) TO BE PAINTED BY DIVISION 9 CONTRACTOR.
8. AIRFLOW QUANTITIES INDICATED ON THE PLANS ARE FOR OCCUPIED OPERATING MODE, UNO.
9. UNLESS OTHERWISE NOTED, ALL DUCT & PIPING MAINS SHALL BE INSTALLED AS HIGH AS POSSIBLE TO UNDERSIDE OF STRUCTURE. ROUTE DUCTS BETWEEN AND/OR THROUGH STRUCTURE WHERE INDICATED. VERIFY ROUTING OF DUCTS WITH CEILING HEIGHTS, STRUCTURAL SYSTEMS AND OTHER TRADES PRIOR TO DUCT FABRICATION. INSTALL PIPING BELOW DUCTWORK, UNO.
10. HVAC CONTRACTOR(S) SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES PRIOR TO FABRICATIONS OF SYSTEMS AND COMMENCEMENT OF INSTALLATION. IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO REVIEW THE WORK OF OTHER TRADES (INCLUDING, BUT NOT LIMITED TO ARCHITECTURAL, CIVIL, ELECTRICAL, EQUIPMENT, FIRE PROTECTION, FIRE ALARM, PLUMBING, AND STRUCTURAL) AS IT AFFECTS THEIR WORK, AND AS THEIR WORK AFFECTS OTHER TRADES. TO INSURE THAT THE CONSTRUCTION DOCUMENTS ARE CLOSELY FOLLOWED. WHERE DISCREPANCIES ARISE, THEY SHALL BE REFERRED TO THE A/E FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK.
11. FLEX-DUCT RUNS SHALL BE 3' MINIMUM AND 5' MAXIMUM LENGTH. PROVIDE STAINLESS STEEL ADJUSTABLE BANDS TO FASTEN FLEX TO DUCTWORK COLLAR AND EQUIPMENT SERVED. PLASTIC TIES ARE UNACCEPTABLE.
12. PROVIDE MANUAL BALANCING DAMPERS IN EACH BRANCH OF SUPPLY, RETURN, VENTILATION, AND EXHAUST DUCTWORK.
13. COORDINATE WORK PRIOR TO INSTALLATION OF ARCHITECTURAL FINISHES AS REQUIRED.
14. COOLING COIL CONDENSATE LINES SHALL BE MINIMUM 3/4" DIAMETER FOR UNITS 5 TONS AND BELOW AND 1-1/4" DIAMETER FOR UNITS ABOVE 5 TONS, UNO.
15. INSTALL ALL DUCTWORK TERMINATING WITH WWM ABOVE FINISHED CEILING, UNO. TERMINATE DUCT COMPLETE WITH ELBOW DIRECTED TOWARDS UNDERSIDE OF ROOF DECK, UNO.
16. INSTALL ALL HVAC WALL MOUNTED SENSORS 48" AFF, MEASURED FROM TOP OF OUTLET BOX, UNO.
17. NOMENCLATURE FOR FINAL ROOM NAMES AND NUMBERS MAY VARY FROM THE CONSTRUCTION DOCUMENTS. FINAL NAMES AND NUMBERS USED IN THE SHOP DRAWINGS, EQUIPMENT TAGS, BAS LABELING AND CLOSEOUT DOCUMENTATION SHALL BE COORDINATED WITH FINAL ROOM NAMES AND NUMBERS ASSIGNED BY THE OWNER AND ARCHITECT.

DESIGN CONDITIONS

	OUTDOOR			
LOCATION	SUMMER, DB	SUMMER, WB	WINTER, DB	WINTER, WB
VA - BLACKSBURG	91ºF	74ºF	10ºF	-
	IINDOOR			
LOCATION	SUMMER, DB	SUMMER, RH%	WINTER, DB	WINTER, RH%
OCCUPIABLE SPACES	75ºF	50	70ºF	-
MECH/ELEC RM	VENTILATE	-	65ºF	-
WORKSHOP/VEHICLE BAY	-	-	65ºF	-

NOTES:

1. OUTDOOR DESIGN CONDITIONS BASED ON VT-DCSM GUIDELINES
2. INDOOR DESIGN CONDITIONS BASED ON ASHRAE 55-2010.
3. WORKSHOP/VEHICLE BAY/MECH/ELEC ROOMS WILL BE HEATED AND VENTILATED ONLY.
4. EQUIPMENT WILL BE SELECTED TO MAINTAIN OPERATION DOWN TO -10ºF.

SHEET LIST - MECHANICAL

SHEET NO	SHEET NAME
M000	LEGENDS, ABBREVIATIONS & GENERAL NOTES
M101	FLOOR PLAN
M501	DETAILS
M601	SCHEDULES
M801	CONTROLS

DESIGN CODES/STANDARDS

CODE/STANDARD	YEAR/VERSION
VIRGINIA BUILDING CODE (VBC)	2021
VIRGINIA MECHANICAL CODE (VMC)	2021
VIRGINIA PLUMBING CODE (VPC)	2021
VIRGINIA ENERGY CONSERVATION CODE (VECC)	2021
VIRGINIA FUEL GAS CODE (VFGC)	2021
NATIONAL ELECTRICAL CODE (NEC)	2020

