STRUCTURAL DRAWINGS

S1 BUILDING DEMOLITION & MODIFICATION PLAN & ELEVATION
S2 WEST WALL MODIFICATION ELEVATION & DETAILS

MECHANICAL DRAWINGS

M1.1 MECHANICAL LEGENDS & SCHEDULES
M1.2 WARNING SIGN & FIRE EXTINGUISHER PLAN, SIGN & VALVE TAG SCHEDULES
M1.3 SYSTEM START UP & SEQUENCE OF OPERATIONS
M1.4 OVERALL MECHANICAL AREA PLAN
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M5.2 DIESEL FUEL & USED OIL PIPING ELEVATIONS & DETAILS
M5.3 EXISTING USED OIL HOPPER & BLENDER MODIFICATION DETAILS
M5.4 200 GALLON DAY TANK FABRICATION
M6.1 EXHAUST & CRANK VENT PLAN & DETAILS
M6.2 CHARGE AIR SYSTEM PLAN & DETAILS
M7.1 VENTILATION PLAN & DETAILS
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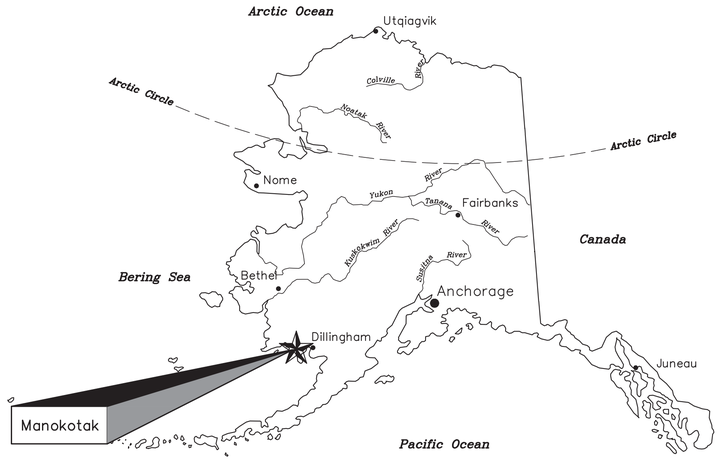
FS1 FIRE DETECTION & ALARM SYSTEM RENOVATION
FS2 FIRE SUPPRESSION SYSTEM RENOVATION

ELECTRICAL DRAWINGS

E1.1 ELECTRICAL LEGENDS & SCHEDULES
E1.2 OVERALL ELECTRICAL AREA PLAN
E1.3 TEMPORARY POWER & STEP UP TRANSFORMER REPLACEMENT PLANS
E2 ELECTRICAL DEMOLITION PLAN
E3.1 ELECTRICAL EQUIPMENT LAYOUT & NEW WORK OVERVIEW
E3.2 WIREWAY, CONDUIT, & EQUIPMENT LAYOUT PLAN & DETAILS
E3.3 SECTIONS, DETAILS, & GENERATOR GROUNDING
E3.4 BACK WALL ELEVATION & DETAILS
E4.1 STATION SERVICE PANEL SS & LIGHTING/RECEPTACLE MODIFICATIONS
E4.2 STATION SERVICE PLAN, DETAILS, & PANELBOARD
E5 INSTRUMENTATION & DATA MODIFICATION PLAN & DETAILS
E6.1 SWITCHGEAR ENCLOSURE LAYOUT, SETTING TABLE, & DETAILS
E6.2 SWITCHGEAR ONE-LINE & DETAILS
E6.3 24VDC ENGINE WIRING JUNCTION BOX
E7.1 DAY TANK CONTROL PANEL LOGIC DIAGRAM & BILL OF MATERIALS
E7.2 DAY TANK CONTROL PANEL LAYOUT & TERMINAL STRIPS
E7.3 DAY TANK CONTROL PANEL NOTES, SEQUENCE OF OPERATIONS & INTERCONNECT DETAILS
E7.4 INTERMEDIATE TANK CONTROL PANEL
E8.1 HEAT RECOVERY SYSTEM HEAT RECOVERY PANEL HRP
E8.2 HEAT RECOVERY SYSTEM END USER BUILDING WIRING PLANS
E9 POWER PLANT AREA FUEL SYSTEM WIRING MODIFICATION PLAN & DETAILS



MANOKOTAK POWER PLANT UPGRADE PROJECT REVISION #1 ISSUED FOR CONSTRUCTION AUGUST 2025

THIS DRAWING SET SHOWS WORK THAT IS UNDER THE BASE BID AND ADDITIVE ALTERNATES. ALL WORK SHOWN IS INCLUDED IN THE BASE BID UNLESS SPECIFICALLY INDICATED AS ADDITIVE ALTERNATE.

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER PLANT UPGRADE PROJECT

TITLE: SCHEDULE OF DRAWINGS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

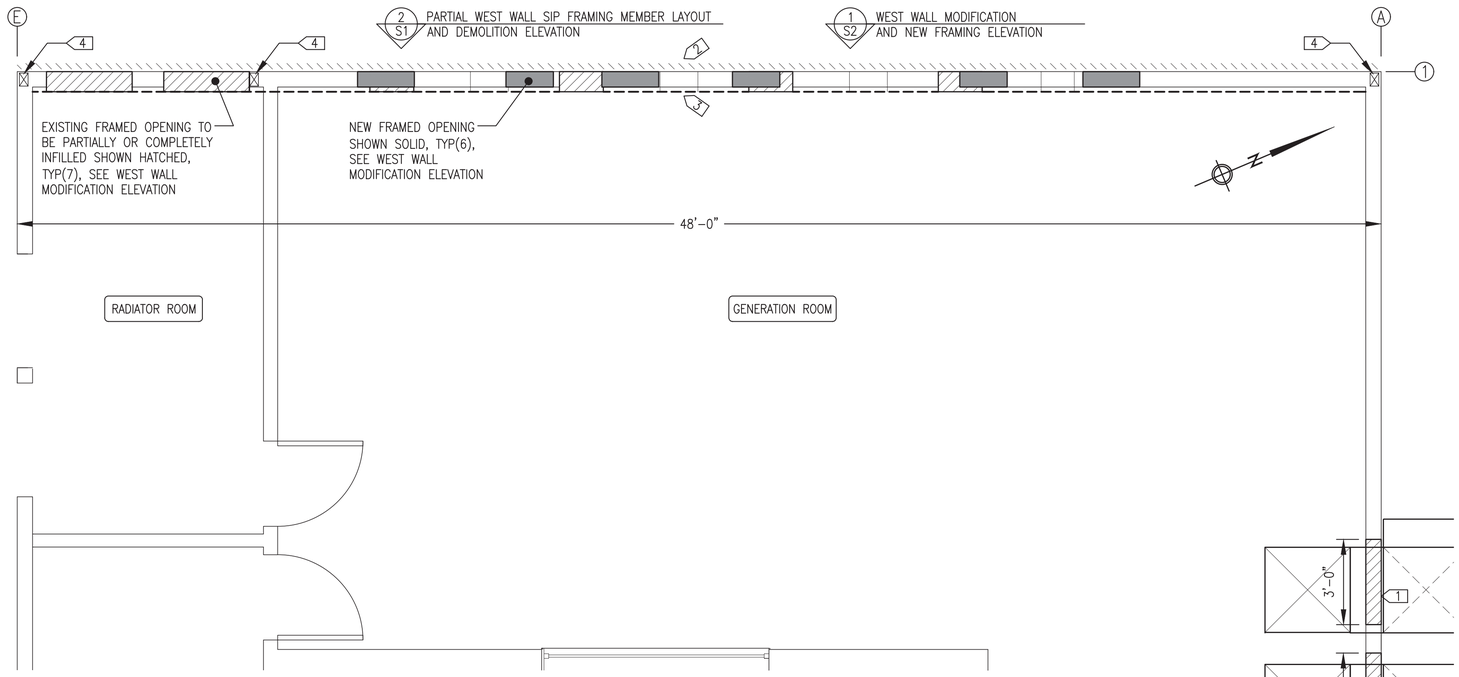
DRAWN BY: BCG
DESIGNED BY: BCG
FILE NAME: MANO PP G1
PROJECT NUMBER:
SCALE: NO SCALE
DATE: 9/28/23
SHEET: G1

BUILDING MODIFICATION GENERAL NOTES:

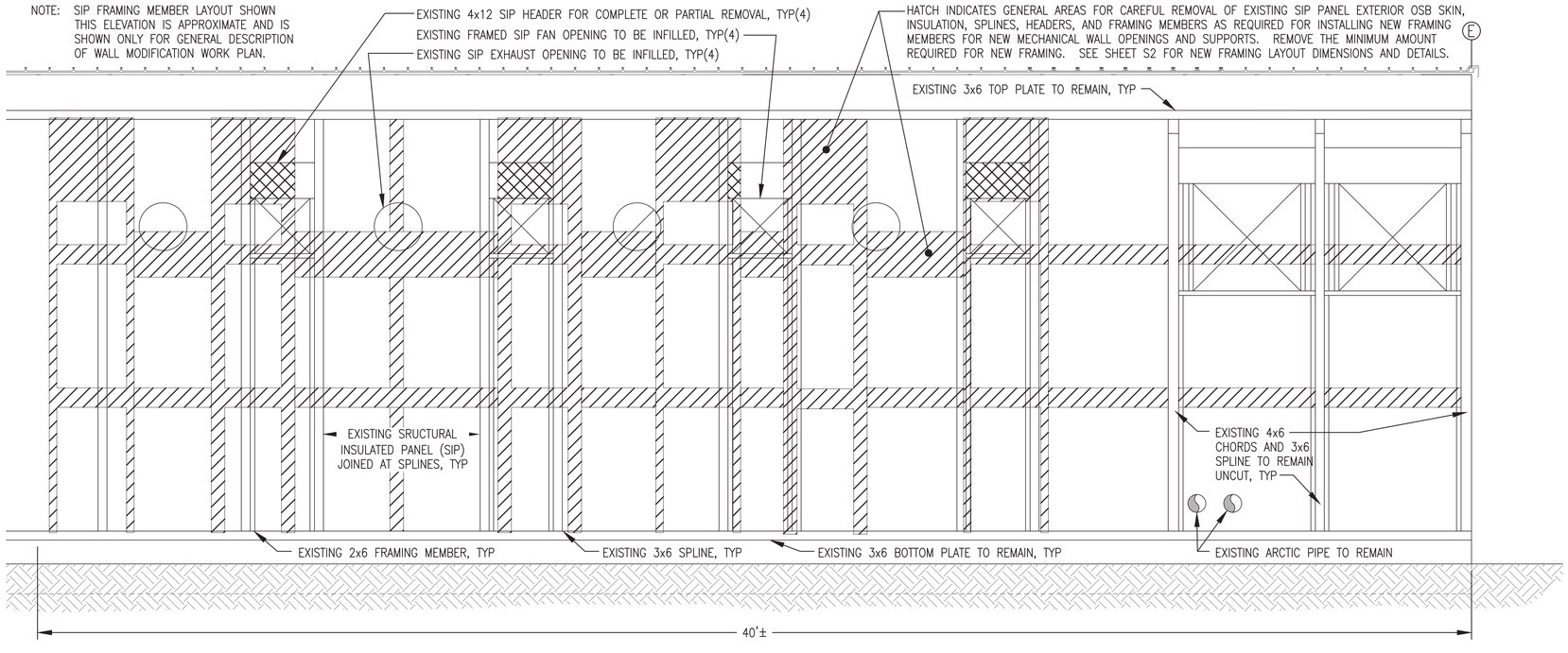
1. REMOVE ALL EXISTING MECHANICAL SYSTEMS, ELECTRICAL SYSTEMS, AND EXTERIOR SIDING FROM WEST WALL PRIOR TO MODIFYING WALL STRUCTURE. SEE SHEETS M2.1, M2.2, M2.3, AND E2.
2. EXISTING BUILDING CONSTRUCTION IS WITH STRUCTURAL INSULATED PANELS (SIP's), 5–1/2" NOMINAL DEPTH FRAMING MEMBERS, 7/16" OSB SKIN BOTH SIDES, METAL SIDING ON EXTERIOR, AND FRP OVER 3/4" CDX PLYWOOD ON INTERIOR. MODIFY EXISTING SIP PANELS ONLY WHERE SPECIFICALLY INDICATED. WHEN MODIFYING EXISTING SIP PANELS TAKE CARE TO ONLY CUT AND REMOVE INTERIOR AND EXTERIOR OSB SHEATHING, INSULATION, AND FRAMING WHERE SPECIFICALLY REQUIRED AS INDICATED. AVOID CUTTING OR DAMAGING ANY PORTION OF EXISTING SIP PANELS TO REMAIN.
3. SHORE UP BUILDING ROOF WITH TEMPORARY BEAMS AND COLUMNS AS REQUIRED TO PREVENT ANY ROOF SAG WHILE MODIFYING WEST WALL.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND THE METHODS, TECHNIQUES, AND SEQUENCE OF PROCEDURES REQUIRED TO PERFORM THE WORK. DRAWINGS INDICATE STRUCTURE IN FINAL FORM CAPABLE OF SUPPORTING DESIGN LOADS.

BUILDING MODIFICATION SPECIFIC NOTES:

1. INFILL TWO EACH 3'x3' NORTH WALL OPENINGS WITH 2x6 FRAMING, OSB, AND PLYWOOD AND INSULATE VOID. FINISH INTERIOR WITH FRP TO MATCH EXISTING. FINISH EXTERIOR WITH SIDING SALVAGED FROM WEST WALL DEMOLITION. SEE SHEET M2.2.
2. PRIOR TO MODIFYING WALL FRAMING REMOVE ALL EXTERIOR METAL SIDING, CORNER TRIM, TOP J–TRIM, AND BOTTOM BASE DRIP FROM WEST. SALVAGE VERTICAL CORNER TRIMS FOR REINSTALLATION. SALVAGE PORTIONS OF SIDING FOR INSTALLATION ON NORTH WALL. SEE SHEET M2.2.
3. THE INTERIOR SURFACE OF THE SIP PANELS IS COVERED WITH 3/4" PLYWOOD AND FRP. LEAVE ALL INTERIOR WALL SHEATHING IN PLACE DURING WALL MODIFICATIONS TO MAINTAIN STRUCTURAL INTEGRITY OF WALL.
4. EXISTING 4x6 CHORD AND SIMPSON TIE DOWN STRAP TO REMAIN



1 S1 BUILDING MODIFICATION PLAN
3/8"=1'



2 S1 PARTIAL WEST WALL SIP FRAMING MEMBER LAYOUT AND DEMOLITION ELEVATION (EXTERIOR VIEW)
1/2"=1'

DESIGN CODES & STANDARDS

BUILDING CODE: IBC–21
RISK CATEGORY: III

DESIGN SNOW LOADS:
GROUND SNOW LOAD: 110 PSF
SNOW IMPORTANCE FACTOR: 1.10
SNOW EXPOSURE FACTOR: 1.00
SNOW THERMAL FACTOR (WARM/COLD): 1.00/1.20
FLAT–ROOF SNOW LOAD (MAIN ROOF): 84.7 PSF
SLOPE FACTOR: 0.94
SLOPED–ROOF SNOW LOAD (CANOPIES): 95.3 PSF
DRIFT SURCHARGE LOAD: 32.1 PSF
SNOW DRIFT WIDTH: 9 FT

DESIGN WIND LOADS
ULTIMATE WIND SPEED: 170 MPH
NOMINAL WIND SPEED: 132 MPH
WIND EXPOSURE: C
INTERNAL PRESSURE COEFFICIENT: +/–0.18

DESIGN SEISMIC LOADS
SEISMIC IMPORTANCE FACTOR: 1.25
SITE CLASS: D
MAPPED SPECTRAL RESPONSE, Ss/S1: 0.27/0.16
DESIGN SPECTRAL RESPONSE, SDS/SD1: 0.28/0.24
SEISMIC DESIGN CATEGORY: D

ISSUED FOR CONSTRUCTION SEPTEMBER 2023

STATE OF ALASKA 49 TH Joshua C. Knutson CE-163854 9/30/2023 REGISTERED PROFESSIONAL ENGINEER

CRW ENGINEERING GROUP LLC PHONE: (907) 562–3252

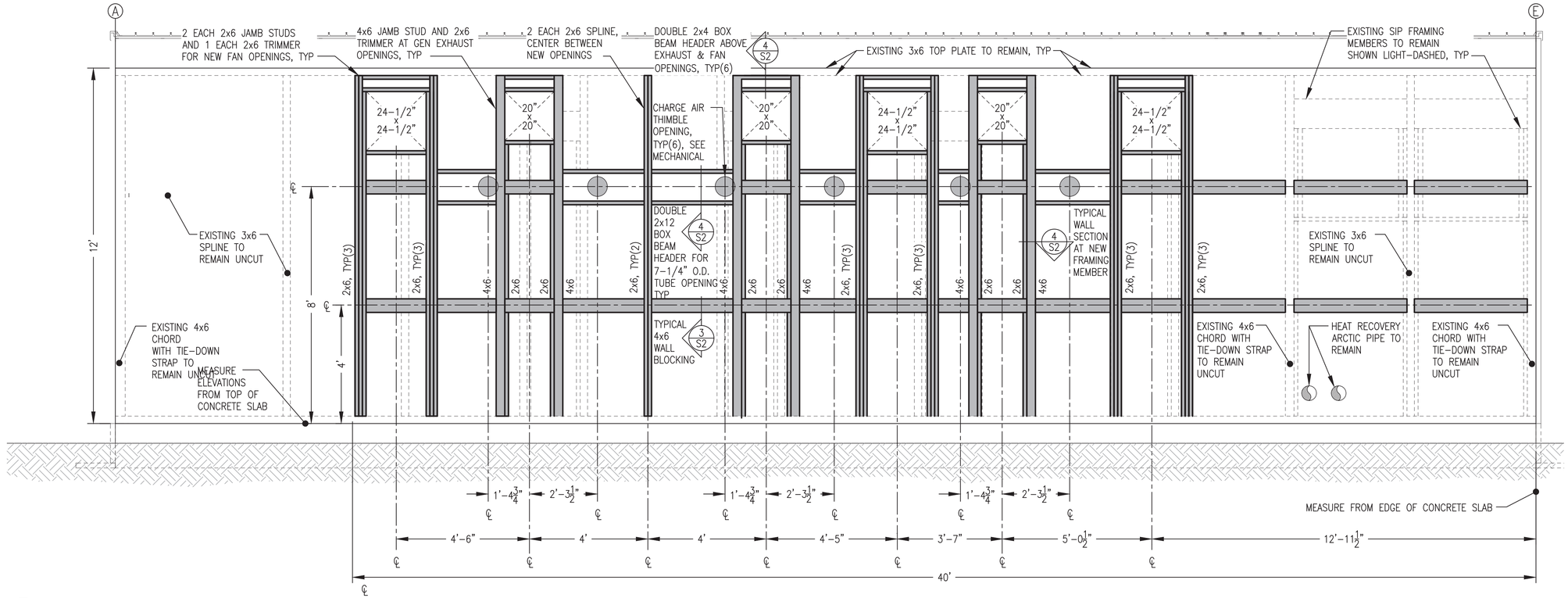
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

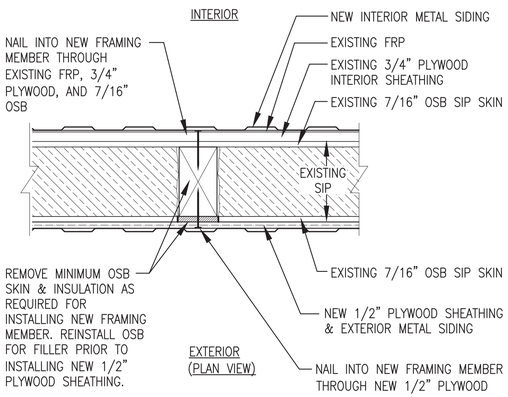
TITLE: BUILDING DEMOLITION & MODIFICATION PLAN & ELEVATION

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: JK/BCG	DATE: 9/28/23
FILE NAME: MANO PP S1–2	SHEET: S1
PROJECT NUMBER:	

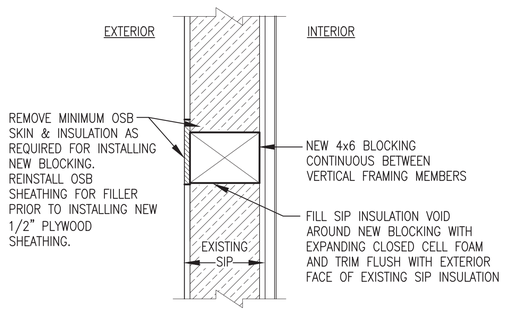


1 S2 WEST WALL MODIFICATION AND NEW FRAMING ELEVATION (EXTERIOR VIEW)
1/2"=1'



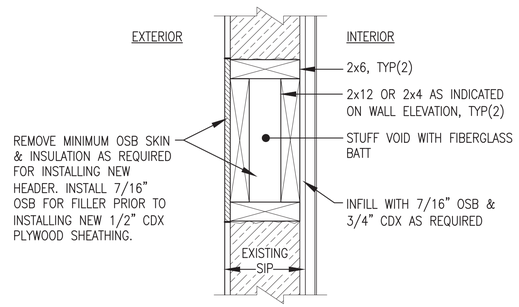
2 S2 TYPICAL FINISHED WALL SECTION AT NEW FRAMING MEMBER
NO SCALE

NOTE:
1. WALL SECTION SHOWN AFTER REMOVAL OF EXISTING EXTERIOR SIDING & PRIOR TO INSTALLATION OF NEW EXTERIOR PLYWOOD, EXTERIOR SIDING, & INTERIOR SIDING.
2. ATTACH NEW BLOCKING TO VERTICAL FRAMING MEMBERS WITH (2) SIMPSON A35 CLIPS EACH END.



3 S2 TYPICAL HORIZONTAL 4x6 BLOCKING INSTALLATION
NO SCALE

NOTE:
1. WALL SECTION SHOWN AFTER REMOVAL OF EXISTING EXTERIOR SIDING AND PRIOR TO INSTALLATION OF NEW EXTERIOR PLYWOOD, EXTERIOR SIDING, AND INTERIOR SIDING.
2. ATTACH NEW HEADER TO VERTICAL FRAMING MEMBERS WITH 2 EACH SIMPSON A35 CLIPS EACH END.
3. AFTER INSTALLING NEW FRAMING, FILL ALL VISIBLE INSULATION VOIDS GREATER THAN 1/2" WITH EXPANDING CLOSED CELL FOAM



4 S2 TYPICAL BOX BEAM HEADER INSTALLATION
NO SCALE

WALL MODIFICATION GENERAL NOTES:

1) SEE TYPICAL WALL SECTION 2/S2 FOR FINAL CONFIGURATION OF WEST WALL ASSEMBLY.
2) FRAMED OPENINGS LOCATED TO MATCH EQUIPMENT, SEE MECHANICAL.
3) NEW 4x6 COLUMNS ARE FOR SUPPORT OF EXHAUST PIPES, SEE SHEET M6.1.
4) AFTER SELECTIVELY REMOVING EXTERIOR 7/16" OSB SHEATHING FROM SIP PANELS AS INDICATED ON ELEVATIONS, CAREFULLY REMOVE EXISTING PANEL INSULATION AND SELECTIVELY CUT FRAMING MEMBERS AS REQUIRED FOR INSTALLING NEW FRAMING MEMBERS, HEADERS, AND BLOCKING.
5) ENSURE THAT INSULATION IS COMPLETELY REMOVED FULL DEPTH FOR DIRECT CONTACT OF NEW FRAME MEMBER TO INTERIOR 7/16" OSB SHEATHING.
6) FROM THE INSIDE FASTEN THROUGH INTERIOR FRP AND SHEATHING INTO NEW FRAMING MEMBERS.
7) FROM THE OUTSIDE APPLY CLOSED CELL SPRAY FOAM INTO ALL INSULATION VOIDS AROUND NEW FRAMING MEMBERS AND INSTALL FIBERGLASS BATT INSULATION IN ALL ABANDONED MECHANICAL OPENINGS.
8) INFILL ALL ABANDONED INTERIOR AND EXTERIOR MECHANICAL OPENINGS TO ALIGN WITH EXISTING WALL SURFACES IN PREPARATION FOR INSTALLATION OF METAL SIDING.
9) SHEATH THE ENTIRE WEST WALL EXTERIOR SURFACE WITH NEW 1/2" CDX PLYWOOD. INSTALL PLYWOOD HORIZONTALLY SO EDGES LAND ON BLOCKING. CUT SHEETS SO THAT END JOINTS LAND ON EXISTING SPLINES OR NEW FRAMING MEMBERS. NAIL ALL PANEL EDGES WITH 0.131"x2.5" NAILS AT 3"O.C.
10) INSTALL NEW SIDING, FLASHING AND TRIM ON INTERIOR AND EXTERIOR OF WEST WALL. SEE SHEETS M2.2 AND M2.3.
11) ALL NEW LUMBER TO BE DOUGLAS FIR #2 GRADE OR BETTER.
12) STITCH NAIL ALL MULTI-PLY MEMBERS TOGETHER WITH 0.162"x3.5" NAILS AT 12"O.C. STAGGERED.
13) ATTACH ALL NEW VERTICAL MEMBERS TO TOP PLATE AND BOTTOM PLATE WITH (2) SIMPSON A35 CLIPS.

ISSUED FOR CONSTRUCTION SEPTEMBER 2023

STATE OF ALASKA 49 TH
Joshua C. Knutson
CE-163854
9/28/2023
REGISTERED PROFESSIONAL ENGINEER

CRW ENGINEERING GROUP, LLC
PHONE: (907) 562-3252

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: WEST WALL MODIFICATION ELEVATION & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: JK/BCG	DATE: 9/28/23
FILE NAME: MANO PP S1-2	SHEET: S2
PROJECT NUMBER:	

PIPING LEGEND

- BUTTERFLY VALVE
- BALL VALVE
- CHECK VALVE
- HOSE END DRAIN VALVE
- GAUGE COCK
- Y–STRAINER
- AUTOMATIC AIR VENT
- FLEXIBLE CONNECTOR
- FLANGED JOINT
- UNION
- ELBOW TURNED UP
- ELBOW TURNED DOWN
- PIPING CONNECTION (TEE)
- PIPING REDUCER
- DIRECTION OF FLOW

INSTRUMENT/CONTROL LEGEND

- (P) PRESSURE GAUGE
- (T) EXISTING ANALOG THERM
- (TH) DIGITAL THERMOMETER
- (TTH) THERMOMETER/TRANSMITTER
- (TT) TEMPERATURE TRANSMITTER
- (TS) HEAT RECOV TEMP SENSOR
- (PTC) COOL. SYS. PRES TRANSMITTER
- (PTH) HT. RECOV. PRES TRANSMITTER
- (DP) DIFFERENTIAL PRES GAUGE
- (FS) FLOAT SWITCH
- (LCA) LOW COOLANT SWITCH

NOTE: SEE SPECIFICATIONS & INSTRUMENTATION SCHEDULE FOR DEVICE FUNCTION & FEATURES.

ABBREVIATIONS

ø	DIAMETER (PHASE)
A	AMPS
AFF	ABOVE FINISHED FLOOR
BTU	BRITISH THERMAL UNIT
DFR	DIESEL FUEL RETURN
DFS	DIESEL FUEL SUPPLY
ECR	ENGINE COOLANT RETURN
ECS	ENGINE COOLANT SUPPLY
EWT	ENTERING WATER TEMPERATURE
EXIST	EXISTING
FPT	FEMALE PIPE THREAD
GA	GAUGE
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
GRC	GALVANIZED RIGID CONDUIT
HP	HORSEPOWER
HRR	HEAT RECOVERY RETURN
HRS	HEAT RECOVERY SUPPLY
ID	INSIDE DIAMETER
KW	KILOWATT
LT	LIQUID TIGHT
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MIN	MINIMUM
MPT	MALE PIPE THREAD
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	ON CENTER
OD	OUTSIDE DIAMETER
PRV	PRESSURE RELIEF VALVE
PSI	POUNDS/PER SQUARE INCH
PSID	PSI DIFFERENTIAL
PSIG	PSI GAUGE
SCH	SCHEDULE
TDH	TOTAL DEVELOPED HEAD
TYP	TYPICAL
UOR	USED OIL RETURN
V	VOLTS
W	WATTS
WG	WATER GAUGE

ENGINE–GENERATOR SCHEDULE (OWNER FURNISHED)

GENSET	DESCRIPTION
GEN #1, #2, & #3	ENGINE – 500 HP, 350 eKW PRIME, MTU–DETROIT 6063TK35. 24 VDC STARTING & CONTROL. GENERATOR – MINIMUM 450 KW CONTINUOUS AT 105°C RISE, NEWAGE/STAMFORD HCI534D.

ENGINE COOLING SYSTEM EQUIPMENT SCHEDULE

SYMBOL	SERVICE/FUNCTION	DESCRIPTION	MANUFACTURER/MODEL
R–1 R–2	GLYCOL RADIATORS (SLAVAGED AFTERCOOLERS)	SINGLE PASS, 5 ROW, VERTICAL CORE, 4" FLANGED CONNECTIONS, GALVANIZED, EXPANDED METAL GUARD. 22,000 BTU/MIN AT 80°F AMBIENT, 240 GPM 50% ETHYLENE GLYCOL AT 200F IN, 2.3 PSI MAX GLYCOL PRESSURE DROP. 5 HP, 460 V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO.	DIESEL RADIATOR PART NO. DR3559 (EXISTING SALVAGED AFTERCOOLER)
CAC–1 CAC–2 CAC–3	CHARGE AIR COOLERS	SINGLE PASS, VERTICAL ALUMINUM CORE, 4" FLANGED TOP CONNECTIONS, EPOXY COATING, EXPANDED METAL GUARD. 1340 SCFM CHARGE AIR AT 395F IN AND 110F OUT AT 75F AMBIENT, 34" H2O MAX CHARGE AIR PRESSURE DROP. 5 HP, 460 V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO.	DIESEL RADIATOR PART NO. DR3376A (OWNER FURNISHED WITH GENSETS)
TV–1	THERMOSTATIC VALVE	4" ANSI 125# FLAT FACED FLANGES, CAST IRON BODY, FACTORY SET NON–ADJUSTABLE FIELD REPLACEABLE THERMOSTATIC ELEMENTS, 175F ELEMENT	FPE PART NO. A4010–175
ET–1	EXISTING GEN COOLANT EXPANSION TANK	24 GALLON CAPACITY TANK, 12.75" O.D x 48" LONG FABRICATED STEEL TANK	CUSTOM FABRICATION
HP–EC1	ENGINE COOLANT FILL HAND PUMP	DOUBLE ACTION PISTON HAND PUMP, ALUM HOUSING, SS PISTON SHAFT & LINER, BUNA–N SEALS, ANTI–SIPHONING VALVE.	GPI MODEL HP–100

POWER PLANT HEAT & HEAT RECOVERY EQUIPMENT SCHEDULE:

TV–2	HEAT RECOV. THERMOSTATIC VALVE	2" ANSI 125# FLAT FACED FLANGES, CAST IRON BODY, FACTORY SET NON–ADJUSTABLE FIELD REPLACEABLE THERMOSTATIC ELEMENTS, 185F NOMINAL TEMPERATURE	FPE PART NO. AF2012–185
HX–1	POWER PLANT HEAT EXCHANGER	316 SS PLATES, BRAZED CONST. 2" SOLDER CUP PORTS, 350 MBH MIN CAPACITY. PRIMARY: 40 GPM 195F EWT (50% ETHYLENE) 1.0 PSI MAX WPD, SECONDARY: 40 GPM 185F LWT (50% PROPYLENE) 1.0 PSI MAX WPD	SWEP INTERNATIONAL AB B320HTLx120/1P
P–HR1A	HEAT RECOVERY PRIMARY	40 GPM AT 10' TDH, 1/3 HP, 115V, 1ø, WITH 1–1/2" NPT FLANGES SET TO FIXED SPEED 2	GRUNDFOS MAGNA1 40–80F
P–HR1B	HEAT RECOVERY SECONDARY	40 GPM AT 22' TDH, 1/2 HP, 115V, 1ø, WITH CIM 500 MODULE & 1–1/2" NPT FLANGES SET TO CONSTANT PRESSURE MODE CP=22'	GRUNDFOS MAGNA3 40–120F CIM 500 PART#98301408
P–UH1 P–UH2	CONTROL ROOM & PARTS ROOM HEAT	2 GPM AT 10' TDH, 1/25HP, 115V, 1ø. PROVIDE WITH 3/4" SOLDER COMPANION SHUT OFF FLANGES, GASKETS, & BOLTS.	GRUNDFOS UPS 15–58FC SPEED 1
ET–2	HEAT RECOV. EXP. TANK	BLADDER TYPE EXPANSION TANK, 132 GALLON TANK, 46 GALLON ACCEPTANCE VOL, 125 PSIG WORKING PRESSURE, 12 PSIG PRE–CHARGE.	AMTROL AX–240V
P–HR2	PUBLIC SAFETY SECONDARY PUMP	8 GPM AT 8' TDH, 1/25HP, 115V, 1ø. PROVIDE WITH 1" SOLDER COMPANION SHUT OFF FLANGES, GASKETS, & BOLTS.	GRUNDFOS UPS 15–58FC SPEED 2
LG–HR	LITTLE GIANT HEAT RECOVERY GLYCOL FILL PUMP	SELF–PRIMING INLINE TRANSFER PUMP, 90 GPH @ 100', 3/4" NPT INLET & OUTLET WITH 3/4" MALE HOSE ADAPTERS, 1/2HP, 115V.	LITTLE GIANT UPSP–5 ITEM# 555104

CLINIC HEAT RECOVERY SYSTEM EQUIPMENT SCHEDULE:

HX–3	CLINIC HEAT EXCHANGER	316 SS PLATES, BRAZED CONST. 1–1/4" SOLDER CUP PORTS, 100 MBH MIN CAPACITY. PRIMARY: 10 GPM 185F EWT (50% PROPYLENE) 1.0 PSI MAX WPD, SECONDARY: 10 GPM 175F LWT (50% PROPYLENE) 1.0 PSI MAX WPD	SWEP INTERNATIONAL AB B320HTLx120/1P
P–HR3	CLINIC SECONDARY PUMP	10 GPM AT 5' TDH, 1/25HP, 115V, 1ø. PROVIDE WITH 1" SOLDER COMPANION SHUT OFF FLANGES, GASKETS, & BOLTS.	GRUNDFOS UPS 15–58FC SPEED 2

VENTILATION EQUIPMENT SCHEDULE:

EF–1 EF–2 EF–3	GENERATION ROOM EXHAUST FANS	DIRECT DRIVE 18"ø PROPELLER SIDEWALL EXHAUST FAN, 3,592 CFM AT 0.375" SP, 1,750 RPM. FURNISH WITH SPECIAL 3/4 HP, 115 V, 1 PH VARIGREEN MOTOR WITH OPTIONAL 0–10V LEADS AND OPTIONAL 24V TRANSFORMER	GREENHECK SE1–18–424–VG (3/4 HP)
VF–1	PARTS ROOM VENTILATION	DIRECT DRIVE 20"ø PROPELLER SIDEWALL EXHAUST FAN, 2,727 CFM AT 0.125" SP, 860 RPM, 1/6 HP, 115 V MOTOR	GREENHECK S1–20–428–C6
EF–1 EF–2 EF–3 COMB.	FAN & INTAKE DAMPERS	OPPOSED BLADE LOW–LEAKAGE CONTROL DAMPER, GALVANIZED STEEL CONSTRUCTION, 304 STAINLESS STEEL BEARINGS AND JAMB SEALS, EPDM BLADE SEALS, TWO–PIECE GALVANIZED STEEL WELDED AIRFOIL BLADES.	GREENHECK VCD–33
(MD)	MOTORIZED DAMPER ACTUATOR	120V SPRING RETURN ACTUATOR	BELIMO AF–BUP

FUEL SYSTEM EQUIPMENT SCHEDULE

SYMBOL	SERVICE/FUNCTION	DESCRIPTION	MANUFACTURER/MODEL
P–DF1 P–DF2 P–UO1	DAY TANK FILL PUMP DIESEL CIRC. PUMP USED OIL DRAIN PUMP	ROTARY GEAR PUMP, 5 GPM @ 25 PSID, C–FRAME MOUNT, 1" FPT INLET AND OUTLET, IRON CONSTRUCTION, STEEL SHAFT, CARBON GRAPHITE BUSHINGS, BUNA–N LIP SEAL, WITH 75 PSID INTERNAL PRV. DIRECT MOUNT TO FOOT MOUNT 56C FRAME MOTOR, 1,200 RPM, 1/2 HP, 115VAC.	GORMAN RUPP GMC1DC4–B–40C PUMP WITH CENTURY #C827 MOTOR FOR FIELD ASSEMBLY
P–UO2	USED OIL INJECTION PUMP	ROTARY GEAR PUMP GEAR PUMP – 1.2 GPH @ 15 PSID, 1/8" FPT INLET AND OUTLET, PEEK GEARS, PTFE SEALS, MAGNETICALLY COUPLED TO FOOT MOUNT 56C FRAME MOTOR, 1,725 RPM, 1/2 HP, 115VAC.	MICROPUMP GA–V21.J8FS.A PUMP WITH #81518 ADAPTER & CENTURY #C826V1 MOTOR
HP–DT	NEW DAY TANK FILL HAND PUMP	DOUBLE ACTION PISTON HAND PUMP, ALUM HOUSING, SS PISTON SHAFT & LINER, BUNA–N SEALS, ANTI–SIPHONING VALVE.	GPI MODEL HP–100
G–DT	NEW DAY TANK LEVEL GAUGE	MAGNETIC OPERATED SPIRAL GAUGE FOR #1 DIESEL, 25 PSIG MAX OPERATING PRESSURE, 35" LIQUID COLUMN PLUS 4" RISER.	ROCHESTER MODEL 8660
M–DT	NEW DAY TANK METER	STEEL BODY, 1" ANSI 150# FLANGED ENDS, 20–800 GPH FLOW RANGE, O–RINGS AND SEALS COMPATIBLE WITH #1 DIESEL, DIRECT READ 6–DIGIT REGISTER TO 0.1 GAL, DRY CONTACT PULSER.	ISTEC CONTOIL 9226–F
F–DT	NEW DAY TANK FILTER BANK	THREE FILTER BANK WITH INDIVIDUAL FILTER ISOLATION VALVES, IMPACT RESISTANT "SEE–THRU" BOWLS, 15 PSIG WORKING PRESSURE. INSTALL 3 EACH 10 MICRON AQUABLOC FILTER ELEMENTS & FURNISH 3 SPARES	RACOR TURBINE SERIES ASSEMBLY # 791000FV10 ELEMENTS 2020V10
F–UOB	USED OIL BLENDER FILTER ELEMENTS	REPLACEMENT ELEMENTS FOR EXISTING FILTER BANK. FURNISH WITH 4 EA. 10 MICRON HYDROSORB II FILTER 2 EA. 2 MICRON PARTICULATE FILTER	CIM–TEK #30034 (HYDROSORB – 4 EA.) CIM–TEK #30066 (2 MICRON – 2 EA.)
P–DF3	INTERMEDIATE TANK FILL PUMP	ROTARY GEAR PUMP, 30 GPM @ 25 PSID, C–FRAME MOUNT, 2" FPT INLET AND OUTLET, IRON CONSTRUCTION, 7/8" STEEL SHAFT, BRONZE BUSHINGS, BUNA–N LIP SEAL, WITH 75 PSID INTERNAL PRV. DIRECT MOUNT TO FOOT MOUNT 184C FRAME TEFC MOTOR, 1,750 RPM, 2 HP, 230VAC.	GORMAN RUPP GMC2GH3–B WITH OPTION 50A & TEFC MOTOR
FOC–1	FUEL OIL COOLER	HORIZONTAL CORE, 1–1/2" FLANGED CONNECTIONS, ENAMEL COATING, EXPANDED METAL DISCHARGE GUARD. 10 GPM NO.1 DIESEL FUEL, 450BTU/MIN WITH 120F MAX OIL OUTLET TEMPERATURE AT 80F AMBIENT, 1 PSI MAX OIL PRESSURE DROP. 1–1/2 HP, 208V, 3PH MOTOR SUITABLE FOR VFD OPERATION AT 10:1.	DIESEL RADIATOR PART NO. DR4147–00
ABV–1 1" AT INTERM. TANK ABV–2 2" AT TANK FARM	ACTUATED BALL VALVE	ACTUATED BALL VALVE ASSEMBLY RATED TO –50F. TYPE 304 STAINLESS STEEL FABRICATED COUPLING BRACKET, SHAFT, AND FASTENERS CONFIGURED TO ALLOW WRENCH ACCESS FOR MANUAL OPERATION OF VALVE WITHOUT REMOVING ACTUATOR. LOW TEMP BALL VALVE, 150# RF FLANGED ENDS. ELECTRIC ACTUATOR WITH OPERATING VOLTAGE, NEMA RATING, AND TORQUE AS INDICATED. CONFIGURE WITHOUT MANUAL OVERRIDE SHAFT EXTENSION. FURNISH WITH PTC SELF REGULATING HEATER, AUXILIARY SWITCH SET (AUXILIARY SWITCHES 3 & 4), AND EXXON BEACON 325 SEVERE COLD LUBRICANT. VALVE ASSEMBLY: DG VALVE (780) 413–1760	1" BALL VALVE – KECKLEY PART # BVF1RF2RSSRGSL–100 2" BALL VALVE – KECKLEY PART # BVF1RF2RSSRGSL–200 NEMA 7 ACTUATOR – 600 IN–LBS TORQUE, 10 SECOND STROKE TIME, 0.50 LOCKED ROTOR AMPS. RCS MODEL SXR–1023

INSTRUMENTATION SCHEDULE

SYMBOL	SERVICE/FUNCTION	DESCRIPTION	MANUFACTURER/MODEL
(TT)	TEMPERATURE TRANSMITTER	RTD, 20–240°F RANGE, 4–20mA OUTPUT, 1/2" NPT PIPING CONNECTION, 6mm DIAMETER BY 2.5" LONG STEM, HIRSCHMANN ELECTRICAL CONNECTION	NOSHOK 800–20/240–1–1–8–8–025–6
(TTH)	THERMOMETER/ TEMP TRANSMITTER	DIGITAL THERMOMETER/TEMP TRANSMITTER, SOLAR POWERED, LCD DISPLAY, 1% OF READING ACCURACY, VARIABLE ANGLE DISPLAY, 3–1/2" STEM LENGTH, DUAL F/C DISPLAY, –52 TO +302 F RANGE 4–20mA OUTPUT, 1/2" ELECTRICAL CONNECTION.	WEISS MODEL DVUT35
(PTC)	COOLING SYSTEM PRESSURE TRANSMITTER	0–20 PSIG RANGE, 4–20mA OUTPUT, 1/4" NPT PIPING CONNECTION, HIRSCHMANN ELECTRICAL CONNECTION	NOSHOK PT40–20–1–1–2–7
(PTH)	HEAT RECOVERY PRESSURE TRANSMITTER	0–60 PSIG RANGE, 4–20mA OUTPUT, 1/4" NPT PIPING CONNECTION, HIRSCHMANN ELECTRICAL CONNECTION	NOSHOK PT40–60–1–1–2–7
(DP)	DIFFERENTIAL PRESSURE GAUGE/SWITCH	DIAPHRAGM TYPE, BRASS BODY, 1/4" FPT IN–LINE CONNECTIONS, 2–1/2" BASIC DIAL, HERMETICALLY SEALED SPDT SWITCH WITH TERMINAL STRIP, PRESSURE RANGES AS INDICATED ON INSTALLATION DETAILS	ORANGE RESEARCH 1516DGS–1E–2.5B–C–0–##PSID
(LCA)	GLYCOL TANK LOW COOLANT ALARM	LOW COOLANT LEVEL ALARM FLOAT SWITCH, SEE MECHANICAL FOR INSTALLATION DETAILS	MURPHY EL–150–K1
(GLS)	GLYCOL TANK LEVEL SENSOR PROBE	12" PROBE, 2" NPT TANK CONNECTION, SS FLOAT, 1/4" RESOLUTION, NEMA 4 ENCLOSURE WITH SIGNAL CONDITIONER AND 1/2" NPT CONDUIT CONNECTION	INNOVATIVE COMPONENTS CLM–2012–SS 5343A 2–WIRE TRANSMITTER
(FS)	DAY TANK/HOPPER FLOAT SWITCH	VERTICAL ACTION FLOAT SWITCH, REVERSIBLE 70VASPST NC/NO SWITCH, 1/8" NPT, 1"MAX ø BUNA–N FLOAT FOR S.G=.47, MINIMUM 60" LONG PVC COATED #20 AWG LEAD WIRES	INNOVATIVE COMPONENTS LS–12–111/2
(LS)	INTERMEDIATE TANK TWO POINT FLOAT TYPE LEVEL SWITCH	TWO POINT MAGNETIC FLOAT SWITCH – 2" ANSI 150# FLAT FACE FLANGE MOUNT, 3/4" NPT CONDUIT ENTRY, 8MM DIAMETER FIXED LENGTH STAINLESS STEEL STEM, 2 EACH 1.2" MAX. DIAMETER STAINLESS STEEL FLOATS FOR MINIMUM S.G.=0.65, 50VA FORM A CONTACTS. 20.25" STEM LENGTH. ACTUATION LENGTHS 14"(N.O.) & 19"(N.O.)	APG MODEL FLE–0A2–B3–B–A–2–E– 20.25in.–14in.NO–19in.NO

PIPE/TUBING STRUT CLAMP SCHEDULE

PIPE/TUBE	CLAMP #	PIPE/TUBE	CLAMP #
1/2" COPPER	B2026DCU	1/2" GRC/PIPE	B2008
3/4" COPPER	B2028DCU	3/4" GRC/PIPE	B2009
1" COPPER	B2030DCU	1" GRC/PIPE	B2010
		1–1/4" GRC/PIPE	B2011
		1–1/2" GRC/PIPE	B2012
		2" GRC/PIPE	B2013
		3" GRC/PIPE	B2015
4" STEEL TUBE	B2016	4" GRC/PIPE	B2017

NOTES:
1) ALL CLAMP NUMBERS ARE B–LINE. EQUIVALENT EQUALS ACCEPTABLE.
2) ALL COPPER TUBE CLAMPS TO BE COPPER PLATED. WRAP COPPER TUBE WITH VINYL PIPE WRAP TAPE FOR CATHODIC ISOLATION FROM PLATED STEEL STRUT.
3) USE RIGID STEEL PIPE CLAMPS FOR ALL STEEL PIPE AND RIGID CONDUIT.
4) SEE PLANS, ELEVATIONS, ISOMETRICS, AND DETAILS FOR ACTUAL PIPE SIZES.

