

DUCTWORK SYMBOLS		
DESCRIPTION	SINGLE LINE	DOUBLE LINE
ACCESS DOOR		
BACKDRAFT DAMPER		
FIRE DAMPER		
SMOKE DAMPER		
COMBINATION FIRE/SMOKE DAMPER		
FLEXIBLE CONNECTION		
MOTORIZED DAMPER		
CONTROL DAMPER		
VOLUME DAMPER, MANUAL		
STATIC PRESSURE MEASURING STATION		
DUCT ELBOW WITH TURNING VANES		
DUCT SECTION - SUPPLY AIR		
DUCT SECTION - RETURN, OUTSIDE, OR RELIEF AIR		
DUCT SECTION - EXHAUST AIR		
DUCT, INCLINED DROP		
DUCT, INCLINED RISE		
FLEXIBLE DUCT - ROUND		
DUCT TRANSITION		
DUCT TRANSITION (SQUARE OR RECTANGULAR TO ROUND)		
RECTANGULAR DUCT, SIZE IN INCHES, FIRST DIMENSION IS SIDE SHOWN (NET CLEAR INSIDE DIMENSION)		
ROUND DUCT, DIAMETER IN INCHES, (NET CLEAR INSIDE DIMENSION)		
AIR FLOW IN DIRECTION OF ARROW		
45° BRANCH TAKE-OFFS		
CONICAL LATERAL BRANCH TAKE-OFFS		
CEILING SUPPLY DIFFUSERS (ROUND)		
CEILING SUPPLY DIFFUSERS		
CEILING RETURN GRILLE/REGISTER		
CEILING EXHAUST GRILLE/REGISTER		
SIDEWALL SUPPLY GRILLE/REGISTER		
SIDEWALL RETURN/EXHAUST GRILLE/REGISTER		
EXTRACTOR		
DUCT TEE WITH SPLITTER DAMPER		
DOOR UNDERCUT		
DOOR LOUVER		

PIPING SYMBOLS	
SYMBOL	DESCRIPTION
	COMBINATION CHILL/HOT WATER SUPPLY
	COMBINATION CHILL/HOT WATER RETURN
	CHILLED WATER SUPPLY
	CHILLED WATER RETURN
	CONDENSER WATER SUPPLY
	CONDENSER WATER RETURN
	HOT WATER SUPPLY
	HOT WATER RETURN
	DRAIN
	CONDENSATE DRAIN PIPE
	LOW PRESSURE GAS
	VENT
	REFRIGERANT GAS
	REFRIGERANT LIQUID
	REFRIGERANT SUCTION
	GLYCOL SUPPLY
	GLYCOL RETURN
	FUEL OIL SUPPLY
	FUEL OIL RETURN
	FUEL OIL VENT
	MAKE-UP WATER
	ELECTRIC HEAT TRACE
	DIRECTION OF PITCH (DOWN)
	FLUID FLOW DIRECTION
	DOMESTIC COLD WATER
	DOMESTIC HOT WATER
	SECTIONAL VALVE (SEE SPECS)
	GATE VALVE
	CHECK VALVE
	THROTTLING VALVE (SEE SPECS)
	GLOBE VALVE
	BUTTERFLY VALVE
	CALIBRATED BALANCING VALVE
	BALL VALVE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF OR SAFETY VALVE
	VACUUM RELIEF OR SAFETY VALVE
	ANGLE VALVE
	SOLENOID VALVE
	MOTOR OPERATED CONTROL VALVE
	3-WAY CONTROL VALVE
	TRIPLE DUTY VALVE
	FLOW CONTROL VALVE
	PLUG VALVE
	SIGHT GLASS
	CABINET UNIT HEATER
	CONDENSER WATER CLEANER
	CHILLED WATER PUMP
	DRY COOLER
	DEHUMIDIFIER
	ELECTRIC BASEBOARD HEATER
	ELECTRIC CABINET UNIT HEATER
	ENGINE EXHAUST REEL
	EXHAUST FAN
	ELECTRIC HEATING COIL
	ENERGY RECOVERY WHEEL
	EXHAUST SILENCER
	ELECTRIC STEAM HUMIDIFIER
	EXPANSION TANK
	ELECTRIC UNIT HEATER
	FILTER
	FLUID COOLER
	FAN COIL UNIT
	FUME EXTRACTOR
	FIN TUBE RADIATION
	FAN TERMINAL UNIT
	GAS FIRED STEAM HUMIDIFIER
	GLYCOL PUMP
	GRAVITY RELIEF HOOD
	GRAVITY VENT
	GAS UNIT HEATER
	HUMIDIFIER
	HEATED AIR CURTAIN
	HEAT PUMP
	HEAT PUMP DRY-COOLER
	EXHAUST AIR HEAT RECOVERY COIL
	HEAT RECOVERY PUMP
	HIGH TEMPERATURE EXHAUST FAN
	HEATING & VENTILATING UNIT
	HOT WATER HEATING COIL
	HOT WATER PUMP
	HEAT EXCHANGER
	INTAKE HOOD
	INFRA-RED HEATER
	PREHEAT COIL
	PACKAGED TERMINAL AIR CONDITIONER
	RETURN AIR FAN
	RELIEF HOOD
	REHEAT COIL
	RADIANT HEATING PANEL
	ROOFTOP UNIT
	SUPPLY AIR FAN
	SOLDER FUME EVACUATION
	SOUND TRAP
	THERMAL EQUALIZER FAN
	TANGENTIAL WATER FILTER
	UNIT HEATER
	VARIABLE AIR VOLUME BOX
	VENTILATION FAN
	PUMP (FOR WATER FLOW DIAGRAM ONLY)

MISCELLANEOUS SYMBOLS	
SYMBOL	DESCRIPTION
	KEYED NOTE
	DUCT SMOKE DETECTOR
	NEW CONNECTION TO EXISTING
	CARBON MONOXIDE DETECTOR
	HUMIDISTAT
	THERMOSTAT OR TEMPERATURE SENSOR (MOUNT 48" AFF)
	NIGHT THERMOSTAT
	DIFFUSER, GRILLE OR REGISTER MARK (SEE SCHEDULE)
	CFM
	NECK SIZE (IF NOT ON SCHEDULE)
	EQUIPMENT MARK (SEE SCHEDULE)
	DETAIL DESIGNATION
	LOCATOR/DESCRIPTOR
	DRAWING WHERE DETAIL IS SHOWN OR WHERE DETAIL IS REFERENCED FROM
	SECTION CUT
	DRAWING WHERE SECTION IS SHOWN OR WHERE SECTION IS REFERENCED FROM

EQUIPMENT ABBREVIATIONS	
ACR	AIR COMPRESSOR
ACU	AIR CONDITIONING UNIT
AHU	AIR HANDLING UNIT
AIF	AIR INTAKE FILTER
ASP	AIR SEPARATOR
ATB	AIR TERMINAL BOX
B	BOILER
BB	BASEBOARD HEATER
BL	BLOWER
CACU	COMPUTER ROOM AIR CONDITIONING UNIT
CC	COILING COIL
CH	CHILLER
CWP	CONDENSATE/CONDENSER WATER PUMP
CT	COOLING TOWER
CTP	CHEMICAL TREATMENT PUMP
CJ	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CWC	CONDENSER WATER CLEANER
CHP	CHILLED WATER PUMP
DC	DRY COOLER
DH	DEHUMIDIFIER
EBH	ELECTRIC BASEBOARD HEATER
ECUH	ELECTRIC CABINET UNIT HEATER
EER	ENGINE EXHAUST REEL
EF	EXHAUST FAN
EHC	ELECTRIC HEATING COIL
ERV	ENERGY RECOVERY WHEEL
ES	EXHAUST SILENCER
ESH	ELECTRIC STEAM HUMIDIFIER
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
F	FILTER
FC	FLUID COOLER
FCU	FAN COIL UNIT
FEX	FUME EXTRACTOR
FTR	FIN TUBE RADIATION
FTU	FAN TERMINAL UNIT
GMAU	GAS FIRED STEAM HUMIDIFIER
GP	GLYCOL PUMP
GRH	GRAVITY RELIEF HOOD
GRV	GRAVITY VENT
GUH	GAS UNIT HEATER
H	HUMIDIFIER
HAC	HEATED AIR CURTAIN
HP	HEAT PUMP
HPD	HEAT PUMP DRY-COOLER
HRC	EXHAUST AIR HEAT RECOVERY COIL
HRP	HEAT RECOVERY PUMP
HTEF	HIGH TEMPERATURE EXHAUST FAN
HVU	HEATING & VENTILATING UNIT
HWC	HOT WATER HEATING COIL
HWP	HOT WATER PUMP
HX	HEAT EXCHANGER
IH	INTAKE HOOD
IRH	INFRA-RED HEATER
PHC	PREHEAT COIL
PTAC	PACKAGED TERMINAL AIR CONDITIONER
RF	RETURN AIR FAN
RH	RELIEF HOOD
RHC	REHEAT COIL
RHP	RADIANT HEATING PANEL
RTU	ROOFTOP UNIT
SAF	SUPPLY AIR FAN
SFE	SOLDER FUME EVACUATION
ST	SOUND TRAP
TEF	THERMAL EQUALIZER FAN
TWF	TANGENTIAL WATER FILTER
UH	UNIT HEATER
VAV	VARIABLE AIR VOLUME BOX
VF	VENTILATION FAN

MECHANICAL ABBREVIATIONS			
AAV	AUTOMATIC AIR VALVE	IN	INCH OR INCHES
AFF	ABOVE FINISHED FLOOR <td>IN H<sub>2</sub>O</td> <td>INCHES WATER COLUMN </td>	IN H <sub>2</sub> O	INCHES WATER COLUMN
AFMS	AIR FLOW MEASURING STATION <td>KW</td> <td>KILOWATT </td>	KW	KILOWATT
AMB	AMBIENT <td>LAT</td> <td>LEAVING AIR TEMPERATURE </td>	LAT	LEAVING AIR TEMPERATURE
APD	AIR PRESSURE DROP <td>LBHR</td> <td>POUNDS PER HOUR (#HR) </td>	LBHR	POUNDS PER HOUR (#HR)
BD	BLOWDOWN <td>LBS</td> <td>POUNDS </td>	LBS	POUNDS
BF	BLIND FLANGE <td>LBS</td> <td>LEVEL CONTROL VALVE </td>	LBS	LEVEL CONTROL VALVE
BFP	BACKFLOW PREVENTER <td>LDL</td> <td>LEAVING DRYBULB TEMPERATURE </td>	LDL	LEAVING DRYBULB TEMPERATURE
BFV	BUTTERFLY VALVE <td>LDP</td> <td>LEAK DETECTION PANEL </td>	LDP	LEAK DETECTION PANEL
BHP	BRAKE HORSEPOWER <td>LRA</td> <td>LOCKED ROTOR AMPS </td>	LRA	LOCKED ROTOR AMPS
BLV	BALANCING VALVE <td>LVL</td> <td>LEAVING </td>	LVL	LEAVING
BOD	BOTTOM OF DUCT <td>LWL</td> <td>LOW WATER LEVEL </td>	LWL	LOW WATER LEVEL
BOP	BOTTOM OF PIPE <td>LWT</td> <td>LEAVING WATER TEMPERATURE </td>	LWT	LEAVING WATER TEMPERATURE
BOS	BOTTOM OF STEEL <td>LxW</td> <td>LENGTH BY WIDTH </td>	LxW	LENGTH BY WIDTH
BAS	BUILDING AUTOMATION SYSTEM <td>MA</td> <td>MIXED AIR (OUTDOOR AND RETURN) </td>	MA	MIXED AIR (OUTDOOR AND RETURN)
BTU	BRITISH THERMAL UNIT <td>MAN</td> <td>MANUAL </td>	MAN	MANUAL
BTUH	BRITISH THERMAL UNIT PER HOUR <td>MAX</td> <td>MAXIMUM </td>	MAX	MAXIMUM
BV	BALL VALVE <td>MBH</td> <td>THOUSAND BRITISH THERMAL UNITS PER HOUR </td>	MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
BWP	BACK WATER PREVENTER <td>MFR</td> <td>MANUFACTURER </td>	MFR	MANUFACTURER
BWV	BACK WATER VALVE <td>MIN</td> <td>MINIMUM </td>	MIN	MINIMUM
CA	COMPRESSED AIR <td>MTR</td> <td>MOTOR </td>	MTR	MOTOR
CCMS	CENTRAL CONTROL MONITORING SYSTEM <td>MU</td> <td>MAKE UP WATER </td>	MU	MAKE UP WATER
CD	CEILING DIFFUSER <td>MVD</td> <td>MOTORIZED VOLUME DAMPER </td>	MVD	MOTORIZED VOLUME DAMPER
CENT	CENTRIFUGAL <td>NC</td> <td>NORMALLY CLOSED </td>	NC	NORMALLY CLOSED
CFM	CUBIC FEET PER MINUTE <td>NK</td> <td>NECK </td>	NK	NECK
CGR	CEILING GRILLE <td>NO</td> <td>NORMALLY OPEN OR NUMBER </td>	NO	NORMALLY OPEN OR NUMBER
CIR	CIRCULATING <td>NTS</td> <td>NOT TO SCALE </td>	NTS	NOT TO SCALE
CMBST	COMBUSTING AIR <td>OA</td> <td>OUTSIDE AIR </td>	OA	OUTSIDE AIR
CMU	CONCRETE MASONRY UNIT <td>OBD</td> <td>OPPOSED BLADE DAMPER </td>	OBD	OPPOSED BLADE DAMPER
COMM	COMMUNICATIONS <td>PD</td> <td>PRESSURE DROP </td>	PD	PRESSURE DROP
CL	CENTERLINE <td>PH</td> <td>PHASE </td>	PH	PHASE
COND	CONDENSATE <td>PI</td> <td>PRESSURE INDICATOR </td>	PI	PRESSURE INDICATOR
CV	CONTROL VALVE OR CONSTANT VOLUME <td>PRS</td> <td>PRESSURE REDUCING STATION </td>	PRS	PRESSURE REDUCING STATION
CW	DOMESTIC COLD WATER <td>PRV</td> <td>PRESSURE RELIEF VALVE </td>	PRV	PRESSURE RELIEF VALVE
D	DIFFUSER OR DAMPER <td>PS</td> <td>PRESSURE SENSOR </td>	PS	PRESSURE SENSOR
DB	DEGREES <td>PSIA</td> <td>POUNDS PER SQUARE INCH ABSOLUTE </td>	PSIA	POUNDS PER SQUARE INCH ABSOLUTE
DEG	DEGREES <td>PSIG</td> <td>POUNDS PER SQUARE INCH GAGE </td>	PSIG	POUNDS PER SQUARE INCH GAGE
DIA	DIAMETER <td>PSV</td> <td>PRESSURE SAFETY VALVE </td>	PSV	PRESSURE SAFETY VALVE
DN	DOWN <td>PTRV</td> <td>PRESSURE TEMPERATURE RELIEF VALVE </td>	PTRV	PRESSURE TEMPERATURE RELIEF VALVE
DOM	DOMESTIC <td>PV</td> <td>PLUG VALVE </td>	PV	PLUG VALVE
DPC	DIFFERENTIAL PRESSURE CONTROLLER <td>RA</td> <td>RETURN AIR </td>	RA	RETURN AIR
DX	DIRECT EXPANSION <td>RED</td> <td>REDUCER </td>	RED	REDUCER
EAT	ENTERING AIR TEMPERATURE <td>REG</td> <td>REGISTER </td>	REG	REGISTER
EDB	ENTERING DRYBULB TEMPERATURE <td>RG</td> <td>RETURN AIR GRILLE </td>	RG	RETURN AIR GRILLE
EFF	EFFICIENCY <td>RH</td> <td>RELATIVE HUMIDITY </td>	RH	RELATIVE HUMIDITY
EG	EXHAUST GRILLE <td>RL</td> <td>REFRIGERANT LIQUID </td>	RL	REFRIGERANT LIQUID
EL	ELEVATION <td>RLA</td> <td>RUNNING LOAD AMPERES </td>	RLA	RUNNING LOAD AMPERES
ELB	ELBOW <td>RPM</td> <td>REVOLUTIONS PER MINUTE </td>	RPM	REVOLUTIONS PER MINUTE
ELEC	ELECTRIC <td>RR</td> <td>RETURN AIR REGISTER </td>	RR	RETURN AIR REGISTER
ENT	ENTERING <td>RS</td> <td>REFRIGERANT SUCTION </td>	RS	REFRIGERANT SUCTION
EP	EXHAUST PIPE <td>RV</td> <td>REFRIGERANT VENT </td>	RV	REFRIGERANT VENT
ER	EXHAUST REGISTER <td>SA</td> <td>SUPPLY AIR </td>	SA	SUPPLY AIR
ESP	EXTERNAL STATIC PRESSURE <td>SENS</td> <td>SENSIBLE </td>	SENS	SENSIBLE
EWB	ENTERING WET BULB TEMPERATURE <td>SF</td> <td>SQUARE FEET </td>	SF	SQUARE FEET
EWT	ENTERING WATER TEMPERATURE <td>SH</td> <td>SENSIBLE HEAT </td>	SH	SENSIBLE HEAT
EXA	EXHAUST AIR <td>SL</td> <td>SOUND LINK </td>	SL	SOUND LINK
EXH	EXHAUST <td>SD</td> <td>SMOKE DETECTOR </td>	SD	SMOKE DETECTOR
EXT	EXTERNAL <td>SMD</td> <td>SOLENOID OPERATED VALVE OR SHUT-OFF VALVE </td>	SMD	SOLENOID OPERATED VALVE OR SHUT-OFF VALVE
F	DEGREES FAHRENHEIT <td>SP</td> <td>STATIC PRESSURE </td>	SP	STATIC PRESSURE
FCV	FLOW CONTROL VALVE <td>SPMS</td> <td>STATIC PRESSURE MEASURING STATION </td>	SPMS	STATIC PRESSURE MEASURING STATION
FIA	FULL LOAD AMP <td>SS</td> <td>STAINLESS STEEL </td>	SS	STAINLESS STEEL
FLEX	FLEXIBLE <td>TA</td> <td>TRANSFER AIR </td>	TA	TRANSFER AIR
FM	FLOW METER <td>TG</td> <td>TRANSFER GRILLE </td>	TG	TRANSFER GRILLE
FPM	FEET PER MINUTE <td>TH</td> <td>TOTAL HEAT </td>	TH	TOTAL HEAT
FPS	FEET PER SECOND <td>TI</td> <td>TEMPERATURE INDICATOR (THERMOMETER) </td>	TI	TEMPERATURE INDICATOR (THERMOMETER)
FT	FEET OR FOOT <td>TOD</td> <td>TOP OF DUCT </td>	TOD	TOP OF DUCT
FWL	FEET WATER COLUMN <td>TOP</td> <td>TOP OF PIPE </td>	TOP	TOP OF PIPE
FWL H <sub>2</sub> O	FIXED WALL LOUVER <td>TOS</td> <td>TOP OF STEEL </td>	TOS	TOP OF STEEL
GAL	GALLON OR GALLONS <td>TS</td> <td>TEMPERATURE SENSOR </td>	TS	TEMPERATURE SENSOR
GPM	GALLONS PER MINUTE <td>TSTAT</td> <td>THERMOSTAT </td>	TSTAT	THERMOSTAT
GR	GRILLE <td>TSP</td> <td>TOTAL STATIC PRESSURE </td>	TSP	TOTAL STATIC PRESSURE
GV	GATE VALVE <td>TW</td> <td>THERMOWELL </td>	TW	THERMOWELL
GW	GLYCOL WASTE <td>V</td> <td>VENT </td>	V	VENT
HERM	HERMETIC <td>VEL</td> <td>VELOCITY </td>	VEL	VELOCITY
HD	HEAD <td>VFD</td> <td>VARIABLE FREQUENCY DRIVE </td>	VFD	VARIABLE FREQUENCY DRIVE
HI	HIGH <td>VTR</td> <td>VENT THROUGH ROOF </td>	VTR	VENT THROUGH ROOF
HP	HORSEPOWER <td>WB</td> <td>WET BULB </td>	WB	WET BULB
HR	HOUR <td>WC</td> <td>WATER COLUMN </td>	WC	WATER COLUMN
HTG	HEATING <td>WPD</td> <td>WATER PRESSURE DROP </td>	WPD	WATER PRESSURE DROP
HU	HUMIDITY <td>WTR</td> <td>WATER </td>	WTR	WATER
HW	DOMESTIC HOT WATER <td>WxHxL</td> <td>WIDTH BY HEIGHT BY LENGTH </td>	WxHxL	WIDTH BY HEIGHT BY LENGTH
HWL	HIGH WATER LEVEL <td></td> <td></td>		
HZ	CYCLES PER SECOND (HERTZ) <td></td> <td></td>		