VIRGINIA TECH NON-CAPITAL CONSTRUCTION

FORESTRY RESEARCH OPERATIONS CENTER

140 INVENTIVE LANE
BLACKSBURG, VA 24061

VT PROJECT CODE W0# 26-819490

DESIGNER

CLARKNEXSEN
A JMT Company
213 SOUTH JEFFERSON, SUITE 1011
ROANOKE, VIRGINIA 24011
540-982-0800

CONSULTANT

2RW CONSULTANTS, INC.
2677 PROSPERITY AVE., SUITE 275
FAIRFAX, VA 22031
703. 718.4355

PROFESSIONAL SEAL

COMMONWEALTH OF VIRGINIA — LUCAS W. HOFFMANN — Lic. No. 042595 — 10.28.2026 — PROFESSIONAL ENGINEER

UBO CONFORMANCE

SUBMITTAL

10/23/2026

ISSUED FOR CONSTRUCTION

REVISIONS

KEY PLAN

SHEET

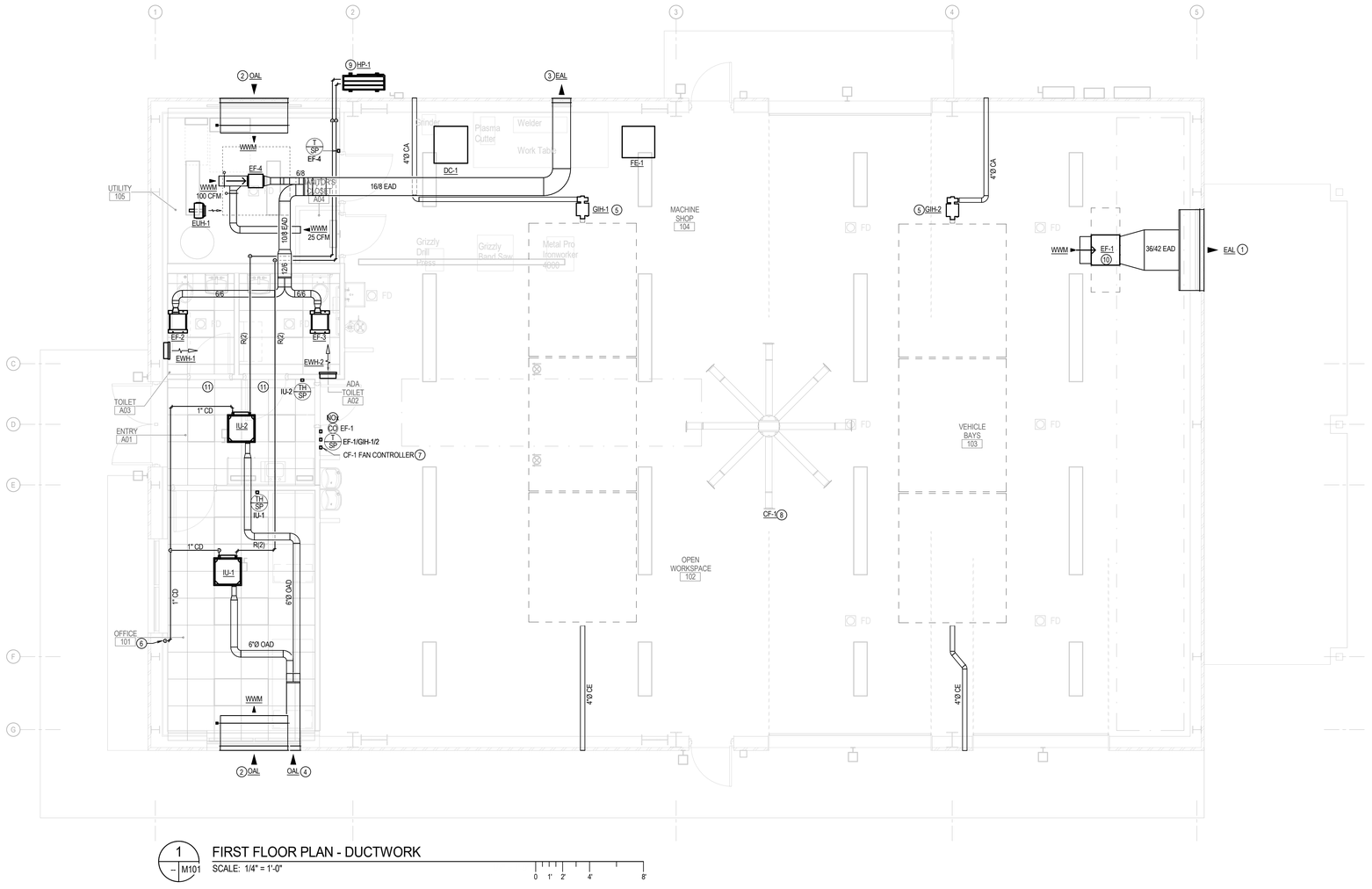
LEGENDS, ABBREVIATIONS & GENERAL NOTES

M000

DESIGN: Designer
DRAWN: Author
REVIEW: Checker

CN 11053

10/28/2026 10:40:25 AM
C:\Users\MikaelD\Documents\Revit Files\25153.1_M25_VT Timber Harvesting Lab_MikaleD@2rw.com.rvt



1 – M101 FIRST FLOOR PLAN - DUCTWORK

SCALE: 1/4" = 1'-0"

0 1' 2' 4' 8'

KEY NOTES (NEW WORK)

1. PROVIDE ARCHITECTURAL EXHAUST AIR LOUVER WITH MINIMUM 11.5 SQFT FREE AREA. REFER TO ARCHITECTURAL DRAWINGS FOR LOUVER SPECIFICATIONS AND SIZE. BOTTOM OF LOUVER TO BE MOUNTED AT 15' 6" A.F.F.
2. PROVIDE ARCHITECTURAL OUTDOOR AIR LOUVER WITH MINIMUM 7.5 SQFT FREE AREA. REFER TO ARCHITECTURAL DRAWINGS FOR LOUVER SPECIFICATIONS AND SIZE. MOTORIZED DAMPER TO BE INTERLOCKED WITH EF-1 OPERATION. BOTTOM OF LOUVER TO BE MOUNTED 11' 4" A.F.F.
3. PROVIDE ARCHITECTURAL EXHAUST AIR LOUVER WITH MINIMUM 0.4 SQFT FREE AREA. REFER TO ARCHITECTURAL DRAWINGS FOR LOUVER SPECIFICATIONS AND SIZE. BOTTOM OF LOUVER TO BE MOUNTED AT 15' 6" A.F.F.
4. PROVIDE ARCHITECTURAL OUTDOOR AIR LOUVER WITH MINIMUM 0.25 SQFT FREE AREA. REFER TO ARCHITECTURAL DRAWINGS FOR LOUVER SPECIFICATIONS AND SIZE.BOTTOM OF LOUVER TO BE MOUNTED AT 9' 2" A.F.F.
5. INSTALL GAS FIRED INFRARED HEATER, ASSOCIATED GAS PIPING, POWER AND CONTROLS PER MANUFACTURER INSTRUCTIONS AT 15 FT A.F.F. PROVIDE SIDEWALL COMBUSTION AIR KIT AND SIDEWALL FLUE VENT KIT. PROVIDE TAMPER-PROOF WALL MOUNTED PROGRAMMABLE THERMOSTAT WITH TIMED OVERRIDE.
6. COORDINATE 1" CONDENSATE DRAIN PIPING CONNECTION TO DOWNSPOUT BOOT. REFER TO CIVIL DRAWINGS FOR CONTINUATION.
7. INSTALL FAN CONTROL ASSEMBLY TO CONTROL HVLS FAN (CF-1). CONTROLS SHOULD BE INSTALLED IN A TAMPER PROOF ENCLOSURE.
8. INSTALL HVLS CIRCULATION FAN, ASSOCIATED POWER AND CONTROLS PER MANUFACTURER INSTRUCTIONS AT 15 FT A.F.F.
9. INSTALL GRADE-MOUNTED HEAT PUMP ON 4" CONCRETE PAD. REFER TO DETAILS 8 AND 9 ON SHEET M501 FOR MORE INFORMATION REGARDING EXTERIOR PIPING INSTALLATION/PROTECTION AND PENETRATION.
10. INSTALL SUSPENDED INLINE EXHAUST FAN PER MANUFACTURER'S RECOMMENDATIONS. OPERATION TO BE INTERLOCKED WITH MAKEUP AIR INTAKE MOTORIZED DAMPERS. BACKDRAFT DAMPER ACCESSORY TO BE PROVIDED.
11. PROVIDE DOOR UNDERCUT TALL ENOUGH TO ACCOMMODATE 75 CFM MAKEUP AIR TO RESTROOM.

VIRGINIA TECH NON-CAPITAL CONSTRUCTION

FORESTRY RESEARCH OPERATIONS CENTER

140 INVENTIVE LANE
BLACKSBURG, VA 24061

VT PROJECT CODE WO# 26-819490

DESIGNER

CLARKNEXSEN
A JMT Company

213 SOUTH JEFFERSON, SUITE 1011
ROANOKE, VIRGINIA 24011
540·982·0800

CONSULTANT

2RW CONSULTANTS, INC.