EQUIPMENT REQUIREMENTS FOR APPROVED EQUALS (APPLIES TO ALL SCHEDULES): SPECIFIC PARTS MANUFACTURER AND MODEL SELECTED NOT ONLY TO MEET PERFORMANCE FUNCTION BUT ALSO TO COORDINATE AND INTERFACE WITH OTHER DEVICES AND SYSTEMS. APPROVED EQUAL SUBSTITUTIONS WILL BE ALLOWED ONLY BY ENGINEER'S APPROVAL. TO OBTAIN APPROVAL, SUBMITTALS MUST CLEARLY DEMONSTRATE HOW SUBSTITUTE ITEM MEETS OR EXCEEDS SPECIFIED ITEM QUALITY AND PERFORMANCE CHARACTERISTICS AND ALSO COMPLIES WITH MECHANICAL AND/OR ELECTRICAL CONNECTIONS AND PHYSICAL LAYOUT REQUIREMENTS.

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH MECHANICAL BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

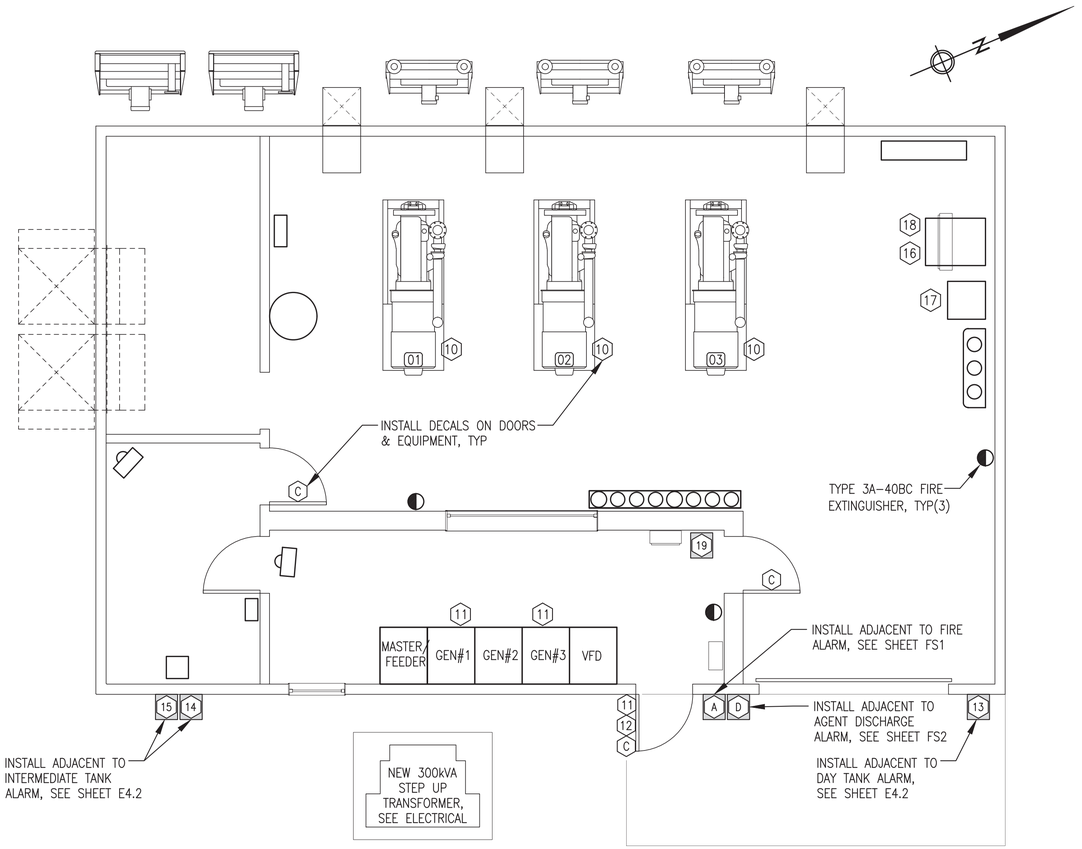
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: MECHANICAL LEGENDS & SCHEDULES

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M1–2 | SHEET: M1.1
PROJECT NUMBER:



1 M1.2 POWER PLANT WARNING SIGN & FIRE EXTINGUISHER PLAN
1/4"=1'-0"

WARNING SIGN & INFORMATIONAL PLACARD SCHEDULE:

PROVIDE DECALS AND SIGN BOARDS AS SPECIFIED BELOW IN ACCORDANCE WITH THE SCHEDULE. INSTALL WHERE SHOWN ON THE WARNING SIGN/PLACARD PLAN THIS SHEET AND OTHER REFERENCED SHEETS.

(#) DECALS — DECALS TO BE WHITE NON-REFLECTIVE VINYL BACKGROUND, 3M 3650-10, WITH 3M SERIES 225 HIGH PERFORMANCE VINYL LETTERS, ONE SIDE ONLY, SELF ADHESIVE BACK. NOMINAL 10"x14" SIZE UNLESS INDICATED OTHERWISE OR REQUIRED TO BE LARGER FOR SPECIFIED LETTER SIZE. WARNING LITES OR EQUAL. APPLY DECALS TO SMOOTH SURFACES OF DOORS, EQUIPMENT, OR ON ADJACENT WALL. ENSURE SURFACE IS CLEAN AND DRY PRIOR TO APPLICATION. USE HEAT GUN AS REQUIRED.

(#) BOARDS — SIGN BOARDS TO BE EQUAL TO DECALS EXCEPT MOUNTED ON 0.08" ALUMINUM PLATE. PROVIDE 3/16" HOLES IN ALL FOUR CORNERS. ATTACH TO CHAIN LINK FENCING WITH HOG RINGS OR STAINLESS STEEL TIES. ATTACH TO WALLS OR STRUCTURES WITH STAINLESS STEEL SCREWS OR BOLTS.

WARNING SIGNS – RED LETTERING ON WHITE BACKGROUND.

(A) "FIRE ALARM"

(C) "CAUTION, ROOM PROTECTED BY WATER MIST FIRE PROTECTION SYSTEM, IN CASE OF FIRE KEEP DOOR CLOSED AND DO NOT ENTER"

(D) "FLASHING LIGHT MEANS FIRE SUPPRESSION AGENT HAS DISCHARGED"

(1) not used

(10) "CAUTION: THIS UNIT STARTS AUTOMATICALLY, LOCK & TAG OUT PRIOR TO SERVICE"

(11) "DANGER HIGH VOLTAGE, AUTHORIZED PERSONNEL ONLY"

(12) "CAUTION HEARING & EYE PROTECTION REQUIRED"

(13) "FUEL OIL DAY TANK ALARM"

(14) "IN CASE OF SPILL CALL DEC 1-800-478-9300"

(15)(15) "INTERMEDIATE TANK ALARM"

INFORMATIONAL PLACARDS – BLACK LETTERING ON WHITE BACKGROUND.

(16) "TO MANUALLY FILL DAY TANK IN CASE OF EMERGENCY:
1) TURN OFF POWER TO THE DAY TANK CONTROL PANEL
2) MANUALLY OPEN ACTUATOR VALVE AT TANK FARM USING A WRENCH
3) OPEN NORMALLY CLOSED VALVE BY HAND PUMP
4) OPERATE HAND PUMP WHILE MONITORING LEVEL GAUGE"

(17) "TO CHANGE ENGINE OIL:
1) VERIFY ENGINE OIL HAS NOT BEEN CONTAMINATED WITH GLYCOL OR OTHER FLUIDS
2) LOCK & TAG GENERATOR OUT OF SERVICE
3) OPEN NORMALLY CLOSED DRAIN VALVE AT GEN
4) TURN ON PUMP TIMER & PUMP OUT ENGINE OIL
5) CHANGE FILTER & PLACE OLD ONE IN HOPPER
6) CLOSE DRAIN VALVE & REFILL ENGINE
7) RUN ENGINE, SHUT OFF, & CHECK DIPSTICK
8) TOP OFF & PLACE ENGINE BACK IN SERVICE"

(18)(18) "CHECK INTERMEDIATE TANK LEVEL DAILY, FILL WHEN BELOW 4'-0"

(19) "INTERMEDIATE TANK FILL PROCEDURE:
1) GO TO THE TANK FARM, SELECT THE BULK TANK TO TRANSFER FROM, VERIFY LEVEL, AND OPEN BOTTOM VALVE ON THE TANK.
2) GO TO THE INTERMEDIATE TANK FILL PANEL IN THE POWER PLANT CONTROL ROOM AND PRESS THE GREEN START BUTTON.
3) MONITOR THE LEVELS IN THE INTERMEDIATE TANK AND THE BULK TANK CONTINUOUSLY. IF THE LEVEL IN THE BULK TANK DROPS BELOW 10" SWITCH TO A DIFFERENT BULK TANK.
4) WHEN THE LEVEL IN THE INTERMEDIATE TANK REACHES 6'-8" (90%) GO TO THE INTERMEDIATE TANK FILL PANEL AND PRESS THE RED STOP BUTTON.
5) RETURN TO THE TANK FARM AND CLOSE THE BOTTOM VALVE ON THE BULK TANK.
6) CHECK THE TANK FARM AND THE INTERMEDIATE TANK FOR LEAKS. CLOSE AND LOCK GATES."

SEE SHEET M9.1 FOR LOCATION OF SIGN BOARDS 18 & 19 AT THE INTERMEDIATE TANK.

VALVE TAG SCHEDULE:

WHITE (EQUIPMENT)

(01) "GEN#1 350KW" (DECAL)
(02) "GEN#2 350KW" (DECAL)
(03) "GEN#3 350KW" (DECAL)

GREEN (DIESEL FUEL)

(21) "NORMALLY OPEN, CLOSE ONLY FOR EMERGENCIES & TEMPORARY MAINTENANCE OF DAY TANK & DEVICES"
(22) "NORMALLY CLOSED, OPEN ONLY FOR HAND PRIMING DAY TANK"
(23) "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF BLENDER"
(24) "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF ENGINE"
(25) "NORMALLY CLOSED, OPEN ONLY FOR TEMPORARY MAINTENANCE OF COOLER"
(26) "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF PUMP/METER"

BROWN (USED OIL)

(41) "NORMALLY CLOSED, OPEN ONLY FOR ENGINE OIL CHANGE"
(42) "BLENDER FILTER, PRE, 10 MICRON HYDROSORB" (DECAL)
(43) "BLENDER FILTER, FINAL, 2 MICRON PARTICULATE" (DECAL)

PINK (COOLING/ETHYLENE GLYCOL)

(51) "NORMALLY CLOSED, OPEN ONLY FOR ADDING COOLANT – ETHYLENE GLYCOL ONLY"
(52) "NORMALLY CLOSED, OPEN ONLY ON HIGH COOLANT TEMPERATURE ALARM"
(53) "NORMALLY OPEN, CLOSE ONLY ON HIGH COOLANT TEMPERATURE ALARM"
(54) "NORMALLY OPEN, HEAT RECOVERY SUPPLY"
(55) "NORMALLY OPEN, HEAT RECOVERY RETURN"

YELLOW (HEAT RECOVERY/PROPYLENE GLYCOL)

(61) "NORMALLY CLOSED, OPEN ONLY FOR ADDING FLUID – PROPYLENE GLYCOL ONLY"
(62) "NORMALLY OPEN, HEAT RECOVERY SUPPLY"
(63) "NORMALLY OPEN, HEAT RECOVERY RETURN"
(64) "NORMALLY OPEN, BOILER RETURN TO HX"
(65) "NORMALLY OPEN, HX TO BOILER"
(66) "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE"

SPECIFICATIONS:
VALVE TAGS – 3"x5"x.08" ALUMINUM, 3/16" HOLES IN ALL FOUR CORNERS, BLACK GERBER THERMAL TRANSFER FILM PRINTED LETTERS ON GERBER 220 HIGH PERFORMANCE VINYL BACKGROUND, COLOR AS INDICATED, ONE SIDE ONLY. WARNING LITES OR APPROVED EQUAL.

DECALS – WHERE NOTED AS DECALS PROVIDE WITHOUT ALUMINUM BACKING PLATE.

INSTALLATION NOTES:
1) SEE DRAWINGS THAT FOLLOW FOR LOCATIONS OF ALL SPECIFIC FUNCTION TAGS.
2) SECURE EACH METAL TAG TIGHT TO VALVE, PIPE, OR DEVICE WITH STAINLESS STEEL SAFETY WIRE THROUGH ALL FOUR CORNERS OR FASTEN TO ADJACENT WALL OR SECTION OF STRUT WITH SCREWS.
3) APPLY DECALS TO SMOOTH SURFACES OF EQUIPMENT OR ON ADJACENT WALL. ENSURE SURFACE IS CLEAN AND DRY PRIOR TO APPLICATION. USE HEAT GUN AS REQUIRED.
4) FOR ALL VALVES NOT INDICATED WITH A SPECIFIC FUNCTION TAG PROVIDE 1-1/2" ROUND BRASS TAG LABELED "N.O." FOR NORMALLY OPEN VALVES AND 1-1/2" SQUARE BRASS TAG LABELED "N.C." FOR NORMALLY CLOSED VALVES. SECURE TAGS TO VALVE OR ADJACENT PIPE WITH BEADED BRASS CHAIN.

FIRE ALARM PLACARDS A, C & D ARE INCLUDED UNDER ADDITIVE ALTERNATES 1 & 2, SEE SHEETS FS1 & FS2.

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: WARNING SIGN & FIRE EXTINGUISHER PLAN, SIGN & VALVE TAG SCHEDULES

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M1-2 | SHEET: M1.2
PROJECT NUMBER:

Final (Permanent) Demand Control Table (PLC)				
Demand Control	Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	One Gen	350	310	---
Level 2	Two Gens	700	620	280
Level 3	All	1050	---	560
Note: All generators are equal capacity. Manually select priority for each.				
Temporary Demand Control for Load Test with 300kW Load Bank				
Level 1	One Gen	150	135	---
Level 2	Two Gens	300	270	120
Level 3	All	450	---	240
Note: Temporarily set to reduced values in order to test all demand levels.				

Engine-Generator Alarm Settings (EZGN Genset Controller)			
Function	Normal Range	Alarm	Shut Down
Overspeed	1795-1805	----	1900 RPM
Oil Pressure	30-50 PSI	14.5 PSI	10 PSI
Air Filter Vacuum	1-10" H2O	15" H2O	20" H2O
Coolant Temp.	180-200°F	210°F	215°F
Exhaust Temp.	500-850°F	900°F	-----
Charge Air Temp.	100-120°F	140°F	150°F
Under Frequency	59.5-60.5 Hz	----	58.2 Hz
Over Frequency	59.5-60.5 Hz	----	61.8 Hz
Under Voltage	470-490 V	----	432 V
Over Voltage	470-490 V	----	528 V
Reverse Power	0	----	10%

Generator Breaker Settings (EZGN Genset Controller)	
Function	Setting
Gen Breaker Trip Setpoint (EZGN Rated Current)	600 A
Gen Breaker Level 1 (100%) Time Over Current	3 sec.
Gen Breaker Level 2 (120%) Time Over Current	1 sec.
Gen Breaker Level 3 (250%) Time Over Current	0.4 sec.

Feeder Breaker Settings (Feeder Protection Relay - FPR)	
Function (Note: Element 1 is the only active element)	Setting
T.O.C. Trip Pickup (amps) Note: 5A = 100% of CT rating	5.0
T.O.C. Curve Selection	U4
T.O.C. Time Dial	5.00
E.M Reset delay (Y/N)	N
Constant Time Adder (seconds)	0.00
Minimum Response Time (seconds)	0.00
Maximum Phase T.O.C. Torque Control	1

Radiator VFD Settings	
Function	Setting
Min PID Feedback	20
Max PID Feedback	240
rSL (Wake UP Threshold)	1
PID Reference Temperature	175°F
Proportional Gain	0.93
Integral Gain	0.3
Derivative	0
Minimum Speed	10 Hz.
Low Speed Timeout	10 sec.
Loss of Phase	Ignore

Charge Air Cooler VFD Settings	
Function	Setting
Min PID Feedback	20
Max PID Feedback	240
rSL (Wake UP Threshold)	Not Used
PID Reference Temperature	100°F
Proportional Gain	0.2
Integral Gain	0.1
Derivative	0

POWER PLANT GENERATION SWITCHGEAR OPERATION

THIS POWER PLANT IS DESIGNED TO OPERATE IN AUTOMATIC MODE UNDER CONTROL OF THE PROGRAMMABLE LOGIC CONTROLLER (PLC). MONITORING AND CONTROL IS PRIMARILY DONE THROUGH THE OPERATOR INTERFACE UNIT (OIU). IN AN EMERGENCY SUCH AS A FAILURE OF THE PLC IT CAN ALSO BE OPERATED IN MANUAL MODE. EACH ENGINE IS CONTROLLED BY AN INDIVIDUAL EASYGEN (EZGN) GENSET CONTROLLER LOCATED IN EACH GENERATOR SECTION. FOLLOWING ARE INSTRUCTIONS FOR OPERATING THE SYSTEM. SEE SECTION 3.1 OF THE O&M MANUAL FOR DETAILED SEQUENCES.

AUTOMATIC OPERATION BLACK START PROCEDURE:

1) TEMPORARILY SET THE "SYSTEM MODE" SWITCH ON THE MASTER SECTION TO MAN.
2) CHECK THE MASTER SECTION FOR ANY FAULTS AS INDICATED BY THE ALARM LAMPS OR BANNERS ON THE EZGN. CORRECT THE CAUSE OF THE FAULT (EMERGENCY STOP, LOW COOLANT LEVEL, FEEDER BREAKER TRIPPED, ETC.) PRESS THE ALARM RESET BUTTON ON THE MASTER SECTION AND VERIFY THAT THE ALARMS CLEAR.
3) CHECK EACH GENERATOR SECTION FOR ANY FAULTS. FOR ENGINE-GENERATOR RELATED FAULTS CORRECT THE CAUSE OF THE FAULT (LOW OIL LEVEL, HIGH TEMPERATURE, CIRCUIT BREAKER TRIPPED, ETC.). TO CLEAR ANY ALARMS PRESS "STOP" BUTTON THEN PRESS THE "HOME" BUTTON TO GET TO THE MAIN SCREEN. PRESS THE "ALARM RESET" BUTTON AND HOLD DOWN UNTIL ALL ALARMS CLEAR.
4) PLACE EACH AVAILABLE GENERATOR IN SERVICE BY PRESSING THE "AUTO" BUTTON. IF A GENERATOR IS OUT OF SERVICE FOR REPAIR, VERIFY THE STOP BUTTON IS ILLUMINATED.
5) CHANGE THE "SYSTEM MODE" SWITCH ON THE MASTER SECTION TO AUTO.
6) THE PLC WILL AUTOMATICALLY START ALL AVAILABLE GENERATORS IN AUTO AND PARALLEL THEM TO THE BUS. AS SOON AS THE BUS IS ENERGIZED THE STATION SERVICE POWER WILL TURN ON.
7) AFTER THE AVAILABLE GENERATORS ARE ON LINE, THE PLC WILL WAIT FOR A BRIEF INTERVAL (USUALLY 15 SECONDS) AND CLOSE THE FEEDER BREAKER TO ENERGIZE THE COMMUNITY. THE RED BREAKER CLOSED LAMP WILL ILLUMINATE.

AUTOMATIC DEMAND CONTROL OPERATION:

1) GENERATORS ARE CONSIDERED AVAILABLE FOR DEMAND CONTROL ONLY WHEN THEIR EZGN IS IN THE AUTO MODE AND THERE ARE NO ALARMS. THE DEMAND CONTROL SYSTEM WILL UTILIZE ALL AVAILABLE GENERATORS AS REQUIRED TO MEET THE LOAD ON THE SYSTEM.
2) ON INITIAL STARTUP THE DEMAND CONTROL IS ACTIVATED AFTER THE FEEDER BREAKER HAS BEEN CLOSED FOR APPROXIMATELY ONE MINUTE. THIS ALLOWS THE PLC TIME TO DETERMINE THE POWER DEMAND ON THE SYSTEM. THE PLC MONITORS THE LOAD ON THE SYSTEM AND COMPARES IT TO THE CONNECTED GENERATING CAPACITY.
3) THE DEMAND CONTROL PROVIDES TWO TYPES OF CONTROL FOR INCREASING LOAD – INCREASE AND OVERLOAD. THE OVERLOAD SETPOINT IS TYPICALLY THE PRIME RATING OF THE GENSET AND THE INCREASE SETPOINT IS TYPICALLY 90% OF THE OVERLOAD SETPOINT. WHEN THE LOAD EXCEEDS THE INCREASE SETPOINT FOR A PRE-SET TIME DELAY (USUALLY 20-30 SECONDS) THE DEMAND CONTROL WILL SWITCH TO THE NEXT HIGHER LEVEL OF GENERATING CAPACITY. WHEN THE LOAD EXCEEDS THE OVERLOAD SETPOINT THE DEMAND CONTROL WILL IMMEDIATELY SWITCH TO THE NEXT HIGHER LEVEL OF GENERATING CAPACITY (NO TIME DELAY).
4) THE DEMAND CONTROL PROVIDES ONE TYPE OF CONTROL FOR DECREASING LOAD. THE DECREASE SETPOINT IS TYPICALLY 80% OF THE OVERLOAD SETPOINT. WHEN THE LOAD DROPS BELOW THE DECREASE SETPOINT FOR A PRE-SET TIME DELAY (USUALLY 120 SECONDS) THE DEMAND CONTROL WILL SWITCH TO THE NEXT LOWER LEVEL OF GENERATING CAPACITY.
5) AS THE COMMUNITY ELECTRIC LOAD INCREASES, THE PLC WILL BRING AN ADDITIONAL GENERATOR ON LINE AND AS THE LOAD DECREASES THE PLC WILL TAKE THE ADDITIONAL GENERATOR OFF LINE. MULTIPLE GENERATORS CAN OPERATE IN PARALLEL TO MEET A PEAK DEMAND.
6) ALL THREE GENERATORS ARE EQUAL CAPACITY AND THEY OPERATE ACCORDING THEIR ASSIGNED PRIORITY. THE PRIORITY SYSTEM IS USED TO EQUALIZE RUNTIME OR TO RUN GENERATORS ACCORDING TO A PLANNED MAINTENANCE SCHEDULE. ON THE SWITCHGEAR OPERATOR INTERFACE UNIT (OIU) UNDER THE DEMAND TAB SELECT CHANGE PRIORITY. THE SET PRIORITY WINDOW WILL OPEN. USE THE UP AND DOWN ARROWS TO SET PRIORITY 1-2-3 FOR EACH ENGINE THEN PRESS SET PRIORITY TO SAVE. NOTE THAT IF THE PRIORITY 1 (LEAD) GENERATOR IS NOT AVAILABLE THE DEMAND CONTROL WILL GO TO THE NEXT PRIORITY GENERATOR.
7) SEE THE DEMAND CONTROL TABLE THIS SHEET FOR DEMAND LEVEL SETPOINTS AT THE TIME OF COMMISSIONING. ON THE SCADA SYSTEM GO TO THE DEMAND TAB TO VERIFY THE PRESENT SETPOINTS.

MANUAL OPERATION BLACK START PROCEDURE:

1) PLACE THE MASTER CONTROL "SYSTEM MODE" SWITCH IN THE MANUAL POSITION.
2) CHECK THE MASTER AND GENERATOR SECTIONS FOR ANY FAULTS AND CLEAR AS DESCRIBED UNDER AUTOMATIC OPERATION STEPS 2 AND 3.
3) TO PLACE A GENERATOR IN SERVICE, PRESS THE EZGN MAN BUTTON, THEN PRESS THE "I" (START) BUTTON. AFTER THE ENGINE STARTS AND STABILIZES, PRESS THE CONTACTOR CLOSE BUTTON ON THE EZGN. THE RED BREAKER CLOSED LAMP WILL ILLUMINATE.
4) REPEAT THIS PROCESS FOR AT LEAST ONE MORE GENERATOR.
5) WITH TWO GENERATORS ON LINE ROTATE THE FEEDER BREAKER CONTROL KNOB FOR THE MAIN FEEDER BREAKER TO THE CLOSE POSITION TO ENERGIZE THE COMMUNITY. MONITOR THE LOAD ON THE SYSTEM FOR ONE MINUTE THEN SELECT THE APPROPRIATE GENERATOR(S) TO MATCH THE LOAD.
6) TAKE ANY GENERATOR(S) NOT NEEDED OFF LINE BY PRESSING THE RED EZGN STOP BUTTON. THE ENGINE WILL COOL DOWN FOR THREE MINUTES THEN SHUT OFF. NOTE THAT PRESSING THE RED STOP BUTTON TWICE WILL IMMEDIATELY SHUT DOWN THE GENERATOR.
7) TO MANUALLY ADD A SECOND GENERATOR TO MEET AN INCREASING LOAD, REPEAT STEP 3. TO MANUALLY REMOVE A SECOND GENERATOR TO MEET A DECREASING LOAD, REPEAT STEP 6.

SERVICE DUE / OIL CHANGE PROCEDURE:

THE FOLLOWING TASKS NEED TO BE PERFORMED ON EACH ENGINE AFTER EVERY 250 HOURS OF RUN TIME. IF THE REQUIRED MAINTENANCE CANNOT BE PERFORMED AT THE SCHEDULED TIME, TAKE THE ENGINE OUT OF SERVICE UNTIL ALL WORK HAS BEEN COMPLETED.

NOTE THAT UNDER AUTOMATIC OPERATION, WHENEVER THE SERVICE TIME HAS BEEN EXCEEDED THE GENERATOR WILL AUTOMATICALLY BE TAKEN OFF LINE (AS LONG AS ANOTHER GENERATOR IS AVAILABLE IN AUTO), A SERVICE ENGINE MESSAGE WILL DISPLAY, AND THE RED "ENGINE ALARM" LAMP WILL ILLUMINATE.

1) IF THE SWITCHGEAR IS IN MANUAL MODE, PERFORM MANUAL OPERATION STEP 3 TO PLACE ANOTHER GENERATOR ON LINE IN MAN MODE. PERFORM MANUAL OPERATION STEP 6 ON THE GENERATOR TO BE SERVICED TO TAKE IT OFF LINE THEN CONTINUE AT STEP 3 BELOW (LOCK OUT).
2) IF THE SWITCHGEAR IS IN AUTOMATIC MODE, PRESS THE EZGN MAN BUTTON ON THE GENERATOR TO BE SERVICED. THE PLC WILL START ANOTHER GENERATOR. ONCE THE OTHER GENERATOR IS ON LINE, PRESS THE EZGN STOP BUTTON ON THE GENERATOR TO BE SERVICED. NOTE THAT IF THE STOP BUTTON IS PRESSED BEFORE ANOTHER UNIT IS ONLINE, AN OUTAGE WILL OCCUR.
3) LOCK THE UNIT OUT USING THE KEY SWITCH AND TAG OUT OF SERVICE.
4) SERVICE ENGINE (OIL CHANGE, FUEL FILTER, AIR FILTER, ETC.).
5) REMOVE TAG AND TURN THE GENERATOR LOCKOUT SWITCH TO RUN.
6) PRESS THE SERVICE HOURS RESET BUTTON AND HOLD DOWN UNTIL IT RESETS TO 250 HOURS. PRESS THE "HOME" BUTTON TO RETURN TO THE MAIN SCREEN.
7) PRESS THE ALARM RESET BUTTON AND HOLD DOWN UNTIL ALL ALARMS CLEAR.
8) START THE ENGINE BY PRESSING THE MAN BUTTON AND THEN "I" (START) BUTTON.
   a) AFTER THE ENGINE COMES UP TO SPEED VERIFY THAT THE ENGINE OIL PRESSURE IS IN THE NORMAL RANGE.
   b) CHECK THE OIL FILTER FOR LEAKS.
9) AFTER THE ENGINE RUNS FOR ONE MINUTE PRESS THE STOP BUTTON.
10) CHECK THE OIL LEVEL USING THE DIPSTICK AND ADD OIL AS REQUIRED.
11) PLACE THE GENERATOR BACK IN SERVICE BY PRESSING THE AUTO BUTTON ON THE EZGN.

NOTE: AT EACH OIL CHANGE THE PRIORITY SELECTION TO THE NEXT UNIT TO DISTRIBUTE THE RUN TIME EQUALLY.

ENGINE-GENERATOR PROTECTION ALARMS:

SEE THE TABLES THIS SHEET FOR ALARM LEVEL SETPOINTS AND BREAKER TRIP SETTINGS AT THE TIME OF COMMISSIONING. SEE SECTION 3.1 OF THE O&M MANUAL FOR DETAILED DESCRIPTIONS OF WARNING ALARM AND PROTECTION SEQUENCES.

FUEL/OIL SYSTEM

AUTOMATIC DAY TANK FILL – THE DAY TANK IS FILLED FROM THE INTERMEDATE TANK. IT HAS AUTOMATIC FILL CONTROLS WITH REDUNDANT HIGH AND LOW LEVEL ALARMS AND TIMERS. SEE FUEL SYSTEM CONTROL PANEL DRAWING SHEET E7.3 FOR DETAILED SEQUENCE OF OPERATION.

MANUAL USED ENGINE OIL DRAIN – USED OIL PUMP P-U01 IS USED TO PUMP USED ENGINE OIL FROM THE ENGINE OIL PANS TO THE USED OIL HOPPER. P-U01 RUNS THROUGH A MANUAL 0-5 MINUTE TIMER SWITCH.

AUTOMATIC USED ENGINE OIL BLENDING SYSTEM – THE USED ENGINE OIL BLENDING SYSTEM FILTERS USED OIL AND MIXES IT WITH DIESEL FUEL IN THE DAY TANK TO BE BURNED BY THE ENGINES. THE PUMPING RATES ARE SET TO BLEND APPROXIMATELY 0.5% USED OIL TO 99.5% DIESEL FUEL. NOTE THAT WHEN THERE IS NO USED OIL IN THE HOPPER THE DIESEL PUMP STILL RUNS TO USE THE BLENDER AS A FUEL "POLISHING" FILTER. SEE FUEL SYSTEM CONTROL PANEL DRAWINGS FOR DETAILED SEQUENCE OF OPERATION.

MANUAL INTERMEDIATE TANK FILL – THE INTERMEDIATE TANK IS LOCATED ADJACENT TO THE POWER PLANT. IT NEEDS TO BE CHECKED DAILY AND FILLED WHENEVER IT DROPS BELOW THE 50% FULL LEVEL (4'-0").

1) GO TO THE TANK FARM, SELECT THE BULK TANK TO TRANSFER FROM, VERIFY LEVEL, AND OPEN BOTTOM VALVE ON THE TANK.
2) GO TO THE INTERMEDIATE TANK FILL PANEL IN THE POWER PLANT CONTROL ROOM AND PRESS THE GREEN START BUTTON.
3) MONITOR THE LEVELS IN THE INTERMEDIATE TANK AND THE BULK TANK CONTINUOUSLY. IF THE LEVEL IN THE BULK TANK DROPS BELOW 10" SWITCH TO A DIFFERENT BULK TANK.
4) WHEN THE LEVEL IN THE INTERMEDIATE TANK REACHES 6'-8" (90%) GO TO THE INTERMEDIATE TANK FILL PANEL AND PRESS THE RED STOP BUTTON.
5) RETURN TO THE TANK FARM AND CLOSE THE BOTTOM VALVE ON THE BULK TANK.
6) CHECK THE TANK FARM AND THE INTERMEDIATE TANK FOR LEAKS. CLOSE AND LOCK GATES

ENGINE COOLING SYSTEM

CHARGE AIR COOLERS (CAC) – CAC FANS WILL OPERATE CONTINUOUSLY ANY TIME THE ASSOCIATED ENGINE RUNS AND STOP WHEN THE ENGINE STOPS. VARIABLE FREQUENCY DRIVES WILL OPERATE AT FULL SPEED FOR 30 SECONDS UPON STARTUP AND THEN WILL MODULATE FAN SPEED TO MAINTAIN ENGINE INTAKE MANIFOLD AIR TEMPERATURE OPERATING SETPOINT. SEE THE CAC VFD SETTINGS TABLE THIS SHEET FOR SETPOINTS AT THE TIME OF COMMISSIONING.

RADIATORS – RADIATOR FAN MOTORS WILL OPERATE UNDER VARIABLE FREQUENCY DRIVE (VFD) CONTROL. WHEN THE COOLANT RETURN TEMP REACHES THE PID REFERENCE SETPOINT THE MOTOR WILL START AT MINIMUM SPEED AND RAMP UP TO THE REQUIRED SPEED. USING PID CONTROL, THE VFD WILL MODULATE THE FAN SPEED AS REQUIRED TO MAINTAIN COOLANT RETURN TEMP AT THE PID REFERENCE SETPOINT. AS THE COOLANT RETURN TEMP RISES, THE VFD WILL INCREASE THE SPEED OF THE FAN MOTOR UP TO 100%. ONCE THE FAN REACHES THE MINIMUM SPEED, THE VFD WILL MAINTAIN THAT SPEED UNTIL THE LOW SPEED TIME OUT EXPIRES. WHEN THE LOW SPEED TIME OUT EXPIRES THE MOTOR WILL STOP. THE MOTOR WILL REMAIN OFF UNTIL THE COOLANT RETURN TEMP RISES TO THE PID REFERENCE SETPOINT. SEE THE RADIATOR VFD SETTINGS TABLE THIS SHEET FOR SETPOINTS AT THE TIME OF COMMISSIONING.

THERMOSTATIC VALVE TV-1 WILL MIX HOT COOLANT FROM THE ENGINE DISCHARGE PIPE WITH COLD COOLANT FROM THE RADIATOR RETURN PIPE TO MAINTAIN 175°F +/- TEMPERATURE COOLANT RETURN TO THE ENGINES.

ENGINE COOLANT RETURN HIGH TEMPERATURE ALARM. WHEN THE ENGINE COOLANT RETURN TEMPERATURE RISES ABOVE 190°F FOR A MINIMUM OF 2 MINUTES, THE "HIGH COOLANT RETURN TEMPERATURE" LAMP SHALL ILLUMINATE. LAMP SHALL REMAIN ON UNTIL MASTER RESET BUTTON IS PRESSED.

POWER PLANT HEATING AND VENTILATION SYSTEM

GENERATION ROOM – THE OPERATING AND OFF LINE GENERATORS REJECT MORE HEAT TO THE GENERATION ROOM THAN IS REQUIRED SO EXHAUST FANS WITH INTAKE AIR DUCTS ARE INSTALLED TO PROVIDE COOLING.

GENERATION ROOM VENTILATION – THERE ARE TWO AIR INTAKES IN THE NEW PARTS ROOM WHICH IS OPEN TO THE GENERATION ROOM. ONE OF THE AIR INTAKES IS USED FOR COMBUSTION AIR AND THE DAMPER IS OPEN ANY TIME THE STATION SERVICE POWER IS ON. THE OTHER AIR INTAKE IS USED FOR COOLING VENTILATION. THE VENTILATION DAMPER IS CONTROLLED BY A LINE VOLTAGE THERMOSTAT AND OPENS WHENEVER THE GENERATION ROOM TEMPERATURE IS ABOVE 70F, ADJUSTABLE.

EXHAUST FANS – THERE ARE THREE EXHAUST FANS ON THE WALL ABOVE THE FRONT OF THE GENERATORS, EF-1, EF-2, AND EF-3. EACH FAN IS EQUIPPED WITH A MOTORIZED DAMPER THAT OPENS WHENEVER THE FAN RUNS ON A CALL FOR COOLING THROUGH A 24VAC DIGITAL MODULATING THERMOSTAT. THE THERMOSTAT WILL PROVIDE A 0-10V SIGNAL TO MODULATE THE FAN SPEED AS REQUIRED TO MAINTAIN GENERATING ROOM TEMP, TYPICALLY SET TO 80F.

MOTOR OPERATED DAMPERS – ALL DAMPER MOTORS ARE NORMALLY CLOSED SPRING RETURN AND WILL CLOSE ON LOSS OF POWER (FIRE ALARM) IN LESS THAN 30 SECONDS.

CONTROL ROOM VENTILATION – COOLING AND VENTILATION FOR THE CONTROL ROOM IS PROVIDED BY AN OPERABLE WINDOW.

CONTROL AND PARTS ROOMS HEATING – THE CONTROL ROOM AND ADJACENT PARTS ROOM ARE HEATED BY UNIT HEATERS. ON A CALL FOR HEAT THE LINE VOLTAGE THERMOSTAT TURNS ON THE UNIT HEATER FAN AND ASSOCIATED PUMP AS REQUIRED TO MAINTAIN ROOM TEMP, TYPICALLY SET TO 65F.

RADIATOR ROOM HEATING – VENT FAN VF-1 RUNS CONTINUOUSLY TO CIRCULATE WARM AIR FROM THE GENERATION ROOM THROUGH THE RADIATOR ROOM.

HEAT RECOVERY SYSTEM

THE POWER PLANT HEAT EXCHANGER (HX-1), THE PRIMARY (HOT SIDE) ENGINE COOLANT CIRCULATING PUMP (P-HR1A), AND THE SECONDARY (COLD SIDE) HEAT RECOVERY FLUID MAIN CIRCULATING PUMP (P-HR1B) ARE LOCATED IN THE POWER PLANT. BOTH PUMPS OPERATE CONTINUOUSLY UNDER MANUAL CONTROL.