TAG NUMBERING SYSTEM	
FUNCTIONS OF THE INDIVIDUAL INSTRUMENT	ROOM OR EQUIPMENT NUMBER
GENERAL FORM: XXX	SYSTEM OR AREA IDENTIFIER
TAG PREFIX: XXX	TAG SUFFIX: ZZ
EXAMPLE: TCV-001-PH	EXAMPLE: TCV TEMPERATURE CONTROL VALVE 001 AHU-001 PH PREHEAT COIL
EXAMPLE: FCD-001-OA	EXAMPLE: FCD FLOW CONTROL DAMPER 001 AHU-001 OA OUTSIDE AIR

SIGNAL TYPE AND MODE TO/FROM DEVICES	
TYPE OF SIGNAL	COMPUTER TO WHICH THE SIGNAL IS WIRED
AI = ANALOG INPUT (TO DESIGNATED DEVICE)	1 = BUILDING MANAGEMENT SYSTEM
AO = ANALOG OUTPUT (FROM DESIGNATED DEVICE)	2 = DIVISION 28 FIRE ALARM SYSTEM
DI = DIGITAL INPUT	
DO = DIGITAL OUTPUT	
SI = SERIAL INTERFACE	

GENERAL NOTES	
1.	EXISTING EQUIPMENT, DUCTWORK, AND PIPING IS SHOWN LIGHTER ON DRAWINGS. NEW ITEMS ARE SHOWN BOLD AND LABELED.
2.	ALL ITEMS SHOWN ARE NOT NECESSARILY USED ON THIS PROJECT.
3.	ALL DUCT SIZES ARE CLEAR INSIDE DIMENSIONS.
4.	PIPING AND DUCTWORK SHALL NOT BE ROUTED IN THE DEDICATED ELECTRICAL SPACE AT OR ABOVE ELECTRICAL SWITCHBOARDS, DISTRIBUTION PANELS, MOTOR CONTROL CENTERS, ETC. PER THE NATIONAL ELECTRICAL CODE, LATEST EDITION.
5.	COORDINATE ALL MECHANICAL EQUIPMENT, DUCTS, PIPING, ETC. WITH OTHER DISCIPLINES.
6.	COORDINATE ALL SMOKE/FIRE RATED PARTITIONS WITH LIFE SAFETY PLANS.
7.	COORDINATE ALL CEILING CAP, WALL, PARTITION PENETRATIONS WITH STRUCTURAL AND ARCHITECTURAL.
8.	VERTICAL AND HORIZONTAL OFFSETS SHOWN IN DUCTS INDICATE GENERAL RELATIONSHIP OF THE LOCATION OF SYSTEMS. PROVIDE ADDITIONAL OFFSETS SIMILAR TO THOSE SHOWN TO SUIT CON

1

2

3

4

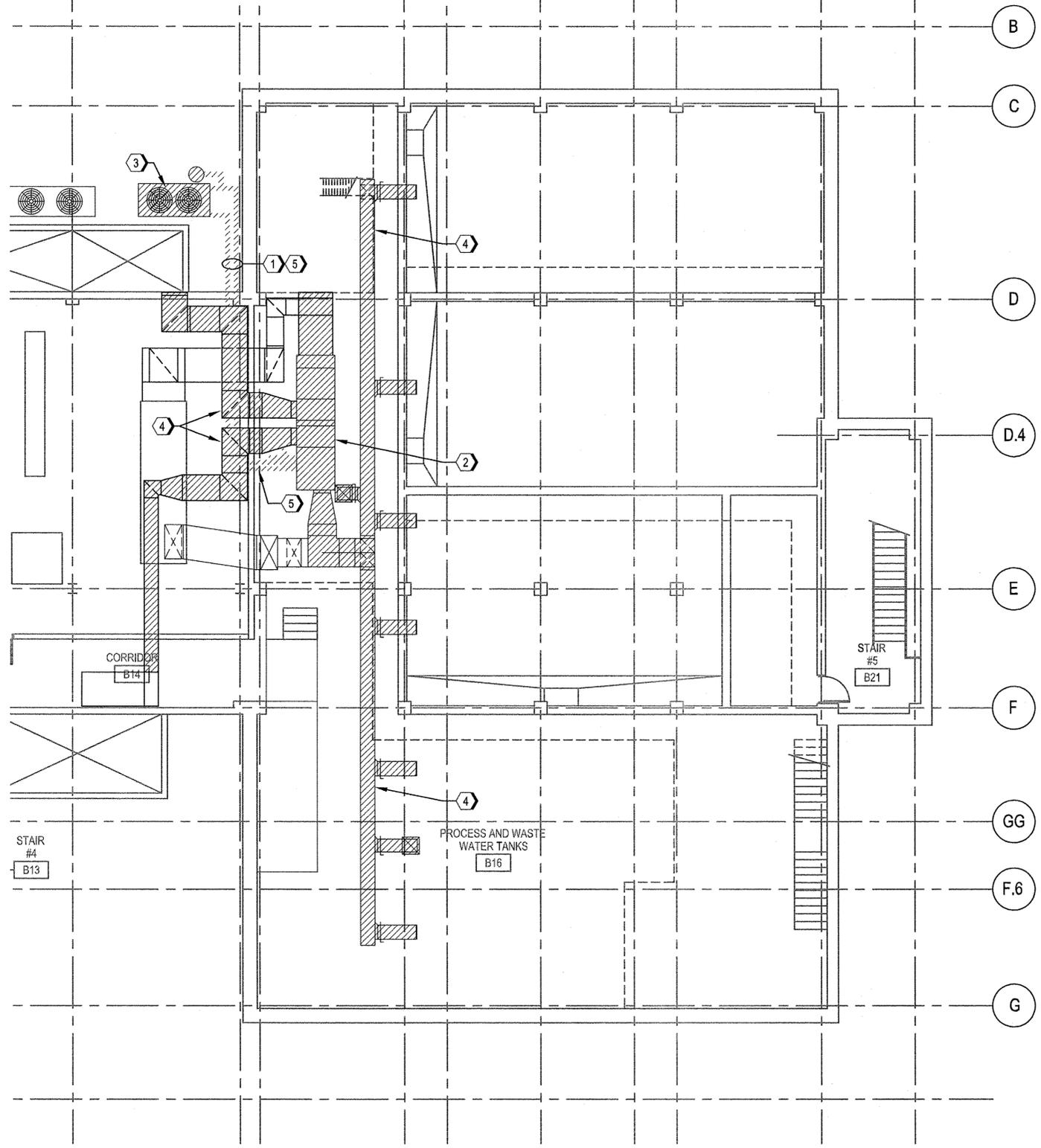
5

D

C

B

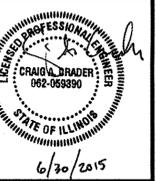
A



### GENERAL MECHANICAL NOTES

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

DATE	SYN	DESCRIPTION



### KEYED NOTES

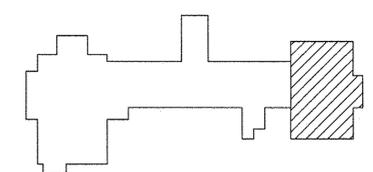
- RECLAIM AND PROPERLY DISPOSE OF REFRIGERANT. PROPERLY DISPOSE OF GLYCOL SOLUTION.
- DEMO EXISTING INDOOR HEAT PUMP UNIT HP-2.
- DEMO EXISTING OUTDOOR HEAT PUMP UNIT HPD-2.
- DEMO DUCTWORK ASSOCIATED WITH HEAT PUMP SYSTEM.
- DEMO REFRIGERANT PIPING ASSOCIATED WITH HEAT PUMP SYSTEM.

**JACOBS**  
 501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102  
 TEL 314-335-4000 FAX 314-335-5012

APPROVED
FOR COMMANDER NAVFAC DWG
ACTIVITY
D. COREY MELTON, TRAINING DIRECTOR SWDS
SATISFACTORY TD 6/18/15
BES CAC DRW TOH CHK MCB
PH/DM RS / JMS
BRANCH MANAGER
CHIEF ENG/ARCH DWG
FIRE PROTECTION

DEPARTMENT OF THE NAVY  
 NAVFAC MID-ATLANTIC  
 GREAT LAKES NAVAL STATION  
 GREAT LAKES, ILLINOIS  
 RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)  
 MECHANICAL FLOOR DEMOLITION PLAN

### KEY PLAN



**A1 PARTIAL BASEMENT FLOOR DEMOLITION PLAN**  
 1/8" = 1'-0"



SCALE:	AS NOTED
PROJECT NO.:	1310337
CONSTR. CONTR. NO.:	N40085-15-R-8720
NAVFAC DRAWING NO.:	12689609
SHEET	47 OF 86
<b>MD101</b>	

1

2

3

4

5

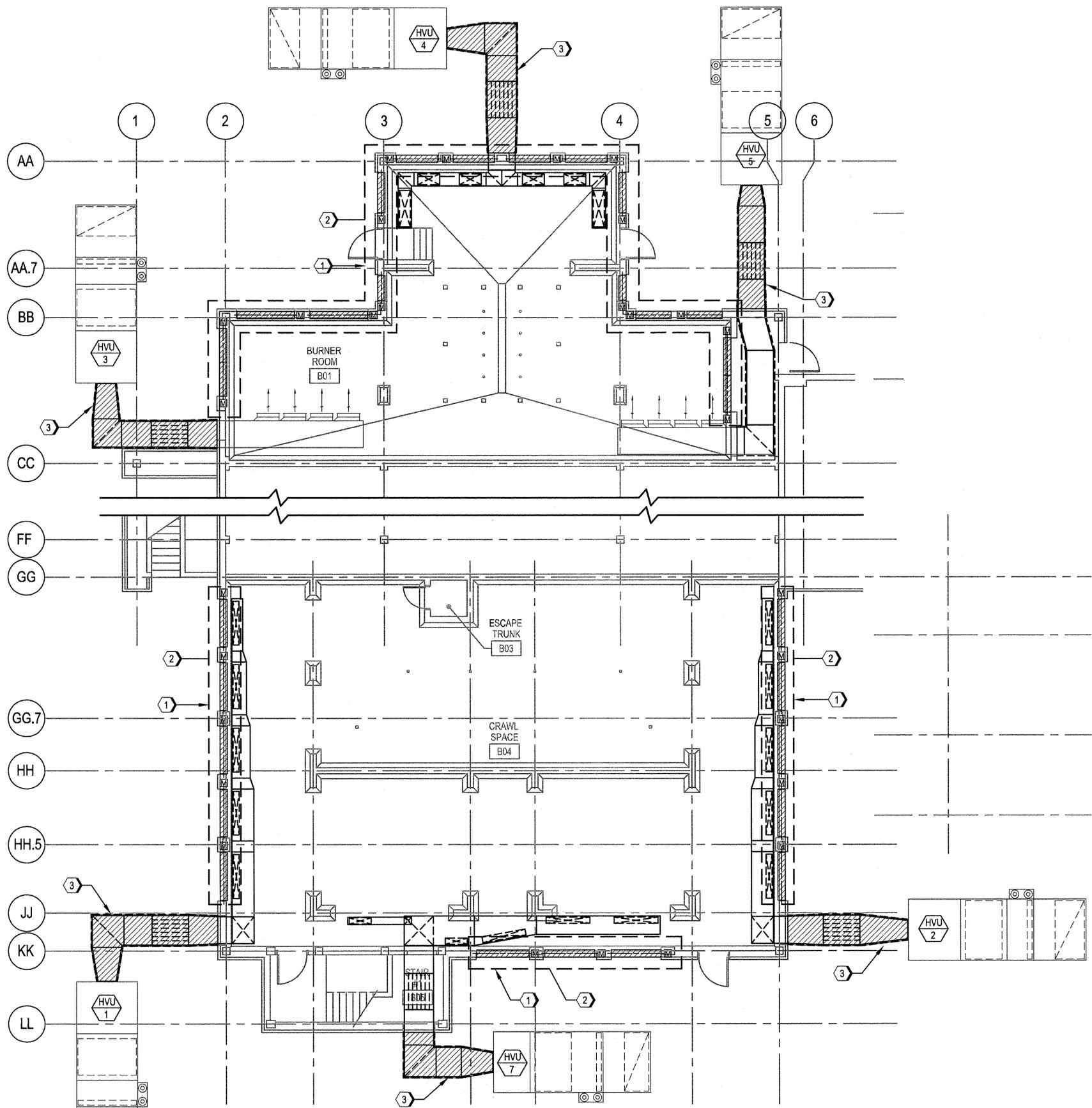
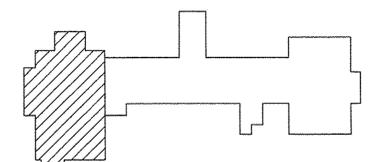
### GENERAL MECHANICAL NOTES

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

### KEYED NOTES

- COORDINATE DISCONNECTION AND RECONNECTION OF POWER TO ACTUATORS WITH ELECTRICAL CONTRACTOR. SEE ALSO SHEET E-102.
- DEMO EXISTING DAMPERS AND ACTUATORS.
- DEMO EXISTING EXTERIOR DUCT INSULATION.