2677 PROSPERITY AVE., SUITE 275
FAIRFAX, VA 22031
703. 718.4355

PROFESSIONAL SEAL

COMMONWEALTH OF VIRGINIA
LUCAS W. HIFFMANN
Lic. No. 042595
10.28.2026
PROFESSIONAL ENGINEER

UBO CONFORMANCE

SUBMITTAL

10/23/2026

ISSUED FOR CONSTRUCTION

REVISIONS

KEY PLAN

SHEET

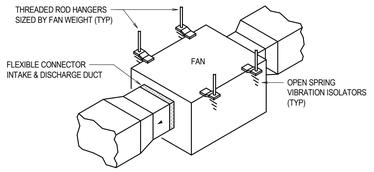
FLOOR PLAN

M101

DESIGN: Designer
DRAWN: Author
REVIEW: Checker

CN 11053

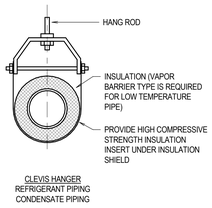
10/28/2026 10:40:26 AM
C:\Users\khuff\Documents\Revit Files\25153.1_M25_VT Timber Harvesting Lab_khuff@2rw.com.rvt



1 – M501 SUSPENDED EXHAUST FAN DETAIL

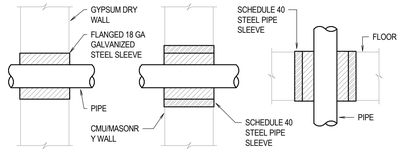
SCALE: NONE

NOTES:
1. PROVIDE FLEXIBLE DUCT CONNECTIONS FOR ALL AIR MOVING EQUIPMENT, UNO.



2 – M501 PIPE HANGER DETAIL

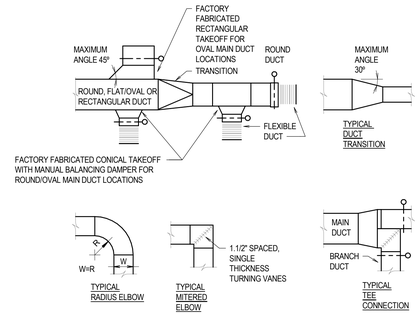
SCALE: NONE



3 – M501 PIPE SLEEVE DETAIL

SCALE: NONE

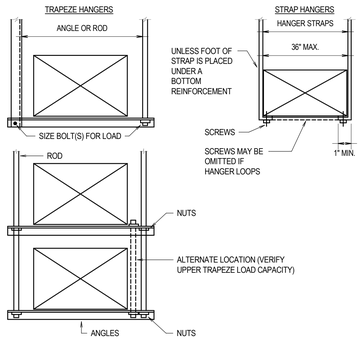
NOTES:
1. DETAIL IS TYPICAL FOR REFRIGERANT AND CONDENSATE PIPING WALL PENETRATIONS IN NON-FIRE RATED WALLS.
2. PROVIDE ESCUTCHEONS WHERE PENETRATIONS ARE EXPOSED IN FINISHED AREAS.



4 – M501 TYP DUCT CONNECTION DETAILS

SCALE: NONE

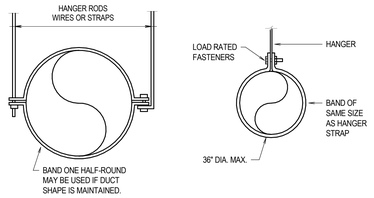
NOTES:
1. DETAIL IS TYPICAL FOR FLAT OVAL DUCTWORK. 1.5D RADIUS ELBOWS SHALL BE USED IN MEDIUM PRESSURE DUCTWORK WHERE CEILING SPACE PERMITS. WHERE LIMITED SPACE EXISTS, MITERED ELBOWS WITH TURNING VANES SHALL BE USED. INSTALL DUCTWORK PER SMACNA FLAT OVAL DUCT STANDARDS.



5 – M501 RECTANGULAR DUCT HANGER DETAILS

SCALE: NONE

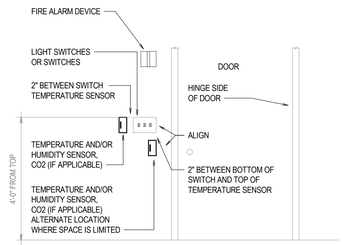
NOTES:
1. SUPPORT MATERIALS AND FASTENERS SHALL BE OF SAME MATERIAL AS SUPPORTED DUCTWORK.



6 – M501 ROUND DUCT HANGER DETAILS

SCALE: NONE

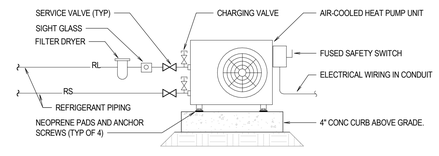
NOTES:
1. SUPPORT MATERIALS AND FASTENERS SHALL BE OF SAME MATERIAL AS SUPPORTED DUCTWORK. HANGERS MUST NOT DEFORM DUCT SHAPE.



7 – M501 TEMPERATURE SENSOR LOCATION

SCALE: NONE

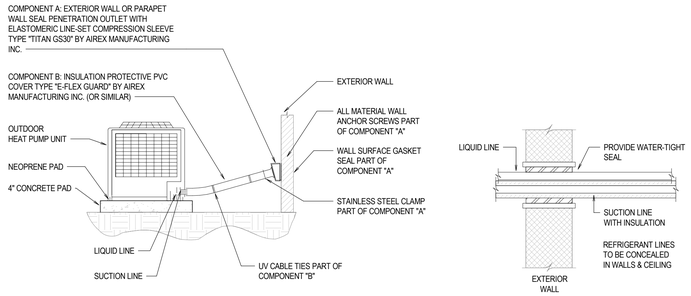
NOTES:
1. DETAIL IS TYPICAL FOR ALL TEMPERATURE [HUMIDITY] [CARBON DIOXIDE] [GAS] SENSORS INSTALLED NEAR LIGHT SWITCHES ONLY WHERE ADEQUATE WALL SPACE IS LIMITED AND DEEMED INSUFFICIENT FOR INSTALLATIONS ADJACENT LIGHTING SWITCHES AND SENSORS.
2. INSTALL ALL OTHER TEMPERATURE SENSORS WITH 4'-0" FROM FINISHED FLOOR TO TOP OF TEMPERATURE SENSOR BOX. REFER TO BAS DRAWINGS FOR FURTHER DETAIL.
3. WHEN ABOVE MOUNTING PROCEDURE IS IMPOSSIBLE HINGE SIDE MOUNTING WILL BE PERMITTED WITH APPOX. 6" CLEARANCE FROM EDGE OF DOOR (IN OPEN POSITION) TO EDGE OF THERMOSTAT & LIGHT SWITCH. IF NEITHER INSTALLATION IS POSSIBLE, SWITCHES AND CONTROLS SHALL BE LOCATED AS DIRECTED BY ENGINEER. DO NOT INSTALL ABOVE DIMMER SWITCHES.
4. [PAINT INSIDE OF BOX PURPLE.]



8 – M501 SPLIT SYSTEM OUTDOOR UNIT DETAIL

SCALE: NONE

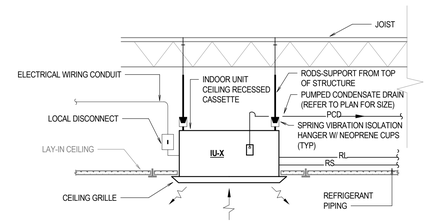
NOTES:
1. INSTALL UNIT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
2. INSTALL UNIT PLUMB AND LEVEL.
3. COORDINATE EQUIPMENT SUPPORT WITH STRUCTURAL DRAWINGS.