PEX ARCTIC PIPE TEMPERING SYSTEM – THE HEAT RECOVERY ARCTIC PIPE IS PEX (PLASTIC) PIPE WHICH HAS A LIMITED LIFE AT ELEVATED TEMPERATURES. THE HEAT RECOVERY SUPPLY TEMPERATURE IS TEMPERED BY A THREE-WAY THERMOSTATIC VALVE "TV-2" THAT IS INSTALLED BETWEEN THE HEAT EXCHANGER AND THE ARCTIC PIPE. THE VALVE MIXES COLD RETURN FLUID WITH HOT FLUID FROM THE HEAT EXCHANGER TO LIMIT THE SUPPLY TEMPERATURE TO APPROXIMATELY 185F.

HEAT RECOVERY LOSS OF PRESSURE – WHEN THE SYSTEM PRESSURE IN THE HEAT RECOVERY PIPING DROPS BELOW 15 PSIG FOR 15 MINUTES, A RED LAMP "HEAT RECOVERY LOSS OF PRESSURE" LOCATED IN THE SWITCHGEAR MASTER SECTION WILL ILLUMINATE.

NO LOAD ON HEAT RECOVERY SYSTEM – WHEN THE HEAT RECOVERY RETURN TEMP. IS EQUAL TO OR GREATER THAN THE HEAT RECOVERY SUPPLY TEMP. FOR 60 MINUTES, AN AMBER LAMP "NO LOAD ON HEAT RECOVERY" LOCATED IN THE SWITCHGEAR MASTER SECTION WILL ILLUMINATE. WHEN THE HEAT RECOVERY SUPPLY TEMP. IS A MIN. OF 1°F GREATER THAN THE HEAT RECOVERY RETURN TEMP. THE LAMP WILL TURN OFF.

HEAT RECOVERY LOSS OF FLOW – WHEN THE FLOW RATE IN THE HEAT RECOVERY PIPING FALLS BELOW 10 GPM FOR 15 MINUTES, A RED LAMP "HEAT RECOVERY LOSS OF FLOW" LOCATED IN THE SWITCHGEAR MASTER SECTION WILL ILLUMINATE.

THE HEAT RECOVERY SYSTEM PROVIDES INTERRUPTIBLE HEAT TO ADJACENT BUILDING(S) IN THE COMMUNITY AS SHOWN ON SHEET M8.1.

WHERE A HEAT EXCHANGER IS USED TO CONNECT TO A BUILDING BOILER SYSTEM (VPSO, CLINIC), THE HEAT RECOVERY SYSTEM PRE-HEATS THE BOILER RETURN. WHEN AVAILABLE RECOVERED HEAT EQUALS OR EXCEEDS BUILDING HEAT DEMAND, THE BOILERS WILL NOT FIRE. AS HEAT LOAD INCREASES THE BUILDING HEATING GLYCOL TEMPERATURE WILL DROP UNTIL BOILERS FIRE. BOILERS MUST BE SET AT 160F-180F OPERATING TEMPERATURE. A HEAT RECOVERY PANEL PREVENTS THE BUILDING HEATING SYSTEM FROM BACKFEEDING INTO THE HEAT RECOVERY SYSTEM OR FROM DEPRESSING THE HEAT RECOVERY LOOP TEMPERATURE. SEE SHEET E8.1 FOR DETAILED SEQUENCE OF OPERATIONS.

WHERE A UNIT HEATER IS USED FOR HEATING (SHOP), THE HEAT RECOVERY FLUID CIRCULATES CONTINUOUSLY THROUGH THE UNIT HEATER COIL. ON A CALL FOR HEAT THE LINE VOLTAGE THERMOSTAT TURNS ON THE UNIT HEATER FAN AS REQUIRED TO MAINTAIN ROOM TEMP, TYPICALLY SET TO 65F.

SYSTEM STARTUP

FUEL OIL PUMPS – PRIOR TO STARTING FUEL AND OIL PUMPS PRIME CAVITIES WITH LUBE OIL AND RUN MOMENTARILY TO VERIFY CORRECT ROTATION AND TO CONFIRM INLET AND OUTLET CONNECTIONS.

FUEL OIL PIPING – AFTER PRESSURE TESTING, FILL ALL FILTER BODIES, PRIME ALL PIPING, AND BLEED OFF AIR.

VERIFY OPERATION OF ALL FUEL SYSTEM CONTROLS IN ACCORDANCE WITH SEQUENCES OF OPERATION ON THE CONTROL PANEL DRAWINGS.

ENGINE COOLANT PIPING – AFTER PRESSURE TESTING, FLUSHING, AND BLEEDING, FILL SYSTEM WITH ETHYLENE GLYCOL SOLUTION. SEE HYDRONIC PIPING SPECIFICATION 23 21 13.

HEAT RECOVERY PIPING – AFTER PRESSURE TESTING FILL SYSTEM WITH PROPYLENE GLYCOL SOLUTION. SEE HYDRONIC PIPING SPECIFICATION 23 21 13.

VERIFY OPERATION OF ENGINE COOLANT SYSTEM AND HEAT RECOVERY SYSTEM THERMOSTATIC VALVES.

VERIFY PROPER OPERATION OF THERMOMETERS, PRESSURE GAUGES, AND ELECTRIAL INSTRUMENTATION DEVICES. SET SWITCHES ON DIFFERENTIAL PRESSURE GAUGES TO SETPOINTS INDICATED. CALIBRATE THERMOMETERS AND ALL ELECTRICAL INSTRUMENTATION DEVICES INCLUDING TEMPERATURE TRANSMITTERS, PRESSURE TRANSMITTERS, DIFFERENTIAL PRESSURE SWITCHES, LEVEL SENSORS, ETC. VERIFY CALIBRATION OF HEAT RECOVERY FLOW RATE READING FROM PUMP. VERIFY HEAT RECOVERY ENERGY CALCULATIONS ON SCADA. SEE INSTRUMENTATION AND CONTROL DEVICES SPECIFICATION 23 09 00.

CLEAN ALL PIPING STRAINERS AFTER FIRST 48 HOURS OR MORE OF OPERATION. MONITOR SYSTEM OPERATION FOR ONE WEEK MINIMUM BEFORE LEAVING SITE. CHANGE GLYCOL FILTER ELEMENTS ON ENGINES AT TIME OF FIRST OIL CHANGE ON EACH ENGINE.

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CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: SYSTEM START UP & SEQUENCE OF OPERATIONS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M1-2 | SHEET: M1.3
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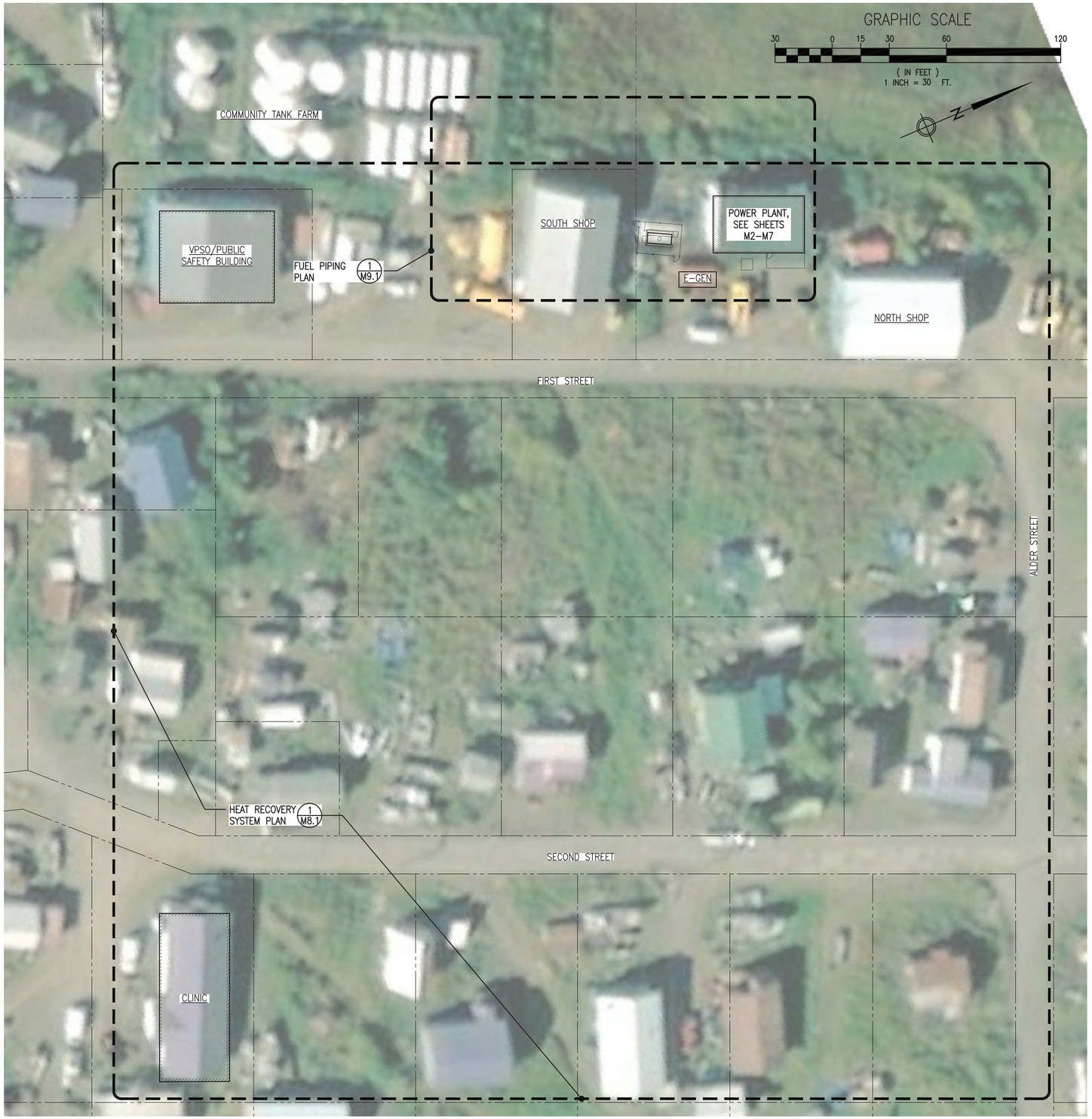

PROJECT OVERVIEW:

1) THE EXISTING POWER PLANT EQUIPMENT HAS REACHED THE END OF ITS USEFUL LIFE AND THIS UPGRADE PROJECT INVOLVES A COMPLETE RENOVATION OF THE PLANT. THE PROJECT INCLUDES BASE BID AND ADDITIVE ALTERNATIVE TASKS. SEE SPECIFICATIONS SECTION 01 11 13 SUMMARY OF WORK FOR DELINEATION OF BASE BID AND ADDITIVE ALTERNATE TASKS.

2) ELECTRICAL UPGRADES INCLUDE BUT ARE NOT LIMITED TO NEW DIESEL–ELECTRIC GENERATORS, MAJOR SWITCHGEAR RENOVATION, NEW POWER AND CONTROL WIRING, NEW CONTROL PANELS, AND MISCELLANEOUS UPGRADES TO THE PLANT STATION SERVICE ELECTRICAL SYSTEM. MECHANICAL UPGRADES INCLUDE BUT ARE NOT LIMITED TO NEW ENGINE EXHAUST SYSTEMS, NEW CHARGE AIR COOLERS, NEW GLYCOL COOLING SYSTEM, NEW HEAT RECOVERY SYSTEM, NEW FUEL OIL DAY TANK AND FUEL COOLER, RENOVATED USED OIL BLENDING SYSTEM, NEW FUEL AND OIL PIPING, AND MISCELLANEOUS MECHANICAL UPGRADES.

3) THE EXISTING POWER PLANT BUILDING IS CONSTRUCTED FROM PRE–ENGINEERED STRUCTURAL INSULATED WALL PANELS (SIP's), WOODEN TRUSSES, METAL ROOFING/SIDING, AND FRP INTERIOR WAINSCOT WITH A SLAB–ON–GRADE FOUNDATION. THE BUILDING HAS BEEN INSPECTED AND HAS BEEN DEEMED TO BE IN GENERALLY SOUND CONDITION. IN ORDER TO INCORPORATE REQUIRED NEW MECHANICAL SUPPORTS AND OPENINGS THE PROJECT INCLUDES MAJOR STRUCTURAL MODIFICATIONS TO THE BUILDING WEST (BACK) WALL AFTER REMOVAL OF ALL EXISTING MECHANICAL AND ELECTRICAL COMPONENTS. SEE POWER PLANT DEMOLITION PLAN SHEET M2.1 AND STRUCTURAL DRAWINGS FOR WEST WALL FRAMING DEMOLITION AND NEW FRAMING WORK.

4) THE BUILDING ALSO REQUIRES MINOR MODIFICATIONS FOR PLANT RENOVATIONS AND TO MEET EGRESS REQUIREMENTS. SEE SHEETS M2.2, M2.3, AND STRUCTURAL.

5) THE EXISTING INTERMEDIATE FUEL STORAGE TANK WILL REMAIN IN SERVICE. THE PROJECT INCLUDES RENOVATION OF THE TANK WITH NEW PIPING, PUMPS, CONTROLS, AND APPURTENANCES.

6) THE EXISTING HEAT RECOVERY SYSTEM SERVES THREE END USER BUILDINGS: THE NORTH SHOP, THE SOUTH SHOP, AND THE VPSO/PUBLIC SAFETY BUILDING. ALL EXISTING EXTERIOR ABOVE GRADE STEEL ARCTIC PIPE THAT SERVES THE THREE EXISTING END USER BUILDINGS WILL REMAIN WITH NO MODIFICATIONS, AS WILL THE NORTH AND SOUTH SHOP INTERIOR HEAT RECOVERY INSTALLATIONS. THE PROJECT SCOPE INCLUDES MODIFICATIONS TO THE VPSO/PUBLIC SAFETY BUILDING EXISTING BOILER ROOM PIPING AND A POTENTIAL NEW HEAT RECOVERY LOOP TO THE EXISTING CLINIC BUILDING.

TEMPORARY GENERATION NOTES:

1) THIS POWER PLANT PROVIDES PRIME POWER TO THE COMMUNITY OF MANOKOTAK. THE UPGRADE PROJECT REQUIRES SUBSTANTIAL MODIFICATIONS TO THE POWER PLANT WHICH WILL RENDER IT UNAVAILABLE FOR PROVIDING COMMUNITY POWER DURING A LARGE PORTION OF THE WORK.

2) AN EXISTING 450kW EMERGENCY STANDBY GENERATOR (E–GEN) HAS BEEN INSTALLED IN A CONNEX ADJACENT TO THE POWER PLANT. THE CONTRACTOR SHALL CONNECT THE E–GEN TO THE ELECTRICAL DISTRIBUTION SYSTEM AS INDICATED ON SHEET E1.3.

3) THE UTILITY WILL OPERATE THE STANDBY GENERATOR TO PROVIDE POWER TO THE COMMUNITY DURING MAJOR RENOVATION OF THE POWER PLANT. THE CONTRACTOR SHALL DEVELOP A SCHEDULE AND WORK PLAN TO LIMIT THE TIME NEEDED TO BE ON STANDBY POWER TO NO MORE THAN THREE CALENDAR MONTHS. THE SCHEDULE MUST BE APPROVED BY THE AUTHORITY AND THE UTILITY PRIOR TO BEGINNING WORK. WRITTEN NOTICE SHALL BE PROVIDED TO THE AUTHORITY AND THE UTILITY OF ANY EVENTS THAT MAY POTENTIALLY ALTER THE APPROVED SCHEDULE.

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STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

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PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: OVERALL MECHANICAL AREA PLAN

Gray Stassel Engineering, Inc.
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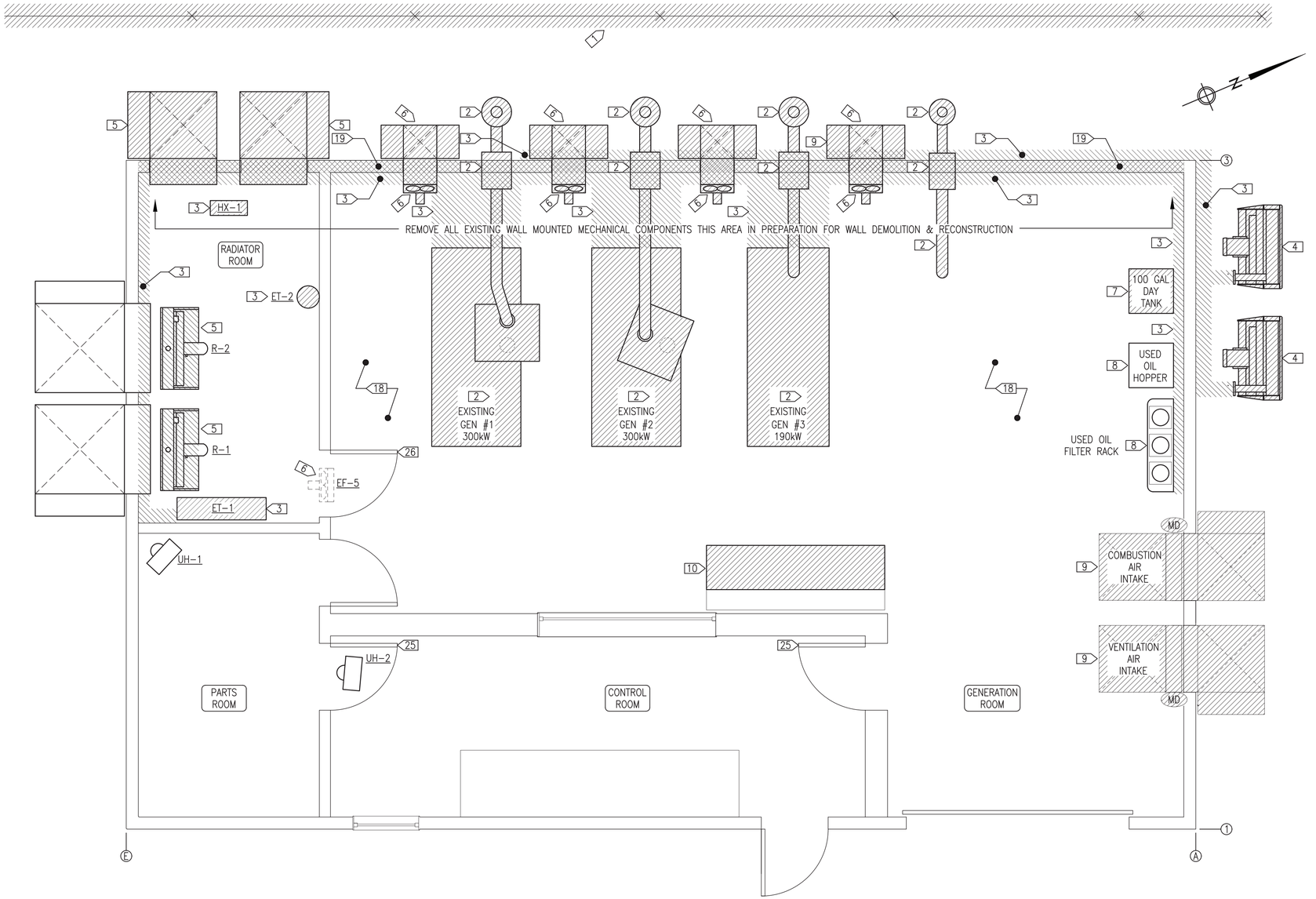

1 M2.1 MECHANICAL DEMOLITION PLAN

3/8"=1'

POWER PLANT MECHANICAL DEMOLITION GENERAL NOTES:

1. THIS PLANT PROVIDES PRIME POWER TO THE COMMUNITY OF MANOKOTAK. KEEP UNPLANNED OUTAGES TO A MINIMUM AND COORDINATE ALL REQUIRED OUTAGES WITH THE UTILITY. SEE STANDBY POWER GENERATION NOTES SHEET M1.4
2. THE BACK (WEST) WALL WILL BE SUBSTANTIALLY MODIFIED IN ORDER TO ACCOMMODATE RELOCATED MECHANICAL OPENINGS AND SUPPORTS. THE INTENT IS TO REMOVE ALL EXISTING INTERIOR AND EXTERIOR EQUIPMENT, MUFFLERS, PIPING, TUBING, AND ELECTRICAL FROM THE WALL PRIOR TO MODIFYING THE STRUCTURE UNLESS SPECIFICALLY INDICATED OTHERWISE. SEE SPECIFIC NOTE 19.
3. ONLY GENERAL DEMOLITION TASKS AND AREAS SHOWN THIS SHEET. REMOVAL OF SMALL MECHANICAL COMPONENTS AS REQUIRED FOR MISCELLANEOUS UPGRADES SHOWN WITH NEW WORK PLANS OR ON DETAILS.
4. ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR DEMOLITION OR SALVAGING FOR RELOCATION. EXISTING EQUIPMENT AND DEVICES TO BE REMOVED INDICATED BY HATCHING. SEE SPECIFIC NOTES FOR FINAL DISPOSITION OF EXISTING EQUIPMENT TO BE REMOVED WHETHER IT BE DEMOLITION FOR PERMANENT REMOVAL FROM PLANT OR SALVAGING FOR FUTURE REINSTALLATION IN NEW LOCATION.
5. TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGE TO GENERATION EQUIPMENT BEING REMOVED DURING DEMOLITION. TARP GENERATORS AND SEAL ALL EXPOSED CONNECTIONS WEATHER TIGHT PRIOR TO REMOVING FROM PLANT. TURN ALL REMOVED EQUIPMENT OVER TO THE UTILITY FOR FINAL DISPOSITION.
6. DRAIN ALL PIPING PRIOR TO DEMOLITION. DRAIN ENGINE BLOCKS PRIOR TO REMOVAL. TURN USED OIL AND GLYCOL OVER TO THE UTILITY FOR FINAL DISPOSITION.

POWER PLANT MECHANICAL DEMOLITION SPECIFIC NOTES:

1. DEMOLISH EXISTING CHAIN LINK FENCE TO PROVIDE EQUIPMENT ACCESS TO EXTERIOR BACK WALL.
2. DEMOLISH ALL EXISTING GENSETS AND ACCESSORIES IN THEIR ENTIRETY INCLUDING ENGINES, GENERATORS, SKIDS, SUPPORT PEDESTALS, VIBRATION ISOLATORS, PARTICULATE FILTERS, INTERIOR EXHAUST PIPING, EXTERIOR EXHAUST PIPING AND MUFFLERS, WALL BRACKETS/STRUT RACKS, WALL THIMBLES, PIPING CONNECTIONS, HOSES, STRUT RACKS, ETC. SEE ELECTRICAL FOR ADDITIONAL DEMOLITION. TURN OVER TO UTILITY FOR FINAL DISPOSITION.
3. REMOVE ALL MECHANICAL ITEMS THIS AREA INCLUDING ALL ENGINE PIPING FOR COOLANT, AFTER-COOLER, HEAT RECOVERY, FUEL, OIL, AND CRANKVENT SYSTEM, ALL TUBING, HOSES, VALVES, EXPANSION TANKS, APPURTENANCES, HEAT EXCHANGERS, PUMPS, HAND PUMPS, AND EQUIPMENT EXCEPT EXTERIOR HEAT RECOVERY ARCTIC PIPE AND FUEL TRANSFER PIPING TO REMAIN.
4. CAREFULLY SALVAGE TWO EACH EXISTING HYDRONIC AFTER-COOLERS AND SAVE FOR REINSTALLATION AS NEW RADIATORS. DEMOLISH SUPPORT PAD AND ALL PIPING CONNECTIONS.
5. DEMOLISH EXISTING RADIATORS R-1 AND R-2 INCLUDING PIPING, DAMPERS, AND FABRIC FLEX DUCTS. EXISTING EXTERIOR HOODS INCLUDING DUCT THROUGH WALL TO REMAIN FOR USE AS INTAKE HOODS. DEMOLISH RADIATOR SUPPLY AIR HOODS AND DAMPERS IN THEIR ENTIRETY.
6. DEMOLISH FOUR EACH GENERATOR ROOM EXHAUST FANS INCLUDING WALL DUCTS AND EXTERIOR HOODS. DEMOLISH RADIATOR ROOM EXHAUST FAN EF-5 BUT LEAVE DUCT THROUGH WALL IN PLACE.
7. DEMOLISH EXISTING 100 GALLON DAY TANK, HOSES, APPURTENANCES, PUMPS AND EQUIPMENT.
8. EXISTING USED OIL HOPPER AND USED OIL FILTER BANK TO REMAIN FOR REUSE. DEMOLISH ALL ASSOCIATED PUMPS, HOSES, INSTRUMENTATION, PRV's, PIPING, VALVES, AND APPURTENANCES FOR REPLACEMENT WITH NEW.
9. DEMOLISH EXISTING AIR INTAKE HOODS, DAMPERS, AND INTERIOR DIVERTER DUCTS.
10. REMOVE EXISTING PARTS BIN AND TURN OVER TO UTILITY.
11. SEE MECHANICAL NEW WORK.
12. SEE ELECTRICAL.
13. SEE ELECTRICAL.
14. SEE ELECTRICAL.
15. SEE ELECTRICAL.
16. SEE ELECTRICAL.
17. SEE ELECTRICAL.
18. THE POWER PLANT GENERATION ROOM WALLS AND CEILING ARE STAINED WITH SOOT AND OILY FILM CREATING A POTENTIAL FIRE HAZARD. AFTER DEMOLITION OF ALL WALL AND CEILING MOUNTED ITEMS AS INDICATED ON THE MECHANICAL AND ELECTRICAL DEMOLITION PLANS, THOROUGHLY CLEAN THE GENERATOR ROOM WALLS AND CEILING. COVER AND SEAL ALL REMAINING ELECTRICAL DEVICES AND EQUIPMENT WATER TIGHT. SOAK WALL AND CEILING WITH INDUSTRIAL DE-GREASER, AND PRESSURE WASH WITH HOT WATER AND DETERGENT. VACUUM UP ALL OILY WATER AND DEBRIS FROM POWER PLANT FLOOR AND PLACE OIL CONTAMINATED WASTE WATER IN DRUMS FOR DISPOSAL. PRESSURE WASH THE ENTIRE POWER PLANT FLOOR WITH HOT WATER AND DETERGENT.
19. SEE STRUCTURAL FOR BACK WALL DEMOLITION.
20. SEE ELECTRICAL.
21. SEE ELECTRICAL.
22. SEE ELECTRICAL.
23. SEE ELECTRICAL.
24. SEE ELECTRICAL.
25. REMOVE, ROTATE AND REINSTALL EXISTING DOOR AND FRAME TO MEET NEC EGRESS REQUIREMENTS. SEE SHEET M2.2.
26. REMOVE DOOR LEAF TO PROVIDE INTAKE AIR OPENING. LEAVE FRAME IN PLACE. SEE SHEET M2.2.

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BRIAN C. GRAY
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TITLE: MECHANICAL DEMOLITION PLAN

Gray Stassel Engineering, Inc.
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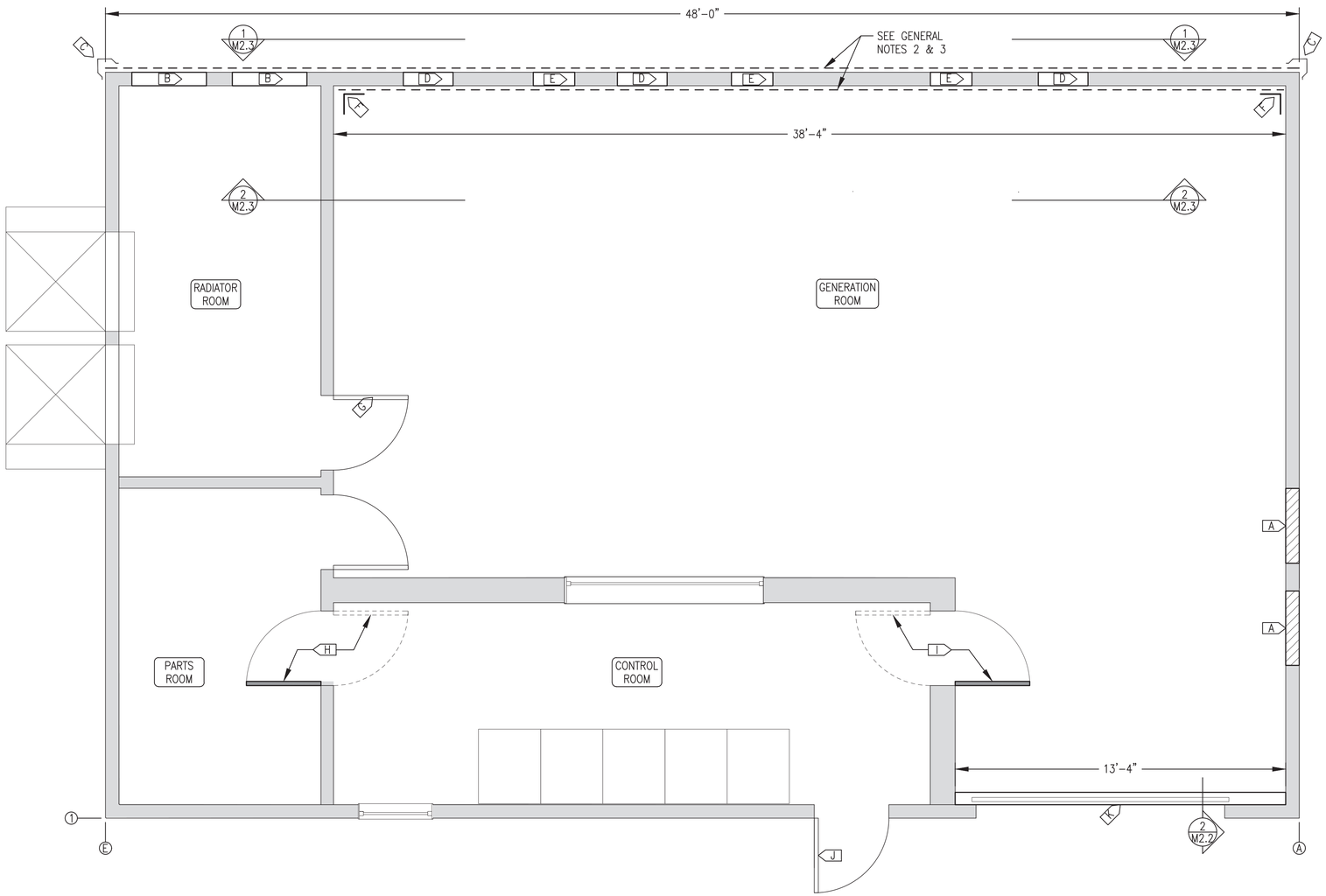


1 M2.2 BUILDING MODIFICATION PLAN FOR MECHANICAL UPGRADES
3/8"=1'

BUILDING MODIFICATIONS FOR MECHANICAL UPGRADES GENERAL NOTES:

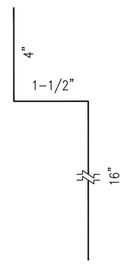
1. THIS PLAN PROVIDES DETAILS FOR NEW WALL COVERINGS, MECHANICAL OPENINGS, TRIM, FLASHING, AND EGRESS MODIFICATIONS AS REQUIRED FOR MECHANICAL AND ELECTRICAL UPGRADES. SEE STRUCTURAL FOR BUILDING FRAMING, SHEATHING, AND SIP MODIFICATIONS.
2. PRIOR TO STRUCTURAL RENOVATION OF THE WALL, REMOVE ALL SIDING FROM EXTERIOR OF WEST WALL. SALVAGE A FEW GOOD SECTIONS OF SIDING FOR PATCHING DUCT INFILL ON WEST WALL. CAREFULLY REMOVE OUTSIDE CORNER FLASHINGS AND SAVE FOR REINSTALLATION. DEMOLISH FOUNDATION Z-FLASHING AND CUT OFF A PORTION OF THE RIGID INSULATION.
3. SEE STRUCTURAL FOR WEST WALL SELECTIVE DEMOLITION, NEW FRAMING, PATCHING, AND NEW SHEATHING. AFTER ALL FRAMING, PATCHING AND SHEATHING IS COMPLETE, INSTALL NEW LOW PROFILE METAL SIDING OVER THE ENTIRE EXTERIOR WALL AND OVER THE INTERIOR OF THE GENERATION ROOM WALL AS INDICATED ON THE ELEVATIONS. PROVIDE ALL FLASHING AND TRIM AS INDICATED ON THIS SHEET AND SHEET M2.3.
4. FURNISH CEE METAL TRIM FOR ALL MECHANICAL OPENINGS AND INSIDE CORNER FLASHING AS SHOWN ON PLAN AND ELEVATIONS. CEE METAL AND FLASHING TO MATCH METAL SIDING AS INDICATED. PROVIDE ALL REQUIRED FASTENERS INCLUDING WOOD SCREWS, SHEET METAL SCREWS, RIVETS, ETC. FOR A COMPLETE INSTALLATION. ALL FASTENERS CORROSION RESISTANT STAINLESS STEEL OR ALUMINUM, COLOR WHITE TO MATCH SIDING.

BUILDING MODIFICATIONS FOR MECHANICAL UPGRADES SPECIFIC NOTES:

- A INFILL EXISTING GENERATOR ROOM AIR INTAKE DUCT OPENINGS AFTER DEMOLISHING DUCTS. SEE STRUCTURAL FOR INFILL FRAMING AND SHEATHING. COVER INTERIOR SHEATHING WITH FRP TO MATCH EXISTING WALLS. COVER EXTERIOR SHEATHING WITH EXISTING METAL SIDING SALVAGED FROM WEST WALL DEMOLITION. SEAL AROUND ALL WALL COVERING PATCHES WITH WHITE POLYURETHANE CAULK.
- B INFILL EXISTING RADIATOR DUCT OPENINGS AFTER DEMOLISHING RADIATORS AND HOODS. SEE STRUCTURAL FOR INFILL FRAMING AND SHEATHING. COVER INTERIOR SHEATHING WITH FRP TO MATCH EXISTING WALLS. SEE PLANS AND ELEVATIONS FOR NEW WEST WALL EXTERIOR SIDING.
- C REINSTALL EXISTING SALVAGED EXTERIOR CORNER TRIM AFTER INSTALLING NEW WEST WALL EXTERIOR SIDING. AT BASE OF OUTSIDE CORNERS INSTALL GALVANIZED SHEET METAL TO COMPLETELY COVER GAP MADE BY LOWERING THE RIGID INSULATION AND Z-FLASHING.
- D TRIM OUT 24"x24" EXHAUST FAN DISCHARGE OPENING AS INDICATED ON DETAIL 2/M7.1.
- E TRIM OUT 20"X20" EXHAUST THIMBLE OPENING AS INDICATED ON DETAIL 3/M6.1.
- F INSTALL NEW 3"x3" INSIDE COLOR ANGLE IN CORNER AFTER INSTALLING NEW INTERIOR SIDING.
- G REMOVE DOOR LEAF TO PROVIDE INTAKE AIR OPENING. LEAVE FRAME IN PLACE.
- H EXISTING 3'-0" x 6'-8" x 8 3/4" DEEP KNOCK-DOWN FRAME STEEL DOOR. REMOVE, ROTATE, AND REINSTALL TO SWING OUT AS INDICATED FOR NEC REQUIRED EGRESS FROM CONTROL ROOM. INSTALL NEW PRECISION MODEL 2108 x 4908AX3 x 630 EXIT DEVICE ON DOOR INTERIOR.
- I EXISTING 3'-0" x 6'-8" x 11 3/4" DEEP WELDED FRAME STEEL DOOR. CAREFULLY CHAMFER CUT FRAME AT TOP CORNERS, REMOVE, ROTATE, AND REINSTALL TO SWING OUT AS INDICATED FOR NEC REQUIRED EGRESS FROM CONTROL ROOM. SEE DETAIL 3/M2.2 FOR WELDED FRAME MODIFICATIONS. INSTALL NEW PRECISION MODEL 2108 x 4908AX3 x 630 EXIT DEVICE ON DOOR INTERIOR.
- J INSTALL NEW PRECISION MODEL 2108 x 4908AX3 x 630 EXIT DEVICE ON DOOR INTERIOR.
- K INSTALL OVERHEAD DOOR CONTAINMENT THRESHOLD. SEE DETAIL 2/M2.2

FOUNDATION FLASHING:

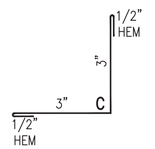
1) FOUNDATION FLASHING SHALL BE MIN 20 GAUGE GALVANIZED STEEL, UNFINISHED.



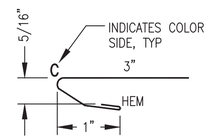
STANDARD FOUNDATION "Z" FLASHING

METAL WALL COVER PANEL SPECIFICATIONS:

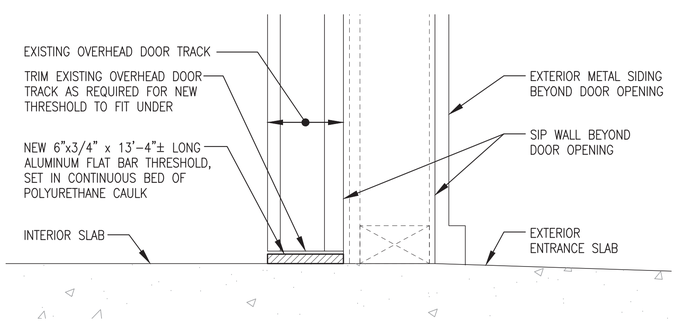
1) CORRUGATED WALL PANELS SHALL BE MIN 24 GAUGE GALVANIZED STEEL, 36" NET COVERAGE, 3/16" LOW PROFILE RIBS AT 4" O.C. MAGIC METALS MESA OR EQUAL. STMP, KYNAR, OR PVDF FINISH, COLOR WINTER WHITE.
3) TRIM/FLASHING SHALL BE MIN 24 GAUGE GALVANIZED STEEL. STMP, KYNAR, OR PVDF FINISH, COLOR WHITE.