### KEY PLAN

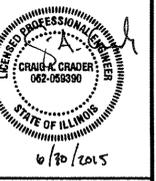
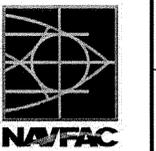


**PARTIAL FIRST FLOOR  
CRAWLSPACE DEMOLITION PLAN**

A1  
1/8" = 1'-0"



DATE	DESCRIPTION



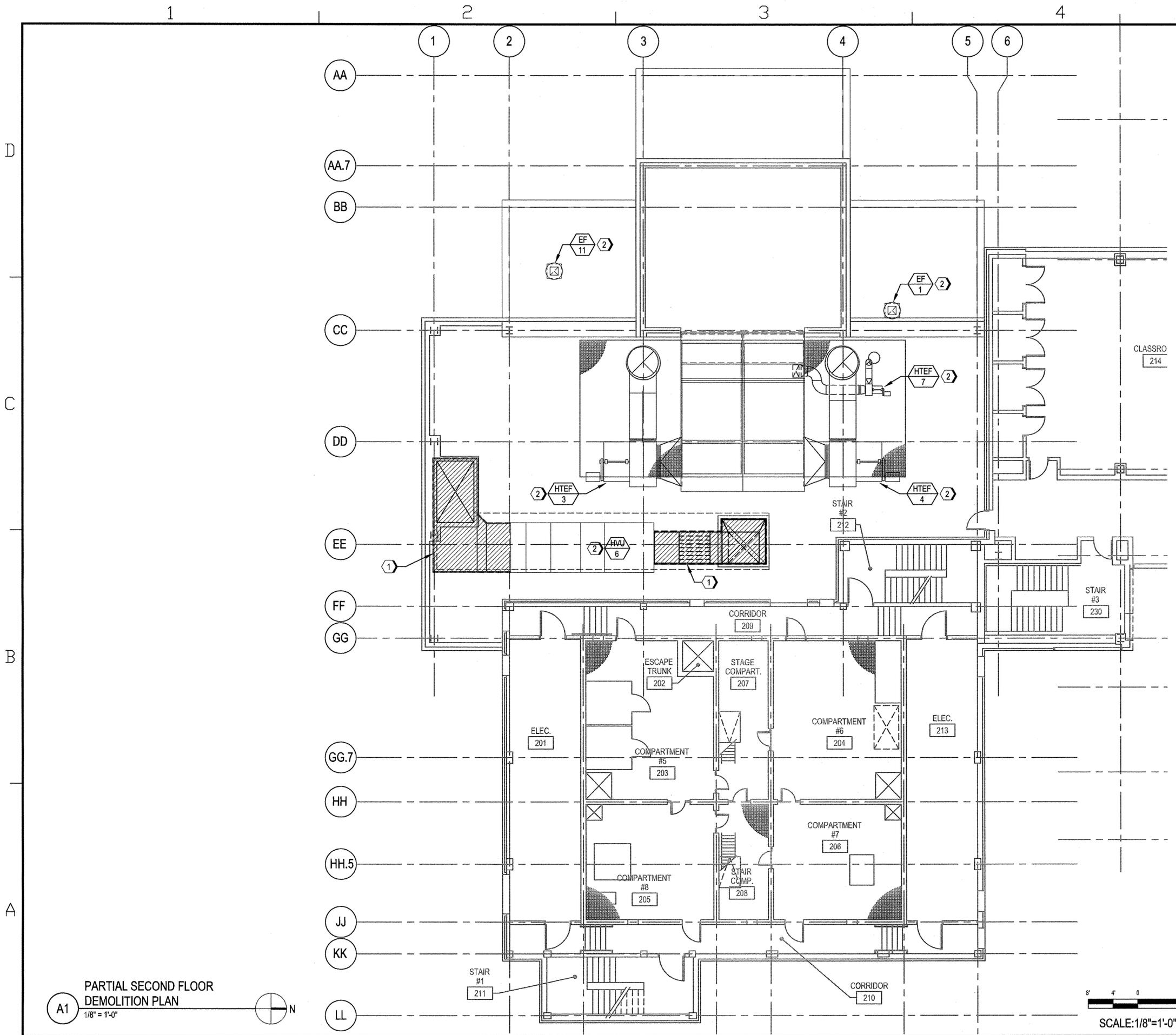
**JACOBS**  
501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102  
TEL 314-335-4000 FAX 314-335-5012

APPROVED  
FOR COMMANDER NAVFAC DWG  
ACTIVITY  
D. COREY MELTON,  
TRAINING DIRECTOR SWDS  
SATISFACTORY TO 6/18/15  
DES CAC DRW TOH CHK MCB  
PM/DM RS / JMS  
BRANCH MANAGER  
CHIEF ENG/ARCH DWG  
FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVAL FACILITIES ENGINEERING COMMAND  
NAVFAC MID-ATLANTIC  
GREAT LAKES NAVAL STATION  
GREAT LAKES, ILLINOIS  
RENOVATE SWOSU FIREFIGHTING TRAINER  
(BUILDING 510)  
MECHANICAL  
PARTIAL FIRST FLOOR CRAWLSPACE DEMOLITION PLAN

SCALE: AS NOTED  
PROJECT NO.: 1310337  
CONSTR. CONTR. NO.: N40085-15-R-8720  
NAVFAC DRAWING NO.: 12689610  
SHEET 48 OF 86  
**MD102**





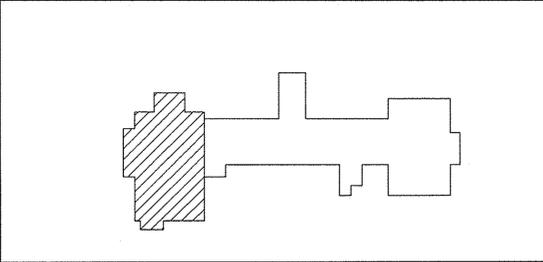
**GENERAL MECHANICAL NOTES**

1. FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

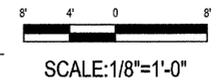
**KEYED NOTES**

- ① DEMO EXISTING EXTERIOR DUCT INSULATION.
- ② EXISTING EQUIPMENT TO REMAIN.

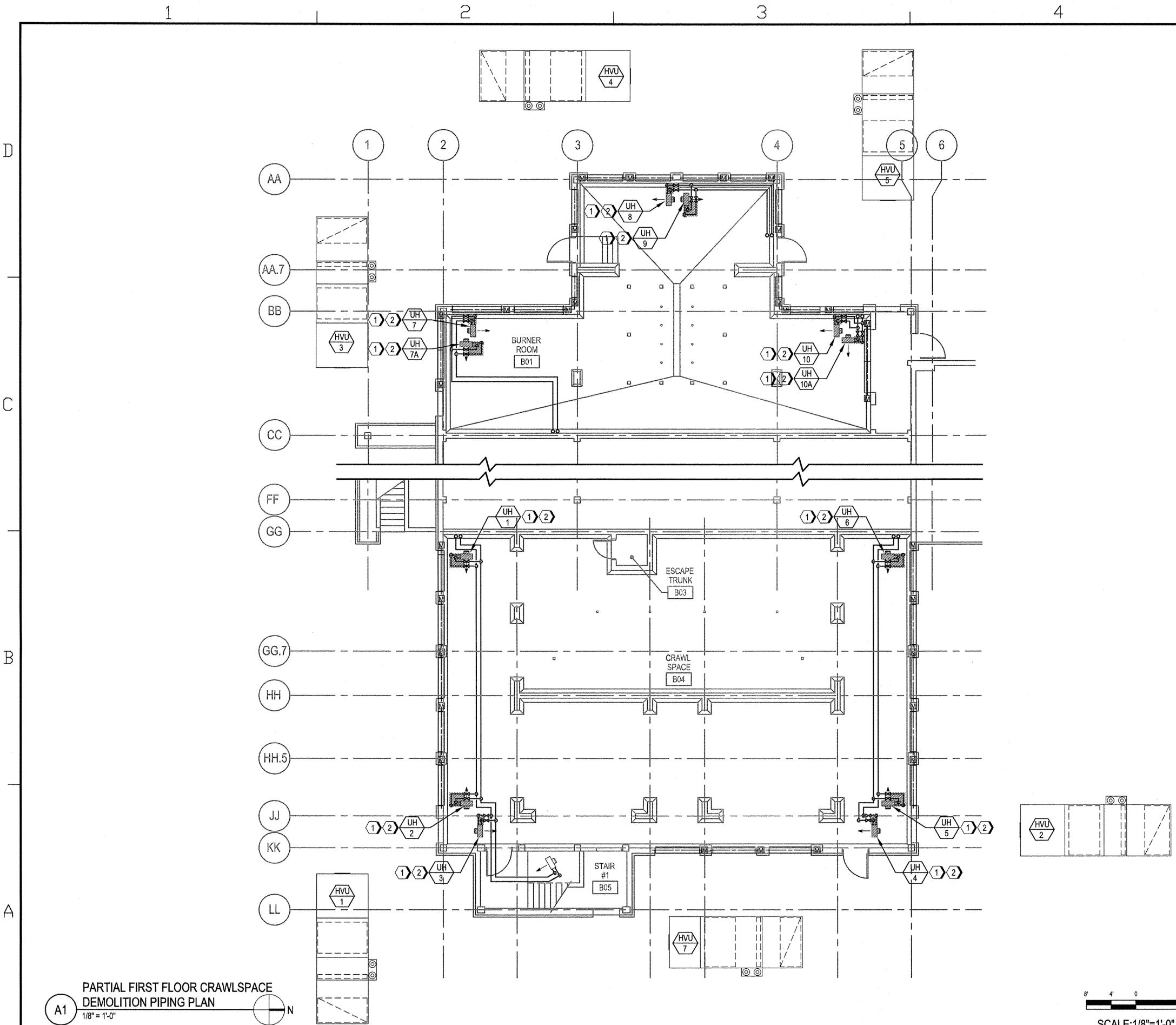
**KEY PLAN**



**A1 PARTIAL SECOND FLOOR DEMOLITION PLAN**  
1/8" = 1'-0"



DATE	
DESCRIPTION	
SYN	
6/30/2015	
<b>JACOBS</b> 501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-355-4000 FAX 314-355-5012	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWOS	
SATISFACTORY TO 6/18/15	
DES CAC DRW TOH CHK MCB	
PW/DH RS / JMS	
BRANCH MANAGER	
CHIEF ENG/ARCH DWG	
FIRE PROTECTION	
DEPARTMENT OF THE NAVY	NAVAL FACILITIES ENGINEERING COMMAND
NAVY	NAVY
GREAT LAKES NAVAL STATION	NAVY
GREAT LAKES, ILLINOIS	NAVY
RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)	NAVY
Mechanical	NAVY
PARTIAL SECOND FLOOR DEMOLITION PLAN	NAVY
SCALE: AS NOTED	PROJECT NO: 1310337
CONSTR. CONTR. NO: N40085-15-R-8720	NAVY TRAVELING NO: 12689612
SHEET 50 OF 86	<b>MD104</b>



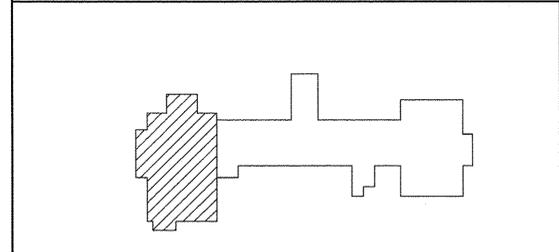
**GENERAL MECHANICAL NOTES**

1. FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

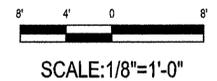
**KEYED NOTES**

- ① COORDINATE DISCONNECTION AND RECONNECTION OF POWER TO UNIT HEATER WITH ELECTRICAL CONTRACTOR.
- ② DEMO UNIT HEATER, INSULATION AND PIPING BACK TO ISOLATION VALVE.

**KEY PLAN**



**A1** PARTIAL FIRST FLOOR CRAWLSPACE DEMOLITION PIPING PLAN  
1/8" = 1'-0"



	DATE
	SYN DESCRIPTION
	
	
6/30/2015	
	
501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-335-4000 FAX 314-335-5012	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWOS	
SATISFACTORY TO 6/18/15	
DES CAC DRW TOH CHK MCB	
PM/DM RS / JMS	
BRANCH MANAGER	
CHIEF ENG/ARCH DWG	
FIRE PROTECTION	
DEPARTMENT OF THE NAVY NAVFAC MID-ATLANTIC GREAT LAKES NAVAL STATION GREAT LAKES, ILLINOIS RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510) MECHANICAL PARTIAL FIRST FLOOR CRAWLSPACE DEMOLITION PIPING PLAN	AS NOTED PROJECT NO: 1310337 CONSTR. CONTR. NO: N40085-15-R-8720 NAVFAC DRAWING NO: 12689613 SHEET 51 OF 86 <b>MD202</b>