9 – M501 REFRIGERANT PIPING PENETRATION THROUGH WALL DETAILS

SCALE: NONE

NOTES:
1. DETAIL IS TYPICAL FOR REFRIGERANT LINES, UNO.



10 – M501 VRF CEILING CASSETTE INDOOR UNIT DETAIL

SCALE: NONE

VIRGINIA TECH NON-CAPITAL CONSTRUCTION

FORESTRY RESEARCH OPERATIONS CENTER

140 INVENTIVE LANE
BLACKSBURG, VA 24061

VT PROJECT CODE WO# 26-819490

DESIGNER

CLARKNEXSEN
A JMT Company

213 SOUTH JEFFERSON, SUITE 1011
ROANOKE, VIRGINIA 24011
540-982-0800

CONSULTANT

2RW CONSULTANTS, INC.

2677 PROSPERITY AVE., SUITE 275
FAIRFAX, VA 22031
703. 718.4355

PROFESSIONAL SEAL

COMMONWEALTH OF VIRGINIA
LUCAS W. HOFFMANN
Lic. No. 042595
10.28.2026
PROFESSIONAL ENGINEER

UBO CONFORMANCE

SUBMITTAL

10/23/2026

ISSUED FOR CONSTRUCTION

REVISIONS

KEY PLAN

SHEET

DETAILS

M501

DESIGN: Designer
DRAWN: Author
REVIEW: Checker

CN 11053

10/28/2026 10:40:27 AM
C:\Users\MikaelE\Documents\Revit Files\25153.1_M25_VT Timber Harvesting Lab_MikaleB@2rw.com.rvt

23 0719, 2300 - REFRIGERANT PIPING AND INSULATION SCHEDULE

SYSTEM	LOCATION	PIPE MATERIAL	JOINTS & FITTINGS	TYPE	THICKNESS IN ALL	JACKET
REFRIGERANT PIPING	CONCEALED	GEL COPPER	BRAZED	PRE-INSULATED	1"	-
REFRIGERANT PIPING	EXTERIOR	SOFT COPPER	BRAZED	ELASTOMERIC CELLULAR	1"	UV RESISTANT

NOTES:
1. ALL REFRIGERANT PIPE IN CONCEALED SPACES AND EXPOSED IN UNFINISHED AREAS - SOFT GEL COPPER WITH FACTORY INSTALLED PREINSULATION UNO BY HEAT PUMP MANUFACTURER. USE K-FLEX TITAN ON OUTDOOR REFRIGERANT PIPING.
2. ALL PIPING SYSTEMS SHALL HAVE CONTINUOUS INSULATION THROUGH HANGERS.
3. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

23 0719, 2113 - HYDRONIC PIPING AND INSULATION SCHEDULE

SYSTEM	LOCATION	PIPE MATERIAL	JOINTS & FITTINGS	INSULATION TYPE	THICKNESS IN ALL	JACKET
CONDENSATE PIPING	INTERIOR	COPPER	SOLDER	GLASS FIBER, RIGID	1"	-
CONDENSATE PIPING	EXTERIOR	COPPER	SOLDER	ELASTOMERIC CELLULAR	1"	-

NOTES:
1. INSULATE EQUIPMENT SIMILAR TO PIPING SYSTEM.
2. ALL PIPING SYSTEMS SHALL HAVE CONTINUOUS INSULATION THROUGH HANGERS.
3. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

23 8200: GAS-FIRED INFRARED UNIT HEATER SCHEDULE

MARK	SERVICE	MOUNTING	HEATER LENGTH FT	HEIGHT AFF - FT	TOTAL HEATING CAPACITY MBH	MAX GAS INPUT MBH	INLET PRESSURE (MIN/MAX) IN. WC.	ELECTRICAL V-PH	ELECTRICAL AMPS	WEIGHT LBS	BASIS OF DESIGN MFR	BASIS OF DESIGN MODEL
GIH-1	MACHINE SHOP/OPEN WORKSPACE	SUSPENDED	32'-1/4"	15'	65	65	6"/14"	120-1	3.0	190	SOLARONICS	STG 65-30BN
GIH-2	VEHICLE BAYS	SUSPENDED	32'-1/4"	15'	65	65	6"/14"	120-1	3.0	190	SOLARONICS	STG 65-30BN

NOTES:
1. DESIGN AND PERFORMANCE BASED ON SOLARONICS.
2. PROVIDE FACTORY SUPPLIED SINGLE TAMPER-PROOF 120V T-STAT CAPABLE OF CONTROLLING ALL HEATERS.
3. MOUNT HEATER 15 FEET AFF, MEASURE FROM BOTTOM OF HEATER TO FINISHED FLOOR.
4. PROVIDE MANUFACTURER'S SIDEWALL INTAKE AND SIDEWALL FLUE VENTING KIT ALONG WITH OTHER RECOMMENDED ACCESSORIES.
5. PROVIDE MANUFACTURER'S SUPPORT AND SUSPENSION.

23 0713, 3100 - DUCT & DUCT INSULATION SCHEDULE

SYSTEM	MATERI...	PRESSURE CLASS, IN WC	SEAL CLASS	INSULATION TYPE	INSULATION THICKNESS, IN	INSULATION JACKET	NOTES
OUTSIDE AIR	GALV	1	A	GLASS FIBER, FLEXIBLE	2	FOIL FACE SCRIM	
GENERAL EXHAUST	GALV	1	A	GLASS FIBER, FLEXIBLE	2	FOIL FACE SCRIM	
GIH COMBUSTION AIR	AL29-4C	-	-	-	-	-	
GIH FLUE	AL29-4C	-	-	-	-	-	

NOTES:
1. PROVIDE DUCT PRESSURE CLASS IN ACCORDANCE WITH EQUIPMENT SCHEDULES AND ASSOCIATED SMACNA RECOMMENDATIONS.
2. ALL DUCTS - PROVIDE DUCT PRESSURE CLASS IN ACCORDANCD WITH EQUIPMENT SCHEDULES AND ASSOCIATED SMACNA RECOMMENDATIONS. SPECIAL ATTENTION SHALL BE PAID DURING TESTING, ADJUSTING, AND BALANCING TO ENSURE ENTIRE DUCTWORK SYSTEM IS INSTALLED AND OPERATIONAL PRIOR TO STARTUP OF EQUIPMENT.
3. INSULATE ALL DUCTS WITH 2" OF FLEXIBLE GLASS FIBER INSULATION WITHIN 10 FEET OF EXTERIOR WALL PENETRATIONS.
4. ALL SHEET METAL DUCTWORK - PROVIDE SHEET METAL THICKNESS IN ACCORDANCE WITH ASSOCIATED SMACNA RECOMMENDATIONS, UNO.
5. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

23 8200: ELECTRIC UNIT HEATER SCHEDULE

MARK	SERVICE	MODEL	MOUNTING	OUTPUT MBH	CFM	KW	V-PH
EUH-1	105 - UTILITY	F1F5103N	SUSPENDED	11.2	400	3.3	208-1

NOTES:
1. DESIGN AND PERFORMANCE BASED ON MARKEL.
2. EACH UNIT SHALL HAVE A FACTORY PROVIDED DISCONNECT SWITCH.
3. PROVIDE INTEGRAL THERMOSTAT FOR EACH UNIT.