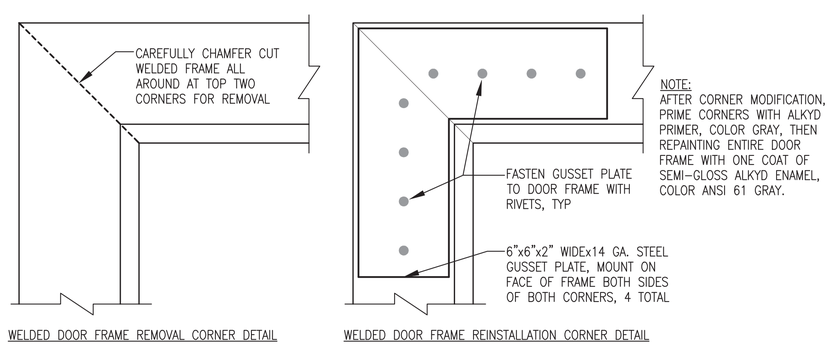
3"x3" INSIDE CORNER



5/16"x3"x1" CEE-METAL



2 M2.2 OVERHEAD DOOR THRESHOLD INSTALLATION
NO SCALE



3 M2.2 WELDED DOOR FRAME REMOVAL AND REINSTALLATION DETAIL
NO SCALE

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STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: POWER PLANT BUILDING RENOVATION
PLAN & DETAILS FOR MECHANICAL UPGRADES

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
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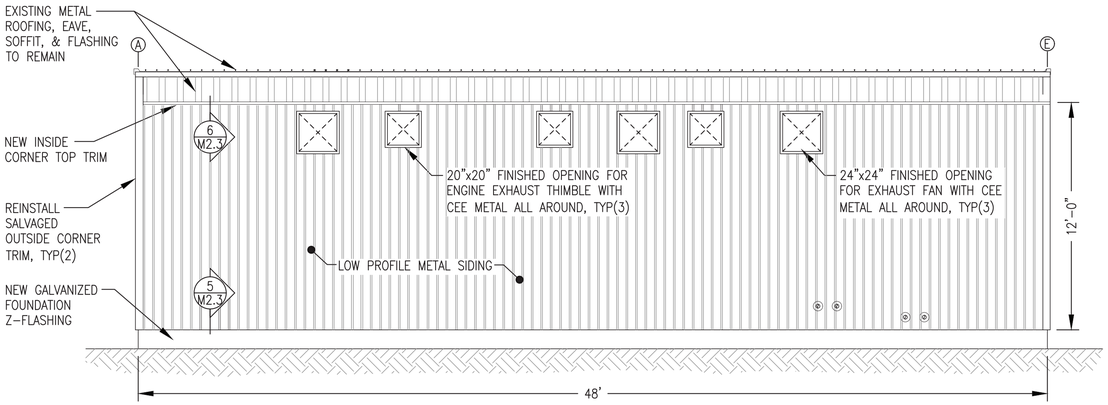
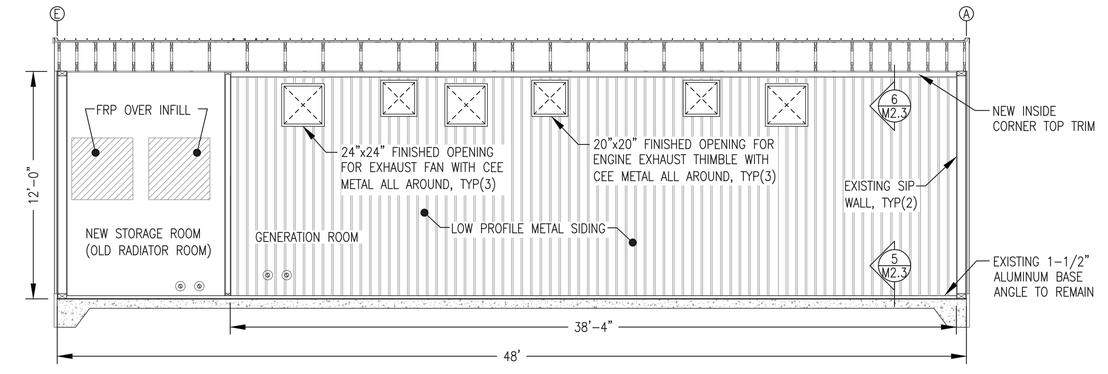
FILE NAME: MANO PP M1-2 | SHEET: M2.2
PROJECT NUMBER:



NOTE: SEE STRUCTURAL FOR BACK WALL FRAMING DETAILS INCLUDING MECHANICAL OPENING LOCATIONS

1 M2.3 WEST WALL EXTERIOR NEW SIDING ELEVATION AFTER FRAMING

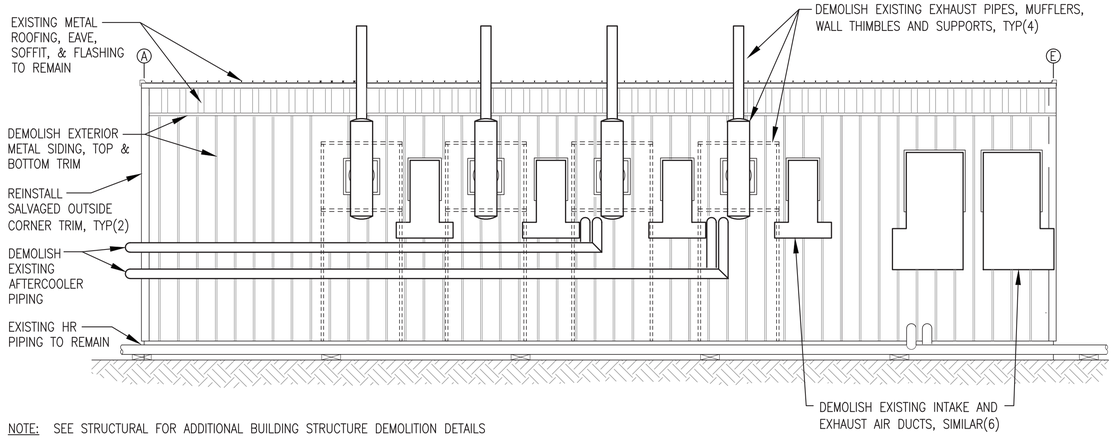
1/4"=1'



NOTE: SEE STRUCTURAL FOR BACK WALL FRAMING DETAILS INCLUDING MECHANICAL OPENING LOCATIONS

2 M2.3 WEST WALL INTERIOR NEW SIDING ELEVATION AFTER FRAMING

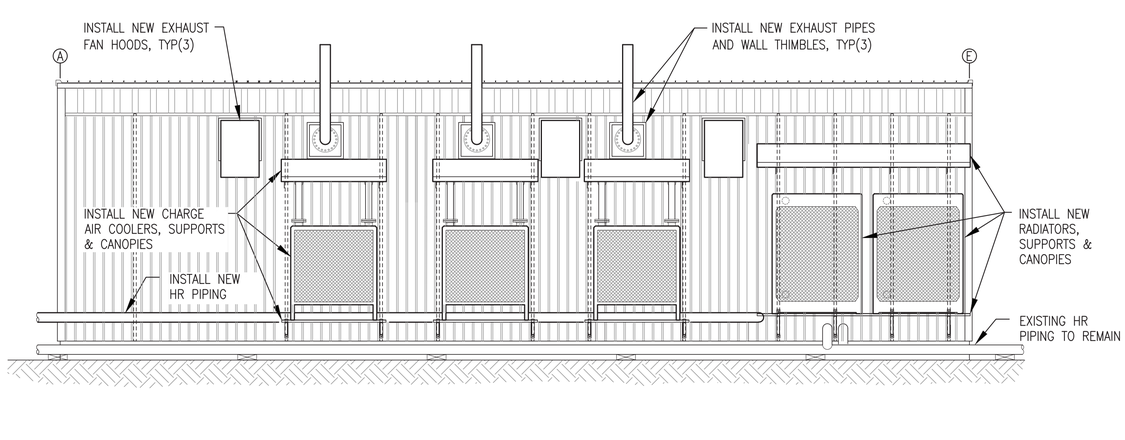
1/4"=1'



NOTE: SEE STRUCTURAL FOR ADDITIONAL BUILDING STRUCTURE DEMOLITION DETAILS

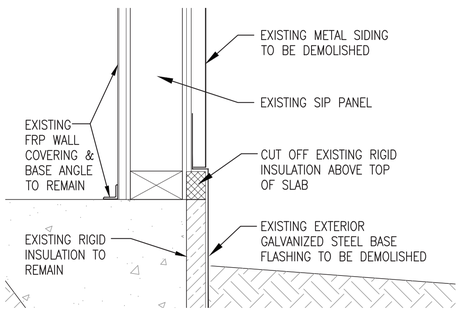
3 M2.3 EXISTING WEST WALL EXTERIOR MECHANICAL DEMOLITION ELEVATION

1/4"=1'

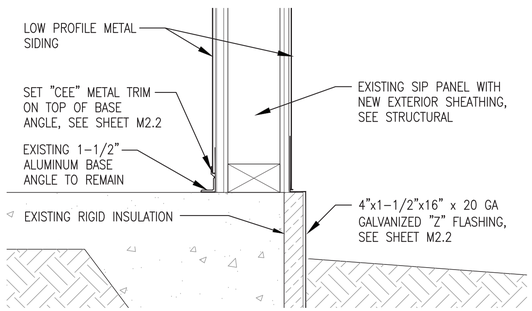


4 M2.3 NEW WEST WALL EXTERIOR EQUIPMENT LAYOUT ELEVATION

1/4"=1'



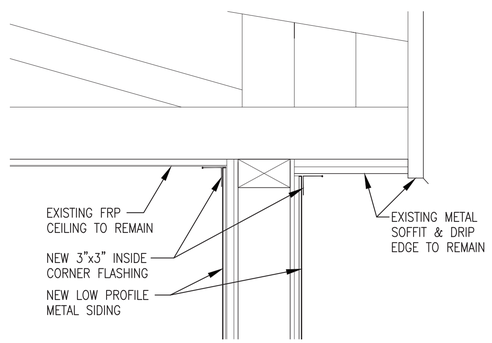
WALL BASE DEMOLITION



WALL BASE NEW WORK

5 M2.3 WEST WALL BASE TRIM MODIFICATION DETAIL

1-1/2"=1'



6 M2.3 WEST WALL TOP TRIM DETAIL

1-1/2"=1'

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: POWER PLANT BUILDING RENOVATION
ELEVATIONS & DETAILS FOR MECHANICAL UPGRADES

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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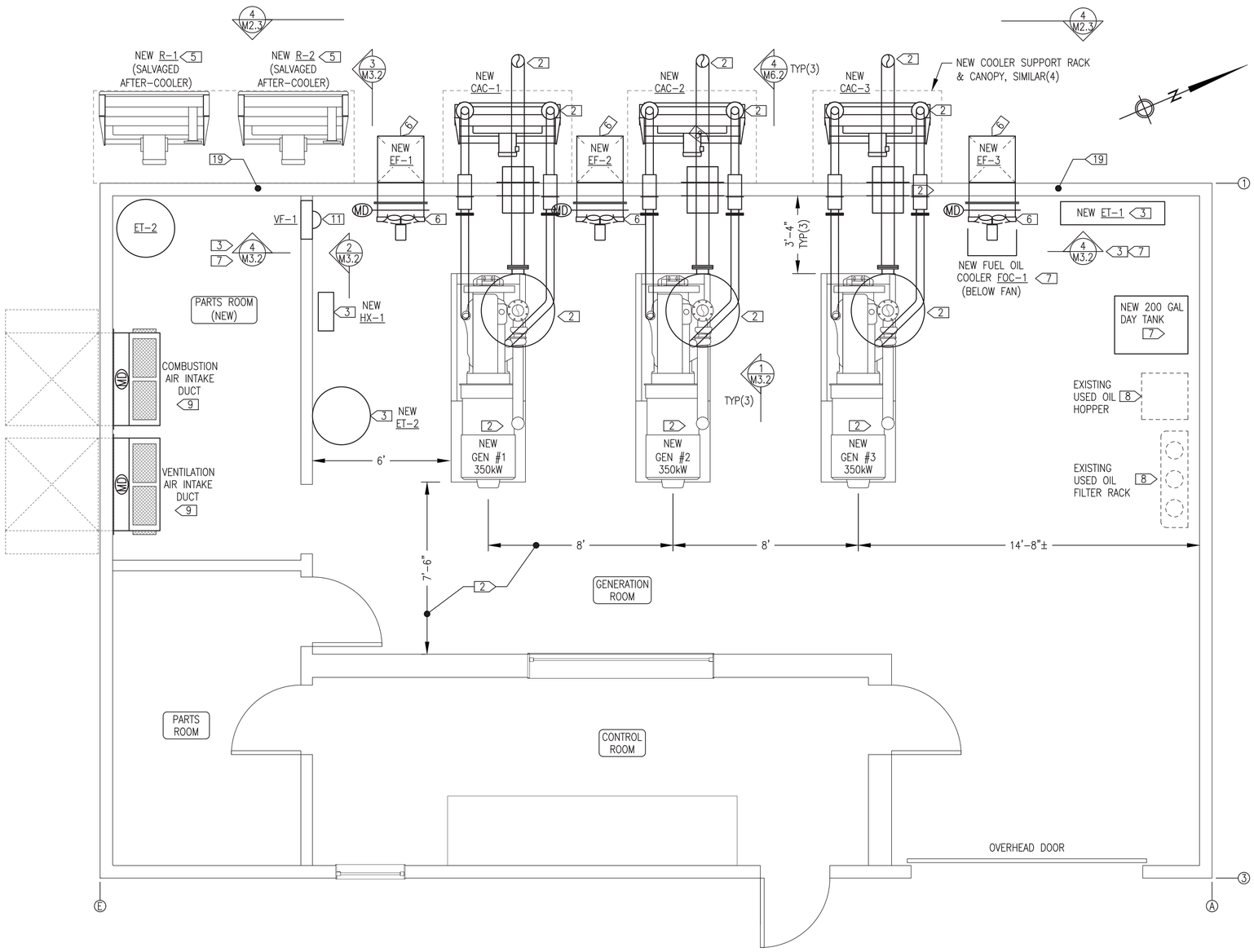

1 M3.1 MECHANICAL NEW WORK PLAN
3/8"=1'

POWER PLANT MECHANICAL NEW WORK GENERAL NOTES:

1. EXISTING EQUIPMENT AND PIPING TO REMAIN IN SERVICE SHOWN WITH LIGHT DASHED LINES.
2. NEW EQUIPMENT AND PIPING TO BE INSTALLED/RELOCATED SHOWN WITH DARK SOLID LINES.
3. NOT ALL EXISTING EQUIPMENT AND PIPING SHOWN. SEE ATTACHED RECORD DRAWINGS OF ORIGINAL POWER PLANT CONSTRUCTION FOR ADDITIONAL DETAIL ON SYSTEMS NOT BEING MODIFIED.
4. ONLY MAJOR NEW WORK ITEMS SHOWN THIS SHEET. SEE NEW WORK PLANS AND DETAILS FOR ADDITIONAL DETAIL.
5. SEE STRUCTURAL FOR NEW WALL FRAMING & INFILL AREAS.
6. SEE SHEETS M3.1–M3.5 FOR GENERAL EQUIPMENT LAYOUT, BASE SUPPORT, FABRICATIONS, AND GENERATOR ASSEMBLY PLANS AND DETAILS.
7. SEE SHEETS M4.1–M4.4 FOR ENGINE COOLANT AND HEAT RECOVERY SYSTEM MODIFICATIONS.
8. SEE SHEET M5.1–M5.4 FOR DIESEL FUEL AND USED OIL SYSTEM MODIFICATIONS.
9. SEE SHEETS M6.1–M6.2 FOR EXHAUST AND CRANK CASE VENTILATION SYSTEM MODIFICATIONS.
10. SEE SHEET M7.1–M7.2 FOR VENTILATION SYSTEM MODIFICATIONS.
11. SEE SHEETS FS1–FS2 FOR FIRE DETECTION, ALARM, AND SUPPRESSION DEMOLITION AND NEW WORK.

POWER PLANT MECHANICAL NEW WORK PLAN SPECIFIC NOTES:

1. SEE MECHANICAL DEMOLITION
2. INSTALL NEW GEN#1, GEN#2, AND GEN#3 INCLUDING SUPPORT PEDESTALS, EXHAUST SYSTEMS, CHARGE AIR SYSTEMS, CRANK VENT SYSTEMS, AND ENGINE COOLANT CONNECTIONS. NOTE THAT LOCATIONS SHOWN THIS PLAN ARE APPROXIMATE. FINAL LOCATION OF GENERATOR BASED ON CENTERING ENGINE EXHAUST RISER UNDER MUFFLER. SEE SHEET M6.1 FOR DIMENSIONAL LOCATION.
3. INSTALL NEW ENGINE COOLANT/HEAT RECOVERY/PLANT HEAT SYSTEMS INCLUDING PIPING, HOSES, VALVES, HEAT EXCHANGERS, HYDRONIC EQUIPMENT, PUMPS, EXPANSION TANKS, AND UNIT HEATERS.
4. SEE MECHANICAL AND ELECTRICAL DEMOLITION.
5. INSTALL SALVAGED RADIATORS R–1 AND R–2.
6. INSTALL NEW GENERATOR ROOM EXHAUST FAN/DAMPER ASSEMBLIES AND EXTERIOR HOODS.
7. INSTALL NEW FUEL SYSTEM INCLUDING NEW 200 GALLON DAY TANK, FUEL COOLER FOC–1, DFS/DFR/UOR PIPING, HOSES, APPURTENANCES, AND EQUIPMENT. SEE SHEETS M5.1 AND M5.2 FOR DETAILS.
8. REFURBISH EXISTING USED OIL HOPPER AND FILTER BANK WITH NEW PUMPS, HOSES, INSTRUMENTATION, PRV's, PIPING, VALVES, AND APPURTENANCES. SEE SHEET M5.3 FOR DETAILS.
9. INSTALL SALVAGED AIR INTAKE HOOD WITH NEW DAMPER ASSEMBLY.
10. SEE MECHANICAL DEMOLITION.
11. INSTALL NEW VENTILATION FAN VF–1.
12. SEE ELECTRICAL.
13. SEE ELECTRICAL.
14. SEE ELECTRICAL.
15. SEE ELECTRICAL.
16. SEE ELECTRICAL.
17. SEE ELECTRICAL.
18. SEE MECHANICAL DEMOLITION AND ELECTRICAL NEW WORK.
19. SEE STRUCTURAL FOR NEW BACK WALL FRAMING FOR MECHANICAL OPENINGS & SUPPORTS. SEE SHEET M2.2 FOR SHEET METAL SIDING INSTALLATION DETAILS
20. SEE ELECTRICAL.
21. SEE ELECTRICAL.
22. SEE ELECTRICAL.

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REGISTERED PROFESSIONAL ENGINEER

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: MECHANICAL EQUIPMENT LAYOUT & NEW WORK OVERVIEW

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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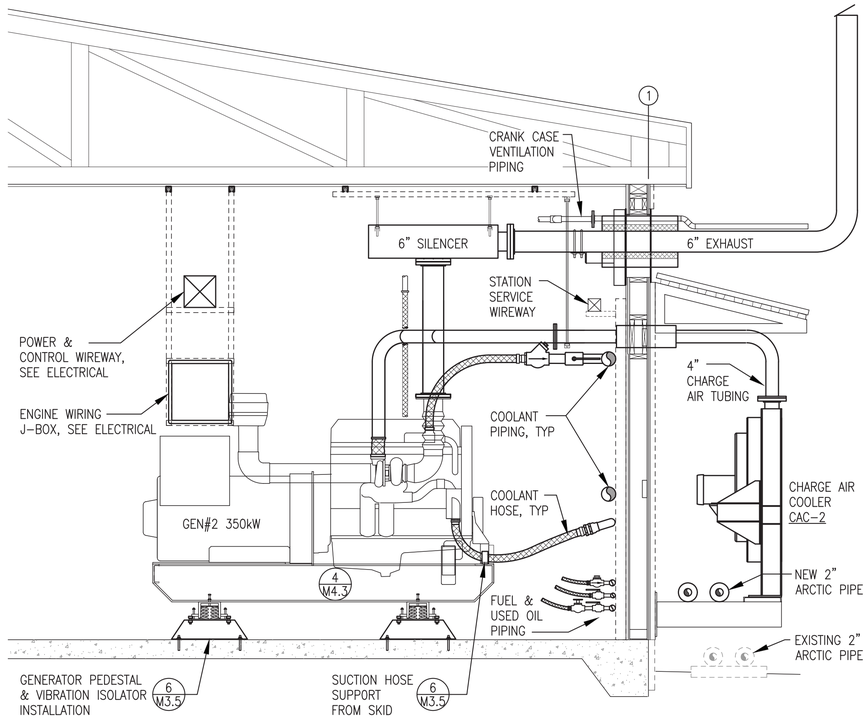
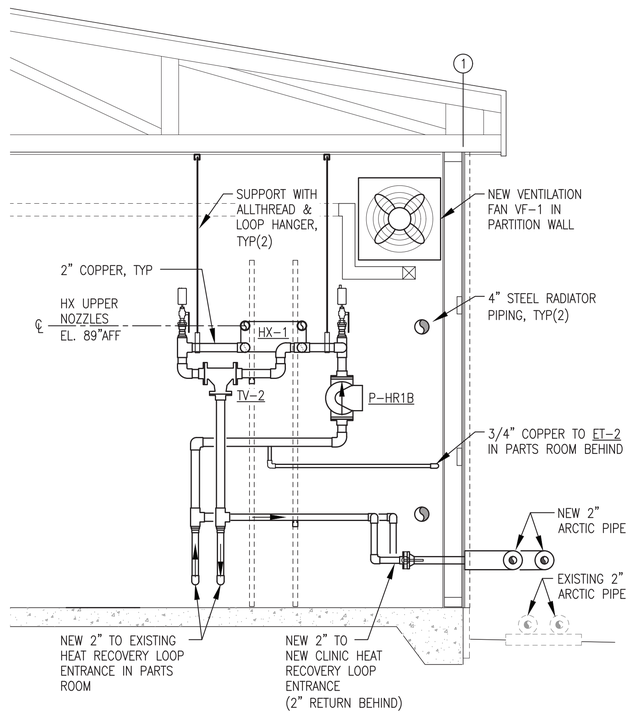
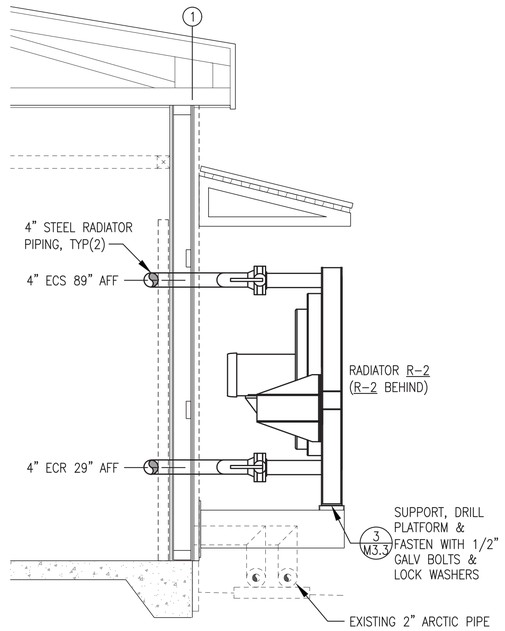


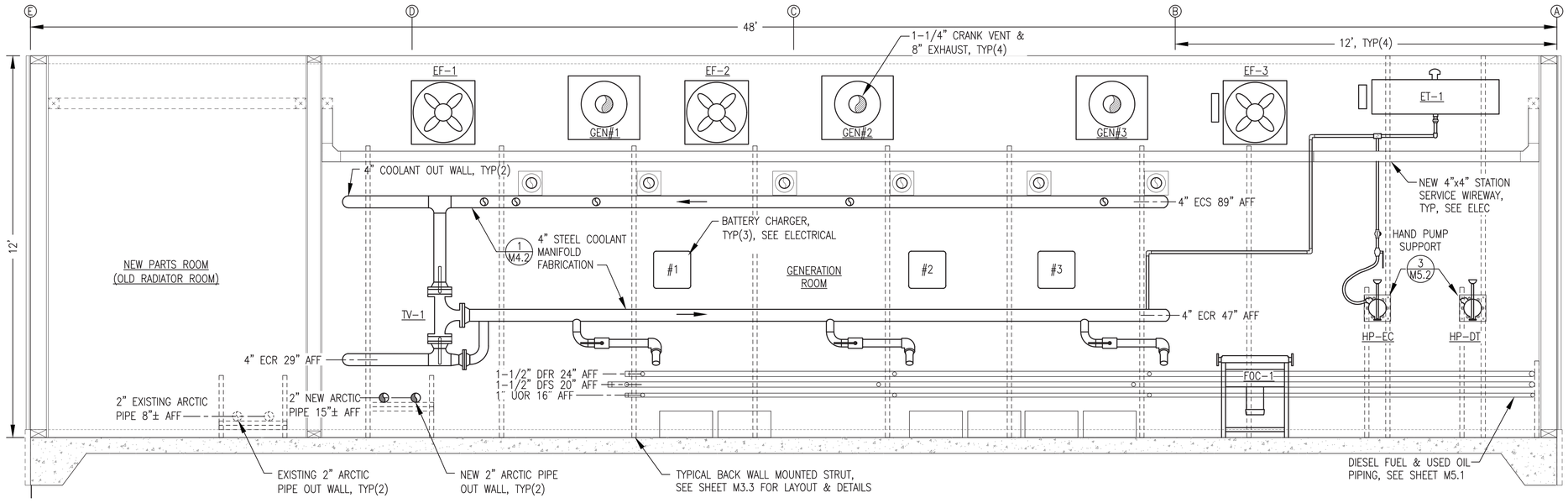
1 M3.2 TYPICAL SECTION THROUGH NEW GENERATOR
1/2"=1'



2 M3.2 PARTITION WALL ELEVATION
NO SCALE



3 M3.2 TYPICAL SECTION THROUGH RADIATOR
1/2"=1'



4 M3.2 BACK WALL ELEVATION
1/2"=1'

GENERAL NOTES:

1. THE SECTIONS AND ELEVATIONS THIS SHEET SHOW MAJOR WORK ITEMS ONLY. ALL PIPING AND EQUIPMENT NOT SHOWN FOR CLARITY.
2. ALL ELEVATIONS ARE ABOVE FINISHED FLOOR (AFF) TO CENTERLINE UNLESS SPECIFICALLY INDICATED OTHERWISE.

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PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: EQUIPMENT LAYOUT SECTIONS & ELEVATIONS

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P.O. 111405, Anchorage, AK 99511 (907)349-0100

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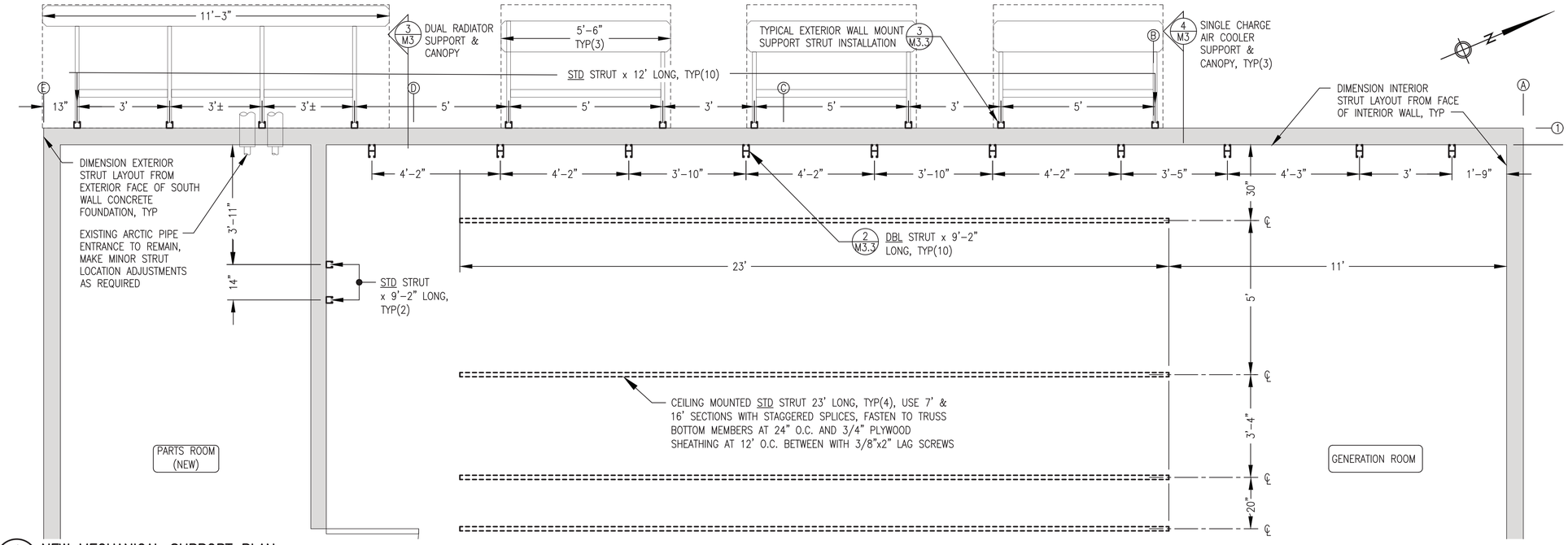
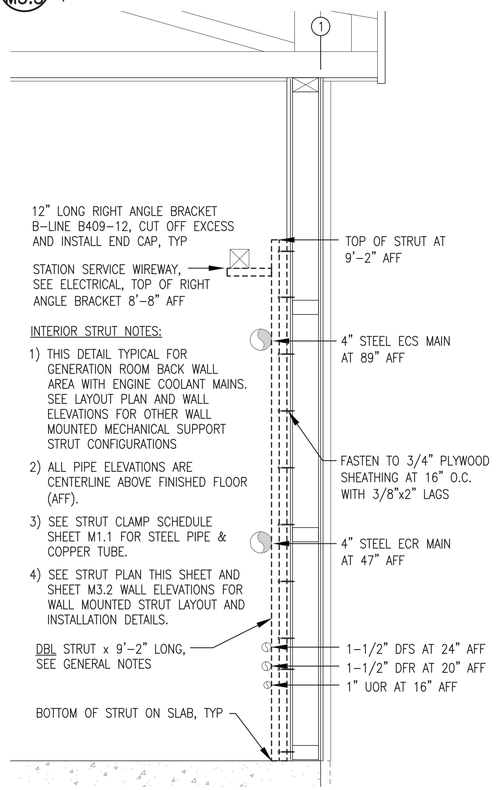
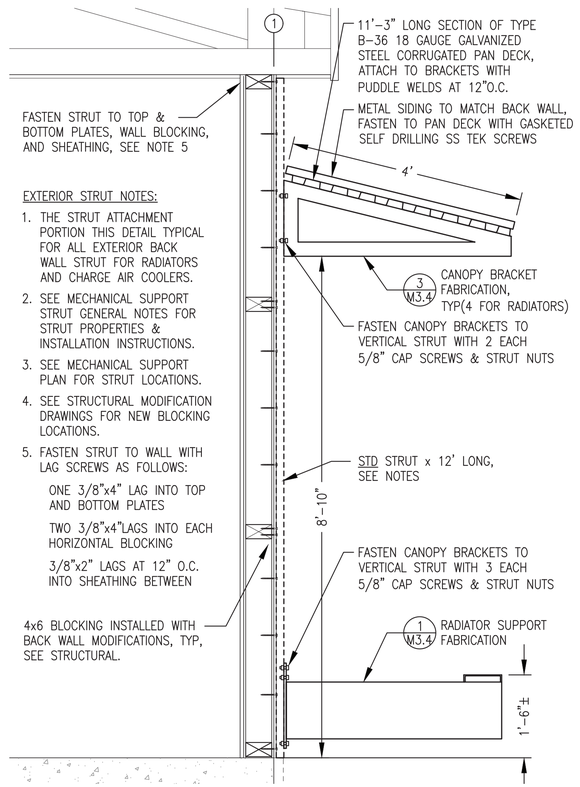
PROJECT NUMBER:



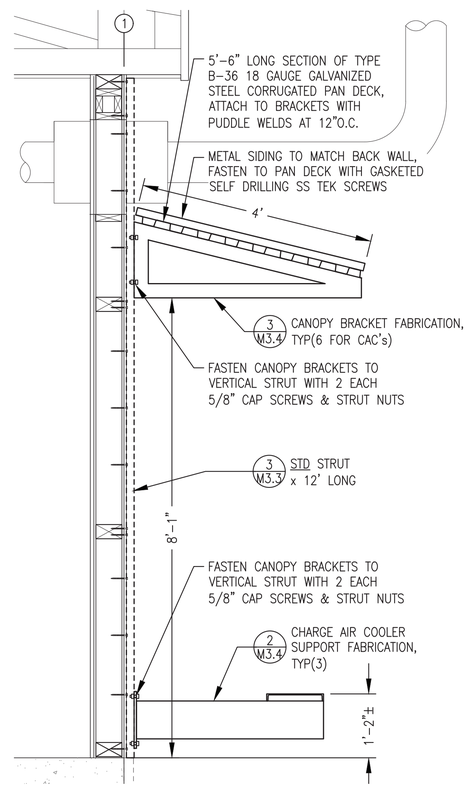
1 M3.3 NEW MECHANICAL SUPPORT PLAN
3/8"=1'



2 M3.3 INTERIOR WALL MOUNTED STRUT INSTALLATION DETAIL
3/4"=1'-0"



3 M3.3 RADIATOR SUPPORT/CANOPY SECTION
3/4"=1'-0"



4 M3.3 TYPICAL CAC SUPPORT/CANOPY SECTION
3/4"=1'-0"

MECHANICAL SUPPORT STRUT GENERAL NOTES

1. MAJOR WALL AND CEILING MOUNTED SUPPORT STRUT SHOWN THIS SHEET IS REQUIRED TO BE INSTALLED AFTER RECONSTRUCTION OD BACK WALL IS COMPLETE AND PRIOR TO INITIAL PIPE, WIREWAY, AND EQUIPMENT INSTALLATION. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL SPECIFIC EQUIPMENT, PIPING, AND WIREWAY STRUT SUPPORTS LOCATIONS AND DETAILS.
2. ALL STRUT LAYOUT DIMENSIONS ON PLAN ARE APPROXIMATE. IF STRUT LANDS ON MAJOR RIB OF CORRUGATED CEILING PANEL, MOVE TO CLOSEST FLAT SECTION IF POSSIBLE. IF CORRUGATION CAN NOT BE AVOIDED, CUT OUT CORRUGATION AND SEAL TO STRUT ALL AROUND.
3. "STD" DESIGNATES STANDARD 1-5/8"x1-5/8" SINGLE STRUT. "DBL" DESIGNATES 1-5/8"x3-1/4" DOUBLE (BACK-TO-BACK) STRUT. SEE SPECIFICATIONS FOR INTERIOR AND EXTERIOR STRUT, FITTING, & FASTENER FINISH REQUIREMENTS
4. USE 3/8"x2" HEX HEAD LAG BOLTS TO FASTEN "STD" STRUT TO WALL OR CEILING STRUCTURE WHERE INDICATED.
5. USE 3/8"x4" HEX HEAD LAG BOLTS TO FASTEN "DEEP" STRUT TO WALL STRUCTURE WHERE INDICATED.
6. INTERIOR WALLS & CEILING ARE SHEATHED WITH 3/4" PLYWOOD. EXTERIOR WALLS ARE SHEATHED WITH 1/2" PLYWOOD AND OSB. PROVIDE LAGS INTO FRAMING MEMBERS AND SHEATHING AS INDICATED.

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ALASKA ENERGY AUTHORITY

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TITLE: MECHANICAL SUPPORT PLAN & SECTIONS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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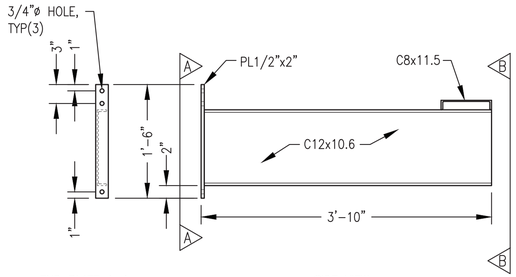
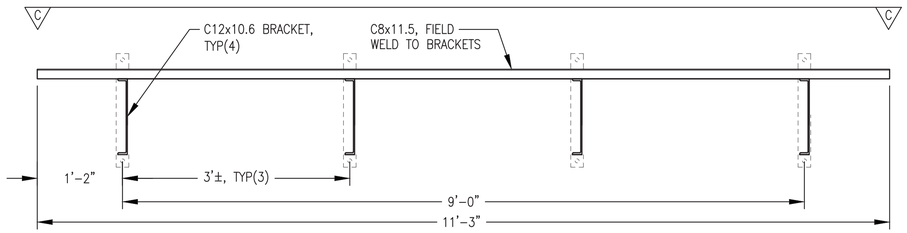
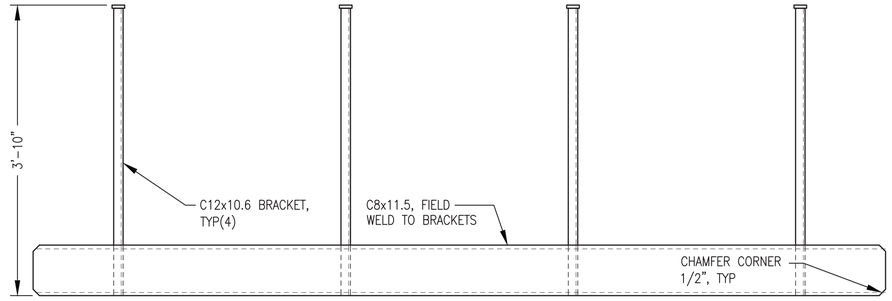


END PLATE A–A

SIDE VIEW



FRONT VIEW B–B

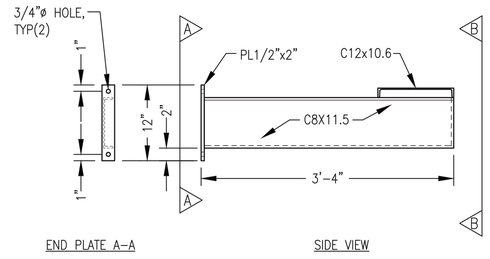


PLAN VIEW C–C

1 M3.4 RADIATOR SUPPORT FABRICATION

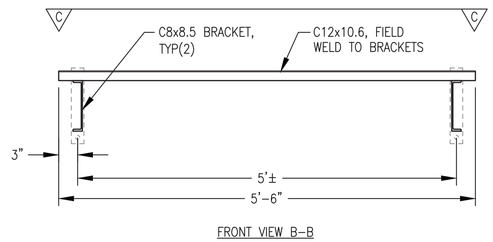
1"=1'-0"

NOTE: ONE CHARGE AIR COOLER SUPPORT ASSEMBLY SHOWN. PROVIDE THREE IDENTICAL.

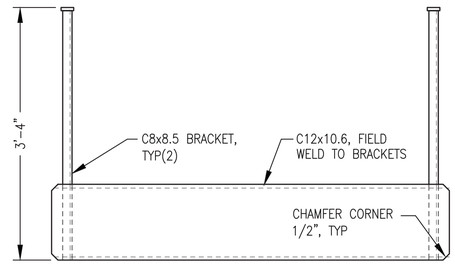


END PLATE A–A

SIDE VIEW



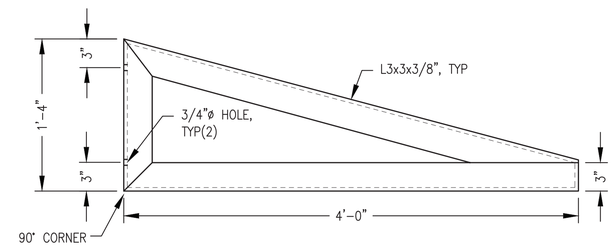
FRONT VIEW B–B



PLAN VIEW C–C

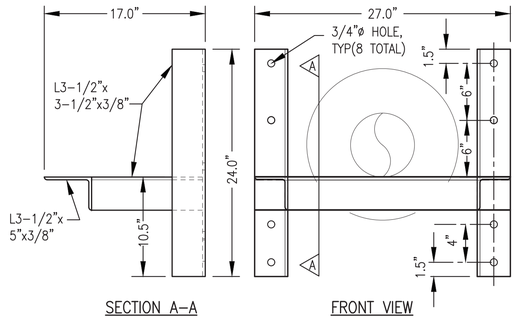
2 M3.4 TYPICAL CHARGE AIR COOLER SUPPORT FABRICATION

1"=1'-0"



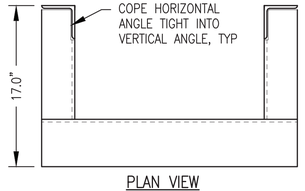
3 M3.4 TYPICAL RADIATOR & CHARGE AIR COOLER CANOPY BRACKET FABRICATION

1-1/2"=1'-0"



SECTION A–A

FRONT VIEW



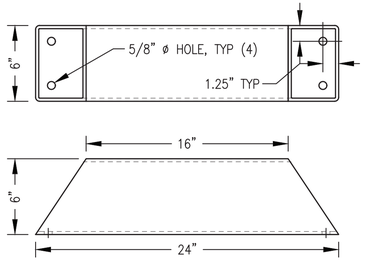
PLAN VIEW

4 M3.4 EXHAUST SUPPORT BRACKET FABRICATION

1-1/2"=1'-0"

EXHAUST SUPPORT & GENERATOR PEDESTAL FABRICATION NOTES:

1) SHOP FABRICATE 3 EACH EXHAUST SUPPORT BRACKETS AS SHOWN IN DETAIL 4.
2) SHOP FABRICATE 12 EACH GENERATOR SUPPORT PEDESTALS AS SHOWN IN DETAIL 5.
3) FABRICATE FROM ASTM A–36 STEEL SHAPES AND ASTMA–500 TUBE.
4) MAKE ALL JOINTS WITH CONTINUOUS GROOVE OR FILLET WELDS.
5) UPON COMPLETION OF WELDING ROUND CORNERS AND GRIND EDGES SMOOTH.
6) WIRE BRUSH OR SANDBLAST ALL FABRICATIONS AND FINISH WITH TWO COATS OF EPOXY, SHERWIN WILLIAMS MACROPOXY 646 OR EQUAL, COLOR STRUCTURAL GRAY 4031.



PEDESTAL NOTES:

1) FABRICATE FROM TS 6x6x1/4. SHOP CUT AND DRILL BASE AS INDICATED.
2) FIELD DRILL TOP TO MATCH VIBRATION ISOLATOR BASE.

5 M3.4 GENERATOR SUPPORT PEDESTAL FABRICATION

NO SCALE

RADIATOR & CHARGE AIR COOLER SUPPORT FABRICATION NOTES:

1) SHOP FABRICATE 4 EACH 3'–10" LONG RADIATOR SUPPORT BRACKETS AND 1 EACH 11'–3" LONG CHANNEL AS SHOWN IN DETAIL 1.
2) SHOP FABRICATE 6 EACH 3'–4" LONG CHARGE AIR COOLER SUPPORT BRACKETS AND 3 EACH 5'–6" LONG CHANNELS AS SHOWN IN DETAIL 2.
3) SHOP FABRICATE 10 EACH CANOPY BRACKETS AS SHOWN IN DETAIL 3.
4) FABRICATE FROM ASTM A–36 STEEL SHAPES AND PLATE.
5) MAKE ALL JOINTS WITH CONTINUOUS GROOVE OR FILLET WELDS.
6) UPON COMPLETION OF WELDING ROUND CORNERS AND GRIND EDGES SMOOTH.
7) WIRE BRUSH OR SANDBLAST ALL FABRICATIONS AND FINISH WITH 3 COATS OF COLD GALVANIZING COMPOUND, ZRC OR EQUAL.
8) FIELD INSTALL BRACKETS ON STRUT PREVIUOSLY INSTALLED ON WALL AND PLACE CHANNELS IN FINAL LOCATION. GRIND OR BRUSH OFF COLD GALV AND FIELD WELD CHANNELS TO BRACKETS. WIRE BRUSH WELD AFFECTED AREAS AND APPLY 3 COATS OF COLD GALVANIZING COMPOUND.