1

2

3

4

5

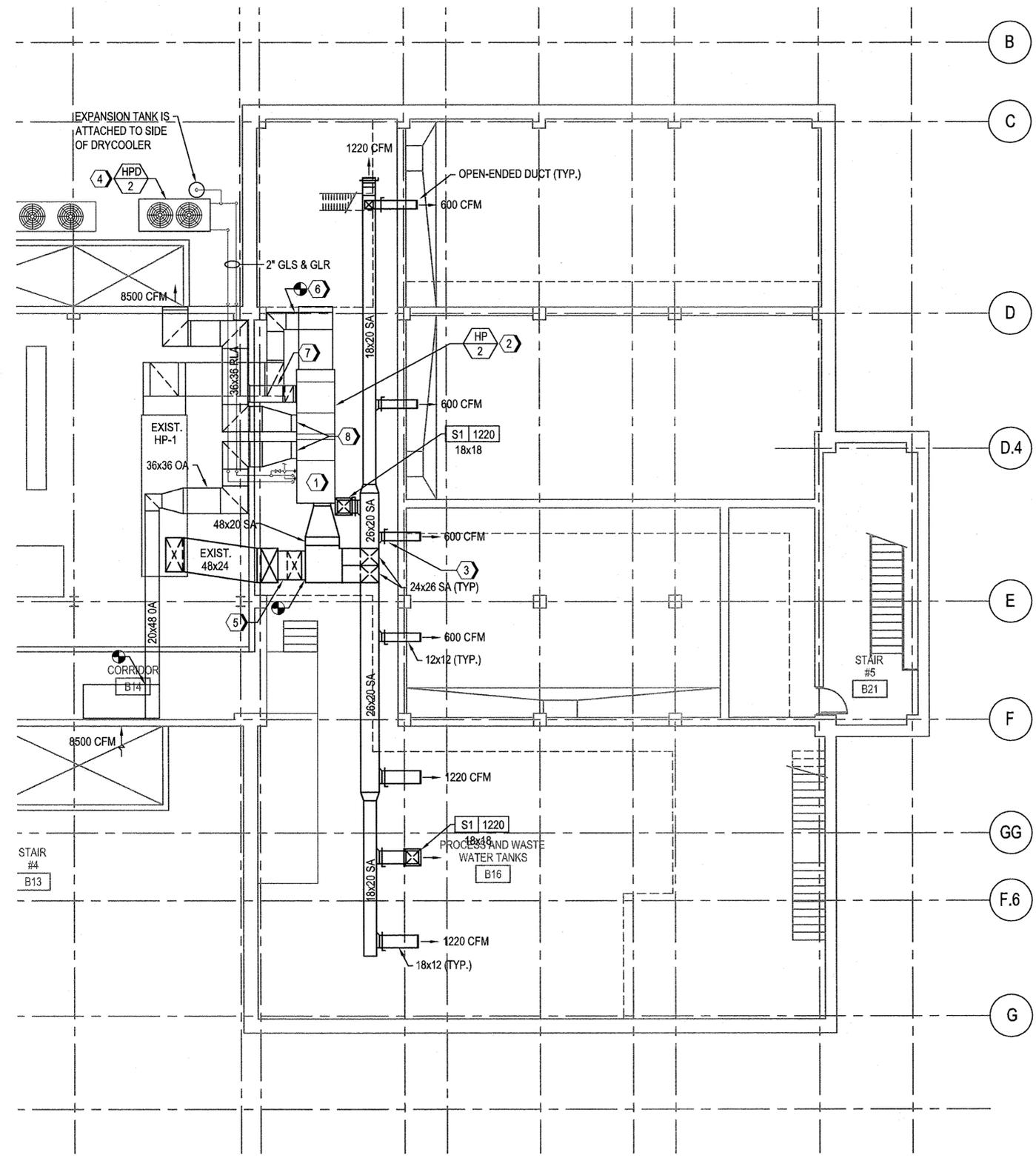
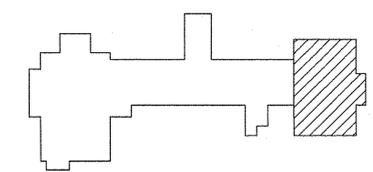
### GENERAL MECHANICAL NOTES

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

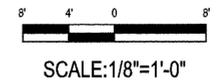
### KEYED NOTES

- COORDINATE WITH STRUCTURAL FOR REVISED HP-2 PLATFORM. REFER TO DETAIL A2 & A4 ON MECHANICAL DETAIL SHEET M-501.
- COORDINATE NEW UNIT WITH EXISTING EQUIPMENT, DUCT & PIPING.
- REFER TO DETAIL A1 ON MECHANICAL DETAIL SHEET M-501 FOR DUCT REQUIREMENTS.
- FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR ATTACHING DRYCOOLER TO EQUIPMENT PAD.
- EXISTING 40x20 SA DUCT INTERCONNECTED TO UNIT HP-1 AND CONNECTED TO NEW DUCTWORK FOR HEAT PUMP HP-2.
- RA DUCT INTERCONNECTED TO UNIT HP-1 AND HP-2.
- NEW 24x12 RELIEF AIR DUCT FROM HP-2.
- CONNECT NEW 24x20 OUTSIDE AIR AND 24x20 RELIEF AIR DUCTS INTO NEW HEAT PUMP HP-2.

### KEY PLAN



**A1** PARTIAL BASEMENT FLOOR NEW WORK PLAN  
 1/8" = 1'-0"



DATE	
SYN	
DESCRIPTION	
<b>JACOBS</b>	
501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-335-4000 FAX 314-335-5012	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWDS	
SATISFACTORY TO: 6/18/15	
DES CAC DRW TOH CHK MCB	
PM/DM RS / JMS	
BRANCH MANAGER	
CHIEF ENG/ARCH DWG	
FIRE PROTECTION	
NAVAL FACILITIES ENGINEERING COMMAND	
NAVFAC MID-ATLANTIC	
GREAT LAKES, ILLINOIS	
GREAT LAKES NAVAL STATION	
RENOVATE SWDSU FIREFIGHTING TRAINER (BUILDING 510)	
MECHANICAL	
PARTIAL BASEMENT FLOOR NEW WORK PLAN	
SCALE: AS NOTED	
EPROJCT NO.: 1310337	
CONSTR. CONTR. NO.: N40085-15-R-8720	
NAVFAC DRAWING NO.: 12689615	
SHEET 53 OF 86	
<b>M-101</b>	

1

2

3

4

5

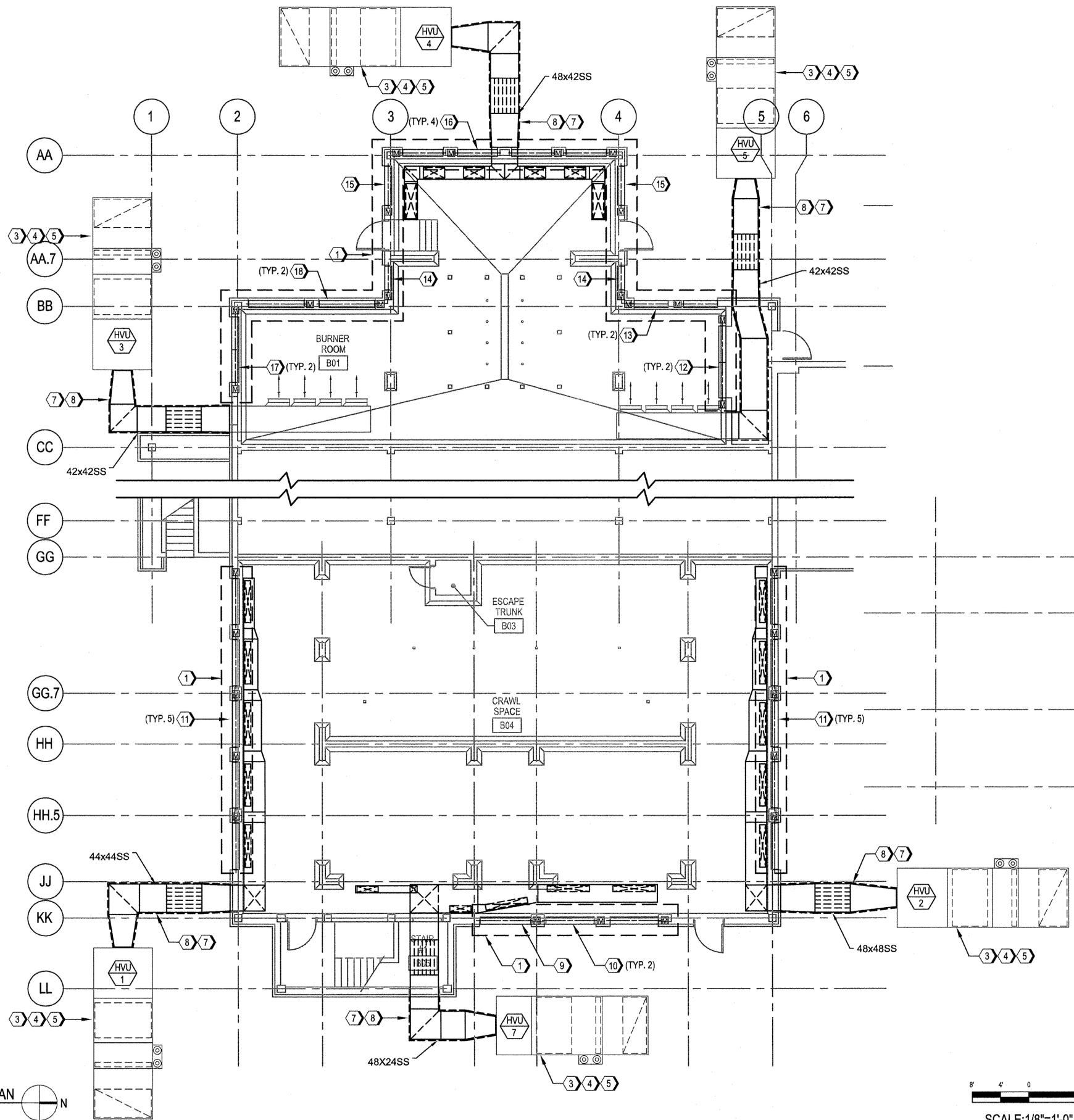
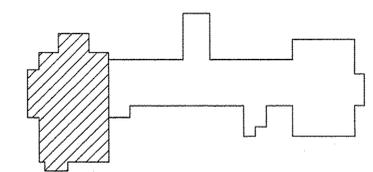
### GENERAL MECHANICAL NOTES

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.
- HVU DUCT SIZES TAKEN FROM AS-BUILT DRAWINGS. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS & LENGTHS PRIOR TO ORDERING MATERIALS.

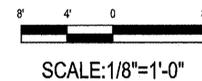
### KEYED NOTES

- DAMPER ACTUATORS SHALL BE TWO POSITION. COORDINATE RECONNECTING POWER WITH ELECTRICAL CONTRACTOR.
- NOT USED
- REPLACE MOTOR, BELTS AND FAN SHAFT BEARINGS. REBALANCE UNIT AFTER COMPONENTS HAVE BEEN REPLACED.
- CLEAN INTERIOR OF UNITS INCLUDING COILS.
- REPLACE PROPANE SENSORS AT UNIT. COORDINATE WITH BAS FOR TIE-IN ALARMS. NEW LOCATION AT BOTTOM OF UNIT.
- NOT USED.
- PRESSURE TEST AND SEAL ALL DUCTWORK AIRTIGHT. DUCTWORK TO MEET OR EXCEED SMACNA CLASS A STANDARDS.
- PROVIDE NEW EXTERIOR DUCT INSULATION WITH PROTECTIVE WRAP.
- PROVIDE NEW 86x30 DAMPER AND ACTUATOR.
- PROVIDE NEW 82x30 DAMPER AND ACTUATOR.
- PROVIDE NEW 78x46 DAMPER AND ACTUATOR.
- PROVIDE NEW 62x40 DAMPER AND ACTUATOR.
- PROVIDE NEW 58x34 DAMPER AND ACTUATOR.
- PROVIDE NEW 40x30 DAMPER AND ACTUATOR.
- PROVIDE NEW 66x62 DAMPER AND ACTUATOR.
- PROVIDE NEW 68x62 DAMPER AND ACTUATOR.
- PROVIDE NEW 56x36 DAMPER AND ACTUATOR.
- PROVIDE NEW 94x30 DAMPER AND ACTUATOR.

### KEY PLAN

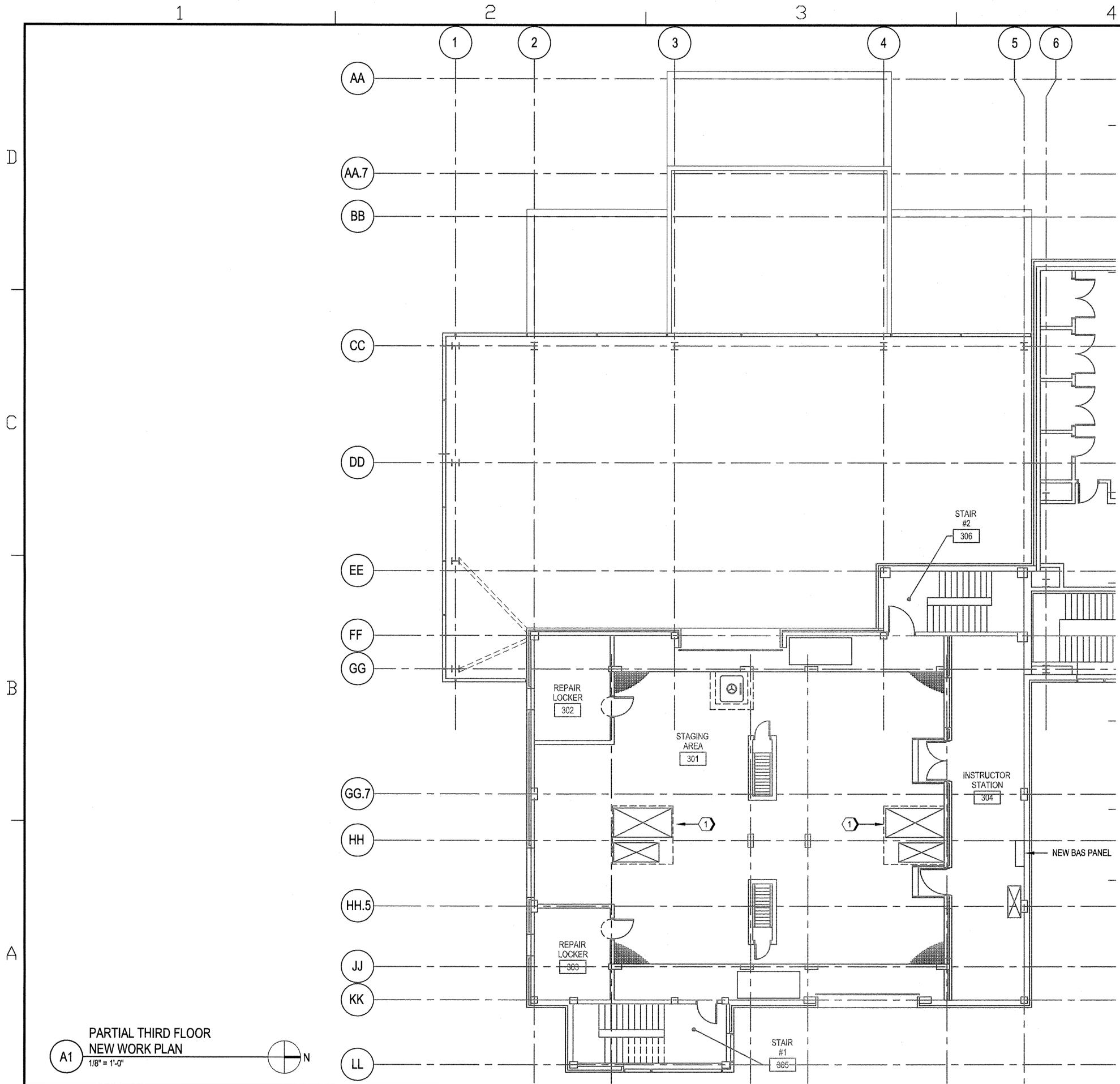


**PARTIAL FIRST FLOOR CRAWLSPACE NEW WORK PLAN**  
 1/8" = 1'-0"

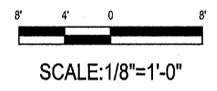


DATE	
SYN	DESCRIPTION
<b>JACOBS</b> 501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-335-4000 FAX 314-335-5012	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWCS	
SATISFACTORY TO	6/18/15
DES CAC DRW TOH CHK MCB	
PA/DH	RS / JMS
BRANCH MANAGER	
CHIEF ENG/ARCH	DWG
FIRE PROTECTION	
NAVAL FACILITIES ENGINEERING COMMAND	GREAT LAKES, ILLINOIS
NAVFAC MID-ATLANTIC	GREAT LAKES, ILLINOIS
DEPARTMENT OF THE NAVY	GREAT LAKES NAVAL STATION
	RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)
	MECHANICAL
	PARTIAL FIRST FLOOR CRAWLSPACE NEW WORK PLAN
SCALE:	AS NOTED
EPROJCT NO.:	1310337
CONSTR. CONTR. NO.:	N40085-15-R-8720
NAVFAC DRAWING NO.:	12689616
SHEET	54 OF 86
<b>M-102</b>	