23 8200: ELECTRIC WALL HEATER SCHEDULE

MARK	SERVICE	MODEL	MOUNTING	OUTPUT MBH	KW	AMPS	V-PH
EWH-1	A03 - TOILET	HF3325TD-RP	RECESSED	7.8	2.3	10.8	208-1
EWH-2	A02 - ADA TOILET	HF3325TD-RP	RECESSED	7.8	2.3	10.8	208-1

NOTES:
1. DESIGN AND PERFORMANCE BASED ON MARKEL.
2. EACH UNIT SHALL HAVE A FACTORY PROVIDED DISCONNECT SWITCH.
3. PROVIDE INTEGRAL THERMOSTAT FOR EACH UNIT.

23 3423 - FAN SCHEDULE

MARK	SERVICE	TYPE	MOUNTING	DRIVE	OPERATION	MIN AIRFLOW CFM	AIRFLOW CFM	ESP IN WC	FAN RPM	HP (WATTS)	V-PH	PHYSICAL DATA LENGTH IN	PHYSICAL DATA WIDTH IN	PHYSICAL DATA HEIGHT IN	PHYSICAL DATA WEIGHT LBS	BASIS OF DESIGN MFR	BASIS OF DESIGN MODEL	NOTES
EF-1	VEHICLE BAY/WORKSHOPS	CENTRIFUGAL INLINE	SUSPENDED	DIRECT	2-SPEED	4000	9000	0.86	1,514	5	208/3	29	32	32	250	GREENHECK	SQ-20-M2-VG	4,5,6,10
EF-2	A03 - TOILET	CEILING EXHAUST FAN	CEILING	DIRECT	CV	-	75	0.5	1,137	(15)	120-1	12	14	7	15	GREENHECK	SP-B200-VG	9
EF-3	A02 - ADA TOILET	CEILING EXHAUST FAN	CEILING	DIRECT	CV	-	75	0.5	1,137	(15)	120-1	12	14	7	15	GREENHECK	SP-B200-VG	9
EF-4	105 - UTILITY	CENTRIFUGAL INLINE	SUSPENDED	DIRECT	CV	-	125	0.5	825	(57)	120-1	12	14	11	35	GREENHECK	CSP-A200	6
CF-1	VEHICLE BAY/WORKSHOPS	HVLS	BEAM MTD	DIRECT	CV	-	74000	-	125	1.5	208/3	144	144	58	185	BIG ASS FAN	POWERFOIL6	7,8

NOTES:
1. PROVIDE ALL REQUIRED SHEAVES/DAMPERS/SPEED CONTROLLERS FOR FINAL BALANCING
2. PROVIDE FACTORY MEANS OF ELECTRICAL DISCONNECT AND THERMAL OVERLOAD PROTECTION, UNO.
3. PROVIDE OPEN SPRING VIBRATION ISOLATORS. PROVIDE BACKDRAFT DAMPERS.
4. FAN CONTROLLED BY DIGITAL TIMER SWITCH.
5. FAN CONTROLLED BY CO MONITORING SYSTEM.
6. FAN CONTROLLED BY LINE VOLTAGE THERMOSTAT.
7. PROVIDE MANUFACTURER CONTROL SYSTEM PANEL.
8. FAN CONTROLLED BY WALL SPEED CONTROLLER.
9. FAN CONTROLLED BY WALL MOUNTED OCCUPANCY SENSOR. OCCUPANCY SENSOR PROVIDED BY ELECTRICAL CONTRACTOR AND SHALL ALSO CONTROL LIGHTING IN AREA SERVED.
10. FAN CONTROLLED BY NOx MONITORING SYSTEM.

23 8126.13: HEAT PUMP INDOOR UNIT SCHEDULE

MARK	DESCRIPTION	LOCATION	EQUIPMENT SERVED	TOTAL AIRFLOW CFM	NOM. COOLING TOTAL CAPACITY BTUH	NOM. HEATING TOTAL CAPACITY BTUH	ELECTRICAL DATA V	PH	MCA	MOCP	PHYSICAL DIMENSIONS LENGTH IN	WIDTH IN.	HEIGHT IN.	WEIGHT LBS	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL
IU-1	CEILING CASSETTE	101 - OFFICE	HP-1	300	13630	15000	208	1	1	15	22	22	8	35	MITSUBISHI	SLZ-AF15NL
IU-2	CEILING CASSETTE	A01- ENTRY	HP-1	405	8180	9000	208	1	1	15	22	22	8	35	MITSUBISHI	SLZ-AF09NL

NOTES:
1. COOLING PERFORMANCE BASED ON 95º F DB OUTSIDE AIR AND 80º F RETURN AIR. PERFORMANCE IS CORRECTED, NOT RATED CAPACITY.
2. HEATING PERFORANCE BASED ON 47º F DB OUTSIDE AIR AND 70º F RETURN AIR. PERFORMANCE IS CORRECTED, NOT RATED CAPCITY.
3. COORDINATE FIELD ADDED REFRIGERANT CHARGE WTH FINAL PIPING LAYOUT.
4. DDC CONTROLS SHALL BE MANUFACTURER PROVIDED. REFER TO CONTROLS DRAWINGS FOR FURTHER DETAIL.
5. REFRIGERANT LINES SHALL BE SIZED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
6. INDOOR UNITS TO BE POWERED FROM OUTDOOR UNIT. MECHANICAL CONTRACTOR SHALL PROVIDE WIRING BETWEEN UNITS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
7. ALL IU MODELS SHALL BE PROVIDED WITH INTEGRAL MANUFACTURER CONDENSATE PUMPS.

23 8126.13: OUTDOOR AIR-COOLED HEAT PUMP SCHEDULE

MARK	SERVICE	LOCATION	EQUIPMENT SERVED	NOMINAL CAPACITY TONS	NOM. COOLING CAPACITY BTUH	NOM. COOLING MIN EER2	NOM. COOLING MIN SEER2	NOM. HEATING CAPACITY BTUH	NOM. HEATING MIN COP	REFRIGERANT CHARGE EQPT LBS	REFRIGERANT CHARGE ADDL LBS	REFRIGERANT CHARGE TOTAL LBS	ELECTRICAL DATA V	PH	MCA	MOCP	PHYSICAL DIMENSIONS LENGTH IN.	WIDTH IN.	HEIGHT IN.	WEIGHT LBS	BASIS OF DESIGN MANUFACTURER	BASIS OF DESIGN MODEL
HP-1	101-OFFICE,...	ON-GRADE	IU-1/2	2	22000	13	20	25000	3.5	6.3	-	6.3	208	1	29	49	37	13	31	160	MITSUBISHI	MXZ-3D24

NOTES:
1. COOLING PERFORMANCE BASED ON 95º F DB OUTSIDE AIR AND 80º F RETURN AIR. PERFORMANCE IS CORRECTED, NOT RATED CAPACITY.
2. HEATING PERFORANCE BASED ON 47º F DB OUTSIDE AIR AND 70º F RETURN AIR. PERFORMANCE IS CORRECTED, NOT RATED CAPACITY.
3. DESIGN AND PERFORMANCE BASED ON LOW GWP, CLASS A2L, R-454B REFRIGERANT.
4. COORDINATE FIELD ADDED REFRIGERANT CHARGE WTH FINAL PIPING LAYOUT.
5. DDC CONTROLS SHALL BE MANUFACTURER PROVIDED. REFER TO CONTROLS DRAWINGS FOR FURTHER DETAIL.
6. PROVIDE WIND BAFFLE FOR LOW AMBIENT COOLING OPERATION.
7. DISCONNECT PROVIDED BY ELECTRICAL CONTRACTOR.
8. EER AND COP BASED ON AHRI 1230-2023 TEST METHOD.