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

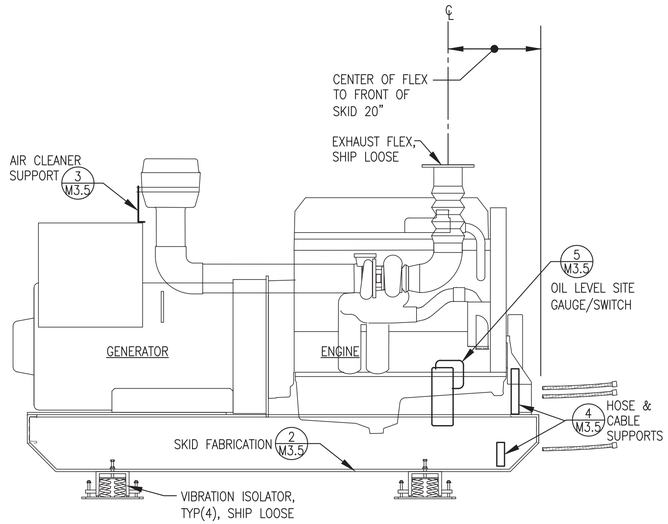
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: MECHANICAL SUPPORT FABRICATION DETAILS

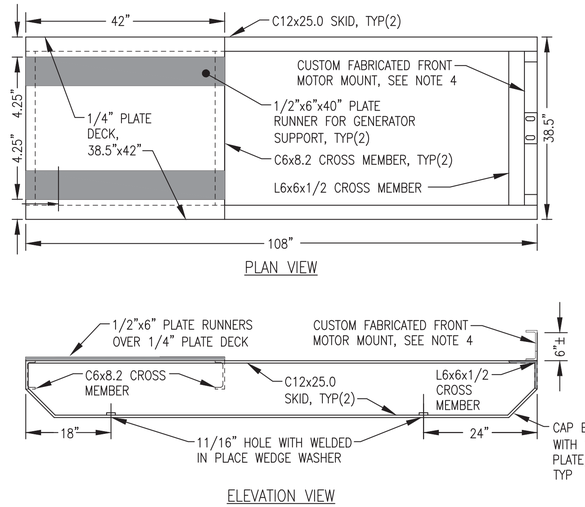
Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M3–7 | SHEET: M3.4
PROJECT NUMBER:



1 M3.5 TYPICAL GENERATOR ASSEMBLY

3/4"=1'-0"

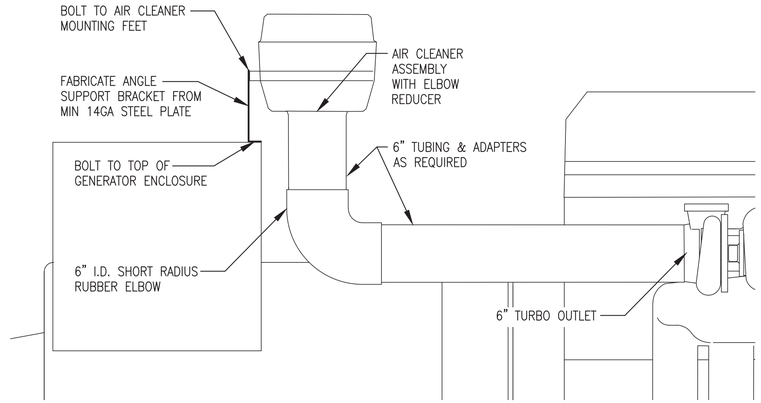


SKID FABRICATION NOTES:

1) FABRICATE FROM ASTM A-36 STEEL.
2) MAKE ALL CONNECTIONS WITH CONTINUOUS WELDS (FILLET OR FULL-PENETRATION GROOVE AS REQUIRED) IN ACCORDANCE WITH CURRENT AWS STANDARD CODE.
3) ROUND ALL CORNERS & GRIND WELDS SMOOTH AFTER FABRICATION. PAINT IN ACCORDANCE WITH SPECIFICATIONS.
4) INSTALL CUSTOM FABRICATED STEEL CHANNEL CROSS MEMBER & FACTORY MOTOR MOUNT TO MATCH GENERATOR ELEVATION.

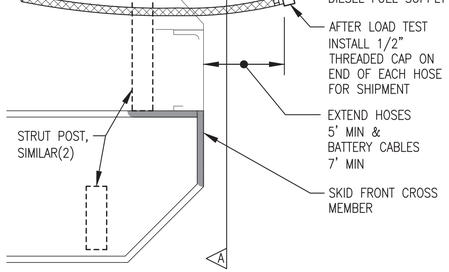
2 M3.5 TYPICAL GENERATOR SKID FABRICATION

3/4"=1'-0"

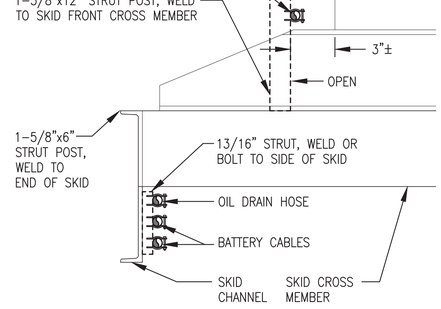


3 M3.5 TYPICAL GENERATOR AIR CLEANER INSTALLATION

1-1/2"=1'-0"



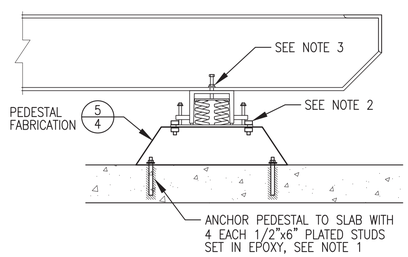
ELEVATION (SIDE) VIEW



SECTION A-A

4 M3.5 TYPICAL SKID FUEL/OIL HOSE & BATTERY CABLE SUPPORT

NO SCALE

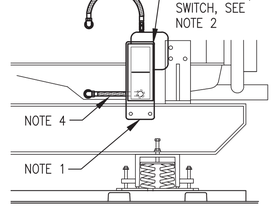


INSTALLATION NOTES:

1) LOCATE GENERATOR TO ALIGN WITH EXHAUST ABOVE PRIOR TO ANCHORING PEDESTALS TO SLAB. SEE SHEET M6.1.
2) FIELD DRILL TOP TO MATCH VIBRATION ISOLATOR BASE & FASTEN WITH 2 EA. 1/2" BOLTS WITH LOCK WASHERS.
3) ADJUST SPRING VIBRATION ISOLATOR LEVELING BOLTS TO ACHIEVE A UNIFORM INSTALLATION HEIGHT OF APPROXIMATELY 5-3/4" THEN TIGHTEN LOCKING NUTS. ADJUST NUTS ON STABILIZER BOLTS TO ACHIEVE A UNIFORM CLEARANCE OF APPROXIMATELY 1/8" THEN TIGHTEN LOCKING NUTS. VERIFY UNIT MOVES FREELY ON ISOLATORS.

6 M3.5 GENERATOR SUPPORT PEDESTAL & ISOLATOR INSTALLATION

NO SCALE



NOTES:

1. 1/4" STEEL SUPPORT PLATE PRE-DRILLED TO MATCH GAUGE/SWITCH MOUNTS AND BOTTOM HOSE ENTRANCE. BOLT TO INSIDE (BACK) OF CHANNEL SKID AT HEIGHT AS REQUIRED TO CENTER GAUGE AT NORMAL FULL OIL LEVEL.
2. MOUNT OIL LEVEL GAUGE/SWITCH TO STEEL SUPPORT PLATE WITH RUBBER SHOCK MOUNTS. LOCATE SO THAT THE OIL LEVEL IS APPROXIMATELY IN THE MIDDLE.
3. CONNECT TOP (VENT) PORT TO ENGINE CRANK CASE WITH #8 HOSE WITH 1/2" OR 3/8" NPT JIC SWIVEL ENDS. ROUTE UPPER HOSE WITH HIGH POINT 4" MIN ABOVE TOP OF GAUGE.
4. CONNECT BOTTOM PORT TO ENGINE OIL PAN WITH #8 HOSE WITH 1/2" OR 3/8" NPT JIC SWIVEL ENDS. DO NOT TEE INTO OIL DRAIN LINE. ROUTE LOWER HOSE BACK THROUGH PRE-DRILLED HOLE IN STEEL PLATE.
5. DURING STARTUP AND COMMISSIONING ADJUST AND MARK THE OIL LEVEL SITE GAUGE AS FOLLOWS:
   A. WITH ENGINE OFF VERIFY OIL LEVEL IS FULL ON THE DIPSTICK. THIS IS THE STATIC FULL LEVEL. ADJUST THE HIGH LEVEL SWITCH TO 1/2" ABOVE THE STATIC FULL LEVEL.
   B. START THE ENGINE, PLACE ON LINE, AND RUN UNDER LOAD LONG ENOUGH FOR LEVEL TO STABILIZE. THIS IS THE RUNNING FULL LEVEL. MARK THE RUNNING FULL LEVEL WITH A GREEN PAINT PEN.
   C. ADJUST THE LOW LEVEL SWITCH TO 1/2" BELOW THE RUNNING FULL LEVEL.

5 M3.5 TYPICAL OIL LEVEL GAUGE/SWITCH INSTALLATION

1"=1'-0"

REVISION #1
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AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: GENSET FABRICATION DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M3.5
PROJECT NUMBER:	

COOLING SYSTEM ISOMETRIC NOTES:

1) ALL PIPING SHOWN THIS ISOMETRIC 4" SCH 40 STEEL WITH WELDED JOINTS UNLESS SPECIFICALLY INDICATED OTHERWISE. ALL ENGINE BRANCH CONNECTIONS SCH 40 STEEL WITH WELDED AND THREADED JOINTS. ALL PIPE INDICATED COPPER THIS ISOMETRIC TYPE "L" HARD DRAWN COPPER WITH SOLDER JOINTS UNLESS SPECIFICALLY INDICATED OTHERWISE.

2) SEE SHEET M4.2 FOR COOLING MANIFOLD FABRICATION DETAILS. SEE SHEETS M4.2 AND M4.3 FOR PIPING CONNECTIONS AND INSTRUMENTATION.

3) ALL COOLANT PRESSURE GAUGES 0–30 PSIG.

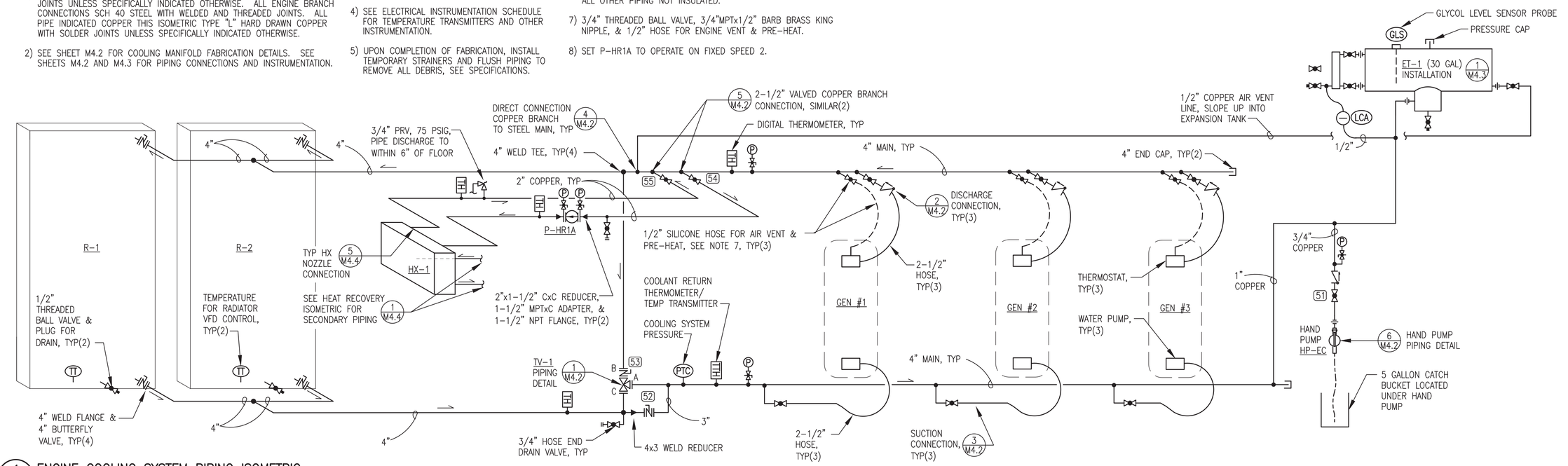
4) SEE ELECTRICAL INSTRUMENTATION SCHEDULE FOR TEMPERATURE TRANSMITTERS AND OTHER INSTRUMENTATION.

5) UPON COMPLETION OF FABRICATION, INSTALL TEMPORARY STRAINERS AND FLUSH PIPING TO REMOVE ALL DEBRIS, SEE SPECIFICATIONS.

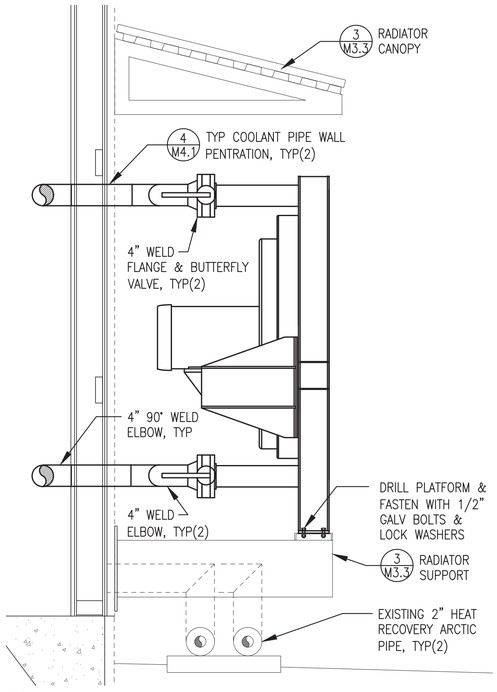
6) INSULATE 4" STEEL COOLANT PIPING MAINS TO WALL PENETRATIONS. ALL OTHER PIPING NOT INSULATED.

7) 3/4" THREADED BALL VALVE, 3/4"MPTx1/2" BARB BRASS KING NIPPLE, & 1/2" HOSE FOR ENGINE VENT & PRE–HEAT.

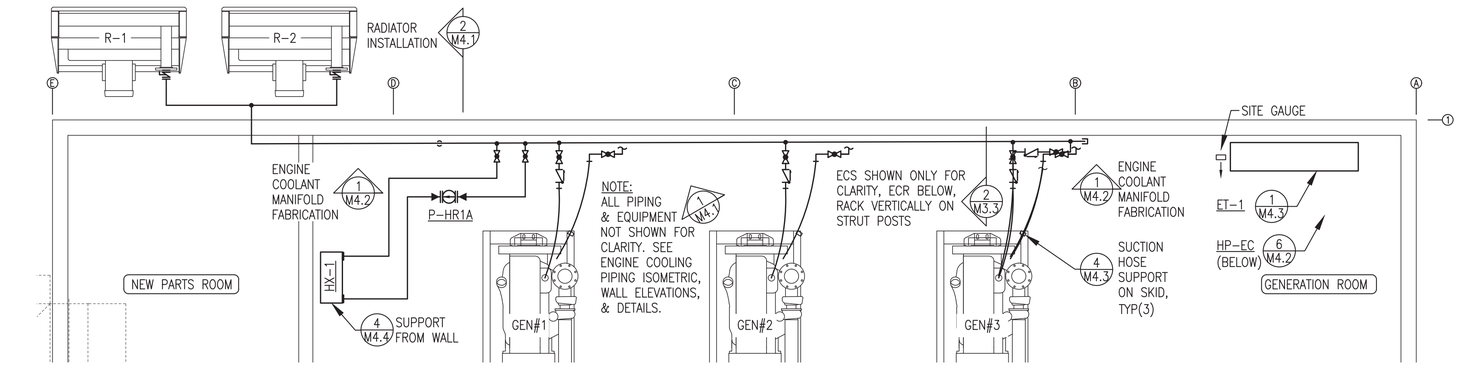
8) SET P–HR1A TO OPERATE ON FIXED SPEED 2.



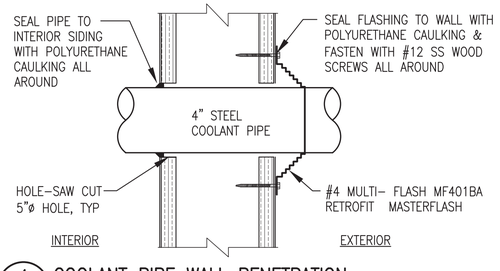
1 M4.1 ENGINE COOLING SYSTEM PIPING ISOMETRIC
NO SCALE



2 M4.1 TYPICAL RADIATOR & PIPING INSTALLATION
3/4"=1'–0"



3 M4.1 ENGINE COOLING SYSTEM PIPING PLAN
3/8"=1'–0"



4 M4.1 COOLANT PIPE WALL PENETRATION
NO SCALE

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AUGUST 2025

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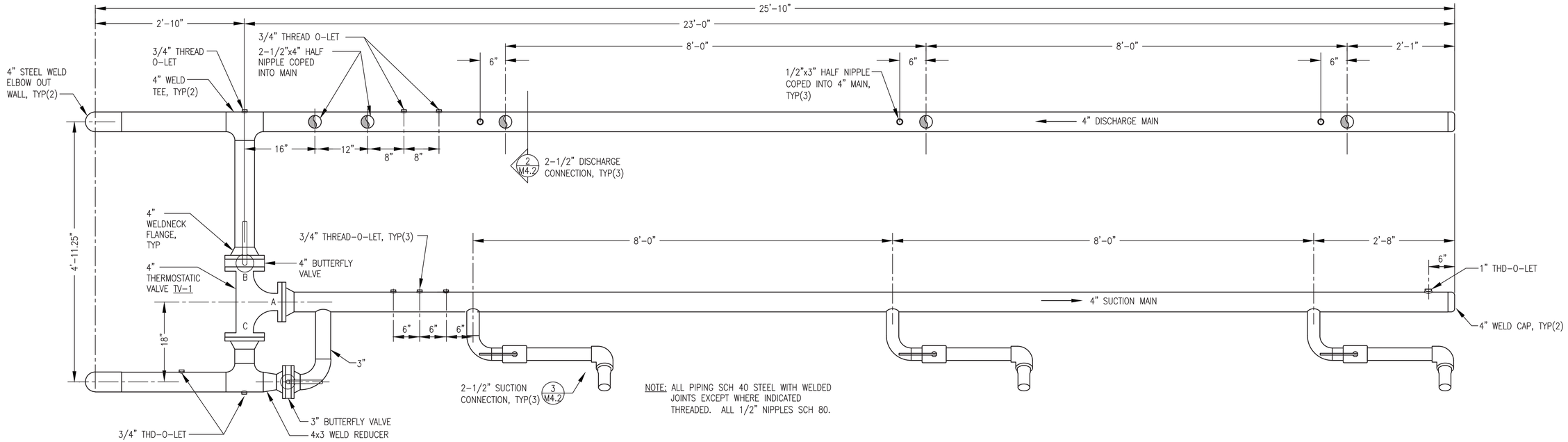
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: ENGINE COOLANT SYSTEM PIPING PLAN, ISOMETRIC, & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

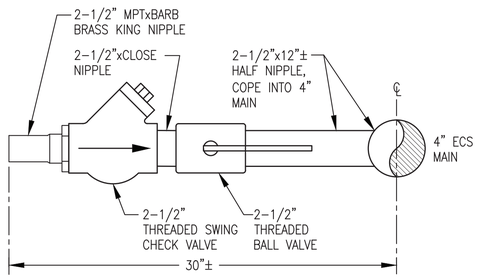
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3–7	SHEET: M4.1
PROJECT NUMBER:	



NOTE: ALL PIPING SCH 40 STEEL WITH WELDED JOINTS EXCEPT WHERE INDICATED THREADED. ALL 1/2" NIPPLES SCH 80.

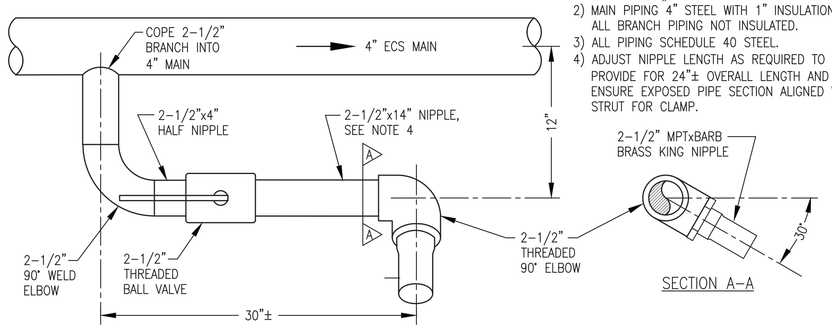
1 M4.2 ENGINE COOLANT MANIFOLD FABRICATION DETAIL
1"=1'-0"

NOTES:
1) MAIN PIPING 4" STEEL WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.
2) ALL PIPING SCHEDULE 40 STEEL.

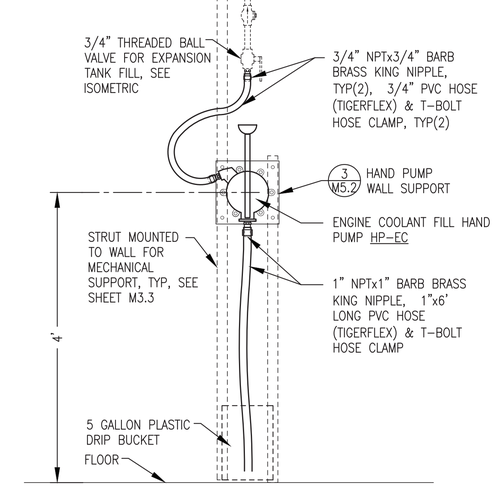


2 M4.2 TYPICAL DISCHARGE CONNECTION
NO SCALE

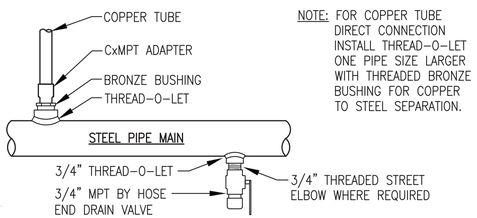
NOTES:
1) GEN#2 & GEN#3 SUCTION CONNECTION SHOWN, GEN#1 MIRROR IMAGE
2) MAIN PIPING 4" STEEL WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.
3) ALL PIPING SCHEDULE 40 STEEL.
4) ADJUST NIPPLE LENGTH AS REQUIRED TO PROVIDE FOR 24"± OVERALL LENGTH AND TO ENSURE EXPOSED PIPE SECTION ALIGNED WITH STRUT FOR CLAMP.



3 M4.2 TYPICAL SUCTION CONNECTION
NO SCALE

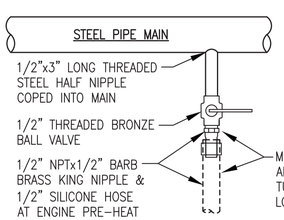


6 M4.2 GLYCOL HAND PUMP HP-EC INSTALLATION
NO SCALE



NOTE: FOR COPPER TUBE DIRECT CONNECTION INSTALL THREAD-O-LET ONE PIPE SIZE LARGER WITH THREADED BRONZE BUSHING FOR COPPER TO STEEL SEPARATION.

4 M4.2 TYP DIRECT CONNECTION TO STEEL MAIN
NO SCALE



NOTE: 1/2" ENGINE PRE-HEAT/VENT HOSE CONNECTION SHOWN. PROVIDE SIMILAR SOLDER COPPER BRANCH CONNECTIONS WHERE SHOWN, SIZE AS INDICATED.

5 M4.2 TYP VALVED BRANCH CONNECTION TO STEEL MAIN
NO SCALE

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STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: ENGINE COOLANT SYSTEM FABRICATION DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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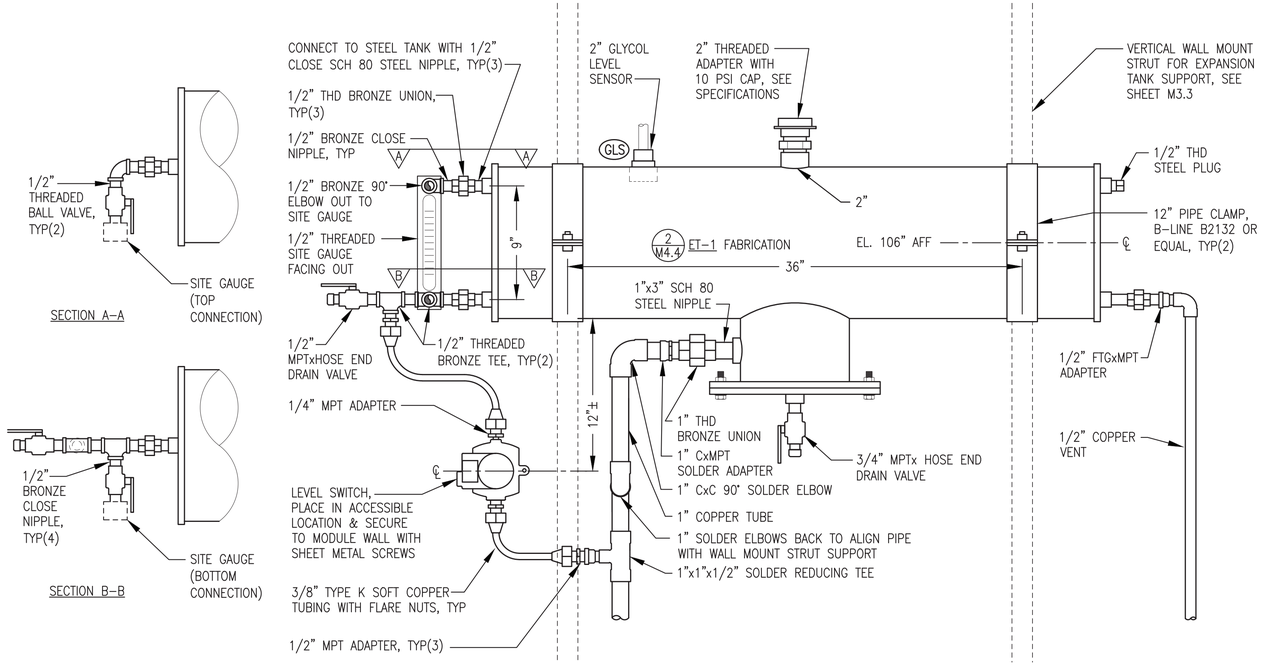
FILE NAME: MANO PP M3-7	SHEET: M4.2
PROJECT NUMBER:	



1 M4.3 **24 GAL EXPANSION TANK ET–1 INSTALLATION**
NO SCALE

EXPANSION TANK GENERAL NOTES:

1) FABRICATE SINGLE WALL 24 GALLON NOMINAL CAPACITY GLYCOL EXPANSION TANK.

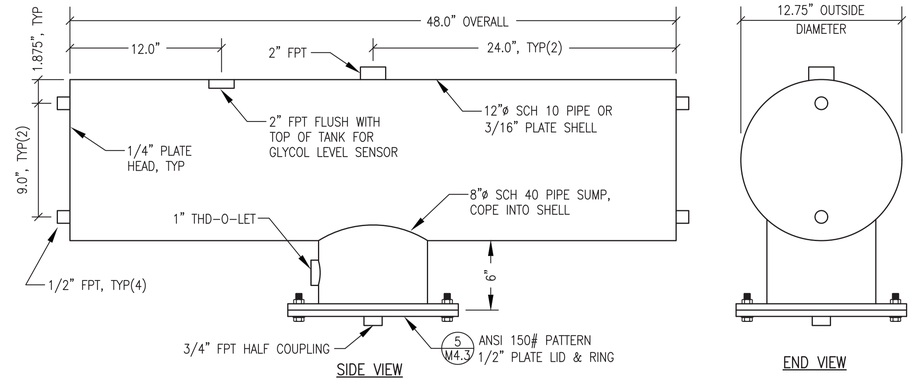
2) FABRICATE SHELL FROM MINIMUM 3/16" ASTM A–36 PLATE STEEL ROLLED AND WELDED OR 12"ø SCHEDULE 10 LIGHTWALL ASTM A53 STEEL PIPE. FABRICATE HEADS FROM 1/4" THICK ASTM A–36 PLATE STEEL. FABRICATE SUMP FROM 8"ø SCHEDULE 40 ASTM A53 STEEL PIPE. FABRICATE SUMP PLATE LID FROM 1/2" THICK ASTM A–36 PLATE STEEL. MAKE ALL JOINTS WITH CONTINUOUS FULL–PENETRATION WELDS.

3) PROVIDE WITH ALL OPENINGS INDICATED USING MINIMUM 3000# FORGED STEEL PIPE HALF COUPLINGS IN ACCORDANCE WITH U.L 142 FIGURE 7.1 #2.

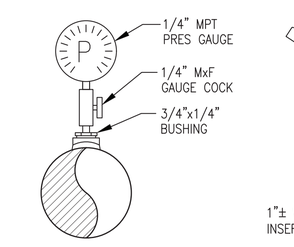
4) PRESSURE TEST COMPLETED ASSEMBLY TO 15 PSIG MINIMUM.

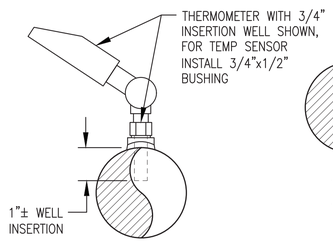
5) UPON COMPLETION OF FABRICATION, ROUND ALL CORNERS AND SHARP EDGES. SANDBLAST TANK EXTERIOR AND ALL ATTACHMENTS IN ACCORDANCE WITH SSPC–SP–6. PAINT WITH TWO COATS EPOXY, SHERWIN WILLIAMS MACROPOXY 646, COLOR STRUCTURAL GRAY 4031.

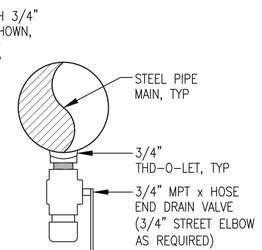
6) UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS, AIR DRY INTERIOR, AND SEAL ALL TANK OPENINGS WITH PLASTIC PLUGS.



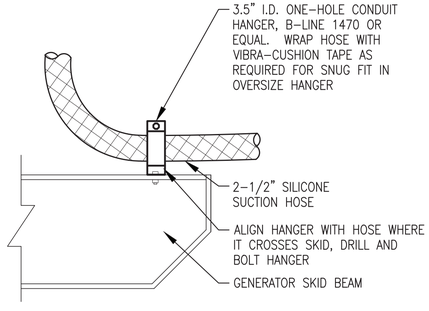
2 M4.3 **EXPANSION TANK ET–1 FABRICATION**
NO SCALE



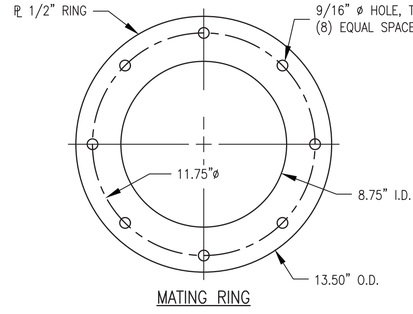


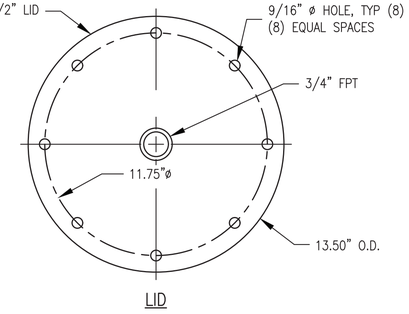


3 M4.3 **TYP INSTRUMENT/DRAIN INSTALLATION IN STEEL PIPE**
NO SCALE

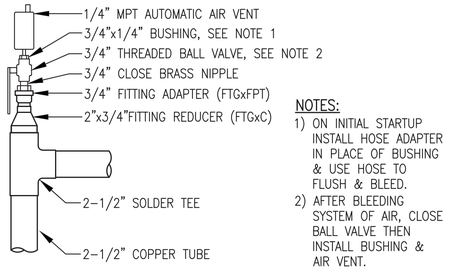


4 M4.3 **TYP SUCTION HOSE SUPPORT ON SKID**
NO SCALE



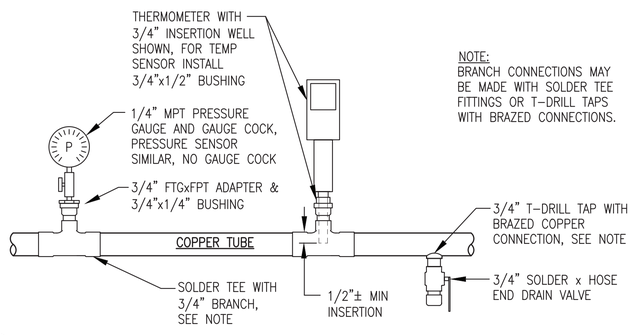


5 M4.3 **LID & MATING RING – PLAN VIEW**
NO SCALE



NOTES:
1) ON INITIAL STARTUP INSTALL HOSE ADAPTER IN PLACE OF BUSHING & USE HOSE TO FLUSH & BLEED.
2) AFTER BLEEDING SYSTEM OF AIR, CLOSE BALL VALVE THEN INSTALL BUSHING & AIR VENT.

6 M4.3 **TYPICAL AIR VENT INSTALLATION IN COPPER**
NO SCALE



7 M4.3 **TYP INSTRUMENT/DRAIN INSTALLATION IN COPPER TUBE**
NO SCALE

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

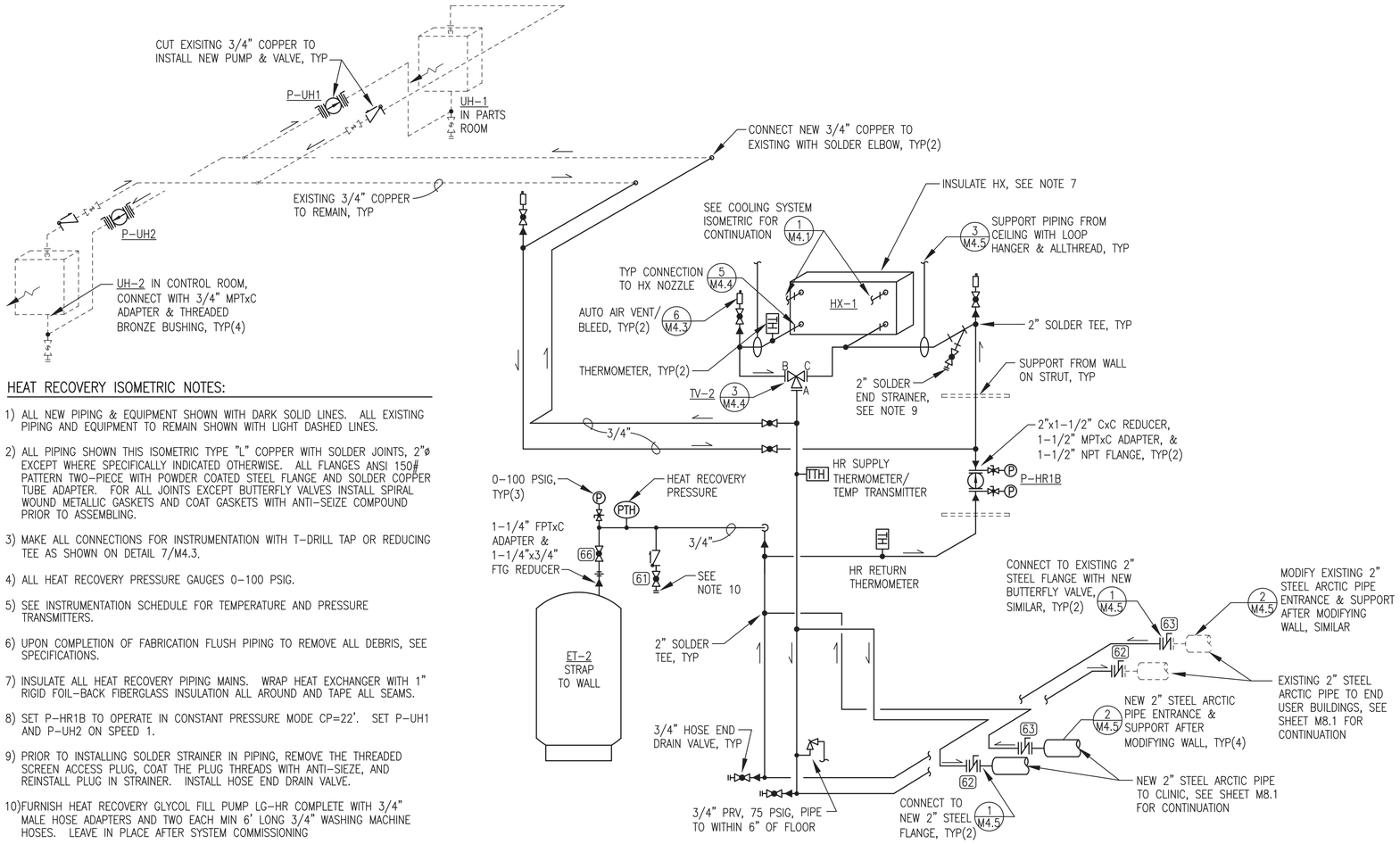
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: ENGINE COOLANT & HEAT RECOVERY PIPING DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

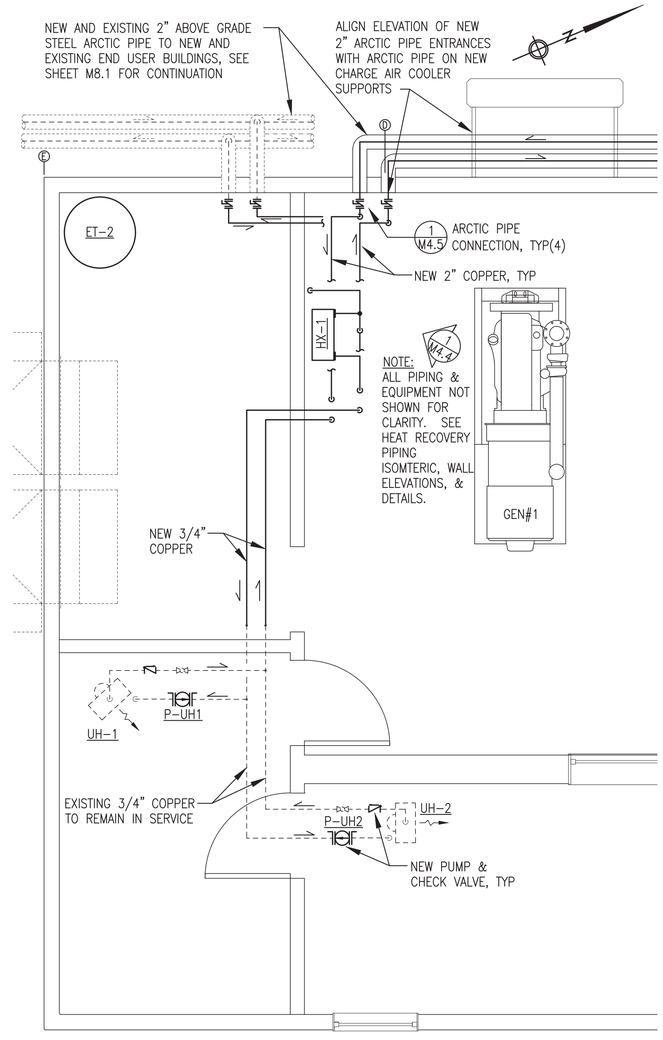
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M3–7 | SHEET: M4.3
PROJECT NUMBER:



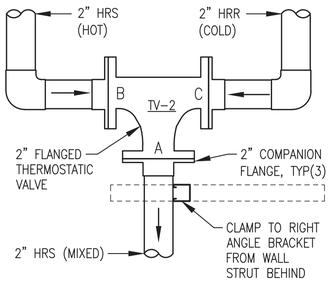
HEAT RECOVERY ISOMETRIC NOTES:

1) ALL NEW PIPING & EQUIPMENT SHOWN WITH DARK SOLID LINES. ALL EXISTING PIPING AND EQUIPMENT TO REMAIN SHOWN WITH LIGHT DASHED LINES.
2) ALL PIPING SHOWN THIS ISOMETRIC TYPE "L" COPPER WITH SOLDER JOINTS, 2"ø EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE. ALL FLANGES ANSI 150# PATTERN TWO-PIECE WITH POWDER COATED STEEL FLANGE AND SOLDER COPPER TUBE ADAPTER. FOR ALL JOINTS EXCEPT BUTTERFLY VALVES INSTALL SPIRAL WOUND METALLIC GASKETS AND COAT GASKETS WITH ANTI-SEIZE COMPOUND PRIOR TO ASSEMBLING.
3) MAKE ALL CONNECTIONS FOR INSTRUMENTATION WITH T-DRILL TAP OR REDUCING TEE AS SHOWN ON DETAIL 7/M4.3.
4) ALL HEAT RECOVERY PRESSURE GAUGES 0-100 PSIG.
5) SEE INSTRUMENTATION SCHEDULE FOR TEMPERATURE AND PRESSURE TRANSMITTERS.
6) UPON COMPLETION OF FABRICATION FLUSH PIPING TO REMOVE ALL DEBRIS, SEE SPECIFICATIONS.
7) INSULATE ALL HEAT RECOVERY PIPING MAINS. WRAP HEAT EXCHANGER WITH 1" RIGID FOIL-BACK FIBERGLASS INSULATION ALL AROUND AND TAPE ALL SEAMS.
8) SET P-HR1B TO OPERATE IN CONSTANT PRESSURE MODE CP=22'. SET P-UH1 AND P-UH2 ON SPEED 1.
9) PRIOR TO INSTALLING SOLDER STRAINER IN PIPING, REMOVE THE THREADED SCREEN ACCESS PLUG, COAT THE PLUG THREADS WITH ANTI-SIEZE, AND REINSTALL PLUG IN STRAINER. INSTALL HOSE END DRAIN VALVE.
10) FURNISH HEAT RECOVERY GLYCOL FILL PUMP LG-HR COMPLETE WITH 3/4" MALE HOSE ADAPTERS AND TWO EACH MIN 6' LONG 3/4" WASHING MACHINE HOSES. LEAVE IN PLACE AFTER SYSTEM COMMISSIONING

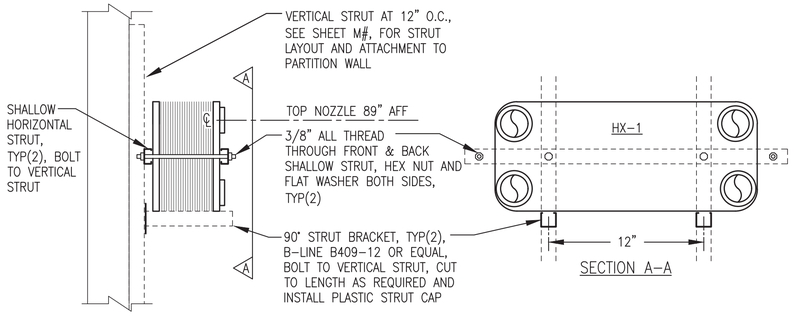
1 M4.4 HEAT RECOVERY SYSTEM PIPING ISOMETRIC
NO SCALE



2 M4.4 HEAT RECOVERY SYSTEM PIPING PLAN
3/8"=1'-0"

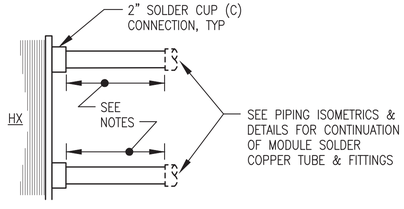


3 M4.4 TV-2 INSTALLATION
NO SCALE



4 M4.4 HEAT EXCHANGER HX-1 SUPPORT FROM WALL
NO SCALE

NOTES:
1) PRIOR TO SHIPPING THE HEAT EXCHANGER TO THE SITE, SHOP BRAZE 12" LONG STRAIGHT COPPER TUBE SECTIONS INTO ALL 4 HEAT EXCHANGER SOLDER CUP NOZZLES UNDER CONTROLLED SHOP CONDITIONS WITH CRAFTSMAN THAT IS HIGHLY EXPERIENCED WITH STAINLESS/COPPER BRAZE CONNECTIONS. USE ONLY SILVER ALLOY BRAZE ROD SPECIFICALLY FORMULATED FOR STAINLESS STEEL TO COPPER CONNECTIONS. INSTALL TEMPORARY CAPS & TAP AS REQUIRED TO SHOP PRESSURE TEST THE ASSEMBLY.
2) DURING INSTALLATION MAINTAIN A MINIMUM 9" LONG STRAIGHT COPPER TUBE SECTION BETWEEN ALL HEAT EXCHANGER NOZZLES AND FIRST SOLDER FITTING TO ALLOW FUTURE INSTALLATION OF NON-DIMPLED REPAIR COUPLING FOR HEAT EXCHANGER TEMPORARY REMOVAL AND/OR REPLACEMENT.