**A1** PARTIAL THIRD FLOOR  
NEW WORK PLAN  
1/8" = 1'-0"



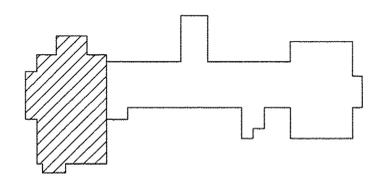
**GENERAL MECHANICAL NOTES**

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

**KEYED NOTES**

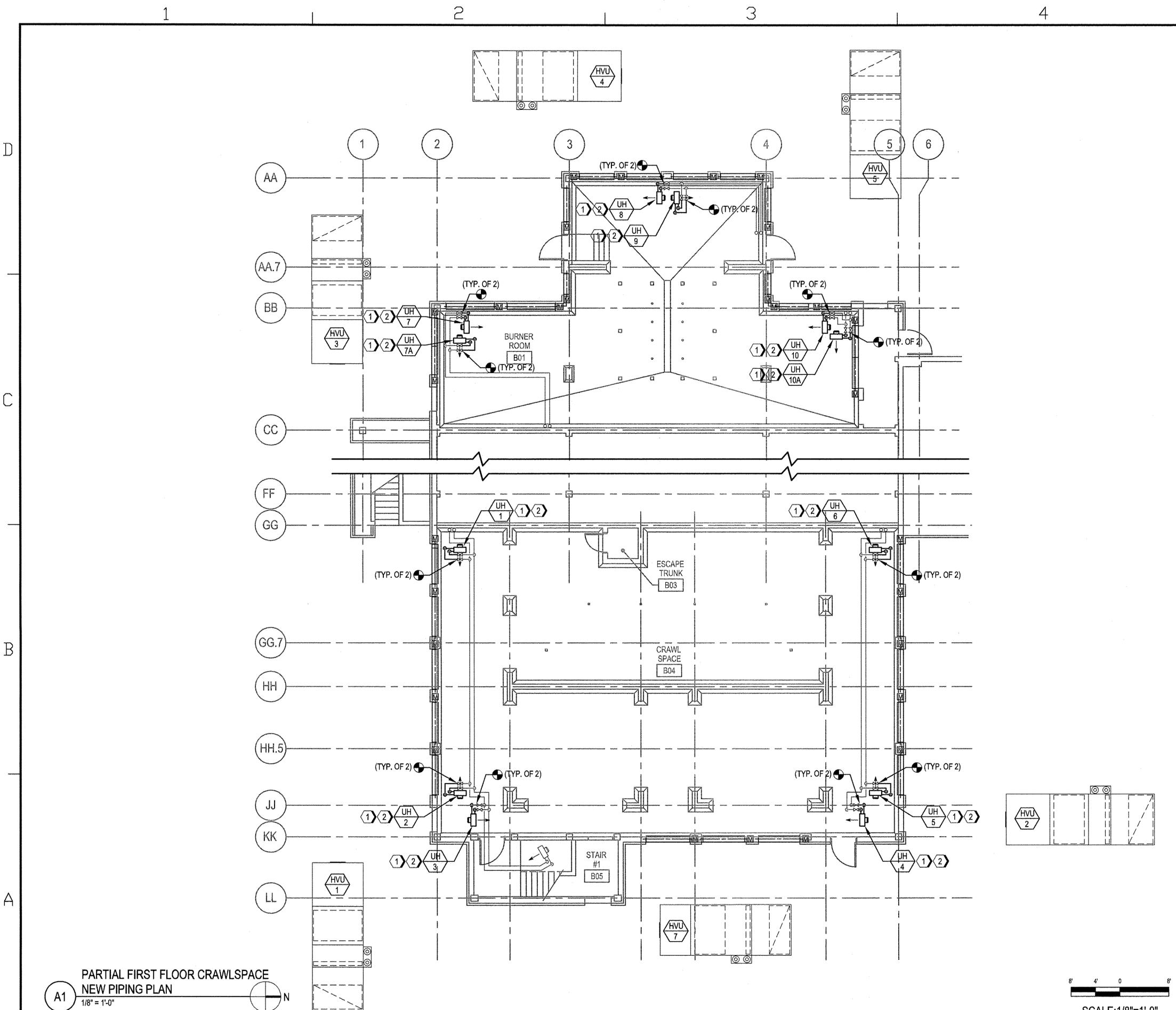
- REPLACE ACTUATORS, LINKAGES AND ACTUATOR SUPPORT BASES.

**KEY PLAN**



DATE	
SYN	
DESCRIPTION	
<b>JACOBS</b> 501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-335-4000 FAX 314-335-5012	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWDS	
SATISFACTORY TO: 6/18/15	
DES	CAC DRW TOH CHK MCB
PH/DM	RS / JMS
BRANCH MANAGER	
CHIEF ENG/ARCH DWG	
FIRE PROTECTION	
DEPARTMENT OF THE NAVY	NAVFAC MID-ATLANTIC
GREAT LAKES NAVAL STATION	GREAT LAKES, ILLINOIS
RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)	
MECHANICAL PARTIAL THIRD FLOOR NEW WORK PLAN	
SCALE:	AS NOTED
EPROJECT NO.:	1310337
CONSTR. CONTR. NO.:	N40085-15-R-8720
NAVFAC DRAWING NO.:	12689618
SHEET	56 OF 86
<b>M-104</b>	





**GENERAL MECHANICAL NOTES**

- FOR MECHANICAL SYMBOLS, ABBREVIATION AND GENERAL NOTES REFER TO DRAWING M-001.

**KEYED NOTES**

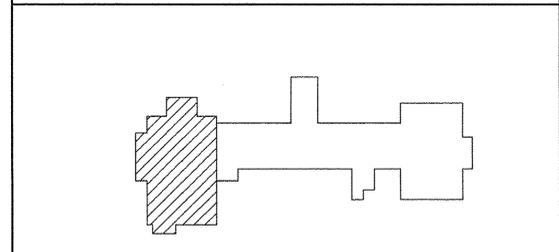
- COORDINATE DISCONNECTION AND RECONNECTION OF POWER TO UNIT HEATER WITH ELECTRICAL CONTRACTOR.
- PROVIDE NEW UNIT HEATER, INSULATION AND PIPING BACK TO ISOLATION VALVE.

**JACOBS**  
 501 NORTH BROADWAY  
 ST. LOUIS, MISSOURI 63102  
 TEL 314-335-4000 FAX 314-335-5012

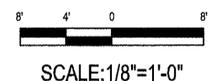
APPROVED
FOR COMMANDER NAVFAC DWG
ACTIVITY
D. COREY MELTON, TRAINING DIRECTOR SWOS
SATISFACTORY TO 6/18/15
DES CAC DRW TOH CHK MCB
PM/DM RS / JMS
BRANCH MANAGER
CHIEF ENG/ARCH DWG
FIRE PROTECTION

DEPARTMENT OF THE NAVY	NAVFAC MID-ATLANTIC	GREAT LAKES, ILLINOIS
GREAT LAKES NAVAL STATION	RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)	MECHANICAL PARTIAL FIRST FLOOR CRAWLSPACE NEW PIPING PLAN

**KEY PLAN**



**A1 PARTIAL FIRST FLOOR CRAWLSPACE NEW PIPING PLAN**  
 1/8" = 1'-0"



DATE	
DESCRIPTION	
SYN	
	6/30/2015
<p><b>JACOBS</b>          501 NORTH BROADWAY          ST. LOUIS, MISSOURI 63102          TEL 314-335-4000 FAX 314-335-5012</p>	
APPROVED	
FOR COMMANDER NAVFAC DWG	
ACTIVITY	
D. COREY MELTON, TRAINING DIRECTOR SWOS	
SATISFACTORY TO 6/18/15	
DES CAC DRW TOH CHK MCB	
PM/DM RS / JMS	
BRANCH MANAGER	
CHIEF ENG/ARCH DWG	
FIRE PROTECTION	
DEPARTMENT OF THE NAVY	NAVFAC MID-ATLANTIC
GREAT LAKES NAVAL STATION	RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)
GREAT LAKES, ILLINOIS	MECHANICAL PARTIAL FIRST FLOOR CRAWLSPACE NEW PIPING PLAN
SCALE: AS NOTED	
EPROJCT NO: 1310337	
CONSTR. CONTR. NO. N40085-15-R-8720	
NAVFAC DRAWING NO. 12689620	
SHEET 58 OF 86	
<b>MP102</b>	



1

2

3

4

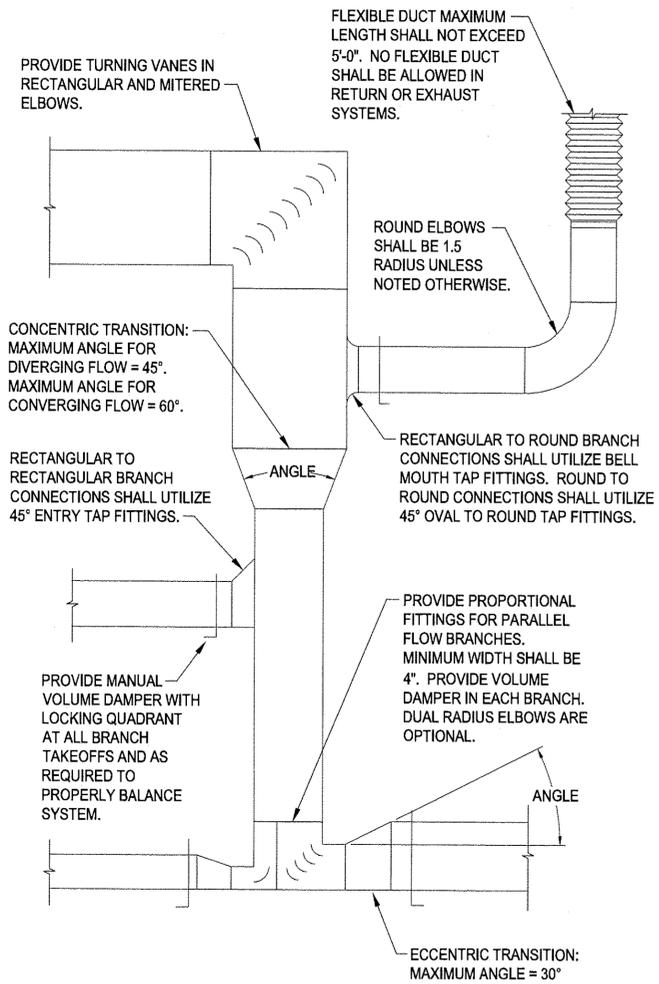
5

D

C

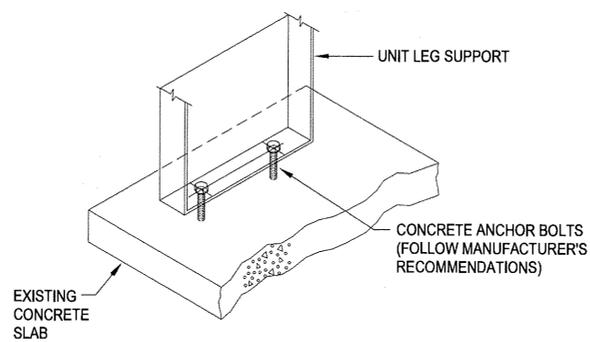
B

A

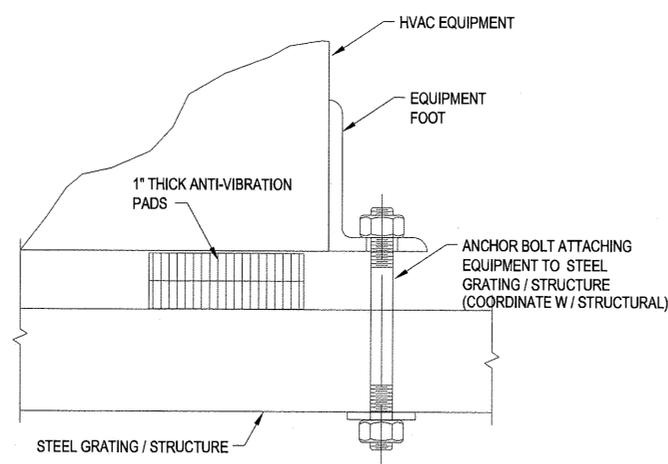


NOTE: DUCT, FITTINGS, MATERIAL AND SUPPORT SHALL BE AS SPECIFIED AND IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."

**A1** TYPICAL DUCT DETAIL  
NOT TO SCALE

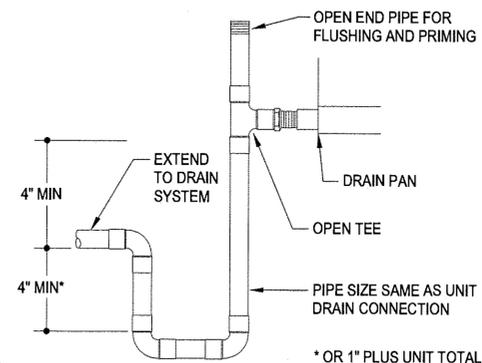


**B2** ACC SUPPORT DETAIL  
NOT TO SCALE



NOTE: INSTALL ANCHORING PER MANUFACTURER'S RECOMMENDATIONS OF THE EQUIPMENT BASE.

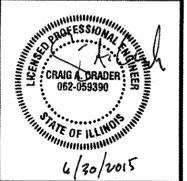
**A2** ANCHORING FOR HVAC EQUIPMENT HP-2  
NOT TO SCALE



\* OR 1" PLUS UNIT TOTAL PRESSURE WHICHEVER IS GREATER

**A4** CONDENSATE DRAIN TRAP DETAIL  
NOT TO SCALE

NO.	DATE	DESCRIPTION



**JACOBS**  
501 NORTH BRADWAY ST. LOUIS, MISSOURI 63102  
TEL 314-335-4000 FAX 314-335-5012

APPROVED
FOR COMMANDER NAVFAC DWG
ACTIVITY
B. COREY MELTON, TRAINING DIRECTOR SWDS
SATISFACTORY TO 6/18/15
DES CAC BRW TOH CHK MB
PM/DH RS / JMS
BRANCH MANAGER
CHIEF ENGR/ARCH DWG
FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVFAC MID-ATLANTIC  
NAVFAC MID-ATLANTIC  
GREAT LAKES, ILLINOIS  
GREAT LAKES NAVAL STATION  
RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)  
MECHANICAL DETAILS

SCALE:	AS NOTED
PROJECT NO.:	1310337
CONSTR. CONTR. NO.:	N40085-15-R-8720
NAVFAC DRAWING NO.:	12689622
SHEET	60 OF 88

**M-501**

### HEAT PUMP SCHEDULE

MARK	SERVING	BASIS OF DESIGN		NOMINAL CFM	MIN OA CFM	DEHUMIDIFICATION COIL						SUPPLY FAN DATA			EXHAUST FAN #1 DATA				EXHAUST FAN #2 DATA				ELECTRICAL DATA		WEIGHT LBS	NOTES	
		MFR	MODEL			TOT MBH	SENS MBH	EAT DB/WB °F	SPACE SETPOINT	REFRIG	MIN OPERATING EER	CONDENSATE REMOVAL LBS/HR	HP	EXT FAN SP	DRIVE TYPE	HP	EXT FAN SP	CFM	DRIVE TYPE	HP	EXT FAN SP	CFM	DRIVE TYPE	VOLTS/PH/HZ			MCA
HP-2	BASEMENT TANK RM	DECTRON	DS100	8,500	2,070	272.1	168.8	91/74	75/50%RH	R410A	11.1	86.5	15	2.0	BELT	1.5	1.5	2071	BELT	5	1.5	7279	BELT	460/3/60	59	6500	(1)(2)(3)(4)(5)(6)

NOTES (1) 2" PLEATED MERV 8 FILTERS (2) OA WINTER DESIGN TEMPERATURE 0° F (3) PROVIDE MOTORIZED BACKDRAFT DAMPER FOR OUTSIDE AIR. (4) PROVIDE AHU WITH BACNET INTERFACE (5) OUTSIDE AIR FLOW SETPOINT IN (NORMAL MODE) AND (PURGE MODE). (6) PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.