23 3423 - PORTABLE DUST COLLECTOR SCHEDULE

MARK	LOCATION	CONFIG	TYPE	MAX AIRFLOW CFM	FAN HP	ELECTRICAL V-PH	ELECTRICAL FREQ	PHYSICAL DATA LENGTH IN	PHYSICAL DATA WIDTH IN	PHYSICAL DATA HEIGHT IN	PHYSICAL DATA WEIGHT LBS	BASIS OF DESIGN MFR	BASIS OF DESIGN MODEL
DC-1	106 - MACHINE SHOP	EXTRACT ARM	PORTABLE	800	1	115-1	60	43.5	30	33	260	MAXFLO	PC-1

NOTES:
1. PROVIDE TEFC MOTOR COMPLETE WITH STEEL FAN WHEEL.
2. PROVIDE MINIMUM 250 SQFT CARTRIDGE FILTER. FINAL FILTER TO BE HEPA CERTIFIED.
3. PROVIDE SINGLE 6" X 10' SOURCE CAPTURE ARM.

23 3423 - PORTABLE WELDING FUME EXTRACTOR SCHEDULE

MARK	LOCATION	CONFIG	TYPE	MAX AIRFLOW CFM	FAN HP	ELECTRICAL V-PH	ELECTRICAL FREQ	PHYSICAL DATA LENGTH IN	PHYSICAL DATA WIDTH IN	PHYSICAL DATA HEIGHT IN	PHYSICAL DATA WEIGHT LBS	BASIS OF DESIGN MFR	BASIS OF DESIGN MODEL
FE-1	106 - MACHINE SHOP	EXTRACT ARM	PORTABLE	600	1.5	115-1	60	29	28	43	225	PLYMOVENT	MOBILEGO2M

NOTES:
1. WELDING STATION FUME EXTRACTOR DESIGN WITH 7' SINGLE NECK EXTRACTOR ARM.
2. PROVIDE HEPA FILTERS WITH QUICK CHANGE FILTER HINGED ACCESS.
3. PROVIDE BASE WITH WHEELS.

VIRGINIA TECH NON-CAPITAL CONSTRUCTION

FORESTRY RESEARCH OPERATIONS CENTER

140 INVENTIVE LANE
BLACKSBURG, VA 24061

VT PROJECT CODE WO# 26-819490

DESIGNER
CLARKNEXSEN
A JMT Company
213 SOUTH JEFFERSON, SUITE 1011
ROANOKE, VIRGINIA 24011
540·982·0800

CONSULTANT
2RW CONSULTANTS, INC.
2677 PROSPERITY AVE., SUITE 275
FAIRFAX, VA 22031
703. 718.4355

PROFESSIONAL SEAL
COMMONWEALTH OF VIRGINIA
LUCAS W. HOFFMANN
Lic. No. 042595
10.28.2026
PROFESSIONAL ENGINEER

UBO CONFORMANCE

SUBMITTAL
10/23/2026
ISSUED FOR CONSTRUCTION

REVISIONS

KEY PLAN

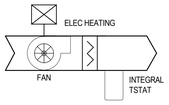
SHEET
SCHEDULES

M601

DESIGN: Designer
DRAWN: Author
REVIEW: Checker

CN 11053

10/28/2026 10:40:27 AM
C:\Users\MikaelE\Documents\Revit Files\25153.1_M25_VT Timber Harvesting Lab_MikaelE@2rw.com.rvt



EUH'S & EWH'S

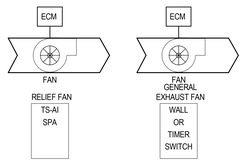
1 ELECTRIC UNIT HEATERS (CUH, ECH, & EUH)

-- | M801

SCALE: NONE

NOTES:

1. DETAIL IS TYPICAL FOR ALL ELECTRIC HEATERS, UNO.
2. LOCAL THERMOSTAT PROVIDED BY MECHANICAL CONTRACTOR, WHERE INDICATED. REFER TO FLOOR PLANS FOR FURTHER DETAIL.



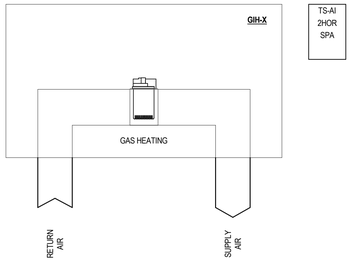
2 EXHAUST FANS

-- | M801

SCALE: NONE

NOTES:

1. CONTROL SEQUENCES BELOW UTILIZE EITHER DDC, ELECTRIC, OR A COMBINATION OF ELECTRIC AND DDC CONTROL.
2. REFER TO FAN SCHEDULE AND FLOORPLANS FOR ADDITIONAL DETAIL.
3. EXHAUST FAN SHALL INTERLOCK WITH ASSOCIATED MOTORIZED OUTSIDE AIR DAMPER, UNO.
4. EF-1: DAMPER PROVIDED BY MECHANICAL CONTRACTOR, INTERLOCKED BY ELEC CONTRACTOR.
5. FANS UNDER .5" ESP: BACKDRAFT DAMPER PROVIDED BY MECHANICAL CONTRACTOR.
6. EXHAUST FAN TSTAT SET POINT FOR MECH/ELEC ROOMS SHALL BE 90° F, UNO.



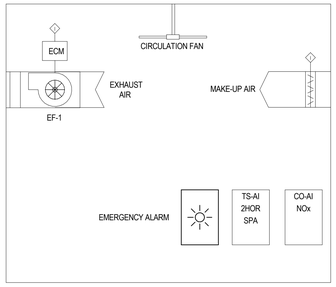
3 GAS FIRED INFRARED HEATER (GIH)

-- | M801

SCALE: NONE

NOTES:

1. SCHEMATIC IS TYPICAL FOR ALL INFRARED UNIT HEATERS, UNO.
2. LOCAL THERMOSTAT PROVIDED BY MECHANICAL CONTRACTOR.



VEHICLE BAY/WORKSHOP EXHAUST SYSTEM

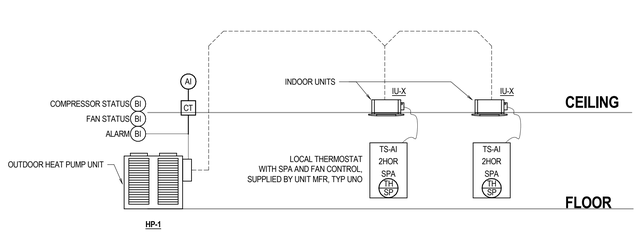
4 VEHICLE BAY/WORKSHOP EXHAUST SYSTEM

-- | M801

SCALE: NONE

NOTES:

1. REFER TO FAN SCHEDULE AND FLOORPLANS FOR ADDITIONAL DETAIL.
2. FANS SHALL INTERLOCK WITH ASSOCIATED MOTORIZED DAMPER, UNO.
3. FANS UNDER .5" ESP: BACKDRAFT DAMPER PROVIDED BY MECHANICAL CONTRACTOR.
4. HEAT RELIEF FAN TSTAT SET POINT FOR ROOM SHALL BE 85° F (ADJ) UNO.