5 M4.4 TYPICAL HX PIPING CONNECTION
NO SCALE

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

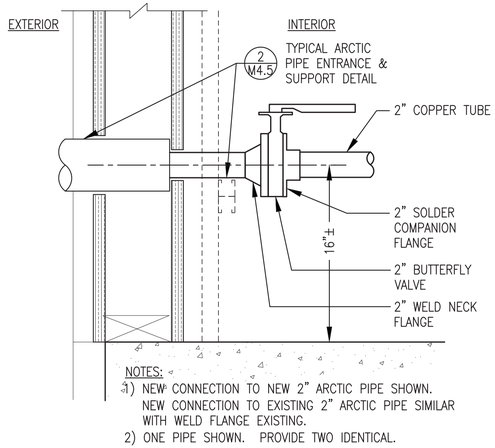
PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: HEAT RECOVERY SYSTEM PLAN, ISOMETRIC, & DETAILS

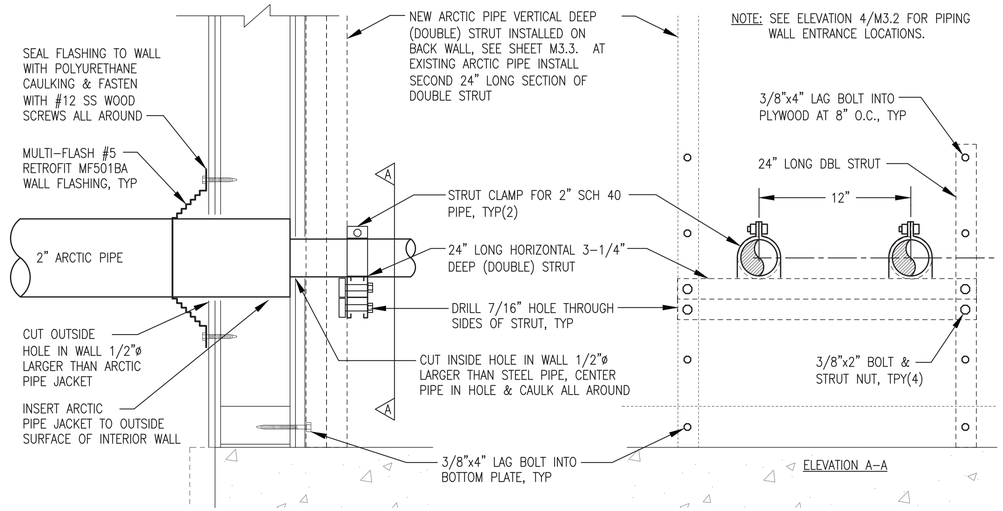
STATE OF ALASKA 49TH — BRIAN C. GRAY ME 8210 — REGISTERED PROFESSIONAL ENGINEER

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

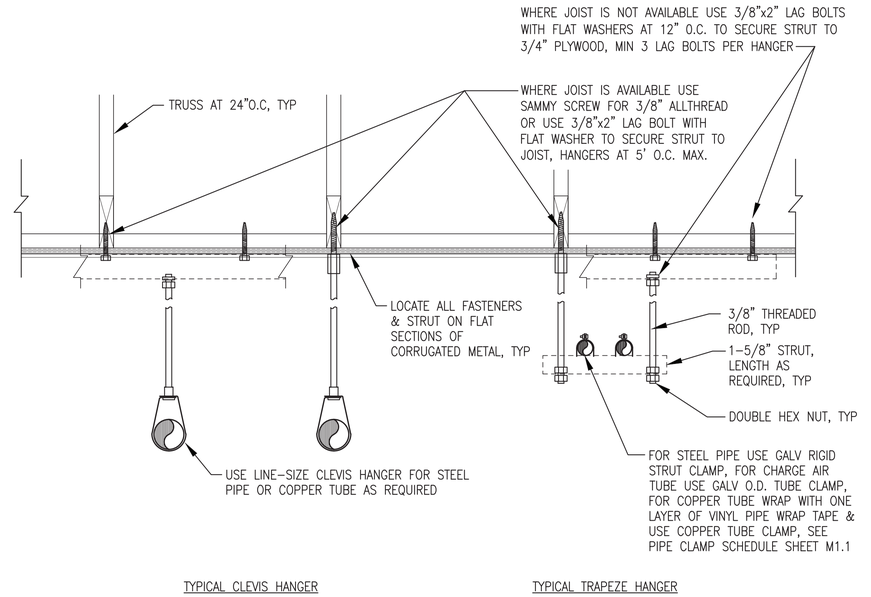
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M3-7 | SHEET: M4.4
PROJECT NUMBER:



1 M4.5 TYPICAL ARCTIC PIPE CONNECTION
NO SCALE



2 M4.5 ARCTIC PIPE ENTRANCE & SUPPORT
2"=1'-0"



3 M4.5 TYPICAL OVERHEAD PIPING SUPPORT DETAIL (4"ø PIPE & SMALLER)
NO SCALE

REVISION #1
ISSUED FOR
CONSTRUCTION
AUGUST 2025

STATE OF ALASKA
49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

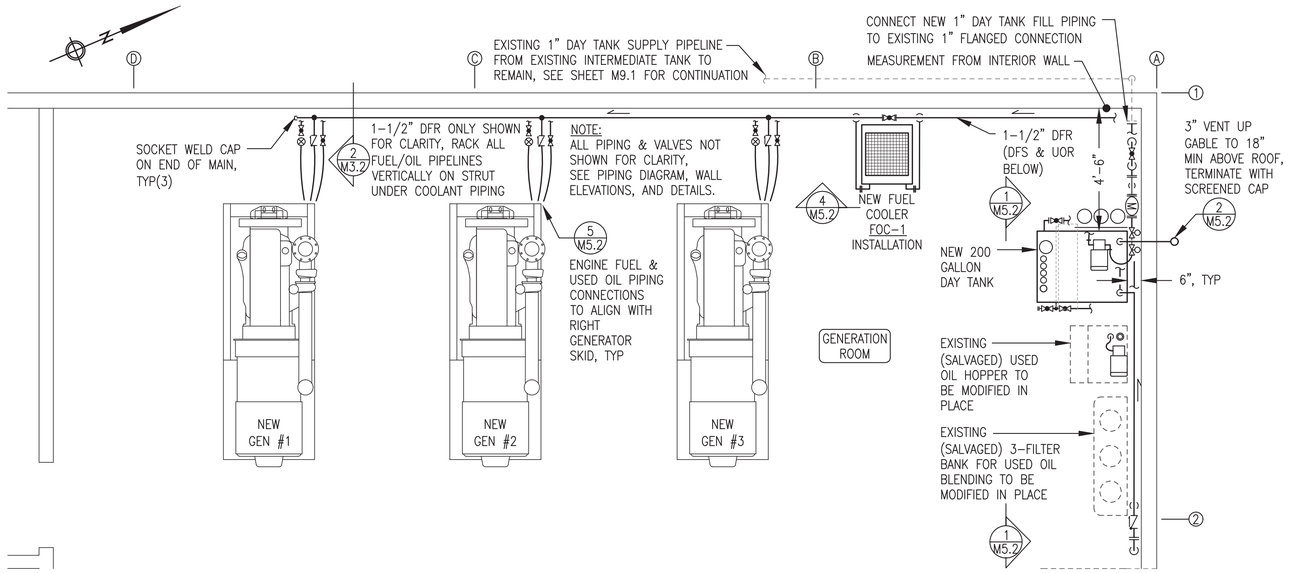
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

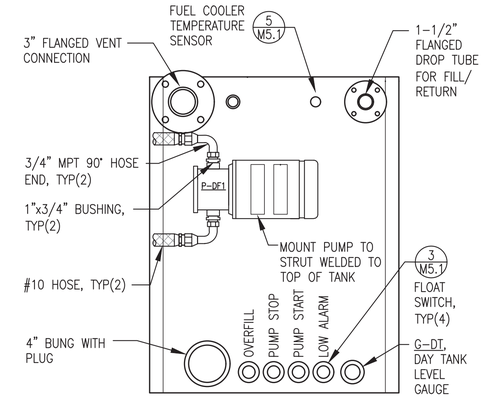
TITLE: HEAT RECOVERY SYSTEM DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M4.5
PROJECT NUMBER:	

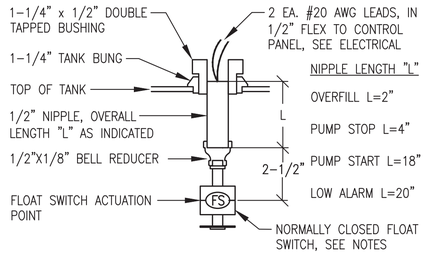


1 M5.1 POWER PLANT FUEL/OIL SYSTEM PIPING PLAN
3/8"=1'-0"

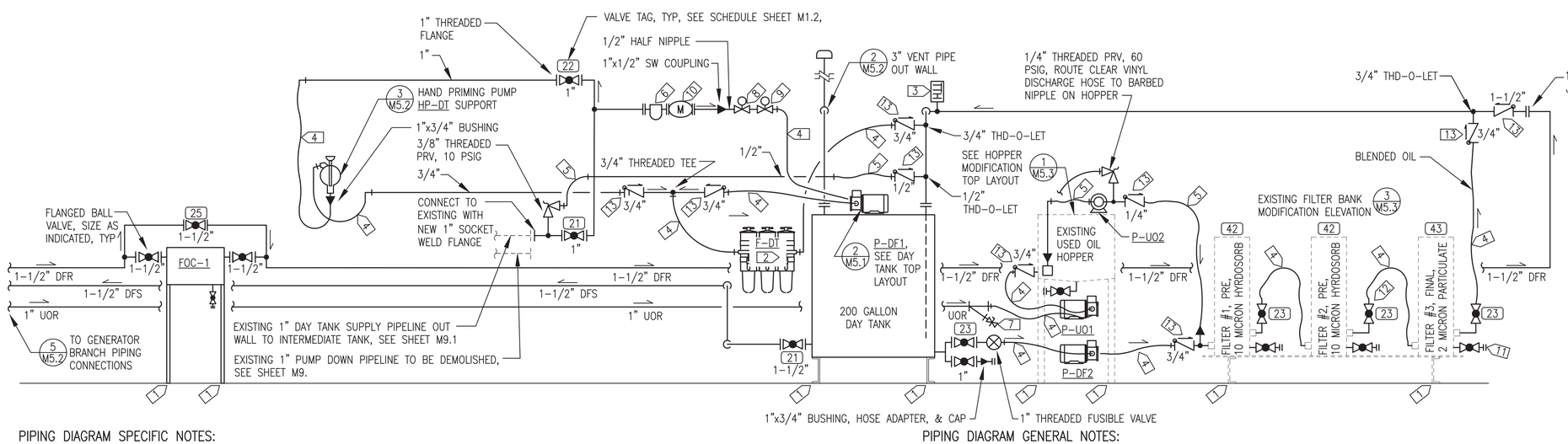


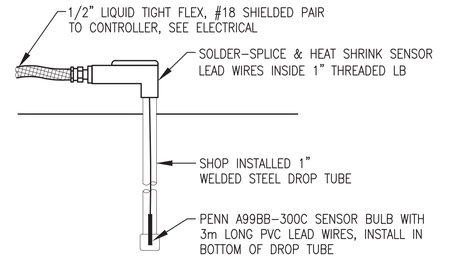
2 M5.1 TOP OF DAY TANK – PLAN VIEW
NO SCALE

NOTES:
1) FLOAT SWITCH SPECIFIED ON INSTRUMENTATION SCHEDULE SHEET M1.1.
2) PRIOR TO INSTALLATION IN TANK, VERIFY THAT ALL DAY TANK FLOAT SWITCHES ARE ORIENTED N.C. (OPEN ON RISE). VERIFY THAT USED OIL HOPPER FLOAT SWITCH IS ORIENTED N.O. (CLOSE ON RISE).
3) IF THREADS ON FLOAT SWITCH HAVE EXCESS EPOXY, CHASE WITH 1/8" PIPE DIE BEING CAREFUL TO AVOID DAMAGING WIRES.



3 M5.1 DAY TANK FLOAT SWITCH INSTALLATION
NO SCALE





5 M5.1 FUEL COOLER TEMPERATURE SENSOR INSTALLATION
NO SCALE

PIPING DIAGRAM SPECIFIC NOTES:

1. FASTEN DEVICE TO FLOOR 3/8"X4" STUD ANCHOR SET IN EPOXY ALL 4 CORNERS.
2. 3/4" THREADED TRIPLE FILTER BANK F-DT.
3. THERMOMETER/TEMP TRANSMITTER, INSTALL WELL IN 3/4" THREAD-O-LET.
4. #10 HOSE WITH 1/2" OR 3/4" NPT ENDS TO MATCH EQUIPMENT.
5. #6 HOSE WITH 1/8", 1/4", OR 3/8" NPT ENDS.
6. 1" FLANGED BASKET STRAINER IN 1" DAY TANK SUPPLY WITH GAUGE COCK BLOW DOWN.
7. 1" THREADED "Y" STRAINER IN 1" UOR WITH GAUGE COCK BLOW DOWN.
8. 1/2" NO SOLENOID VALVE.
9. 1/2" NC SOLENOID VALVE.
10. METER M-DT EQUIPPED WITH 1" ANSI 150# FLANGED ENDS.
11. 3/4" THREADED BALL VALVE WITH HOSE ADAPTER & CAP, TYP(3).
12. 3/4" THREADED BALL VALVE, TYP(3).
13. THREADED SWING CHECK VALVE, SIZE AS INDICATED

PIPING DIAGRAM GENERAL NOTES:

1) ALL EQUIPMENT, PIPE, AND HOSES NEW UNLESS SPECIFICALLY INDICATED AS EXISTING.
2) FABRICATE 200 GALLON DAY TANK IN ACCORDANCE WITH FABRICATION DETAILS.
3) ALL DFS, DFR & UOR PIPING SCH 80. ALL UOR 1". ALL DFS & DFR 1-1/2" EXCEPT WHERE INDICATED AS 3/4". ALL VENT PIPING 3" SCH 40.
4) ALL DFS, DFR & UOR PIPING JOINTS SOCKET OR BUTT WELD EXCEPT FOR THREADED CONNECTIONS TO EQUIPMENT & VALVES. ALL VENT PIPING JOINTS THREADED.
5) ON ALL HOSES FIELD INSTALL JICxNPT SWIVEL ENDS, SIZE REQUIRED TO MATCH PIPING, PUMPS, OR EQUIPMENT.
6) PRIOR TO CONNECTING HOSES TO PUMPS, FILL CAVITIES WITH LUBE OIL AND VERIFY PROPER ROTATION AND INLET/OUTLET CONNECTIONS.

4 M5.1 DIESEL FUEL & USED OIL PIPING DIAGRAM
NO SCALE

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

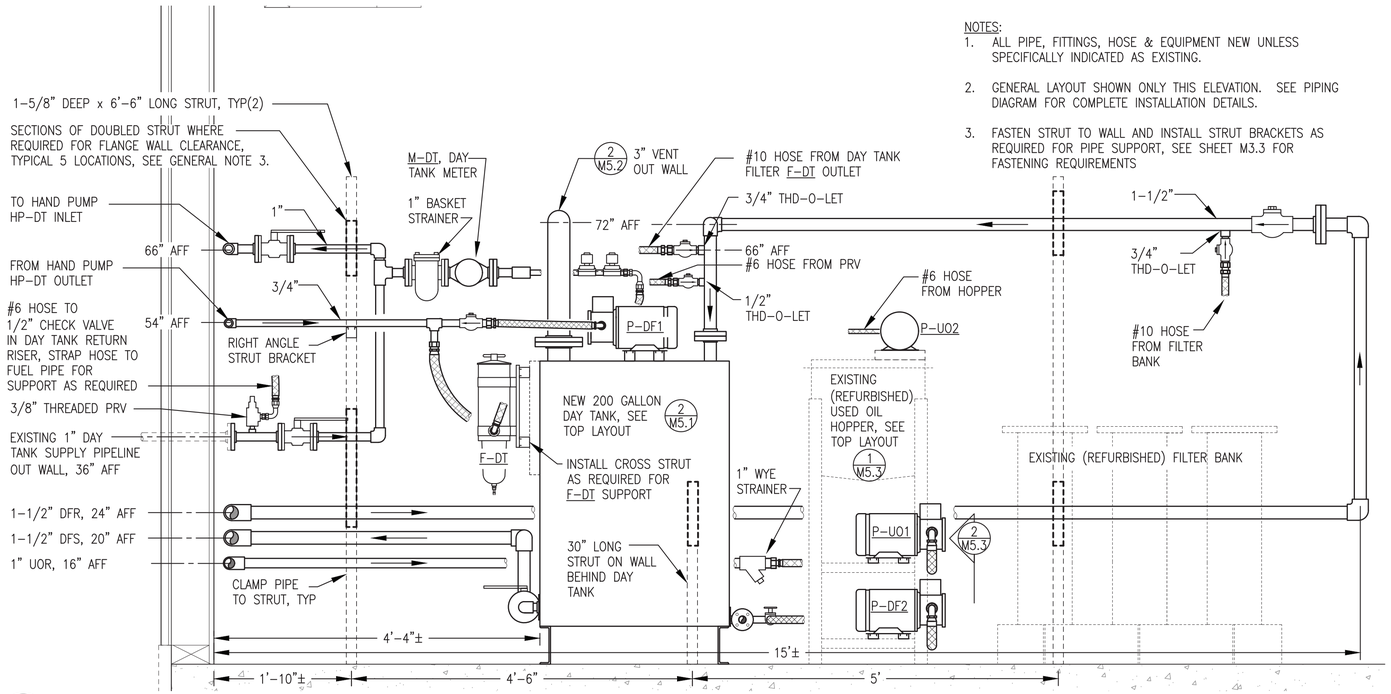
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

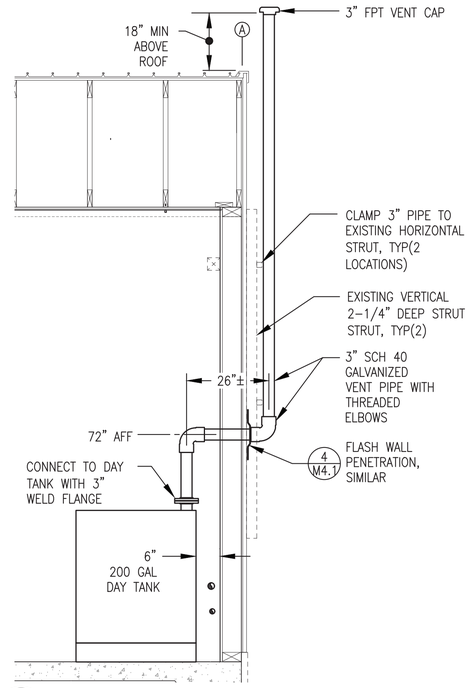
TITLE: DIESEL FUEL & USED OIL PIPING PLAN, DIAGRAM, & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

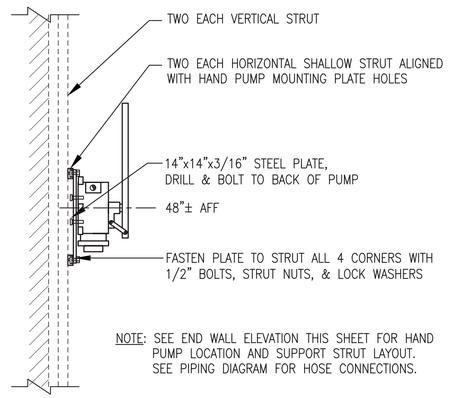
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M5.1
PROJECT NUMBER:	



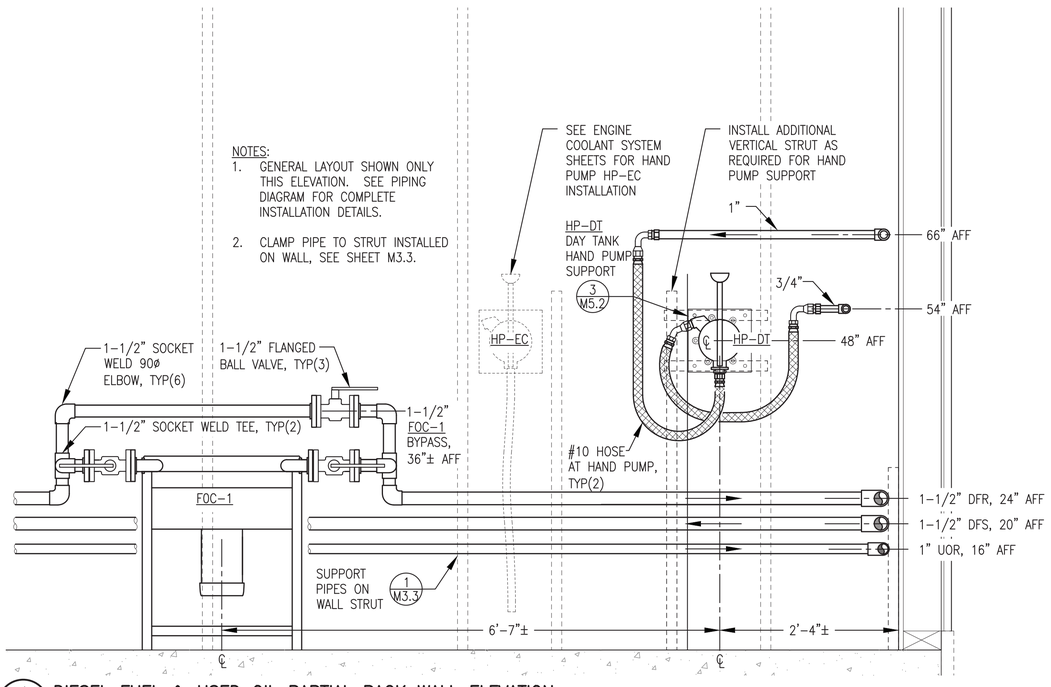
1 M5.2 DIESEL FUEL & USED OIL END WALL ELEVATION
1"=1'



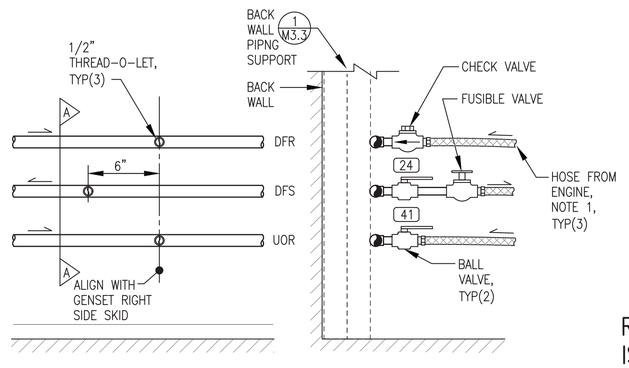
2 M5.2 DAY TANK VENT INSTALLATION
1/2"=1'-0"



3 M5.2 DAY TANK HAND PUMP HP-DT WALL SUPPORT
NO SCALE



4 M5.2 DIESEL FUEL & USED OIL PARTIAL BACK WALL ELEVATION
1"=1'



NOTES:
1) HOSES PROVIDED WITH ENGINE, SIZE VARIES PER ENGINE & PRODUCT. CUT TO LENGTH & INSTALL JIC SWIVELS & 1/2" MPT ADAPTERS.
2) ALL PIPING & NIPPLES SCH 80. ALL VALVES 1/2" SIZE, THREADED BODY.

5 M5.2 ENGINE FUEL PIPING CONNECTION
NO SCALE

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: DIESEL FUEL & USED OIL PIPING ELEVATIONS & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

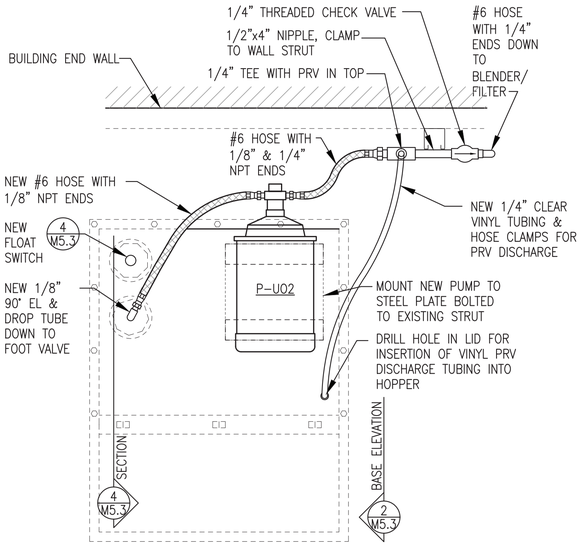
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M3-7 | SHEET: M5.2
PROJECT NUMBER:

EXISTING OIL HOPPER & BLENDER MODIFICATION GENERAL NOTES

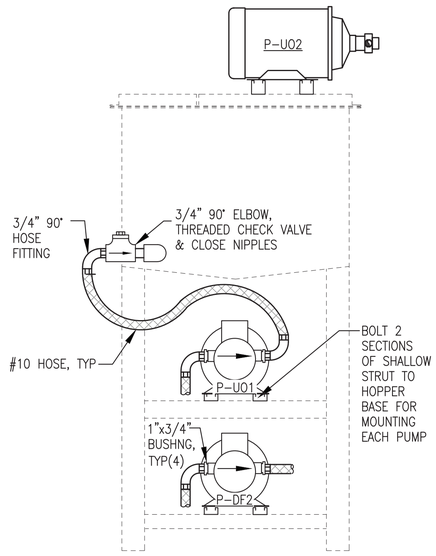
1) ALL PIPING SCH 80, SIZE AS INDICATED. ALL PIPING JOINTS THREADED.

2) ON ALL HOSES FIELD INSTALL JICxNPT SWIVEL ENDS, SIZE REQUIRED TO MATCH PIPING, PUMPS, OR EQUIPMENT.

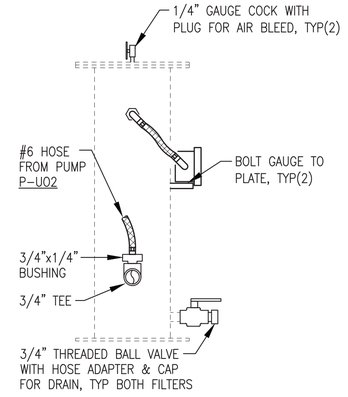
3) DEMOLISH ALL VALVES, HOSES, AND INSTRUMENTATION AND REPLACE WITH NEW. NOTE THAT FITTINGS CONNECTED DIRECTLY TO TANK, INCLUDING INTERNAL DROP TUBES, MAY BE LEFT IN PLACE IF NOT DAMAGED. EXISTING COMPONENTS TO REMAIN SHOWN WITH LIGHT-DASHED LINES. NEW COMPONENTS SHOWN WITH DARK-SOLID LINES.



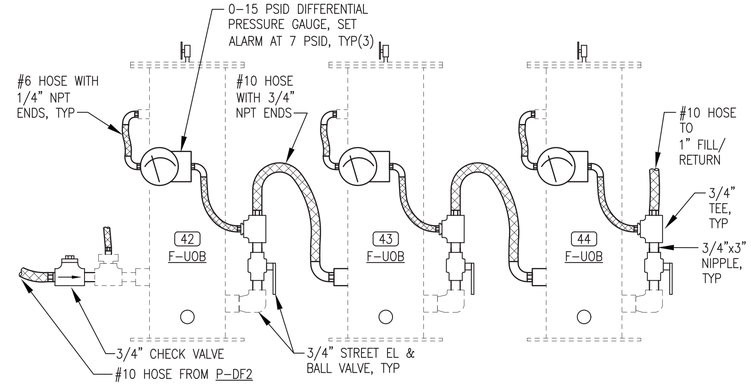
1 M5.3 TOP OF EXISTING HOPPER – PLAN VIEW
NO SCALE



2 M5.3 EXISTING HOPPER BASE ELEVATION
NO SCALE

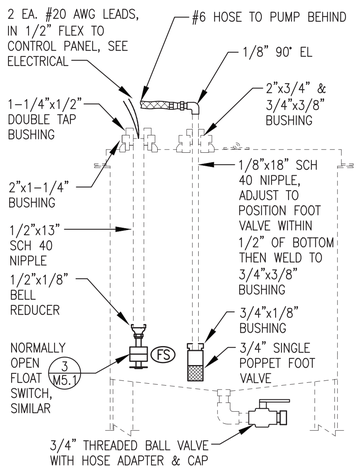


FILTER #1 INLET SIDE ELEVATION



FRONT ELEVATION

3 M5.3 EXISTING FILTER BANK ELEVATIONS
NO SCALE



NOTES:
1) FLOAT SWITCH (FS) SPECIFIED ON INSTRUMENTATION SCHEDULE SHEET M1.1.

2) INTERNAL DROP TUBES, MAY BE LEFT IN PLACE IF NOT DAMAGED. INSTALL NEW FLOAT SWITCH, FOOT VALVE, DRAIN VALVE, AND HOSES.

3) PRIOR TO INSTALLATION, VERIFY ALL HOPPER FLOAT SWITCH IS ORIENTED NORMALLY OPEN, CLOSE ON RISE.

4) BEFORE CONNECTING TO BELL REDUCER, CHASE THREADS ON FLOAT SWITCH WITH 1/8" PIPE DIE TO CLEAN OFF ANY EXCESS EPOXY, USE CARE TO AVOID DAMAGING WIRES.

4 M5.3 SECTION THROUGH EXISTING HOPPER
NO SCALE

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: EXISTING USED OIL HOPPER & BLENDER MODIFICATION DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
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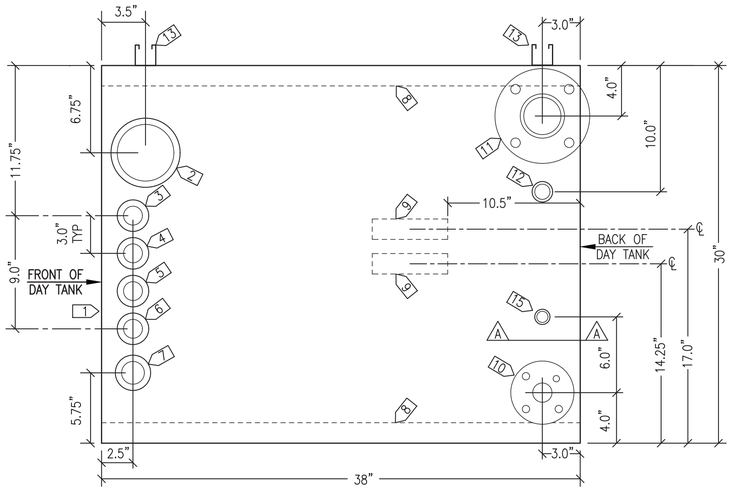
FILE NAME: MANO PP M3-7	SHEET: M5.3
PROJECT NUMBER:	



TOP VIEW

DAY TANK SPECIFICATIONS:

1) FABRICATE SINGLE WALL 200 GALLON NOMINAL CAPACITY DAY TANK. FABRICATE IN ACCORDANCE WITH UL 142.

2) FABRICATE FROM ASTM A-36 STEEL PLATE, 10 GAUGE MINIMUM EXCEPT FOR TOP 3/16" MINIMUM. ALL TANK SEAM JOINTS TO BE FULL CONTINUOUS WELDS IN ACCORDANCE WITH UL 142 FIGURE 6.5 – #1, #6, #7, OR #8.

3) PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. ALL STRUT TO BE 1-5/8"x1-5/8"x12 GA SOLID BACK PLAIN (BLACK), B-LINE B22 PLN OR EQUAL. SEAL WELD ALL TANK ATTACHMENTS.

4) INSTALL ALL FPT OPENINGS IN ACCORDANCE WITH UL 142 FIGURE 7.1 – #4 UNLESS INDICATED OTHERWISE. ALL DROP TUBES SCH 40 ASTM A53 STEEL PIPE WITH MPT OR FLANGED END AS INDICATED.

5) PRESSURE TEST COMPLETED ASSEMBLY TO 5 PSIG MAXIMUM USING SOAPY WATER SOLUTION ON ALL WELD JOINTS.

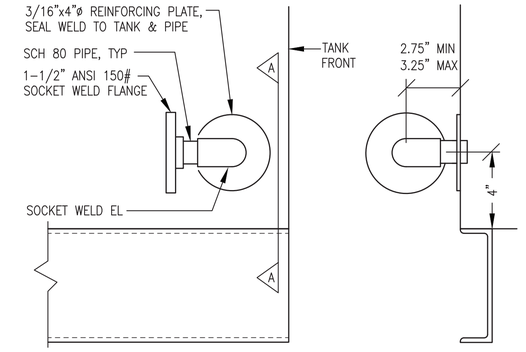
6) UPON COMPLETION OF FABRICATION, ROUND ALL CORNERS AND SHARP EDGES. SANDBLAST TANK EXTERIOR AND ALL ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-6. PAINT WITH TWO COATS EPOXY, SHERWIN WILLIAMS MACROPOXY 646, COLOR STRUCTURAL GRAY 4031.

7) LABEL ALL OPENINGS WITH 1/4" BLACK LETTERS INDICATING FUNCTION AS LISTED IN PARENTHESES IN SPECIFIC NOTES.

8) UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS AND AIR DRY INTERIOR. SEAL ALL MPT OPENINGS WITH THREADED STEEL CAPS. SEAL FPT TANK OPENINGS WITH THREADED STEEL PIPE PLUGS WHERE INDICATED. INSTALL 1-1/4" VENT CAP WHERE INDICATED. SEAL ALL OTHER FPT OPENINGS WITH PLASTIC OR STEEL PLUGS.

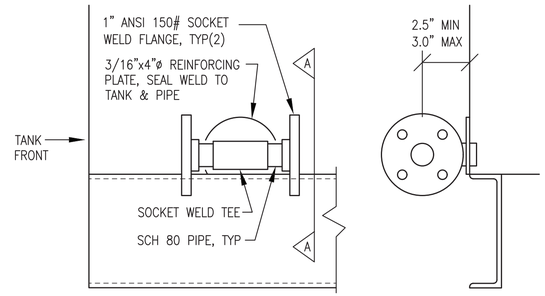
DAY TANK SPECIFIC NOTES:

1. PROVIDE 2" HIGH LETTERING: "DIESEL FUEL 200 GALLONS"
2. 4" FPT (MANUAL FILL) – INSTALL THREADED STEEL PLUG
3. 1-1/4" FPT (OVERFILL) – INSTALL VENT CAP FOR SHIPPING
4. 1-1/4" FPT (PUMP STOP)
5. 1-1/4" FPT (PUMP START)
6. 1-1/4" FPT (LOW ALARM)
7. 1-1/2" FPT (TANK GAUGE)
8. 38"LONGx1-5/8"x1-5/8" STRUT, ENDS FLUSH WITH TANK FRONT & BACK
9. 6"LONGx1-5/8"x1-15/8" STRUT
10. 1-1/2" SCH 40 DROP TUBE (FILL) WITH 1" 150# FLANGE
11. 3" 150# FLANGED VENT CONNECTION
12. 1" FPT (SPARE) – INSTALL THREADED STEEL PLUG
13. 24"LONGx1-5/8"x1-5/8" STRUT, ENDS FLUSH WITH TOP OF TANK
14. C6x8.2, 38" LONG
15. 1" MPT FOR TEMPERATURE SENSING



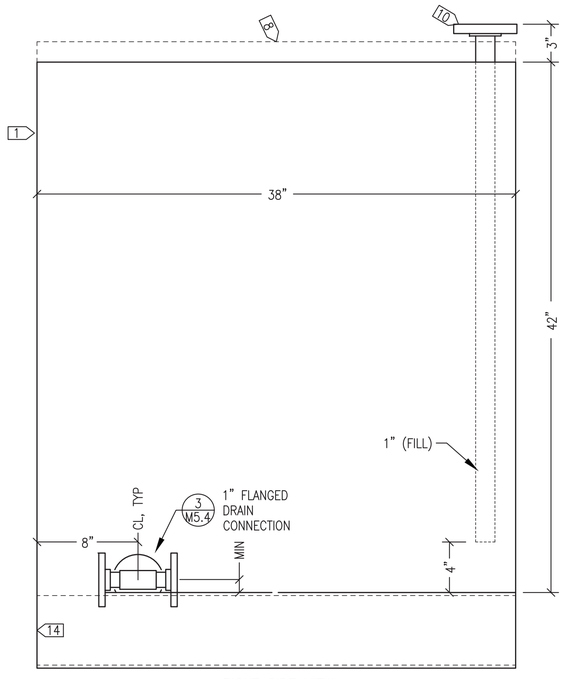
LEFT SIDE ELEVATION SECTION A-A

2 M5.4 **1-1/2" FLANGED SUPPLY CONNECTION**
NO SCALE

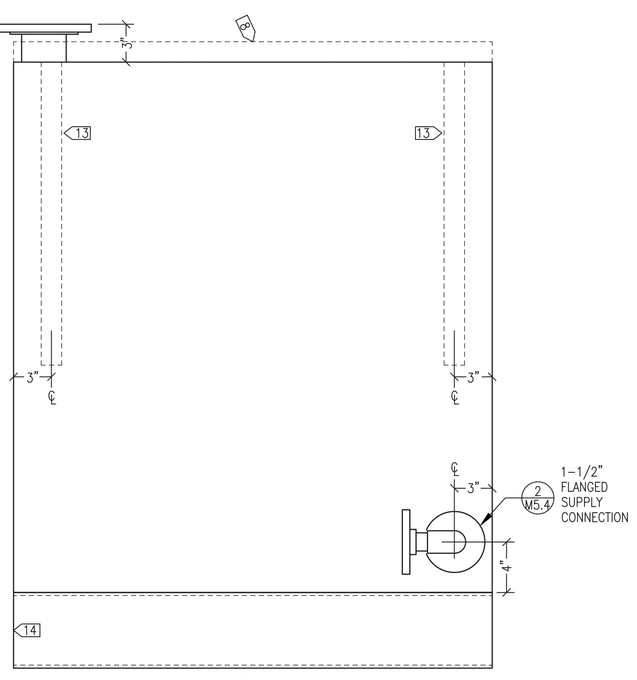


RIGHT SIDE ELEVATION SECTION A-A

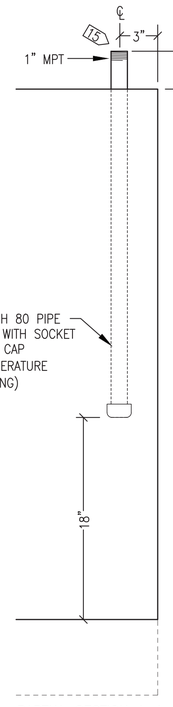
3 M5.4 **1" FLANGED DRAIN CONNECTION**
NO SCALE