### EXISTING HEAT AND VENTILATING UNIT SCHEDULE

MARK	SERVING	SUPPLY FAN				ELECTRICAL DATA		WEIGHT LBS	NOTES
		CFM	SP IN WG	RPM	MOTOR HP	VOLTS/PH/HZ	FLA		
HVU-1	TRAINER	20,000	1	900	20	460/3/60	-	-	(1)(2)
HVU-2	TRAINER	20,000	1	900	20	460/3/60	-	-	(1)(2)
HVU-3	TRAINER	19,000	1	800	15	460/3/60	-	-	(1)(2)
HVU-4	TRAINER	22,500	1	900	20	460/3/60	-	-	(1)(2)
HVU-5	TRAINER	19,000	1	800	15	460/3/60	-	-	(1)(2)
HVU-6	TRAINER	30,000	1	900	25	460/3/60	-	-	(1)(2)
HVU-7	TRAINER	12,000	1	1050	10	460/3/60	-	-	(1)(2)

NOTES (1) VALUES ARE PROVIDED FOR TESTING AND BALANCING PURPOSES ONLY. (2) PROVIDE 50°C TEFC AMB MOTOR 2 SPEED, 2 WINDING.

### DRYCOOLER CONDENSING UNIT SCHEDULE

MARK	LOCATION	SERVES	BASIS OF DESIGN		CONDENSER				POWER VOLTS/PH/HZ	OPERATING WEIGHT LBS	NOTES
			MFR	MODEL	AMB AIR °F	OUTDOOR FAN					
					RPM	HP	FLA				
HPD-2	HPD YARD	HP-2	DECTRON	GW-RP	95	550	1.5	2.8	460/3/60	1300	(1)(2)

NOTES (1) PROVIDE WITH OPTIONAL PUMP PACKAGE SIZED FOR 100 LF TOTAL PIPE BETWEEN DRYCOOLER & HP-2 AND 40% PROPYLENE GLYCOL MIX. (2) PROVIDE UNIT WITH SINGLE POINT POWER CONNECTION.

### EXISTING HIGH TEMPERATURE EXHAUST FAN SCHEDULE

MARK	SERVING	TYPE	CFM	SP IN WC	RPM	DRIVE TYPE	MOTOR DATA		NOTES
							HP	VOLTS/PH/HZ	
HTEF-1	COMPARTMENTS 1, 4, 5, 8	CENTRIFUGAL	40,500	4.3	858	BELT	50	460/3/60	(1)
HTEF-2	COMPARTMENTS 2, 3, 6, 7	CENTRIFUGAL	40,500	4.3	858	BELT	50	460/3/60	(1)
HTEF-3	FFT PIT FIRE	CENTRIFUGAL	60,000	2.5	516	BELT	50	460/3/60	(1)
HTEF-4	FFT PIT FIRE	CENTRIFUGAL	60,000	2.5	516	BELT	50	460/3/60	(1)
HTEF-5	COMPARTMENTS 1, 4, 5, 8	CENTRIFUGAL	3,000	1.0	919	BELT	2	460/3/60	(1)
HTEF-6	COMPARTMENTS 2, 3, 6, 7	CENTRIFUGAL	3,000	1.0	919	BELT	2	460/3/60	(1)
HTEF-7	FFT PIT FIRE	CENTRIFUGAL	1,500	1.0	1800	BELT	3/4	460/3/60	(1)
HTEF-8	COMPARTMENTS	CENTRIFUGAL	23,000	4.4	-	BELT	30	460/3/60	(1)
HTEF-9	COMPARTMENTS	CENTRIFUGAL	6,000	1.0	-	BELT	3	460/3/60	(1)

NOTES (1) VALUES PROVIDED FOR TESTING AND BALANCING PURPOSES ONLY.

### AIR DEVICE SCHEDULE

MARK	SELECTION BASED ON		DIFFUSER/SLOT		BORDER TYPE	PATTERN	NOTES
	MFR	MODEL	MODULE SIZE	NECK SIZE			
S-1	TITUS	TMS-AA	24x24	18x18	SURFACE	4-WAY	(1)

NOTES (1) CONSTRUCTED IN ALUMINUM.

### HOT WATER UNIT HEATER SCHEDULE

MARK	SERVING	TYPE	CAPACITY MBH	CFM	FLOW GPM	EAT °F	EWT/LWT °F	MOTOR DATA			NOTES
								HP	VOLTS/PH/HZ	RPM	
UH-1	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-2	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-3	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-4	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-5	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-6	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-7	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-7A	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-8	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-9	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-10	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-10A	1ST FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-25	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-26	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-27	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-29	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-30	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)
UH-31	2ND FLOOR CRAWLSPACE	HORIZONTAL	80	-	4.0	-10	180/140	1/6	115/1/60	1140	(1)(2)

NOTES (1) EPOXY-COATED ENCLOSURE (2) FLOW AND CAPACITY BASED ON 40% PROPYLENE GLYCOL FLUID MIXTURE.

DATE

SYN DESCRIPTION



STATE OF ILLINOIS  
LICENSED PROFESSIONAL ENGINEER  
GREG A. CRAIG  
062-059390  
6/30/2015

**JACOBS**  
501 NORTH BROADWAY  
ST. LOUIS, MISSOURI 63102  
TEL 314-335-4000 FAX 314-335-5012

APPROVED

FDR COMMANDER NAVFAC DWG

ACTIVITY

D. COREY MELTON,  
TRAINING DIRECTOR SWDS

SATISFACTORY TO 6/18/15

DES CAC DRW TOH CHK MCB

PH/DM RS / JMS

BRANCH MANAGER

CHIEF ENG/ARCH DWG

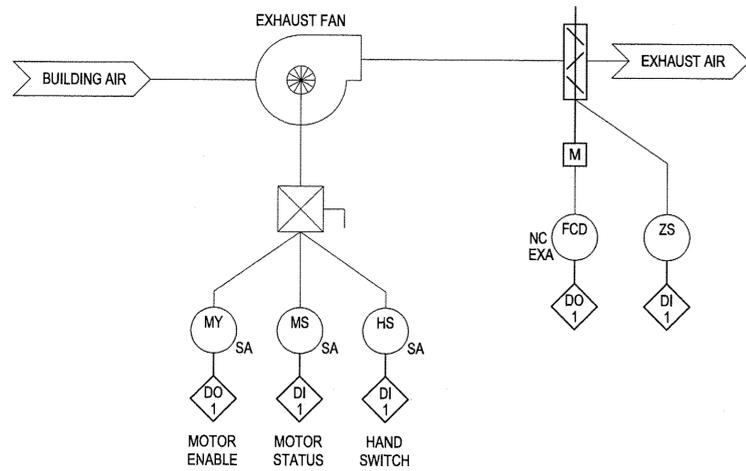
FIRE PROTECTION

DEPARTMENT OF THE NAVY  
NAVFAC MID-ATLANTIC  
GREAT LAKES, ILLINOIS  
RENOVATE SWDSU FIREFIGHTING TRAINER  
(BUILDING 510)  
MECHANICAL EQUIPMENT SCHEDULES

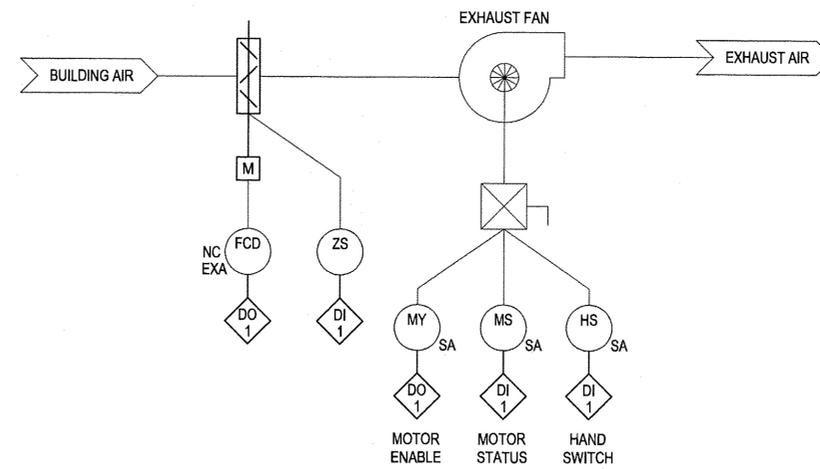
SCALE: AS NOTED  
EPROJECT NO: 1310337  
CONSTR. CONTR. NO. N40085-15-R-8720  
NAVFAC DRAWING NO. 12689623  
SHEET 61 OF 86

**M-601**

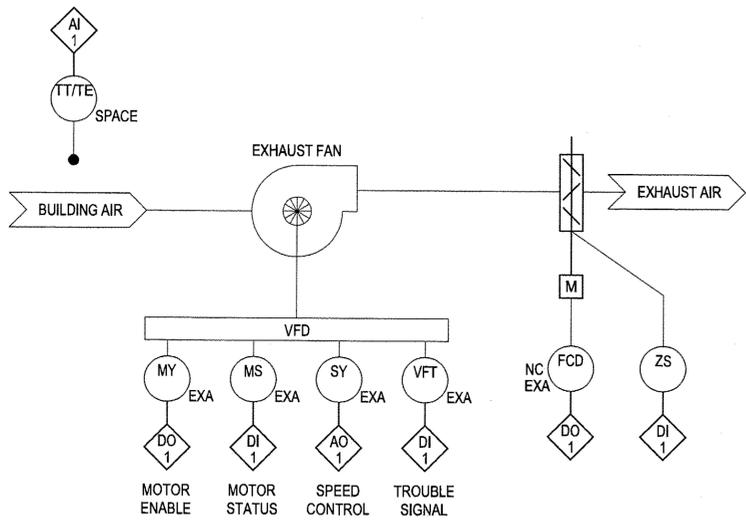




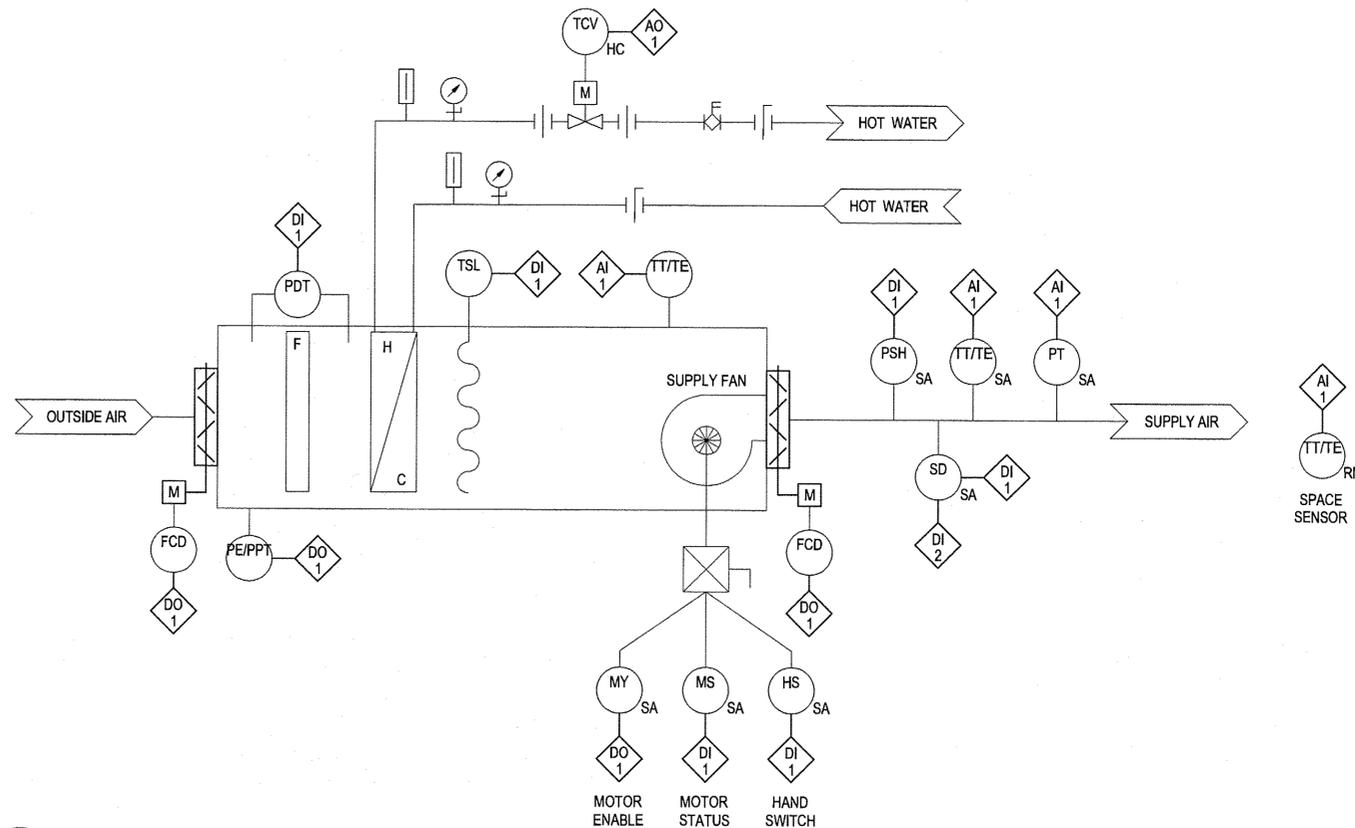
C1 HTEF-5 THRU 7 & 9 CONTROL DIAGRAM  
NOT TO SCALE



C3 EF-8, 9 & 10 CONTROL DIAGRAM  
NOT TO SCALE



A1 HTEF-1 THRU 4 & 8 CONTROL DIAGRAM  
NOT TO SCALE



A3 HVU-1 THRU 7 CONTROL DIAGRAM  
NOT TO SCALE

NO. 1	NO. 2	NO. 3	NO. 4	NO. 5
DATE				
SYMBOL	DESCRIPTION			
<b>JACOBS</b> 501 NORTH BROADWAY ST. LOUIS, MISSOURI 63102 TEL 314-335-4000 FAX 314-335-5012				
APPROVED				
FOR COMMANDER NAVFAC DWG				
ACTIVITY				
D. COREY MELTON, TRAINING DIRECTOR SWDS				
SATISFACTORY TO 6/18/15				
DES	CAC	DRW	TOH	CHK
PM/DM	RS	JMS		MCB
BRANCH MANAGER				
CHIEF ENG/ARCH DWG				
FIRE PROTECTION				
DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND NAVFAC MID-ATLANTIC GREAT LAKES, ILLINOIS GREAT LAKES NAVAL STATION RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510) MECHANICAL CONTROL DIAGRAMS				
SCALE: AS NOTED				
EPROJCT NO: 1310337				
CONSTR. CONTR. NO: N40085-15-R-8720				
NAVFAC DRAWING NO: 12689625				
SHEET 63 OF 86				
<b>M-702</b>				

BAS POINT LIST HEAT PUMP HP-2												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
OCCUPIED / UNOCCUPIED MODE							X					X
SUPPLY FAN ENABLE				X								X
SUPPLY FAN STATUS			X									X
SUPPLY FAN VFD SPEED												X
SUPPLY FAN BELT FAILURE			X					X				X
FIRE ALARM SYSTEM SHUTDOWN			X					X				X
SUPPLY SMOKE DETECTOR			X					X				X
SUPPLY AIR HUMIDITY			X					X				X
SUPPLY AIR TEMPERATURE	X							X	50°F	90°F		X
SUPPLY AIR TEMPERATURE SETPOINT; DEADBAND					55; 2°F							X
SUPPLY AIR STATIC PRESSURE SETPOINT					SEE SEQUENCE							X
SUPPLY AIR STATIC PRESSURE	X							X	0.5 IN WC	2.5 IN WC		X
ROOM AIR HUMIDITY SETPOINT									25%	60%		X
SPACE TEMPERATURE SETPOINT	X				55; 2°F				50°F	90°F		X
CHLORINE PPM	X									10 PPM		X
FREEZESTAT			X					X	32°F			X
FILTER PRESSURE - CLEAN / DIRTY			X					X		2.0 IN WC		X
OUTSIDE AIR FLOW	X						X	X	-10%	10%		X
OUTSIDE AIR FLOW SETPOINT (UNOCCUPIED)					SEE SCHEDULE							X
OUTSIDE AIR FLOW SETPOINT (OCCUPIED)					SEE SCHEDULE							X
OUTSIDE AIR DAMPER (ECONOMIZER) CONTROL		X										X
ECONOMIZER HL TEMP. SETPOINT; DEADBAND					58; 2°F							X
ECONOMIZER LL TEMP. SETPOINT; DEADBAND					35; 2°F							X
CONDENSER UNIT FAULT			X					X				X
RETURN AIR TEMPERATURE	X											X
RETURN AIR STATIC PRESSURE SETPOINT					SEE SEQUENCE							X
RETURN AIR STATIC PRESSURE	X							X	0.5 IN WC	2.5 IN WC		X
RETURN SMOKE DETECTOR			X					X				X
GLYCOL PUMP ENABLE			X									X
GLYCOL PUMP STATUS			X									X
GLYCOL SYSTEM FLOW			X									X
RELIEF AIR DAMPER CONTROL		X										X
RETURN AIR HUMIDITY	X							X	25%	75%		X
RETURN FAN #1 ENABLE				X								X
RETURN FAN #1 STATUS			X									X
RETURN FAN #1 BELT FAILURE			X									X
RETURN FAN #2 ENABLE				X								X
RETURN FAN #2 STATUS			X									X
RETURN FAN #2 BELT FAILURE			X									X