HP-1

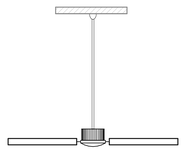
5 AIR-COOOLED SPLIT SYSTEM (HP, IU)

-- | M801

SCALE: NONE

NOTES:

1. TSTAT AND ASSOCIATED WIRING FURNISHED BY EQUIPMENT MANUFACTURER, INSTALLED BY MECH CONTRACTOR.
2. COMMUNICATION TRUNK PROVIDED BY EQUIPMENT MANUFACTURER.
3. CONDENSATE WATER LEVEL DETECTION DEVICE PROVIDED BY MANUFACTURER.
4. UNIT CONTROLLERS AND INTERNAL UNIT SENSORS SHALL PROVIDED BY MANUFACTURER - FACTORY INSTALLED, TESTED, AND CALIBRATED, UNO.
5. CONTROLS CONDUIT PROVIDED BY CONTROLS CONTRACTOR. DO NOT INSTALL CONTROL WIRING IN THE SAME CONDUIT AS POWER WIRING.
6. PROVIDE LOCKABLE BOX COVER FOR COMMON AREA UNITS.
7. ALL IU THERMOSTATS SHALL CONTROL FROM SPACE TEMPERATURE WALL LOCATION.



HIGH VOLUME LOW SPEED FAN

6 HVLS CIRCULATION FANS (CF)

-- | M801

SCALE: NONE

NOTES:

1. REFER TO FAN SCHEDULE AND FLOOR PLANS FOR ADDITIONAL DETAIL.

SYMBOLS

- INTERLOCK
- TS — TEMPERATURE SENSOR
- HS — HUMIDITY SENSOR
- PS — PRESSURE SENSOR
- FM — FLOW MEASUREMENT
- DM — DAMPER MODULATION
- DS — DAMPER STATUS
- CO2 — CARBON DIOXIDE SENSOR
- DPS — DIFFERENTIAL PRESSURE SENSOR
- MOTOR
- ECM — EC MOTOR
- EMERGENCY ALARM
- XX-YY / XX-YY / ZZ / ZZ — WALL STAT
  - XX = SENSOR TYPE
  - YY = POINT TYPE
  - ZZ = SETPOINT/OVERRIDE
- DUCT INLET
- DUCT OUTLET
- DAMPER
- FILTER
- FAN

ABBREVIATIONS

2HOR	2 HOUR OVERRIDE	DM	DAMPER MOTOR	NC	NORMALLY CLOSED
AFMS	AIR FLOW MONITORING STATION	DP	DIFFERENTIAL PRESSURE	NO	NORMALLY OPEN
AH	AIR HANDLER	DPS	DIFFERENTIAL PRESSURE SENSOR	OA	OUTSIDE AIR
AHU	AIR HANDLING UNIT	DS	DAMPER SWITCH	PM	POWER METER
AI	ANALOG INPUT	DSS	DUCTLESS SPLIT SYSTEM	PS	PRESSURE SENSOR
AO	ANALOG OUTPUT	DX	DIRECT EXPANSION	RA	RETURN AIR
BCU	BUILDING CONTROL UNIT	EA	EXHAUST AIR	RH	RELATIVE HUMIDITY
BI	BINARY INPUT	ECH	ELECTRIC CEILING HEATER	RHC	REHEAT COIL
BO	BINARY OUTPUT	ECM	ELECTRICALLY COMMUTATED MOTOR	RTU	ROOFTOP UNIT RTU
CAV	CONSTANT AIR VOLUME	EF	EXHAUST FAN	SA	SUPPLY AIR
CD	CONDENSATE DRAIN	EOL	END OF LINE	SCR	SILICON CONTROLLED RECTIFIER
CO	CARBON MONOXIDE	EQPT	EQUIPMENT	SD	SMOKE DETECTOR
CO2	CARBON DIOXIDE	EUH	ELECTRIC UNIT HEATER	SF	SUPPLY FAN
CP	CIRCULATOR PUMP	EWH	ELECTRIC WALL HEATER	SP	SET POINT
CSR	CURRENT SENSING RELAY	FC	FAN COIL	SPA	SET POINT ADJUSTMENT
CT	CURRENT TRANSFORMER	FIP	FAIL IN PLACE	S/S	START / STOP
CU	CONDENSING UNIT	FM	FLOW METER	SZ	SINGLE ZONE
DCW	DOMESTIC COLD WATER	HG	HOT GAS	TE	TOTAL ENTHALPY
DDC	DIRECT DIGITAL CONTROL	HP	HEAT PUMP	TEMP	TEMPERATURE
		HS	HUMIDITY SENSOR	TS	TEMPERATURE SENSOR
		HSTAT	HUMIDISTAT	TSTAT	THERMOSTAT
		MFR	MANUFACTURER	TYP	TYPICAL
		MOD	MODULATING	UC	UNIT CONTROLLER
		MS/TP	MASTER SLAVE TOKEN PASSING	UM	UNIT MANUFACTURER
		MSB	MAIN SWITCHBOARD	UNO	UNLESS NOTED OTHERWISE
		MZ	MULTIZONE	UPS	UNINTERRUPTED POWER SUPPLY

GENERAL NOTES (CONTROLS)

1. CONTROLS CONTRACTOR SHALL COORDINATE 120V ELECTRICAL REQUIREMENTS WITH ELECTRICAL CONTRACTOR. 120 VOLT CIRCUITS FOR CONTROL POWER ARE SHOWN ON THE ELECTRICAL DRAWINGS. CONTROLS CONTRACTOR SHALL PROVIDE ANY ADDITIONAL CIRCUITS AS REQUIRED FOR CONTROL POWER.
2. ALL CONTROL WIRING SHALL RUN IN CONDUIT, MIN 3/4", CONCEALED WITHIN WALLS OR ABOVE CEILINGS OF FINISHED SPACES, UNLESS NOTED OTHERWISE. IN SPACES WITH EXPOSED STRUCTURE CEILINGS, CONTRACTOR SHALL CLOSELY COORDINATE ROUTING WITH OTHER TRADES. CONDUIT FROM THE WALL OUTLET BOX MAY TERMINATE SEVERAL INCHES ABOVE THE CEILING WHERE LAY-IN CEILING TILES ARE TO BE USED. CABLING ABOVE THE CEILING SHALL BE NEATLY BUNDLED AND ATTACHED TO OR INDEPENDENTLY SUPPORTED FROM THE BUILDING STRUCTURE ABOVE.
3. ALL CONTROLS, SENSORS, FLOW METERS SHALL BE PROVIDED BY THE CONTROLS CONTRACTOR, UNO. CONTROLS CONTRACTOR SHALL PROVIDE ADDITIONAL POINTS & COMPONENTS AS NEEDED TO ACHIEVE THE SPECIFIED SEQUENCE OF OPERATION AND SYSTEM GRAPHIC DISPLAY.
4. INSTALL ALL HVAC WALL MOUNTED SENSORS 48" AFF, MEASURED FROM TOP OF OUTLET BOX, UNO.
5. REFER TO ELECTRICAL DRAWINGS FOR COORDINATION WITH ELECTRICAL SYSTEM CONTROL.
6. THE INSTALLATION OF ALL EQUIPMENT SHALL BE IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND INSTALLATION DOCUMENTATION.