RIGHT SIDE VIEW



LEFT SIDE VIEW



PARTIAL SECTION A-A

1 M5.4 **200 GALLON SINGLE WALL DAY TANK**
1"=6"

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

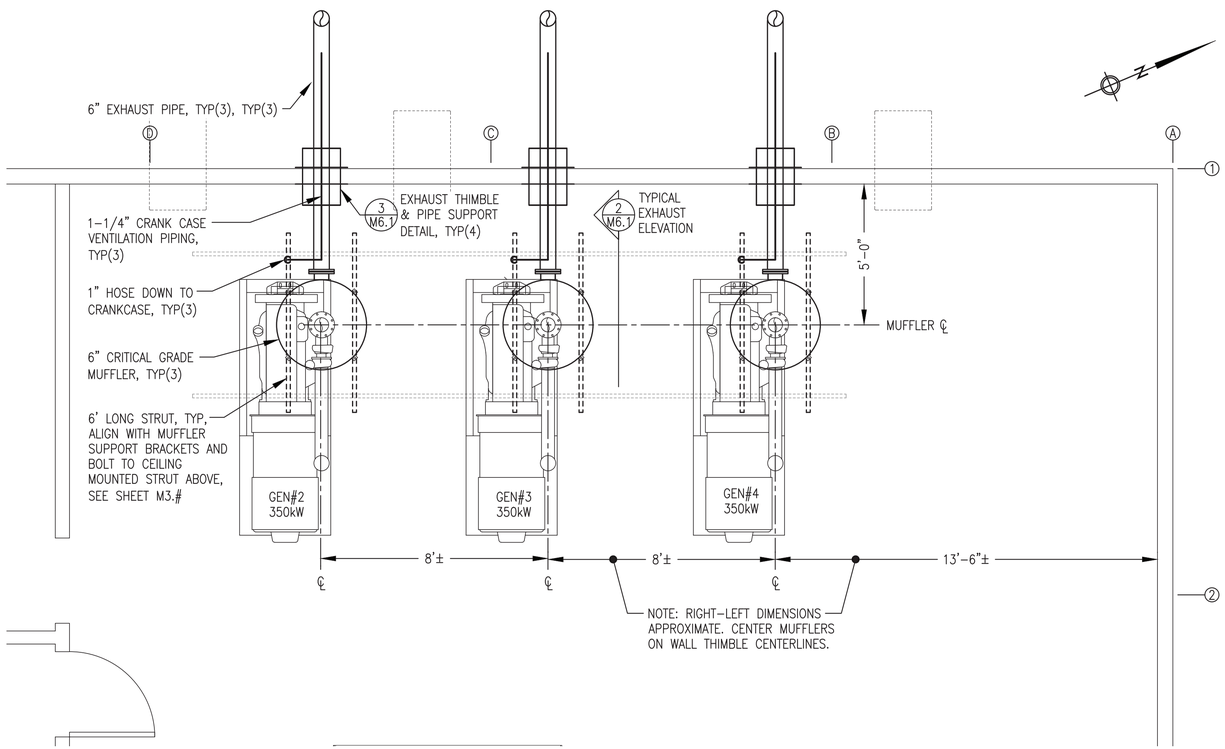
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: 200 GALLON DAY TANK FABRICATION

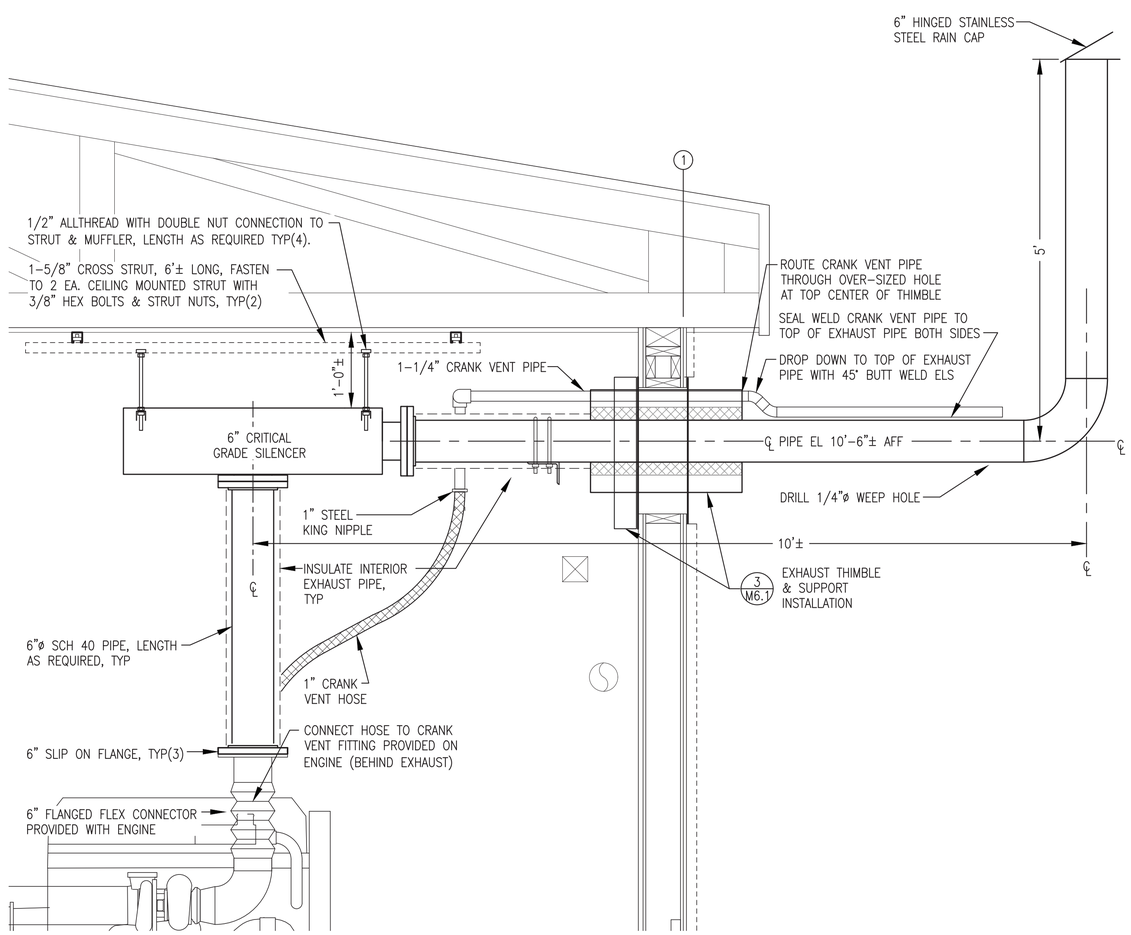
Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M3-7 | SHEET: M5.4
PROJECT NUMBER:



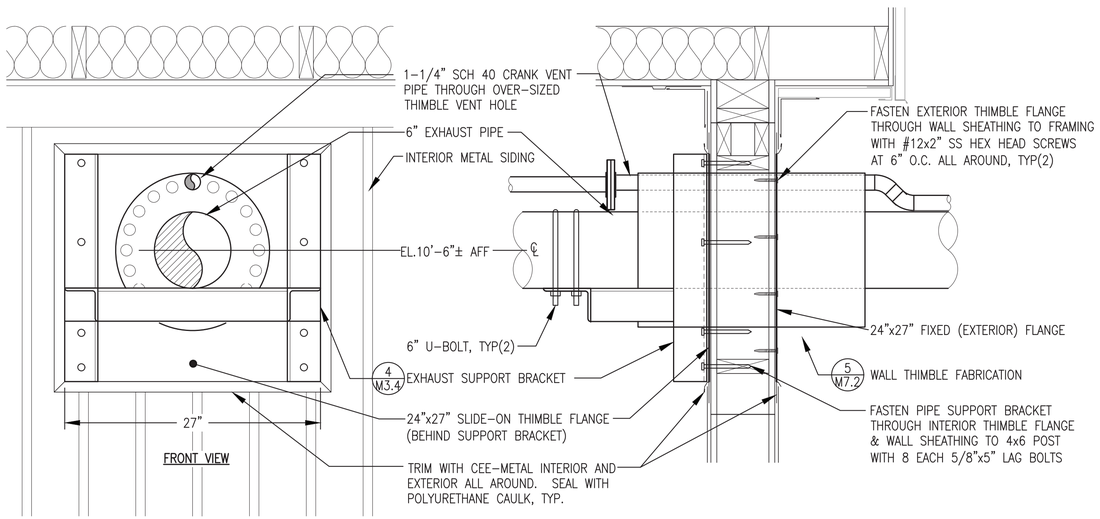
1 M6.1 EXHAUST & CRANK VENT PLAN

3/8"=1'-0"



2 M6.1 TYPICAL GENERATOR EXHAUST ELEVATION

1"=1'-0"



3 M6.1 TYPICAL EXHAUST THIMBLE & PIPE SUPPORT INSTALLATION

NO SCALE

EXHAUST SYSTEM GENERAL NOTES:

1) THE MAXIMUM EXHAUST TEMPERATURE FOR THE ENGINES IS LESS THAN 1400°F. THE EXHAUST SYSTEM LAYOUT PROVIDES MORE THAN 9" CLEARANCE TO COMBUSTIBLES IN ACCORDANCE WITH NFPA 37 8.3. PARAGRAPH 8.3.1.
2) TRIPLE WALL INSULATED/VENTILATED WALL THIMBLES SHALL BE FABRICATED AS INDICATED AND LISTED FOR ZERO CLEARANCE TO COMBUSTIBLES.
3) MUFFLERS SHALL BE PACKED DISC STYLE, BOTTOM CENTER IN AND SIDE OUT, SIZE AS INDICATED, ASA 125# FLANGED CONNECTIONS, 2" INTERNAL ACOUSTICAL/ THERMAL WRAP, FOUR MOUNTING TABS, HIGH TEMPERATURE SATIN BLACK FINISH, CRITICAL GRADE.
4) EXHAUST PIPE SCH 40 ASTM A-53B WITH BUTT WELD 90° ELS, ANSI 150# FLAT FACED SLIP FLANGES WITH HIGH TEMPERATURE FULL FACE GASKETS.
5) CRANK VENT PIPE SCH 40 ASTM A-106B WITH BUTT WELD ELS ON EXTERIOR AND BUTT WELD OR SOCKET WELD ELS ON INTERIOR.
6) INSULATE INTERIOR EXHAUST PIPE WITH 1-1/2" MEDIUM TEMPERATURE RIGID INSULATION WITH ALUMINUM JACKET WHERE INDICATED.
7) INSULATE EXHAUST FLEX INCLUDING FLANGES WITH HIGH TEMPERATURE BLANKET SYSTEM.

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

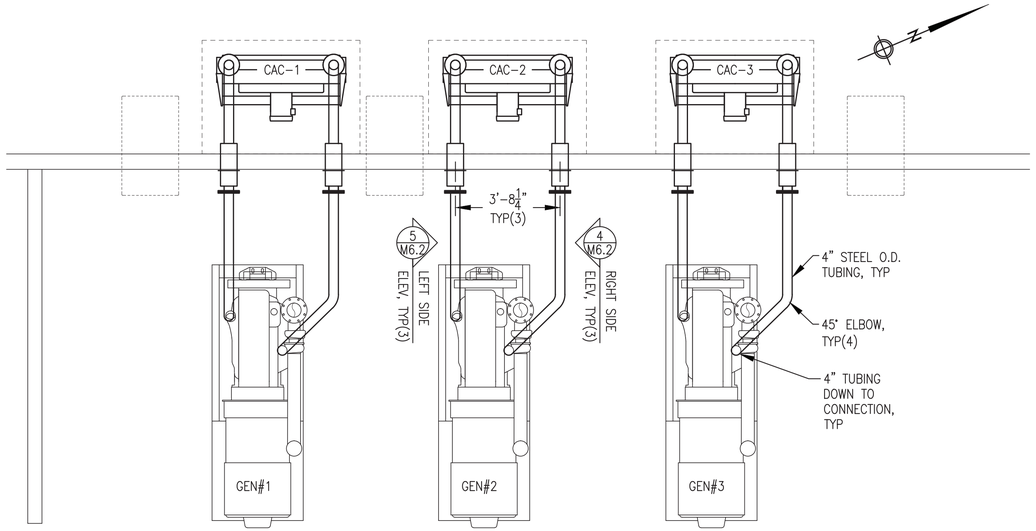
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

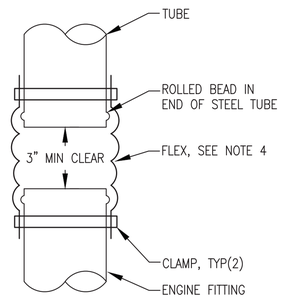
TITLE: EXHAUST & CRANK VENT PLAN & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

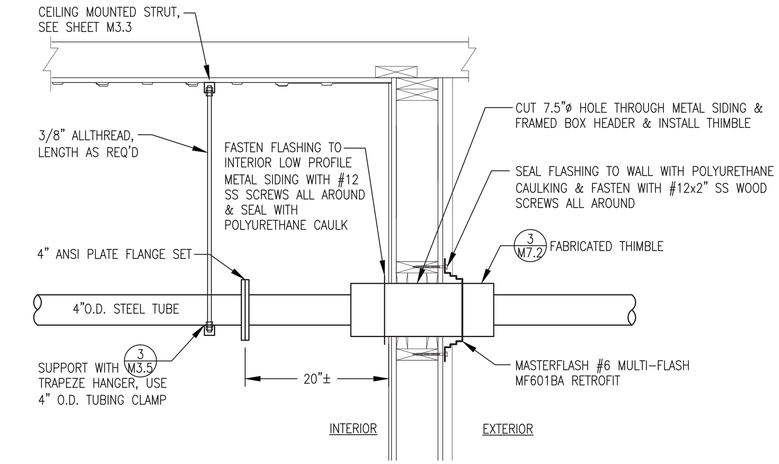
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M6.1
PROJECT NUMBER:	



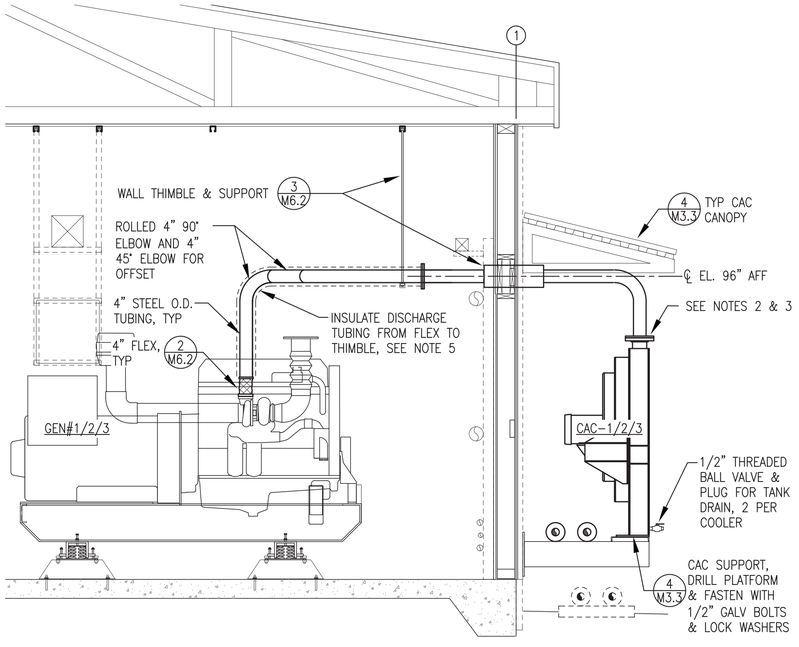
1 M6.2 CHARGE AIR PLAN
3/8"=1'-0"



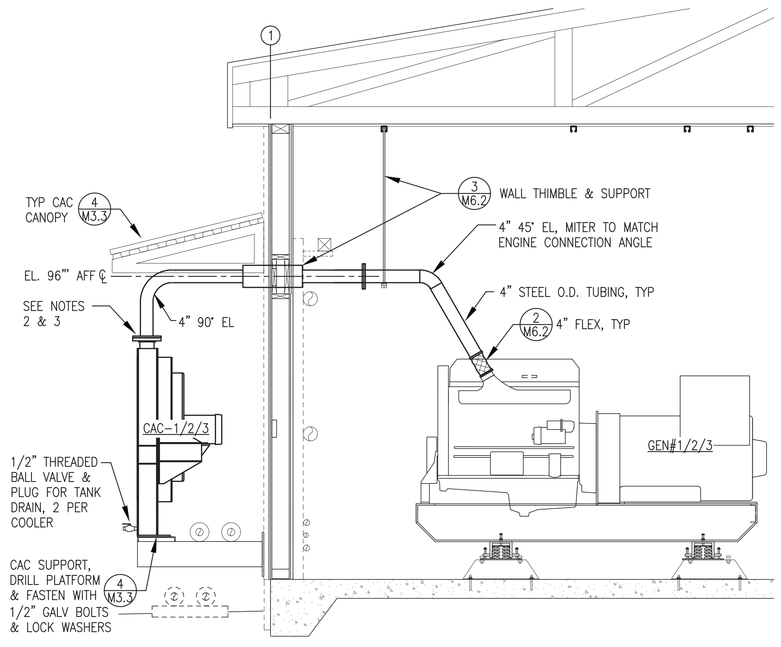
2 M6.2 TYPICAL CHARGE AIR FLEX
NO SCALE



3 M6.2 CHARGE AIR TUBING WALL ENTRANCE & TRAPEZE SUPPORT
NO SCALE



4 M6.2 TYPICAL CHARGE AIR RIGHT (HOT) SIDE INSTALLATION
1/2"=1'-0"



5 M6.2 TYPICAL CHARGE AIR LEFT (COLD) SIDE INSTALLATION
1/2"=1'-0"

CHARGE AIR SYSTEM GENERAL NOTES:

1) ALL TUBING TO BE LIGHT WALL CARBON STEEL O.D. TUBING. ALL ELBOWS TO BE LONG RADIUS SWEEP FITTINGS TO MATCH TUBING. ALL JOINTS TO BE WELDED EXCEPT AS INDICATED.

2) MAKE COOLER CONNECTIONS AND FLANGED JOINTS WITH O.D. TUBE BY ANSI 125# STEEL PLATE FLANGES, G.T. EXHAUST OR EQUAL.

3) ALL CHARGE AIR FLANGE GASKETS HIGH TEMPERATURE FULL FACE. ALL CHARGE AIR FLANGE BOLTS GALVANIZED STEEL. COAT WITH HIGH TEMPERATURE ANTI-SIEZE COMPOUND.

4) INSTALL HIGH TEMPERATURE DOUBLE HUMP SILICONE TURBO SLEEVES WITH RINGS, FLEXFAB 7715-0002 OR EQUAL. FASTEN WITH LINED STAINLESS STEEL CLAMPS, IDEAL 5364(3) OR EQUAL.

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STATE OF ALASKA 49TH
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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: CHARGE AIR SYSTEM PLAN & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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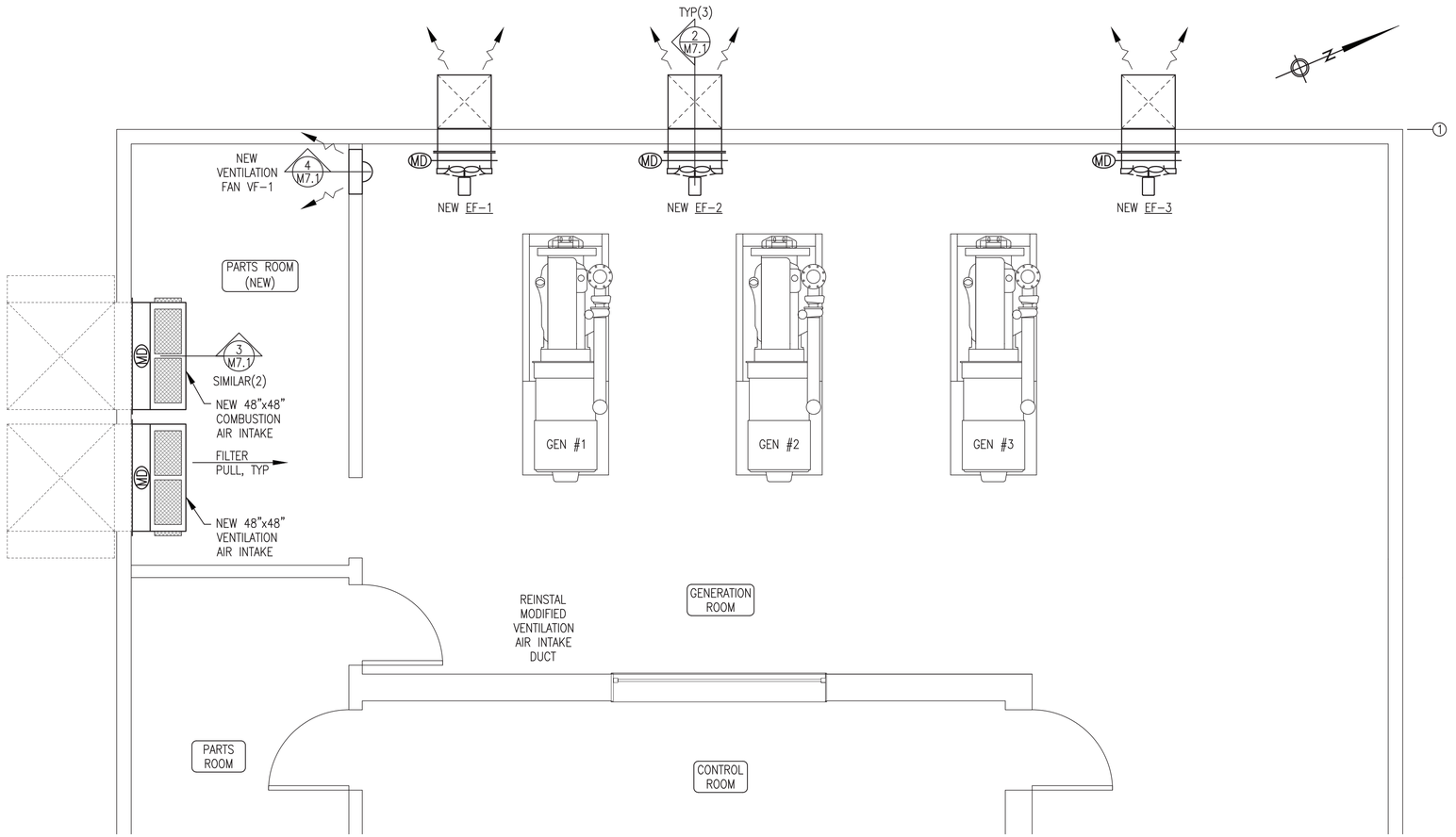
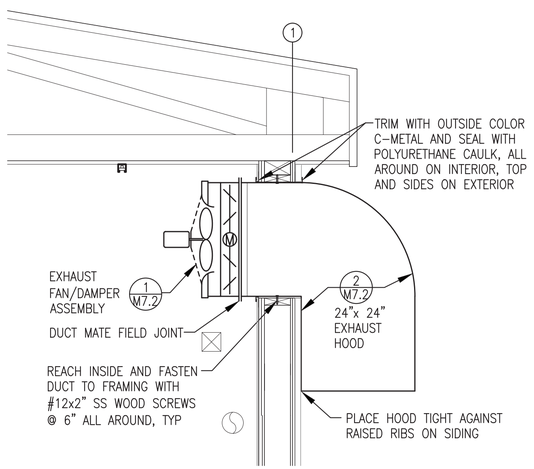
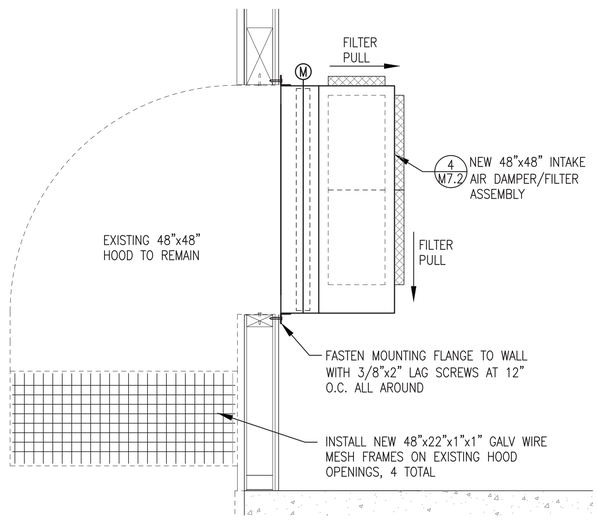
FILE NAME: MANO PP M3-7 | SHEET: M6.2
PROJECT NUMBER:



1 M7.1 VENTILATION PLAN
3/8"=1'-0"



2 M7.1 EXHAUST FAN & HOOD INSTALLATION
3/4"=1'-0"



3 M7.1 TYPICAL AIR INTAKE DUCT MODIFICATION DETAIL
3/4"=1'-0"

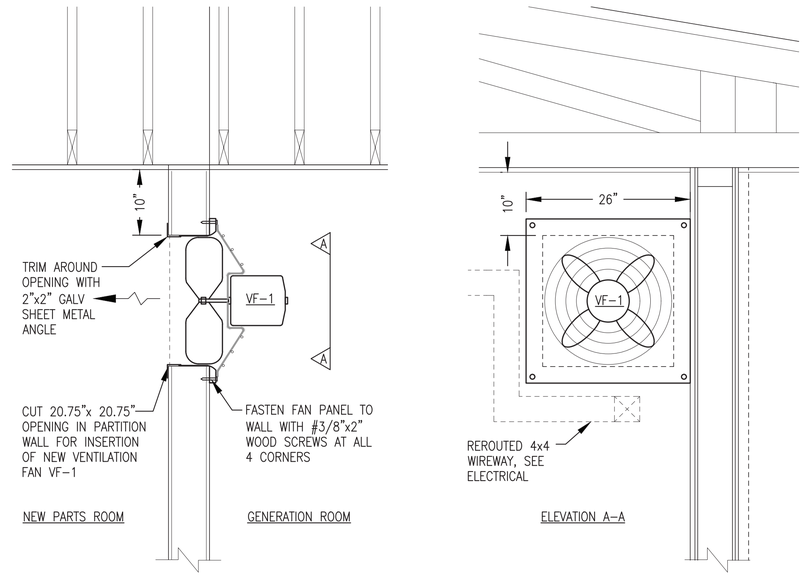
VENTILATION EQUIPMENT NOTES

GENERAL – PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE INTERNATIONAL MECHANICAL CODE AND APPLICABLE SMACNA STANDARDS.

INSTALLATION – EQUIPMENT INSTALLATION IS NOT PART OF THE FABRICATION SCOPE OF WORK. FAN AND DAMPER ASSEMBLIES AND HOODS WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS. FASTEN AND SUPPORT ALL FABRICATIONS AS INDICATED.

INTERIOR SHEET METAL FABRICATIONS – FABRICATE ALL DAMPER AND FAN ASSEMBLIES FROM MINIMUM 20 GAUGE GALVANIZED SHEET METAL EXCEPT FOR INTAKE HOODS USE MINIMUM 18 GAUGE SHEET METAL. USE STANDARD MECHANICAL JOINTS AND SEAL ALL JOINTS AIR TIGHT.

EXHAUST HOODS – FABRICATE FROM MINIMUM 0.090" THICK TYPE 5052 ALUMINUM USING CONTINUOUS SEAL WELDS FOR ALL JOINTS.



4 M7.1 NEW VENTILATION FAN VF-1 INSTALLATION
1"=1'-0"

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BRIAN C. GRAY
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1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

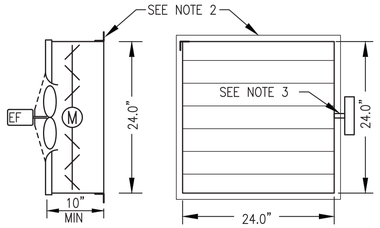
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: VENTILATION SYSTEM PLAN & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M7.1
PROJECT NUMBER:	

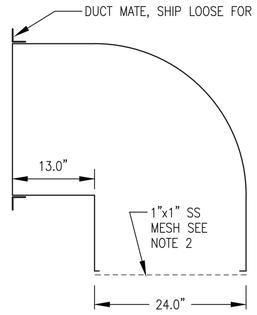


NOTES:

1. FABRICATE THREE IDENTICAL EXHAUST FAN ASSEMBLIES COMPLETE WITH FAN AND DAMPER MOUNTED AND SEALED TO DUCT.
2. SHOP MOUNT DUCTMATE FLANGE.
3. PROVIDE MIN 3" DAMPER ROD EXTENSION ON THE RIGHT SIDE. INSTALL BELIMO AF-BUP ACTUATOR, NO SUBSTITUTES. FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.

1 M7.2 EXHAUST FAN/DAMPER ASSEMBLY FABRICATION

1"=1'-0"

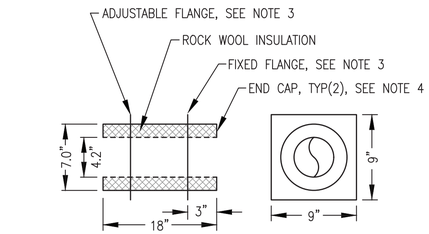


NOTES:

1. FABRICATE 3 EACH IDENTICAL HOODS FROM 0.090" THICK TYPE 5052 ALUMINUM WITH ALL WELDED SEAMS. GRIND AND BUFF EXPOSED WELDS FOR CLEAN FINISH.
2. PROVIDE 1" FRAME ALL AROUND BOTTOM OF HOOD. INSTALL 1"x1" STAINLESS STEEL WIRE MESH IN HEMMED STAINLESS STEEL FRAME AND FASTEN TO HOOD WITH STAINLESS STEEL SCREWS ALL AROUND.

2 M7.2 EXHAUST HOOD FABRICATION

1"=1'-0"

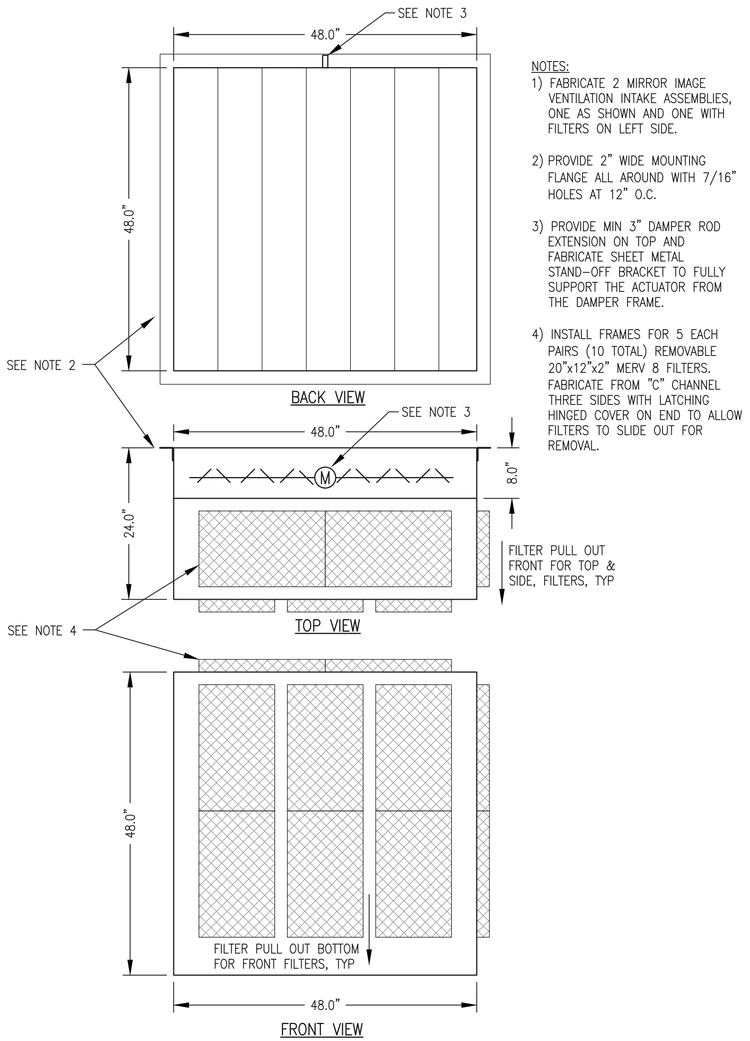


NOTES:

1) FABRICATE 8 IDENTICAL CHARGE AIR THIMBLES.
2) FABRICATE ENTIRE ASSEMBLY FROM MINIMUM 16 GAUGE TYPE 304 STAINLESS STEEL WITH ALL JOINTS SEAL WELDED.
3) FABRICATE IDENTICAL PAIRS OF FLANGES. SEAL WELD FIXED FLANGE TO OUTER SHELL. ADJUSTABLE FLANGE TO SHIP LOOSE FOR FIELD INSTALLATION.
4) SEAL WELD END CAPS TO INNER AND OUTER SHELLS.

3 M7.2 CHARGE AIR TUBING THIMBLE FABRICATION

NO SCALE



NOTES:

1) FABRICATE 2 MIRROR IMAGE VENTILATION INTAKE ASSEMBLIES, ONE AS SHOWN AND ONE WITH FILTERS ON LEFT SIDE.
2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 7/16" HOLES AT 12" O.C.
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON TOP AND FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.
4) INSTALL FRAMES FOR 5 EACH PAIRS (10 TOTAL) REMOVABLE 20"x12"x2" MERV 8 FILTERS. FABRICATE FROM "C" CHANNEL THREE SIDES WITH LATCHING HINGED COVER ON END TO ALLOW FILTERS TO SLIDE OUT FOR REMOVAL.

4 M7.2 INTAKE AIR DAMPER/FILTER ASSEMBLY FABRICATION

1"=1'-0"

NOTES:

1. FABRICATE 3 EACH IDENTIACL THIMBLES.
2. FABRICATE ENTIRE ASSEMBLY FROM MINIMUM 16 GAUGE TYPE 304 STAINLESS STEEL WITH ALL JOINTS SEAL WELDED.
3. FABRICATE IDENTICAL PAIRS OF FLANGES. SEAL WELD FIXED FLANGE TO OUTER SHELL. ADJUSTABLE FLANGE TO SHIP LOOSE FOR FIELD INSTALLATION.
4. SEAL WELD END CAPS TO INNER AND OUTER SHELLS. PROVIDE 1"ø VENT HOLES INTO UNINSULATED SPACE BOTH ENDS, QUANTITY AS INDICATED, EQUALLY SPACED. ON EXTERIOR (FIXED FLANGE) END INSTALL 1/8" STAINLESS STEEL BUG SCREEN.
5. AT TOP-CENTER LOCATION EACH END PROVIDE 1.75"ø HOLE WITHOUT SCREEN FOR CRANK VENT PIPE INSTALLATION.

5 M7.2 EXHAUST PIPE THIMBLE FABRICATION

1-1/2"=1'-0"

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1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

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AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

ALASKA ENERGY AUTHORITY

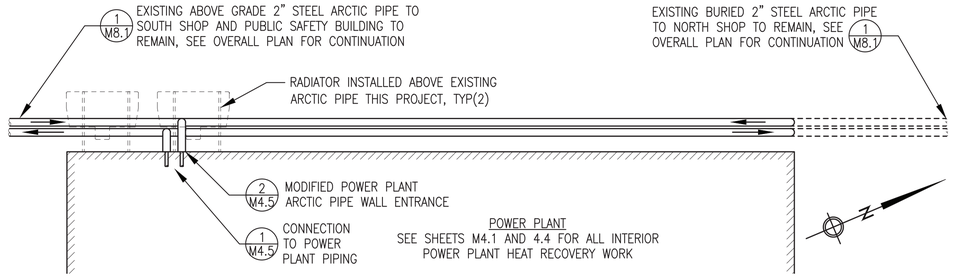
PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: SHEET METAL FABRICATION DETAILS

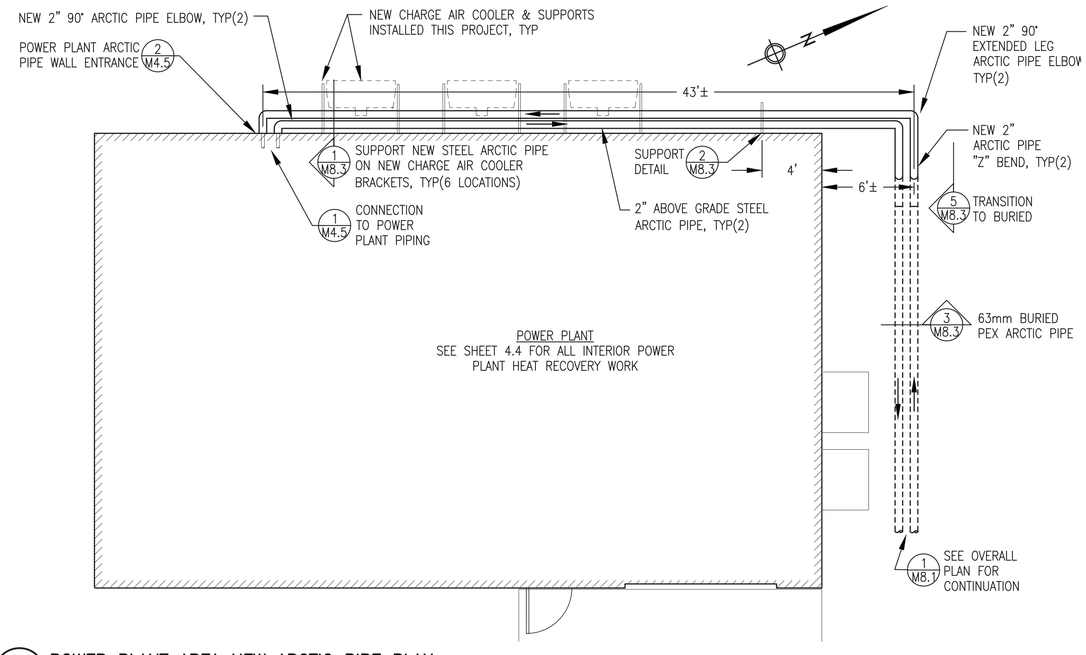
Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M3-7	SHEET: M7.2
PROJECT NUMBER:	

1 M8.1 OVERALL HEAT RECOVERY SYSTEM PLAN
1"=30'



2 M8.1 POWER PLANT AREA EXISTING ARCTIC PIPE PLAN
1"=5'



3 M8.1 POWER PLANT AREA NEW ARCTIC PIPE PLAN
1"=5'

REVISION #1
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AUGUST 2025

STATE OF ALASKA 49TH
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

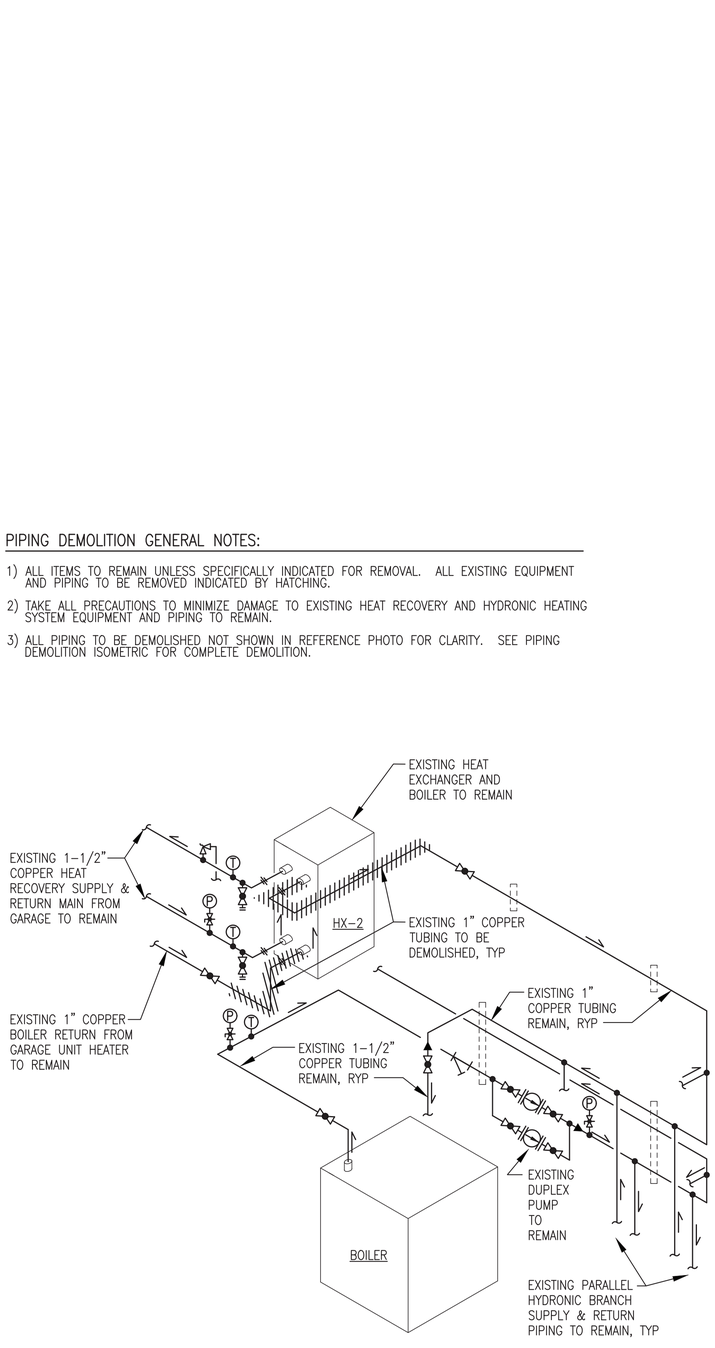
TITLE: HEAT RECOVERY SYSTEM
OVERALL AREA & POWER PLANT AREA PLANS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD
DESIGNED BY: BCG
FILE NAME: MANO PP M8
PROJECT NUMBER:
SCALE: AS NOTED
DATE: 9/28/23
SHEET: M8.1

PIPING DEMOLITION GENERAL NOTES:

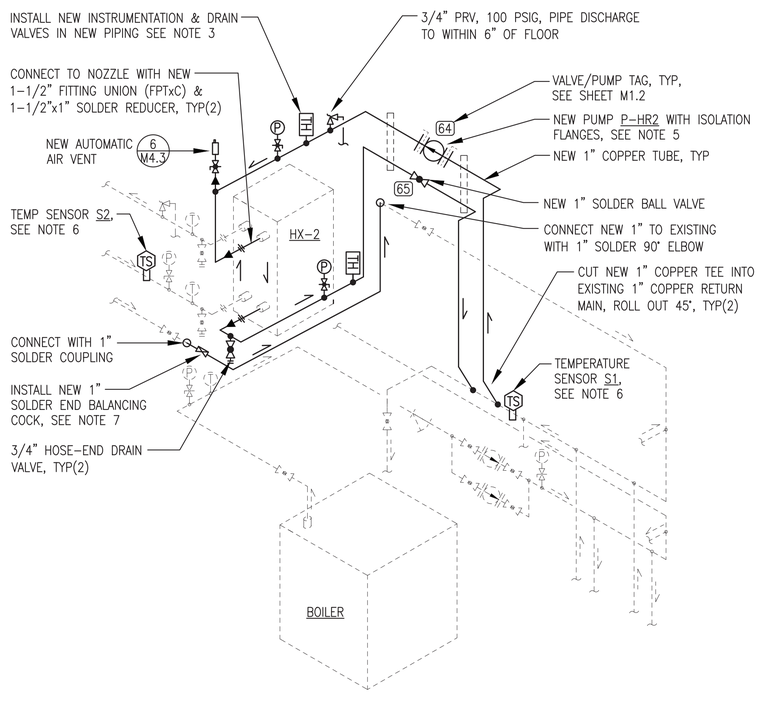
1) ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR REMOVAL. ALL EXISTING EQUIPMENT AND PIPING TO BE REMOVED INDICATED BY HATCHING.
2) TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGE TO EXISTING HEAT RECOVERY AND HYDRONIC HEATING SYSTEM EQUIPMENT AND PIPING TO REMAIN.
3) ALL PIPING TO BE DEMOLISHED NOT SHOWN IN REFERENCE PHOTO FOR CLARITY. SEE PIPING DEMOLITION ISOMETRIC FOR COMPLETE DEMOLITION.