NOTE: ALL SETPOINTS AND DEADBANDS SHALL BE ADJUSTABLE

BAS POINT LIST HIGH TEMPERATURE EXHAUST FAN HTEF-1 THRU HTEF-4 & HTEF-8												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
ROOM OR AREA SERVED							X					X
FAN ENABLE				X								X
FAN BELT FAILURE - CURRENT TRANSMITTER			X					X				X
FAN STATUS		X					X					X
EXHAUST AIR DAMPER CONTROL			X					X				X
EXHAUST DAMPER POSITION			X									X

NOTE 1: ALL SETPOINTS AND DEADBANDS SHALL BE ADJUSTABLE

BAS POINT LIST HIGH TEMPERATURE EXHAUST FAN HTEF-5 THRU HTEF-7 & HTEF-9												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
ROOM OR AREA SERVED							X					X
FAN ENABLE				X				X				X
FAN BELT FAILURE - CURRENT TRANSMITTER			X					X				X
EXHAUST AIR DAMPER CONTROL			X					X				X
EXHAUST FAN START/STOP			X									X
EXHAUST FAN STATUS		X						X				X
EXHAUST FAN HAND SWITCH	X						X	X				X
EXHAUST DAMPER POSITION			X									X

NOTE 1: ALL SETPOINTS AND DEADBANDS SHALL BE ADJUSTABLE

BAS POINT LIST HEATING VENTILATION UNIT HVU-1 THRU 7												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
OCCUPIED / UNOCCUPIED MODE							X					X
SUPPLY FAN ENABLE				X								X
SUPPLY FAN STATUS			X									X
SUPPLY FAN BELT FAILURE			X									X
FIRE ALARM SYSTEM SHUTDOWN			X					X				X
FREEZESTAT			X					X	35°F			X
FIRE DAMPER POSITION		X										X
SUPPLY AIR TEMPERATURE	X							X	40°F	90°F		X
SUPPLY AIR TEMPERATURE SETPOINT; DEADBAND					55; 2°F							X
SUPPLY AIR STATIC PRESSURE SETPOINT					SEE SEQUENCE							X
SUPPLY AIR STATIC PRESSURE	X							X	0.5 IN WC	2.5 IN WC		X
HEATING COIL VALVE CONTROL		X										X
FILTER PRESSURE - CLEAN / DIRTY			X					X		2.0 IN WC		X
ISOLATION DAMPER CONTROL			X									X
OUTSIDE AIR FLOW SETPOINT (UNOCCUPIED)					SEE SCHEDULE							X
OUTSIDE AIR FLOW SETPOINT (OCCUPIED)					SEE SCHEDULE							X
OUTSIDE AIR DAMPER CONTROL			X									X
OUTSIDE AIR TEMPERATURE	X											X
SPACE TEMPERATURE SETPOINT					55°F					45°F	90°F	X
PROPANE SENSOR ALARM			X					X				X

NOTE: ALL SETPOINTS AND DEADBANDS SHALL BE ADJUSTABLE

BAS POINT LIST CRAWL SPACE DAMPERS												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
AREA SERVED												X
DAMPER POSITION		X						X				X
DAMPER STATUS		X						X				X
EXHAUST AIR DAMPER CONTROL			X									X

BAS POINT LIST EXHAUST FAN EF-8, EF-9 & EF-10												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
ROOM OR AREA SERVED								X				X
FAN ENABLE				X				X				X
FAN BELT FAILURE - CURRENT TRANSMITTER			X					X				X
EXHAUST FAN START/STOP			X									X
EXHAUST FAN STATUS		X						X				X
EXHAUST FAN HAND SWITCH	X							X	X			X
EXHAUST DAMPER POSITION			X									X

NOTE 1: ALL SETPOINTS AND DEADBANDS SHALL BE ADJUSTABLE

BAS UTILITY POINT LIST												
POINT NAME	HARDWARE POINTS				SOFTWARE POINTS							SHOW ON GRAPHIC
	AI	AO	DI	DO	AV	DV	SCHED	TREND	ALARM	ALARM LIMITS		
										LOW	HIGH	
PROPANE METER	X		X		X			X				X

DATE

DESCRIPTION

REV



6/30/2015



**JACOBS**

501 NORTH BROADWAY  
ST. LOUIS, MISSOURI 63102  
TEL. 314-335-4000 FAX 314-335-5012

APPROVED

FDR COMMANDER NAVFAC DWG

ACTIVITY

D. COREY MELTON,  
TRAINING DIRECTOR SVDS

SAISFACTORY TD: 6/18/15

BES CAC DRV TOH CHK MCB

PH/DM RS / JMS

BRANCH MANAGER

CHIEF ENG/ARCH DWG

FIRE PROTECTION

NAVFAC MID-ATLANTIC

GREAT LAKES, ILLINOIS

RENOVATE SWOSU FIREFIGHTING TRAINER (BUILDING 510)

MECHANICAL BAS POINTS LIST

SCALE: AS NOTED

EPROJECT NO: 1310337

CONSTR. CONTR. NO: N40085-15-R-8720

NAVFAC DRAWING NO: 12689626

SHEET 64 OF 86

**M-703**

SEQUENCES OF OPERATION - GENERAL NOTES

- A. THE SEQUENCES AND POINTS IN THIS SECTION ARE REGARDED AS A MINIMUM. WHENEVER POSSIBLE, MANUFACTURER SPECIFIC SEQUENCES SHALL BE UTILIZED. PROJECT AND APPLICATION SPECIFIC CUSTOM SEQUENCES ARE ACCEPTABLE BUT MUST BE PRE-APPROVED BY THE OWNER OR THE OWNER'S REPRESENTATIVE IN ADVANCE.
B. CONTROLS WORK RELATED TO HP-2/HPD-2 SHALL BE FULLY INTEGRATED INTO THE EXISTING BUILDING AUTOMATION SYSTEM.
C. THE EXISTING DATA TERMINAL CABINET (DTC) SHALL BE REMOVED FROM THE THIRD DECK INSPECTOR STATION. CONTROLS WORK RELATED TO THE DTC SHALL BE A NEW STANDALONE SYSTEM AND INTEGRATE ALL HVAC SYSTEMS, ALARMS AND MONITORING RELATED TO THE TRAINER. THIS SYSTEM SHALL BE A DIRECT DIGITAL CONTROL (DDC) SYSTEM AS DESCRIBED WITHIN THE CONSTRUCTION DOCUMENTS. THE NEW SYSTEM SHALL BE MONITORED VIA FLAT SCREEN TV AS SPECIFIED AND LOCATED IN THE INSPECTOR STATION. COORDINATE TV LOCATION WITH OWNER.
D. ALL DISCHARGE TEMPERATURE CONTROL LOOPS AND VARIABLE SPEED CONTROL LOOPS SHALL, AT A MINIMUM, BE PROPORTIONAL-INTEGRAL (PI) CONTROL LOOPS.
E. WHERE MULTIPLE PIECES OF EQUIPMENT ARE STARTED WHEN A CERTAIN REQUIREMENT IS MET, THE SOFTWARE SHALL BE ARRANGED SO THAT INDIVIDUAL EQUIPMENT STARTS ARE STAGGERED TO LIMIT ELECTRICAL DEMAND REQUIREMENTS.
F. ECONOMIZER FLAG (HP-2/HPD-2):
1. THE ECONOMIZER FLAG WILL BE ON BASED UPON THE FOLLOWING CONDITION: OAT-DB IS <60 F
G. TIME OF DAY SCHEDULE: EQUIPMENT THAT RUNS OFF A TIME OF DAY SCHEDULE WILL HAVE TWO, USER DEFINABLE SCHEDULES PER DAY FOR EACH DAY OF THE WEEK. IN ADDITION, THE SCHEDULING SHALL ALLOW FOR UP TO 25 HOLIDAYS AND AT LEAST TEN SPECIAL-EVENT SCHEDULES FOR EACH PEACE OF EQUIPMENT. IN ADDITION, THE OPERATOR WILL HAVE THE ABILITY TO DESIGNATE THE LAST 0-2 HOURS OF ANY OCCUPIED PERIOD AS A COAST TIME DURING WHICH ALL SPACE SET-POINTS WILL BE INCREASED (OR DECREASED BASED ON THE SEASON) BY A SINGLE, USER-DEFINABLE AMOUNT.
H. OTHER ALARM POINTS SHALL INCLUDE, BUT NOT BE LIMITED TO, UTILITY SYSTEMS TEMPERATURES, FLOWS, PRESSURE, PROOFS OF OPERATIONS, SPEED FEEDBACKS AND SAFETY POINT INPUTS TO THE BMS SYSTEM. ALARM LIMITS AND SYSTEM RESPONSES SHALL BE IDENTIFIED IN PROGRAMMING PHASES AND ON SUBMITTAL DOCUMENTS FOR REVIEW AND SHALL BE COORDINATED WITH THE OWNER. AN ALARMED EVENT SHALL INCLUDE AN EQUIPMENT'S PROOF OF OPERATION INDICATING THAT THE EQUIPMENT IS RUNNING WHEN THE BUILDING AUTOMATION SYSTEM (BAS) HAS NOT CALLED FOR THAT EQUIPMENT TO RUN OR THE BAS SYSTEM CALLING FOR A PIECE OF EQUIPMENT TO RUN, BUT THE PROOF OF OPERATION INDICATES THAT THE UNIT IS OFF.
I. ALL CONTROLLED VARIABLE SETPOINTS LISTED ARE TO BE ADJUSTABLE FROM THE BAS SYSTEM.
J. SAFETIES:
1. A CURRENT SENSOR SHALL BE USED ON ALL BELT DRIVEN FANS TO DETECT BELT FAILURE AND SHALL SEND AN ALARM TO THE BAS. UPON AN EXHAUST FAN FAILURE (MOTOR OR BELT), THE CONTROL DAMPER ASSOCIATED WITH EXHAUST FAN SHALL BE CLOSED BY THE BAS UPON DETECTION OF FAN FAILURE.
2. PROPANE SENSORS LOCATED AT EACH HVU SHALL BE USED TO DETECT PROPANE LEAK WITHIN THE EQUIPMENT YARD AND SHALL STOP THE HVU FANS AND SIGNAL ALARM TO BAS SYSTEM. PROPANE SENSORS LOCATED IN THE CRAWL SPACE SHALL BE USED TO DETECT PROPANE WITHIN EACH COMPARTMENT. IN THE EVENT THAT PROPANE SENSORS IN THE CRAWL SPACE INDICATE LEVELS ABOVE NORMAL LEVELS, ALARM IS SENT TO BAS SYSTEM AND COMPARTMENT PURGE IS INITIATED.
K. DEFAULT POSITIONS: UNLESS OTHERWISE NOTED IN THE SEQUENCES, ALL HEATING VALVES SHALL FAIL IN THE OPEN POSITION (NO), OUTSIDE AND RELIEF AIR DAMPERS SHALL FAIL CLOSED (NC); RETURN AIR DAMPERS SHALL FAIL OPEN (NO).
L. PROVIDE AN OUTDOOR AIR TEMPERATURE, BUILDING PRESSURE, AND CO2 SENSOR FOR SHARED USE THROUGHOUT THE BAS SYSTEM AND SEQUENCES FOR ALL SYSTEMS WHERE REQUIRED.
M. TRAINING SCENARIOS SHALL BE CONTROLLED VIA INSTRUCTOR STATION LOCATED ON THE THIRD FLOOR OF THE TRAINER. SCENARIOS SHALL BE INITIALLY PROGRAMMED TO MEET GENERAL TRAINING. SYSTEM SHALL HAVE ABILITY FOR USER TO MODIFY SCENARIOS WHILE TRAINING SCENARIOS ARE UNDERWAY.

EMERGENCY SHUTDOWN OF AIR SYSTEMS

- A. IN THE EVENT OF A SITUATION THAT WOULD REQUIRE INDOOR AIR SAFETY MEASURES, EMERGENCY AIR SYSTEMS SHUTDOWN SWITCHES SHALL BE MANUALLY ACTIVATED VIA ANY OF THE LOCAL OPERATING CONTROL (LOC) PANELS USED FOR THE INTEGRATED FIRE ALARM SYSTEM. UPON ACTIVATION OF THE SHUTDOWN SWITCH AT ANY LOC PANEL LOCATION, THE BAS SHALL RECEIVE A DRY CONTACT INPUT SIGNAL FROM THE FIRE ALARM SYSTEM VIA THE FIRE ALARM CONTROL MODULE LOCATED ON FIRST FLOOR CORRIDOR. THE BAS SHALL DEACTIVATE ALL AIR SYSTEMS THAT HAVE START/STOP CAPABILITIES. START/STOP CAPABILITIES SHALL BE PROVIDED UTILIZING THE MOTOR ENABLE CONTROL POINT AS INDICATED ON THE CONTROL DIAGRAMS. IN ADDITION, ALL DAMPERS FOR OUTSIDE, RELIEF, AND EXHAUST AIR OPENINGS SHALL CLOSE. THIS SHALL BE PERFORMED UTILIZING THE FLOW CONTROL DAMPER CONTROL POINT AS INDICATED ON THE CONTROL DIAGRAMS. THERE SHALL BE A TIME DELAY BETWEEN DEACTIVATING AN AIR SYSTEM AND CLOSING OF RESPECTIVE DAMPERS TO AVOID OVERUNDER PRESSURIZING A SYSTEM AND CAUSING SYSTEM DAMAGE (I.E. DUCT COLLAPSE). THIS TIME DELAY SHALL BE DETERMINED BY THE COMMISSIONING AGENT AND EQUIPMENT CONTRACTOR DURING COMMISSIONING OF THE SYSTEMS.
B. THE EMERGENCY SHUTDOWN CONDITION SHALL BE RESET FROM THE BAS PANELS ONLY.

HEATING AND VENTILATING UNITS, (HVU-1 THROUGH HVU-7)

- A. WHENEVER THE SUPPLY FAN IS DE-ENERGIZED, AS COMMANDED BY DATA TERMINAL CABINET (DTC), THE OUTSIDE AND EXHAUST DAMPERS SHALL BE CLOSED.
B. THE UNIT FAN CONTROLS SHALL BE ENERGIZED BY THE DTC. ONCE THE FAN CONTROLS ARE ENERGIZED, THE OUTSIDE AIR THERMOSTAT SHALL START THE FAN. OUTSIDE AIR THERMOSTAT SHALL BE UNIT-MOUNTED, ADJUSTABLE, AND SET AT 50 DEG. F. WHEN THE FAN IS ENERGIZED, THE CONTROLS FOR THE HOT WATER COIL SHALL ALSO BE ENERGIZED BY A SEPARATE CONTROL CIRCUIT. SHOULD THE OUTSIDE AIR TEMPERATURE DROP BELOW 35 DEG. F, THE CONTROLS FOR THE HOT WATER COIL SHALL BE ENERGIZED WHETHER OR NOT THE FAN IS ENERGIZED. ONCE THE HOT WATER COILS ARE ENERGIZED, THE HOT WATER CONTROL VALVE SHALL BE MODULATED TO MAINTAIN A SUPPLY AIR TEMPERATURE WHICH SHALL BE RESET BY OUTSIDE AIR TEMPERATURE AS SCHEDULED BELOW:

OUTSIDE AIR TEMPERATURE (DEG. F) SUPPLY AIR TEMPERATURE (DEG. F)

Table with 2 columns: Outside Air Temperature (DEG. F) and Supply Air Temperature (DEG. F). Values range from -20 to 50.