SEQUENCE OF OPERATIONS

ELECTRIC UNIT/WALL HEATERS (EUH/EWH)

1. UNITS SHALL BE CONTROLLED BY FACTORY INSTALLED INTEGRAL THERMOSTATS.
2. OPERATION:
   A. UNIT HEATER SUPPLY FAN AND ELECTRIC HEATING ELEMENT SHALL CYCLE TO MAINTAIN THE SETPOINT OF THE ROOM THERMOSTAT.
   B. ROOM THERMOSTAT SETPOINTS SHALL BE 65°F MECHANICAL ROOMS.

GENERAL EXHAUST FANS (EF)

1. REFER TO VEHICLE BAY/WORKSHOP EXHAUST SYSTEM FOR EF-1 CONTROLS.
2. EF-2/3 TO BE CONTROLLED BY WALL MOUNTED OCCUPANCY SENSOR.
3. EF-4 TO BE CONTROLLED BY LINE-VOLTAGE THERMOSTAT.

GAS FIRED INFRARED HEATER (GIH-X)

1. THE HEATING ONLY UNIT SHALL BE ENABLED WHEN THE ROOM AIR TEMPERATURE IS BELOW 65° F (ADJ).
2. OCCUPIED OPERATION:
   A. THE SYSTEM SHALL OPERATE TO MAINTAIN OCCUPIED SPACE TEMPERATURE SET POINTS.
   B. HEATING: TO MAINTAIN SPACE TEMPERATURE HEATING SET POINT (ADJ), THE INFRARED GAS HEATER SHALL FIRE TO GRADUALLY INCREASE THE SPACE AIR TEMPERATURE UP TO THE SCHEDULED SET POINT (ADJ).
   C. ONCE THE SPACE TEMPERATURE SET POINTS ARE MET, THE UNIT SHALL TURN OFF.

VEHICLE BAY/WORKSHOP EXHAUST SYSTEM

1. THE FAN SHALL OPERATE CONTINUOUSLY AT MINIMUM AIRFLOW AND SHALL INTERLOCK WITH MOTORIZED OUTSIDE AIR DAMPERS TO PROVIDE MAKE-UP AIR. THE FAN SHALL BE ENABLED BY THE SPACE TEMPERATURE SENSOR, CO SENSOR NOx SENSOR, OR DIGITAL TIMER SWITCH.
2. OCCUPIED MODE: THE EXHAUST FAN SHALL OPERATE CONTINUOUSLY AT SCHEDULED MINIMUM CFM.
3. SHOULD THE CO/NO2 LEVEL OF ANY SENSOR REACH 25 PPM, THE EXHAUST FAN SHALL RAMP UP TO MAXIMUM AIRFLOW AND MOTORIZED DAMPERS SHALL BE INTERLOCKED TO OPEN.
4. ONCE ALL CO SENSORS INDICATE SPACE CONCENTRATIONS BELOW 20 PPM, THE EXHAUST FAN SHALL RAMP DOWN TO MINIMUM SPEED SETPOINT.
5. SHOULD THE NOx LEVEL OF ANY SENSOR REACH 5 PPM(ADJ.), THE FAN SHALL RAMP UP TO MAXIMUM AND MOTORIZED DAMPERS SHALL BE INTERLOCKED TO OPEN. SHOULD THE NOx LEVEL OF ANY SENSOR REACH OR EXCEED 25 PPM(ADJ.), AN EMERGENCY ALARM SHALL BE GENERATED.
6. THE CIRCULATOR FANS, CF-X, SHALL OPERATE CONTINUOUSLY TO CIRCULATE AIR WITHIN THE GARAGE SPACES.
7. TEMPERATURE CONTROL: SHOULD THE SPACE TEMPERATURE EXCEED SPACE SET POINT, THE EXHAUST FAN SHALL OPERATE AT THE MINIMUM SPEED AS SCHEDULED. FAN SHALL INTERLOCK WITH MOTORIZED DAMPER TO PROVIDE MAKEUP AIR.

AIR-COOLED HEAT PUMP SYSTEM (HP)

1. UNOCCUPIED OPERATION: THE CONDENSER AND SUPPLY FAN SHALL CYCLE IN HEATING OR COOLING AS REQUIRED TO MAINTAIN UNOCCUPIED SET POINTS.
   A. INDOOR TERMINAL SUPPLY FANS SHALL CYCLE ON/OFF AND SYSTEM SHALL OPERATE UNDER IT'S PACKAGED CONTROLS FOR MAINTAINING THE ASSOCIATED UNOCCUPIED ROOM HEATING AND COOLING TEMPERATURE SETPOINTS.
2. OCCUPIED OPERATION: THE CONDENSER FAN SHALL CYCLE IN HEATING OR COOLING AS REQUIRED TO MAINTAIN OCCUPIED SET POINTS.
3. TIMED OVERRIDE: WHEN AN OVERRIDE IS INITIATED AT A TERMINAL UNIT SENSOR WITHIN THE SPACES SERVED BY THE ASSOCIATED UNIT, THE SYSTEM SHALL RETURN TO ITS NORMAL OCCUPIED OPERATION FOR 2 HOURS (ADJ). WHEN THE TIMED OVERRIDE PERIOD HAS ENDED, THE SYSTEM SHALL AUTOMATICALLY RETURN TO ITS UNOCCUPIED OPERATION.
4. AFTER POWER FAILURE ALL SETPOINTS TO BE AUTOMATICALLY RESTORED AND HELD FOR A MINIMUM OF 48 HOURS.

HIGH VOLUME LOW SPEED (HVLS) CIRCULATION FANS (CF)

1. THE FAN SHALL BE PROVIDED WITH MANUFACTURER WALL SPEED CONTROLLER AND OVERRIDE CONTROL AS SHOWN ON THE FLOOR PLANS.

VIRGINIA TECH NON-CAPITAL CONSTRUCTION

FORESTRY RESEARCH OPERATIONS CENTER

140 INVENTIVE LANE
BLACKSBURG, VA 24061

VT PROJECT CODE WO# 26-819490

DESIGNER
CLARKNEXSEN
A JMT Company
213 SOUTH JEFFERSON, SUITE 1011
ROANOKE, VIRGINIA 24011
540·982·0800

CONSULTANT
2RW CONSULTANTS, INC.
2677 PROSPERITY AVE., SUITE 275
FAIRFAX, VA 22031
703. 718.4355

PROFESSIONAL SEAL
COMMONWEALTH OF VIRGINIA
LUCAS W. HIPFMANN
Lic. No. 042595
10.28.2026
PROFESSIONAL ENGINEER

UBO CONFORMANCE

SUBMITTAL
10/23/2026
ISSUED FOR CONSTRUCTION

REVISIONS

KEY PLAN

SHEET
CONTROLS

M801

DESIGN: Designer
DRAWN: Author
REVIEW: Checker

CN 11053

10/28/2026 10:40:28 AM
C:\Users\MikaelE\Documents\Revit Files\25153.1_M25_VT Timber Harvesting Lab_MikaelE@2rw.com.rvt