C. DEADBANDS AND SETPOINTS

- 1. HEATING CRAWLSPACE SETPOINT 55 DEG. F
2. HEATING ENABLED AT OUTSIDE AIR LESS THAN 55 DEG. F
3. FREEZE PROTECTION SETPOINT 40 DEG. F
4. FREEZE PROTECTION LOW LIMIT 35 DEG. F
5. SUPPLY FAN DISCHARGE STATIC PRESSURE LIMIT 1.5" WG

D. FREEZE CONTROL

- 1. THE LOW LIMIT FREEZE PROTECTION SENSOR IS LOCATED ON THE LEAVING SIDE OF THE HEATING COIL WHEN THE TEMPERATURE LEAVING THE HEATING COIL IS AT OR BELOW THE FREEZE PROTECTION SETPOINT, THE FOLLOWING EVENTS SHALL OCCUR:
a) THE SUPPLY FAN SHALL STOP.
b) THE OUTSIDE AIR AND EXHAUST DAMPERS SHALL CLOSE.
c) THE HEATING COIL VALVE SHALL RETURN TO ITS NORMAL POSITION.
d) A VISUAL ALARM SHALL BE ANNUNCIATED AT THE DTC. THE "ALARM" IS A RED LIGHT INDICATING THE HTEF FAN IS ON.
e) A MANUAL RESET OF FREEZE PROTECTION DEVICE SHALL BE REQUIRED.

E. SYSTEM START/STOP CONTROL

- 1. EACH UNIT SHALL BE STARTED AND STOPPED REMOTELY VIA THE DTC. WHEN THE FAN SYSTEM IS STARTED, THE FOLLOWING EVENTS SHALL OCCUR:
a. ITS RESPECTIVE CONTROL SYSTEM SHALL BE ENABLED.
b. THE OUTSIDE AIR (SMOKE) DAMPER AND LOUVER INTAKE DAMPERS SHALL OPEN.
c. THE EXHAUST FANS SHALL START.
d. THE SUPPLY FAN SHALL START.
e. PROOF OF AIRFLOW SHALL BE BY DIFFERENTIAL PRESSURE SWITCHES ACROSS THE FANS.
2. THE EXHAUST FANS SHALL BE INTERLOCKED TO THE SUPPLY FAN ONLY SUCH THAT AN ALARM WILL OCCUR AT THE DTC IF A SUPPLY FAN IS STARTED WITHOUT ITS CORRESPONDING EXHAUST FAN ON.
3. WHEN THE SYSTEM IS STOPPED, THE FOLLOWING EVENTS SHALL OCCUR:
a. THE SUPPLY FAN SHALL STOP.
b. THE EXHAUST FANS SHALL STOP.
c. THE OUTSIDE AIR DAMPER ADD LOUVER INTAKE DAMPERS SHALL CLOSE.
d. THE EXHAUST FAN DAMPER SHALL CLOSE.
e. HTEF-5, 6, 7, 9 ARE CONTINUOUS PURGE (FLUSHING FANS) WHICH REMAIN ON UNLESS THE SEQUENCE FOR THE RESPECTIVE HTEF-1, 2, 3, 4, 8 IS "ON". HTEF-5, 6, 7, 9 OPERATE TO PREVENT PROPANE BUILD-UP "AFTER HOURS". THE RESPECTIVE HTEF-5, 6, 7, 9 MUST BE OFF (WITH ITS INLET DAMPERS CLOSED) BEFORE HTEF-1, 2, 3, 4, 8 STARTED (TO PREVENT MOTOR BURNOUT) OR AN ALARM IS ACTIVATED ON THE DTC. MAKE-UP AIR IS BY DAMPER LEAKAGE.

F. HEATING CYCLE CONTROL

- 1. WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW THE HEATING SETPOINT, THE HEATING COIL VALVE SHALL MODULATE TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.

G. FILTER CONTROL

- 1. PROVIDE A DIFFERENTIAL PRESSURE GAGE ACROSS THE FILTER SECTION FOR VISUAL PRESSURE DROP INDICATION.

H. DUCT SMOKE DETECTOR CONTROL

- 1. SMOKE IN THE SUPPLY AIR (OCCUPIED MODE): WHEN A SMOKE DETECTOR IN THE SUPPLY AIR IS ACTIVATED, THE FOLLOWING EVENTS SHALL OCCUR.
a. AN ALARM SHALL BE ANNUNCIATED AT THE BAS CENTRAL CONTROL STATION AND FIRE ALARM PANEL.
b. THE SUPPLY FANS SHALL STOP.
c. THE OUTSIDE AIR (SMOKE) DAMPERS SHALL CLOSE.
d. THE HEATING VALVES SHALL CLOSE.

I. FIRST FLOOR STAGING (HVU-6)

- 1. NORMAL SPEED SETTING SHOULD BE ON LOW. HIGH MAY BE MANUALLY SELECTED IF THE OPERATOR IS CERTAIN THAT THERE IS SUFFICIENT EXHAUST FROM ONE OR BOTH HTE FANS (HTEF 1 & 2) TO AVOID OVER PRESSURIZING THE FIRST FLOOR STAGING AREA/PIT FIRE AREA INTO THE CRAWLSPACE AND BURNER ROOM.
2. NORMAL SUPPLY SETTING SHOULD BE AUTO. HVU-6 DAMPER TO OPEN AND UNIT TO RUN WHENEVER HTEF-1 AND/OR HTEF-2 RUNS. SUPPLY OFF MAY BE SELECTED IN SUMMER IF THE STAGING AREA 101 ROLL UP DOORS ARE OPEN. HAND MAY BE SELECTED IF THE AUTO SETTING FAILS, OR IF THE OPERATOR WANTS TO VENTILATE THE STAGING AREA 101 WITH ROLL UP DOORS OPEN OR HTE FANS ON A MANUAL OPERATION.
3. RUN INDICATOR LIGHT (WHITE) TO CONFIRM FAN START (WHETHER BY HAND OR AUTO) VIA A PRESSURE DIFFERENTIAL INDICATOR ACROSS THE SUPPLY FAN. FAIL INDICATOR LIGHT (RED) TO SIGNAL A FAILURE TO ESTABLISH A SUPPLY FAN DIFFERENTIAL PRESSURE (WHETHER BY A HAND OR AUTO START). FAIL LIGHT WOULD CLEAR FROM A MANUAL OFF SWITCH POSITION OR FROM AN "OFF" SIGNAL WITH THE AUTO SWITCH POSITION.
4. NORMAL HVU-6 DAMPER SETTING TO BE AUTOMATIC. THE SHUT OFF DAMPERS (MINIMUM TWO ACTUATORS ON SEPARATE DAMPER SECTIONS) SHALL OPEN BEFORE THE FAN STARTS, TO AVOID NUISANCE TRIPS. PILOT LIGHT (WHITE) TO INDICATE (VIA END SWITCHES WIRED IN PARALLEL) WHEN THE DAMPERS ARE IN FULL CLOSE POSITION, AND PILOT LIGHT (GREEN) TO INDICATE WHEN THE DAMPERS ARE IN THE FULL OPEN POSITION. THE OPERATOR MAY MANUALLY SELECT THE DAMPER OPEN SETTING, WITH OR WITHOUT HVU-6 ON.

J. HTEF TEMPERATURE INDICATORS

- 1. PANEL MOUNT LED TYPE DIGITAL DISPLAY UNIT WITH NOMINAL 0.6 INCH HIGH NUMBERS TO READ 000 TO 999.

DISPLAY AND INPUT TO BE COMPATIBLE WITH TEMPERATURE SENSORS AT THE INLET OF EACH RESPECTIVE HTEF.

- 2. A HIGH LIMIT SENSING, EITHER A SEPARATE SENSOR OR IN CONJUNCTION WITH SAME SENSOR AS FOR THE TEMPERATURE INDICATOR, TO LIGHT THE RESPECTIVE (RED) HIGH TEMP PILOT AT 1000 DEG. F AND ABOVE.

K. CROSS CONNECT PLENUM ( HTEF-1 & 8 AND HTEF-2 & 8)

- 1. NORMAL POSITION IF FULL CLOSE FOR EACH DAMPER WITH (W) PILOT LIGHT ON. ONE OR BOTH DAMPER MAY BE OPENED AS REQUIRED BY THE OPERATOR.
2. THIS IS A MANUAL OPERATION ONLY, TO OPEN OR CLOSE THE 2-POSITION CROSS CONNECT DAMPERS ON THE ROOF BETWEEN THE RESPECTIVE PLENUMS. IF ONE THE FAN (1, 2, OR 8) FAILS AND TRAINING MUST STILL CONTINUE, AN ADJACENT FAN MAY BE USED TEMPORARILY FOR EXHAUST. END SWITCHES ON THE RE RESPECTIVE DAMPERS TO INDICATE VIA PILOT LIGHTS WHEN THE DAMPER HAS REACHED THE FULL OPEN (R) POSITION.

L. HVU-1, 2, 3, 4, 5, & 7 FAN FAIL INDICATORS

- 1. NORMAL INDICATION OF (RED) PILOT LIGHT IS OFF.
2. FAIL INDICATOR LIGHT (RED) TO SIGNAL A FAILURE TO ESTABLISH A SUPPLY FAN DIFFERENTIAL PRESSURE (WHETHER BY A HAND OR AUTO START).
3. FAIL LIGHT WOULD CLEAR FROM A MANUAL OFF SWITCH POSITION OR AN "OFF" SIGNAL WITH THE "AUTO" SWITCH POSITION.

M. CO2 ALARM

- 1. CO2 (LOW OXYGEN) SENSING THE TANK FILLING ROOM 131 TO START ER-131B (NORMALLY OFF), STOP EF-131A (NORMALLY ON), AND START MAKE-UP AIR UNIT SF-4 (IF NOT ALREADY ON), UPON INDICATION OF A CO2 CONDITION ABOVE THE SENSOR SETPOINT.
2. THIS ALARM SHALL USE EXISTING SENSORS AND WIRING TO BE CONNECTED TO NEW BAS CONTROLS.

N. PROPANE ALARMS

- 1. PROPANE YARD ALARM FOR (RED) PILOT LIGHT, SEE DRAWINGS PP100A. (NOTE 2 REQUIRES A REMOTE ALARM FROM THE VAPORIZERS TO THE DTC). THE ON PILOT LIGHT TO INDICATE THE STATUS OF THE RESPECTIVE ALARM CIRCUIT.
2. PROPANE SENSORS WIRED IN PARALLEL FOR HVU-1, 2, & 7 AND HVU-3, 4, 5, & 6 TO ALARM UPON PROPANE SENSING WITH THE UNIT, WHETHER ON OR OFF. THE RESPECTIVE ON PILOT LIGHTS TO INDICATE THE STATUS OF THE RESPECTIVE ALARM CIRCUITS. A PROPANE ALARM WILL SHUT DOWN THE RESPECTIVE HVU.
3. VAPORIZERS 1 AND 2 TO HAVE INDIVIDUAL PILOT LIGHT STATUS INDICATIONS FOR WHETHER THE UNITS ARE ON (WHITE) OR OFF (RED), AND ALARM PER DRAWING PP506.
4. PROPANE DEVICE ALARM TO HAVE 24V SPARK SUPPRESSING CONTACTS AND PILOT LIGHT TO INDICATE STATUS AND ALARM FOR A 24V SIGNAL FROM THE GOVERNMENT DEVICE CONTRACTOR'S PROPANE SENSING SYSTEM. (WHITE) INDICATES CIRCUIT IS ACTIVE.
5. ALL PROPANE ALARMS SHALL SEND SIGNAL TO DDC PANEL AND TO GAS DETECTOR PANEL OF BUILDING 510. THE DDC PANEL IS LOCATED IN CONTROL ROOM ON THIRD FLOOR AND GAS DETECTOR PANEL IS LOCATED IN "SECURITY ROOM 133".

O. PROPANE EMERGENCY OFF

- 1. PILOT LIGHT (WHITE) TO INDICATE THAT THE EMERGENCY CIRCUIT IS ENERGIZED.
2. PILOT LIGHT (RED) TO INDICATE THAT THE EMERGENCY CIRCUIT IS DE-ENERGIZED.
3. PROPANE "OFF" BUTTON IS MANUAL ACTUATION IN CONJUNCTION WITH THE SAFETY CIRCUIT SHOWN IN THE EMERGENCY SHUTOFF VALVE SYSTEM WIRING DIAGRAM SHOWN ON DRAWING PP503.

P. AUTOMATIC PROPANE SHUTDOWN

- 1. CONTROLS CONTRACTOR TO WIRE AUTOMATIC SHUTDOWN OF PROPANE SYSTEM IN THE EVENT OF PROPANE SENSOR ALARM FROM EITHER TRUCK TRANSPORT STATION, PROPANE YARD, VAPORIZERS OR HVU. PROVIDE RELAYS, WIRING, PROGRAMMING AND VISUALS FOR FUNCTIONAL SHUTDOWN.
2. WHEN DDC SYSTEM RECEIVES ALARM FROM PROPANE SENSOR, DDC SYSTEM SHALL ENERGIZE SOLENOID TO MASTER SHUTOFF VALVE LOCATED AT VAPORIZERS AS DEPICTED ON SHEET PP501. SOLENOID TO RELEASE CO2 FROM EMERGENCY SHUTDOWN SYSTEM CLOSING ALL ASSOCIATED PROPANE VALVES.

TRAINING SPECIFIC SCENARIOS

- A. CONTROLS DESKTOP COMPUTER AS SPECIFIED TO BE LOCATED ON THIRD DECK CONTROL ROOM. THE NEW DDC CONTROLS SHALL FUNCTION AS LISTED BELOW WITH INPUTS FROM INSTRUCTOR OPERATING STATIONS (IOS), AT ANY POINT DURING A TRAINING FUNCTION, THE TRAINING OPERATOR SHALL HAVE THE ABILITY TO ABORT THE TRAINING FUNCTION. IN THE EVENT OF AN ABORT, ALL SYSTEMS WILL FOLLOW PROCEDURES TO PREVIOUSLY INDICATED SHUTDOWN MODES.
B. TRAINING START UP SHALL START WITH RECEIVING 24 VAC SIGNAL FROM EITHER IOS-1 OR IOS-2. BELOW ARE THE INCOMING SIGNALS FROM THE IOS TO THE TRAINER CONTROL SYSTEM.
1. VENT FAN LOW.
2. VENT FAN HIGH.
3. PROPANE ALARM.
C. CONTROL SYSTEM SHALL HAVE THE ABILITY TO OPERATE, START AND STOP MULTIPLE TRAINING FUNCTIONS SIMULTANEOUSLY WITHOUT INTERFERENCE TO OTHER TRAINING FUNCTIONS.
D. VENT FAN LOW SIGNAL
1. REFER ALSO TO HVU SEQUENCE SECTION E.3.E.
2. DAMPERS FOR HTEF-5, 6, 7 AND 9 SHALL OPEN & INITIATE CRAWLSPACE PURGE. MAKE-UP AIR IS VIA CRAWLSPACE DAMPER LEAKAGE.
E. VENT FAN HIGH SIGNAL
1. REFER ALSO TO HVU SEQUENCE SECTION FOR TEMPERATURE CONTROL, SETPOINTS, START/STOP AS WELL AS DAMPER AND LOUVER INTERLOCKS.
2. HTEF-5, 6, 7 AND 9 SHALL BE DE-ENERGIZED AND DAMPERS SHALL BE CLOSED.
3. DAMPERS FOR HTEF-1, 2, 3, 4 AND 8 SHALL OPEN AND HTEF-1, 2, 3, 4 AND 8 SHALL BE ENERGIZED.

SEQUENCES CONTINUED ON SHEET M-705

Vertical sidebar containing logos for NAVFAC, JACOBS, and project information including drawing title 'MECHANICAL SEQUENCE OF OPERATION', drawing number 'M-704', and sheet number '65 OF 86'.