PIPING DEMOLITION ISOMETRIC

PIPING NEW WORK GENERAL NOTES:

1) ALL EXISTING PIPING TO REMAIN IN SERVICE SHOWN WITH LIGHT/DASHED LINES AND ALL NEW PIPING TO BE INSTALLED THIS PROJECT SHOWN WITH DARK/SOLID LINES.
2) ALL NEW PIPING AND VALVES NOT SHOWN IN REFERENCE PHOTO FOR CLARITY. SEE NEW WORK PIPING ISOMETRIC FOR COMPLETE INSTALLATION.
3) SEE DETAIL 7/M4.3 FOR INSTRUMENTATION INSTALLATION.
4) SEE ELECTRICAL PLANS FOR ADDITIONAL NEW WORK.
5) INSTALL 1" SOLDER SHUT-OFF FLANGES ON PUMP INLET AND OUTLET. SET PUMP TO SPEED 2.
6) TEMPERATURE SENSOR PROVIDED WITH HEAT RECOVERY PANEL, SEE ELECTRICAL. INSTALL ON SURFACE OF PIPING WHERE INDICATED. WIRE BRUSH AREA ON PIPE TO REMOVE ALL SURFACE RESIDUE. PLACE SENSOR DIRECTLY ON CLEANED AREA AND SECURE TO PIPE WITH MINIMUM 2 WRAPS OF HIGH TEMPERATURE FOIL BACKED TAPE. ROUTE LEAD WIRE ALONG PIPE. INSULATE PIPE 6" EITHER SIDE OF SENSOR WITH 1/8"x2" SELF-ADHESIVE FOIL BACKED FOAM INSULATION SPIRAL WRAPPED.
7) NEW BALANCING COCK IS INSTALLED ON GARAGE UNIT HEATER BRANCH TO ENSURE ADEQUATE FLOW IS PROVIED TO OTHER BUILDING HEAT ZONES. START SYSTEM WITH BALANCING COCK FULLY OPEN THEN ADJUST AS REQUIRED TO PROVIDE FULL FLOW TO OTHER HEATING ZONES.



PIPING NEW WORK ISOMETRIC

1 M8.2 PUBLIC SAFETY BUILDING BOILER PIPING ISOMETRICS
NO SCALE

2 M8.2 PUBLIC SAFETY BUILDING BOILER PIPING REFERENCE PHOTO
NO SCALE

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH — BRIAN C. GRAY ME 8210 — REGISTERED PROFESSIONAL ENGINEER

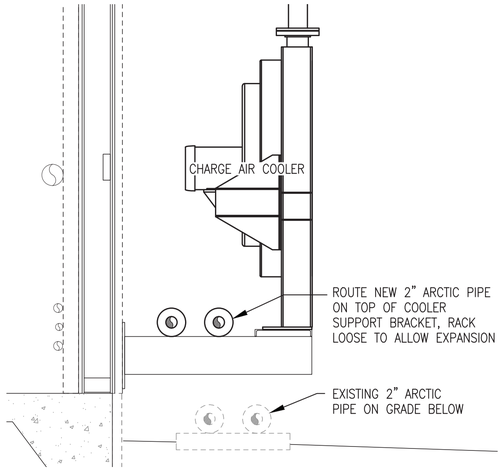
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

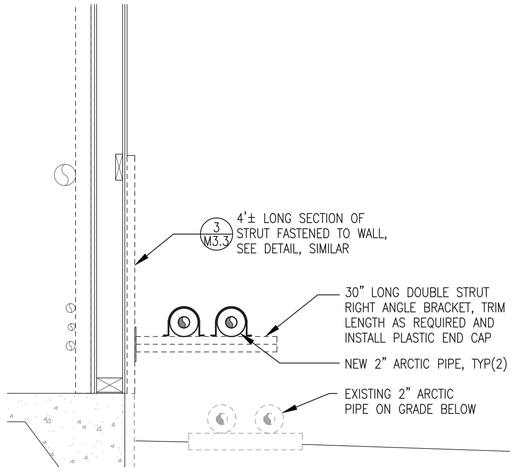
TITLE: HEAT RECOVERY SYSTEM
PUBLIC SAFETY BUILDING DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

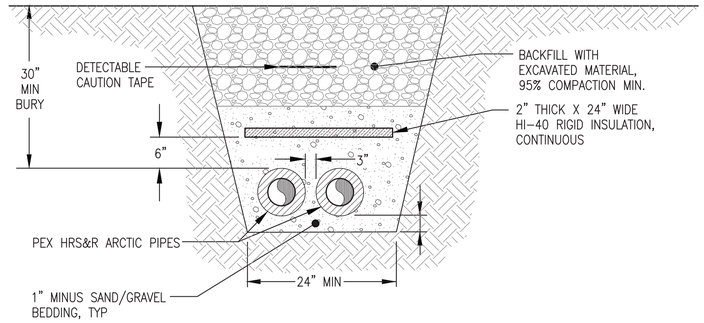
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M8 | SHEET: M8.2
PROJECT NUMBER:



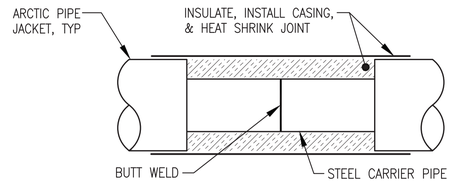
1 M8.3 ARCTIC PIPE SUPPORT FROM CAC BRACKET
3/4"=1'-0"



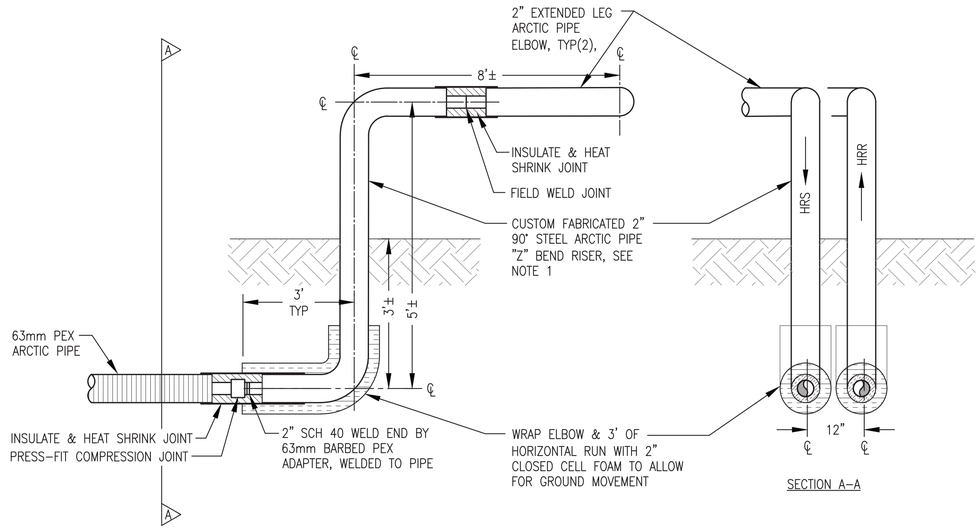
2 M8.3 ARCTIC PIPE SUPPORT FROM STRUT BRACKET
3/4"=1'-0"



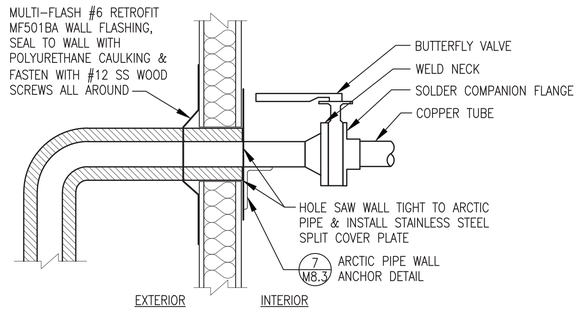
3 M8.3 TYPICAL BURIED ARCTIC PIPE INSTALLATION
NO SCALE



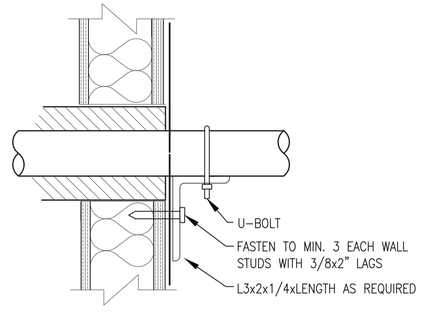
4 M8.3 TYPICAL ARCTIC PIPE WELDED JOINT & INSULATION DETAIL
NO SCALE



5 M8.3 ARCTIC PIPE TRANSITION TO BURIED AT POWER PLANT
NO SCALE



6 M8.3 CLINIC ARCTIC PIPE WALL ENTRANCE AND SUPPORT DETAIL
NO SCALE



7 M8.3 CLINIC ARCTIC PIPE WALL ANCHOR
NO SCALE

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STATE OF ALASKA 49TH
BRIAN C. GRAY ME 8210
REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

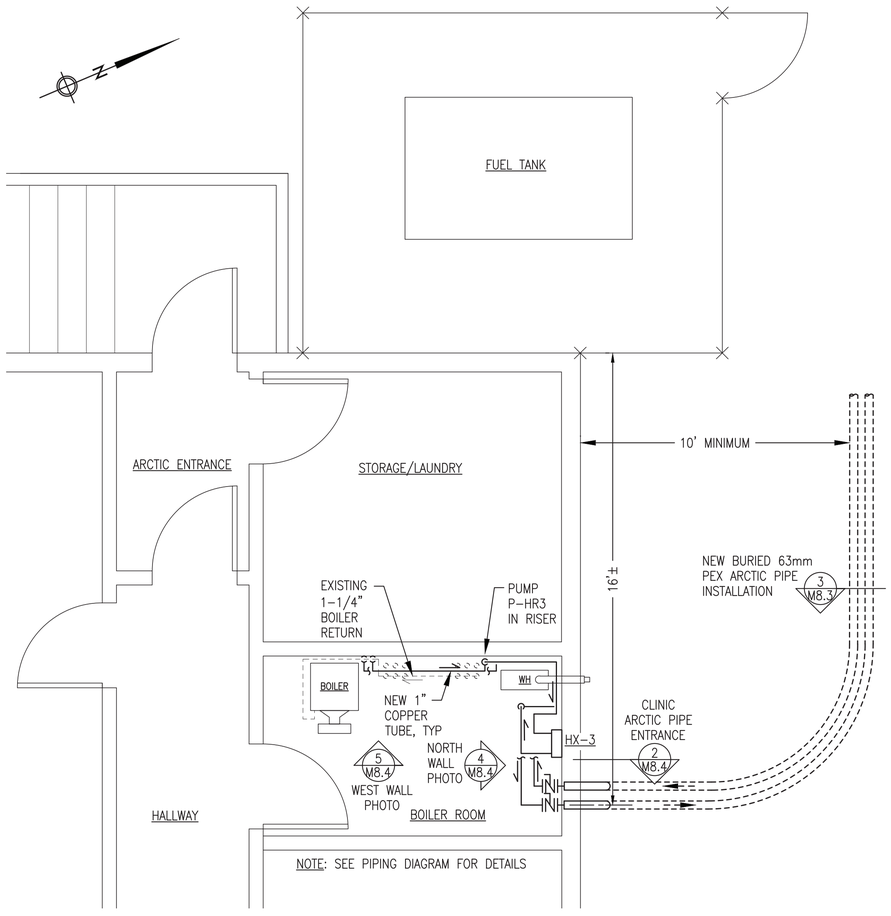
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

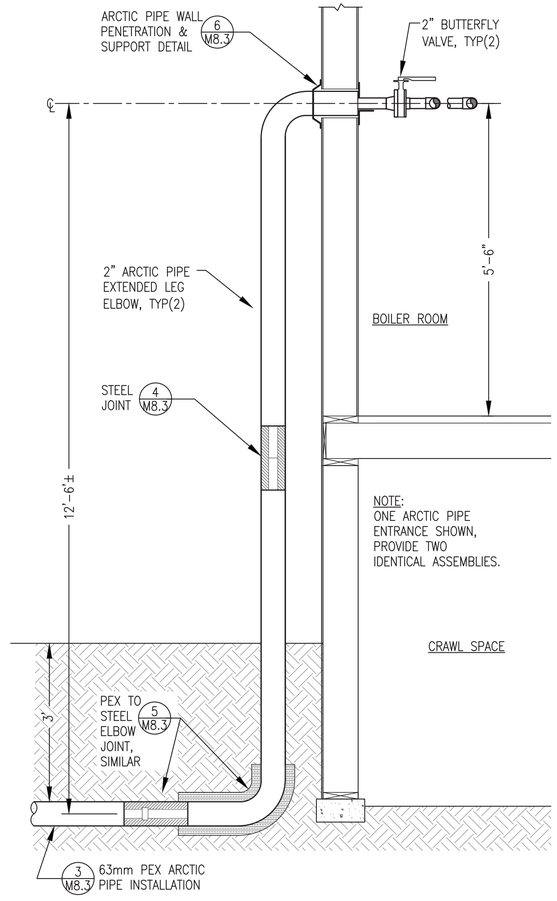
TITLE: HEAT RECOVERY SYSTEM
ARCTIC PIPE ELEVATIONS & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

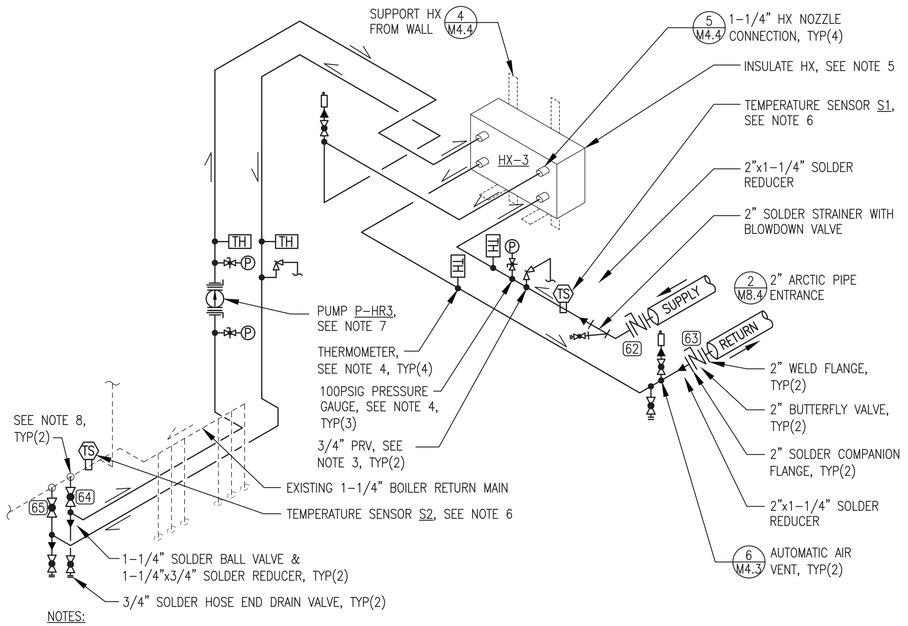
DRAWN BY: JTD
DESIGNED BY: BCG
FILE NAME: MANO PP M8
PROJECT NUMBER:
SCALE: AS NOTED
DATE: 9/28/23
SHEET: M8.3



1 M8.4 CLINIC HEAT RECOVERY PLAN
1/2"=1'-0"



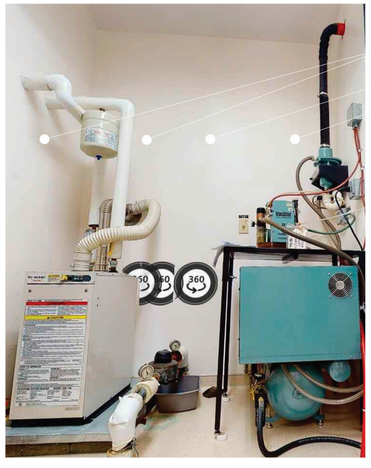
2 M8.4 ARCTIC PIPE TRANSITION AT CLINIC
3/4"=1'-0"



NOTES:

1. ALL NEW PIPING AND EQUIPMENT SHOWN IN DARK SOLID LINES. ALL EXISTING PIPING SHOWN IN LIGHT DASHED LINES.
2. ALL NEW PIPING 1-1/4" TYPE "L" COPPER TUBE UNLESS SPECIFICALLY INDICATED OTHERWISE. SUPPORT PIPING AND EQUIPMENT FROM WALLS WITH STRUT, RIGHT ANGLE BRACKETS, CLAMPS AND FITTINGS SIMILAR TO EXISTING OR AS REQUIRED. SEE DETAIL 3/M4.5 FOR SUPPORTING PIPING FROM CEILING AS REQUIRED.
3. 3/4" PRV, 100 PSIG SETPOINT, PIPE DISCHARGE TO WITHIN 6" OF FLOOR.
4. SEE DETAIL 7/M4.3 FOR INSTRUMENTATION INSTALLATION.
5. WRAP HEAT EXCHANGER WITH 1" RIGID FOIL-BACK FIBERGLAS INSULATION ALL AROUND AND TAPE ALL SEAMS. INSULATE ALL NEW HEAT RECOVERY PIPING WITH 1/8"x2" SELF-ADHESIVE FOIL BACKED FOAM INSULATION SPIRAL WRAPPED. EXISTING BUILDING HEATING PIPING TO REMAIN UN-INSULATED.
6. TEMPERATURE SENSOR PROVIDED WITH HEAT RECOVERY PANEL, SEE ELECTRICAL. INSTALL ON SURFACE OF PIPING WHERE INDICATED. WIRE BRUSH AREA ON PIPE TO REMOVE ALL SURFACE RESIDUE. PLACE SENSOR DIRECTLY ON CLEANED AREA AND SECURE TO PIPE WITH MINIMUM 2 WRAPS OF HIGH TEMPERATURE FOIL BACKED TAPE. ROUTE LEAD WIRE ALONG PIPE. ON NEW PIPING (S1) INSULATE OVER SENSOR. ON EXISTING PIPING (S2) INSULATE PIPE 6" EITHER SIDE OF SENSOR WITH 1/8"x2" SELF-ADHESIVE FOIL BACKED FOAM INSULATION SPIRAL WRAPPED.
7. INSTALL 1-1/4" SOLDER SHUT-OFF FLANGES ON PUMP INLET AND OUTLET. SET PUMP TO SPEED 2.
8. CONNECT TO EXISTING 1-1/4" COPPER MAIN WITH 1-1/4" SOLDER TEE.

3 M8.4 CLINIC ISOMETRIC PIPING DIAGRAM
NO SCALE

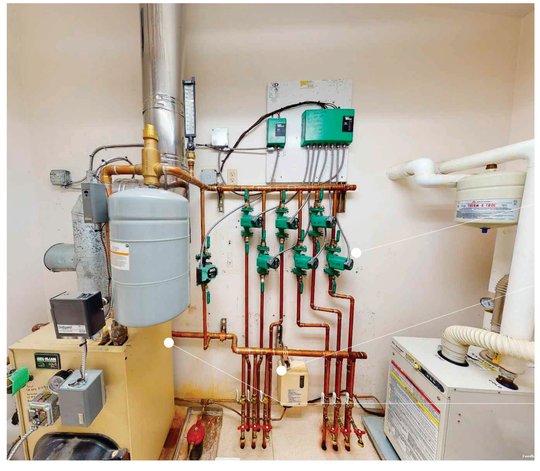


ROUTE NEW PIPING ON WALL BEHIND EXISTING PIPING THESE AREAS

INSTALL HEAT EXCHANGER THIS AREA

INSTALL ARCTIC PIPE ENTRANCES THIS AREA

4 M8.4 CLINIC BOILER ROOM NORTH WALL PHOTO
NO SCALE



INSTALL RISERS AND PUMP ON WALL THIS AREA

NEW PIPING TO OFFSET OUT FROM WALL AND ROUTE BETWEEN EXISTING BOILER SUPPLY & RETURN PIPING THIS AREA, SUPPORT FROM WALL ON RIGHT ANGLE STRUT BRACKET SIMIAR TO EXISTING

NEW SECONDARY LOOP PIPING TO CONNECT TO EXISTING 1-1/4" BOILER RETURN PIPING THIS AREA

5 M8.4 CLINIC BOILER ROOM WEST WALL PHOTO
NO SCALE

REVISION #1
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AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: HEAT RECOVERY SYSTEM
CLINIC AREA ELEVATIONS & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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DESIGNED BY: BCG
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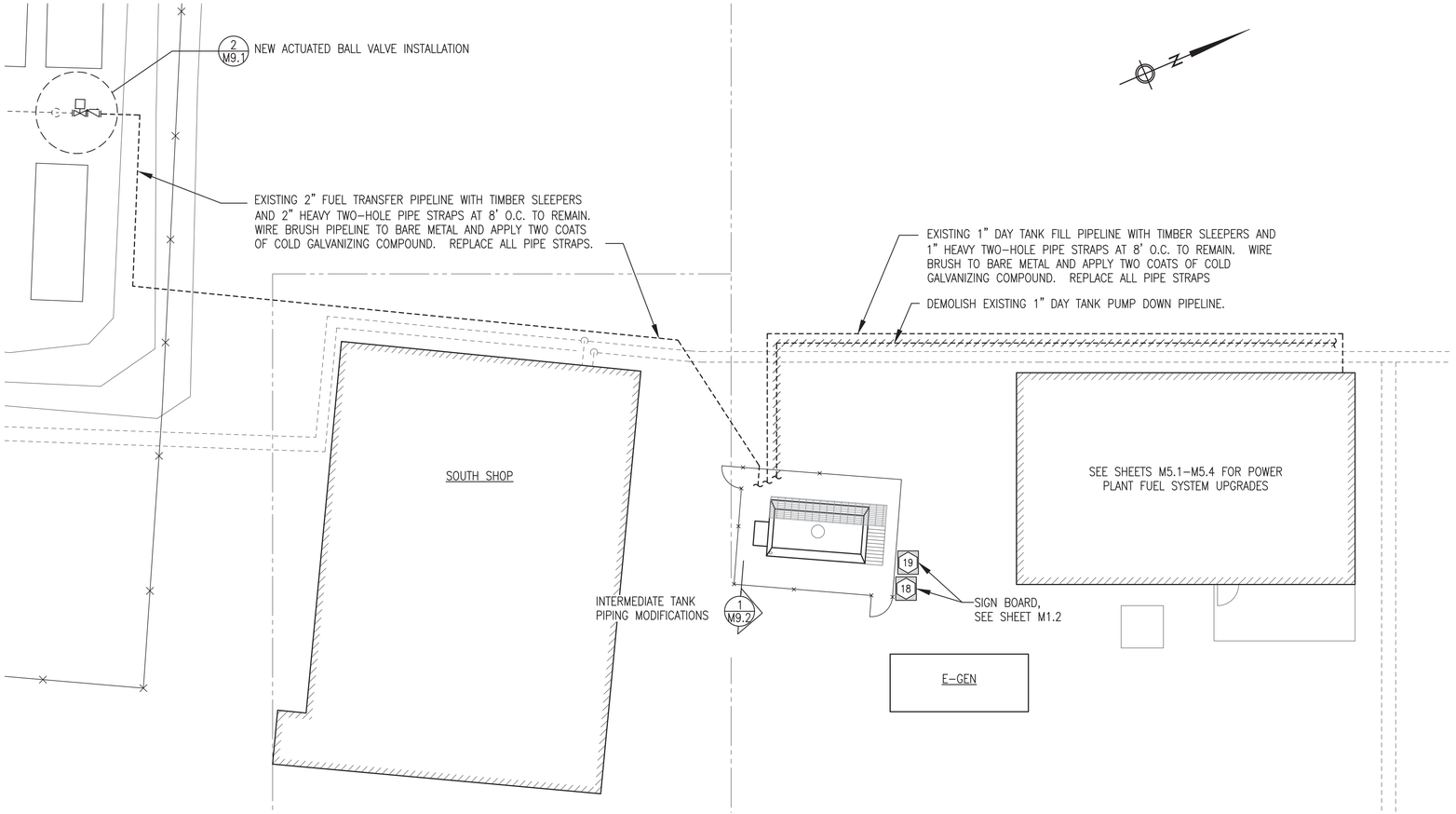
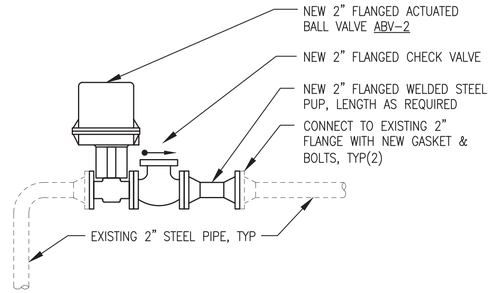
SHEET: M8.4



1 M9.1 POWER PLANT AREA FUEL PIPING MODIFICATION PLAN
1"=10'

DEMOLITION



NEW WORK

2 M9.1 TANK FARM PIPING MODIFICATION & NEW ACTUATED BALL VALVE INSTALLATION
NO SCALE

PAINTING OF EXTERIOR FUEL PIPING IS INCLUDED UNDER ADDITIVE ALTERNATE #3.

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STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

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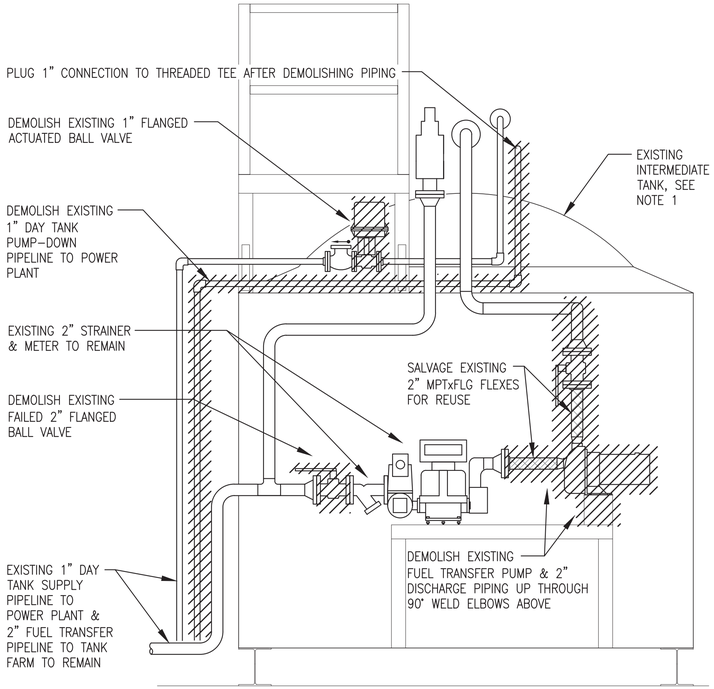
ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: POWER PLANT AREA FUEL PIPING PLAN & DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 9/28/23
FILE NAME: MANO PP M9	SHEET: M9.1
PROJECT NUMBER:	



DEMOLITION

GENERAL NOTES:

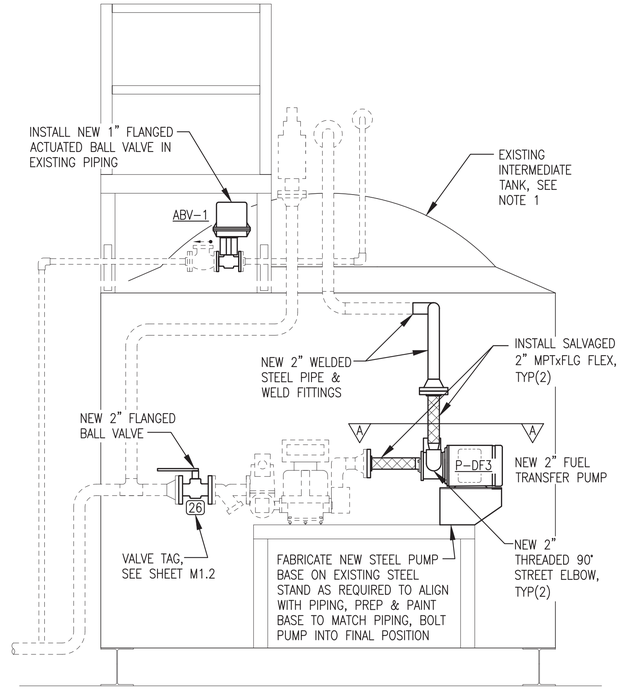
1. EXISTING 8'-0"øx14'-0"L NOMINAL 5,000 GALLON CAPACITY SELF DIKED WELDED STEEL TANK TO REMAIN. THE TANK IS MANUFACTURED AND LABELED IN ACCORDANCE WITH U.L. 142 AND CONFIGURED WITH REDUNDANT OVERFILL PROTECTION AS INDICATED IN ACCORDANCE WITH EPA GUIDELINES FOR ALTERNATIVE SECONDARY CONTAINMENT SYSTEM.

DEMOLITION NOTES:

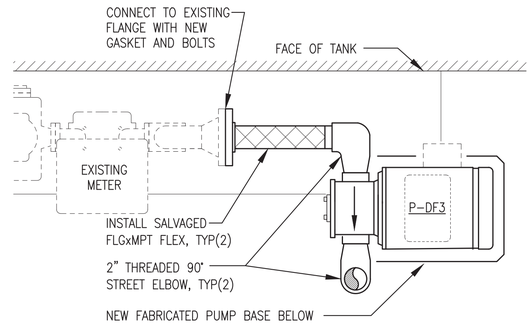
1. PRIOR TO PERFORMING WORK DIP TANK WITH WATER CUT PASTE TO DETERMINE FUEL AND WATER LEVEL AND PROVIDE RESULTS TO ENGINEER. PUMP OFF ANY WATER IF DETECTED.
2. ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR REMOVAL. EXISTING EQUIPMENT AND PIPING TO BE REMOVED INDICATED BY HATCHING.
3. DRAIN AND PURGE ALL PIPING PRIOR TO REMOVAL OR MODIFICATION.
4. TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGE TO FUEL SYSTEM EQUIPMENT BEING REMOVED DURING DEMOLITION. TURN ALL REMOVED EQUIPMENT OVER TO THE UTILITY FOR FINAL DISPOSITION.
5. SEE ELECTRICAL PLANS FOR ADDITIONAL DEMOLITION.

NEW WORK NOTES:

1. CLEAN, DEGREASE, PREPARE, & PAINT EXISTING TANK:
   - USE 3,000 PSI HOT WATER PRESSURE WASHER WITH DEGREASER/DETERGENT INJECTION TO CLEAN ENTIRE TANK AND KNOCK OF LOOSE PAINT & RUST.
   - WIRE BRUSH AS REQUIRED TO REMOVE REMAINING SURFACE RUST.
   - ABRADE ALL EXISTING PAINTED SURFACES WITH 80 GRIT SAND PAPER.
   - PRE-PRIME ALL BARE METAL AREAS WITH ONE COAT OF EPOXY
   - AFTER ABRADING & PRIMING, PAINT ALL SURFACES WITH TWO COATS OF EPOXY, DEVOE BAR-RUST 236 OR APPROVED EQUAL, TO 8 MILS MIN DFT, COLOR GRAY.
2. PREPARE & PAINT ALL NEW AND EXISTING PIPING:
   - WIRE BRUSH ALL NEW AND EXISTING PIPING AS REQUIRED TO REMOVE MILL SCALE AND/OR SURFACE RUST
   - PAINT ALL PIPING WITH TWO COATS COLD GALVANIZING COMPOUND, ZRC OR APPROVED EQUAL.
3. ALL PIPING SHOWN WITH LIGHT/DASHED LINES IS EXISTING TO REMAIN IN SERVICE.
4. ALL PIPING AND DEVICES SHOWN WITH DARK/SOLID LINES ARE NEW OR REUSED AND ARE TO BE INSTALLED THIS PROJECT.
5. TANK AND PIPING PRESENTLY CONTAIN DIESEL FUEL. INERT EXISTING PIPES PRIOR TO CUTTING AND WELDING. PERFORM ALL WELDING IN ACCORDANCE WITH APPROPRIATE HOT WORK PROCEDURES PER NFPA 51B.
6. SEE ELECTRICAL PLANS FOR ADDITIONAL NEW WORK.



NEW WORK



ENLARGED SECTION A-A (PLAN VIEW)

1 M9.2 INTERMEDIATE TANK PIPING MODIFICATIONS
3/4"=1'-0"

PREP & PAINTING OF THE EXISTING TANK IS INCLUDED UNDER ADDITIVE ALTERNATE #3.

REVISION #1
ISSUED FOR CONSTRUCTION
AUGUST 2025

STATE OF ALASKA 49TH BRIAN C. GRAY ME 8210 REGISTERED PROFESSIONAL ENGINEER

REV.	DESCRIPTION	DATE	BY
1	UPDATED FOR 2025 AEA STANDARDS	8/15/25	BCG

ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: INTERMEDIATE TANK PIPING MODIFICATION DETAILS

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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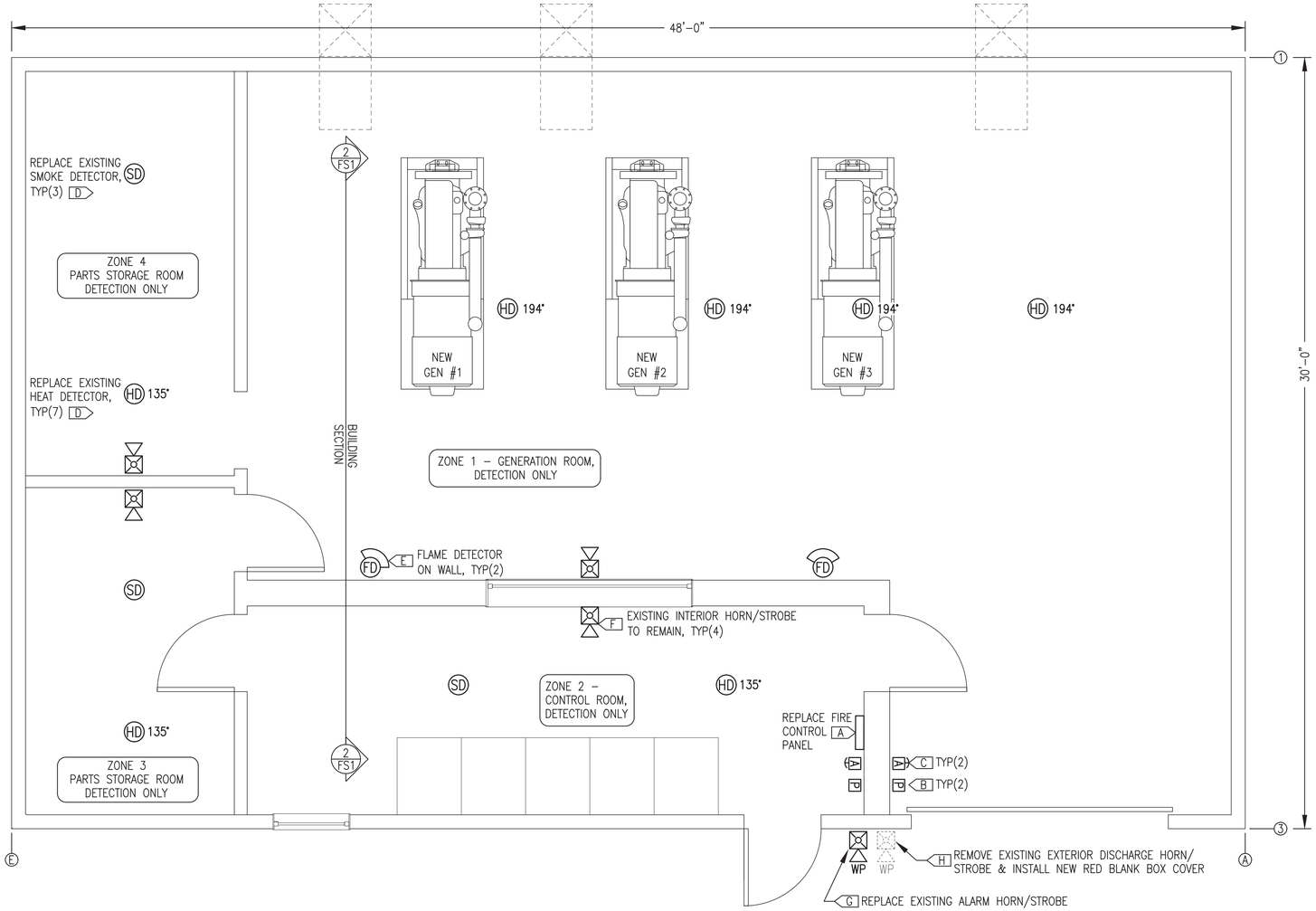
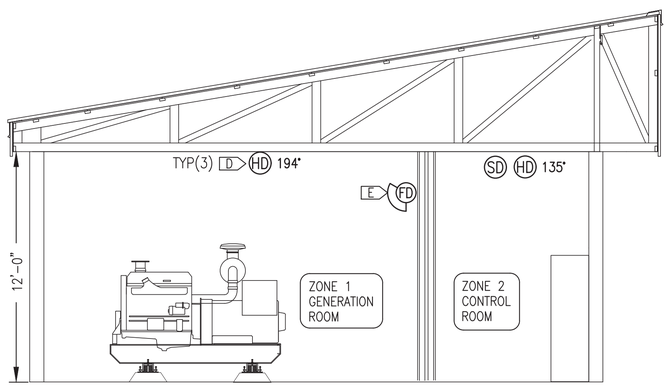
DESIGNED BY: BCG | DATE: 9/28/23
FILE NAME: MANO PP M9 | SHEET: M9.2
PROJECT NUMBER:



1 FS1 FIRE SUPPRESSION SYSTEM RENOVATION PLAN
3/8"=1'



2 FS1 TYPICAL SECTION THROUGH POWER PLANT
1/4"=1'

3 FS1 PHOTO OF PANEL & PULL STATION
NO SCALE

FIRE ALARM SYSTEM RENOVATION SPECIFIC NOTES:

1) THE POWER PLANT IS EQUIPPED WITH AN EXISTING MARIOFF HI-FOG FIRE SUPPRESSION SYSTEM THAT IS CURRENTLY INOPERABLE. SEE SHEETS M2.1 AND E2 FOR ADDITIONAL DEMOLITION NOTES. THE SCOPE OF THIS PROJECT IS TO REPLACE ALL INDICATED EXISTING COMPONENTS WITH NEW IN ORIGINAL LOCATION AND TO COMMISSION AND CERTIFY THE RENOVATED FIRE SUPPRESSION SYSTEM.
2) THE EXISTING, NOZZES, TUBING, RACEWAYS, AND CONDUCTORS ARE TO REMAIN IN ORIGINAL LOCATION TO THE MAXIMUM EXTENT POSSIBLE. SEE SHEETS M2.1 AND E2 FOR ADDITIONAL DEMOLITION NOTES.
3) SEE SPECIFICATIONS FOR SYSTEM DETAILS INCLUDING SEQUENCE OF OPERATION.
4) SEE SHEET M1.2 FOR WARNING PLACARD INSTALLATION. IN ADDITION TO ANY MANUFACTURER'S SIGNS FURNISH AND INSTALL ALL FIRE SYSTEM SIGNS AND DECALS INDICATED ON M1.2.

FIRE DETECTION & ALARM SYSTEM RENOVATION SPECIFIC NOTES:

A REPLACE EXISTING FIRE CONTROL PANEL AND BATTERIES, BACKBOX MAY REMAIN. SEE PHOTO.
B EXISTING PULL STATIONS TO REMAIN. SEE PHOTO.
C REMOVE EXISTING ABORT BUTTONS, REMOVE WIRING, AND REMOVE BOX OR INSTALL RED COVER. SEE PHOTO.
D REMOVE ALL EXISTING CEILING MOUNTED SMOKE DETECTORS, NORMAL TEMPERATURE (135°) HEAT DETECTORS, AND HIGH TEMPERATURE (194°) HEAT DETECTORS AND REPLACE WITH NEW.
E REMOVE EXISTING WALL MOUNTED FLAME DETECTORS AND REPLACE WITH NEW.
F EXISTING INTERIOR WALL MOUNTED HORN/STOBES TO REMAIN. VERIFY PROPER FUNCTION.
G REMOVE EXISTING EXTERIOR WALL MOUNTED ALARM HORN/STROBE AND REPLACE WITH NEW.
H REMOVE EXISTING EXTERIOR DISCHARGE HORN/STROBE & INSTALL RED BLANK BOX COVER.

FIRE DETECTION & ALARM SYSTEM SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
P	MANUAL PULL STATION	HD 135°	NORMAL TEMP. (135°F) DETECTOR
	INTERIOR ALARM HORN/STROBE	HD 194°	HIGH TEMP. (194°F) DETECTOR
WP	EXTERIOR ALARM HORN/STROBE	FD	FLAME (OPTICAL) DETECTOR
A	MANUAL ABORT STATION	SD	SMOKE (IONIZATION) DETECTOR

ALL FIRE ALARM & DETECTION THIS SHEET IS INCLUDED UNDER ADDITIVE ALTERNATE #1.

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STATE OF ALASKA 49TH
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ME 8210
REGISTERED PROFESSIONAL ENGINEER

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: FIRE DETECTION & ALARM SYSTEM RENOVATION

Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

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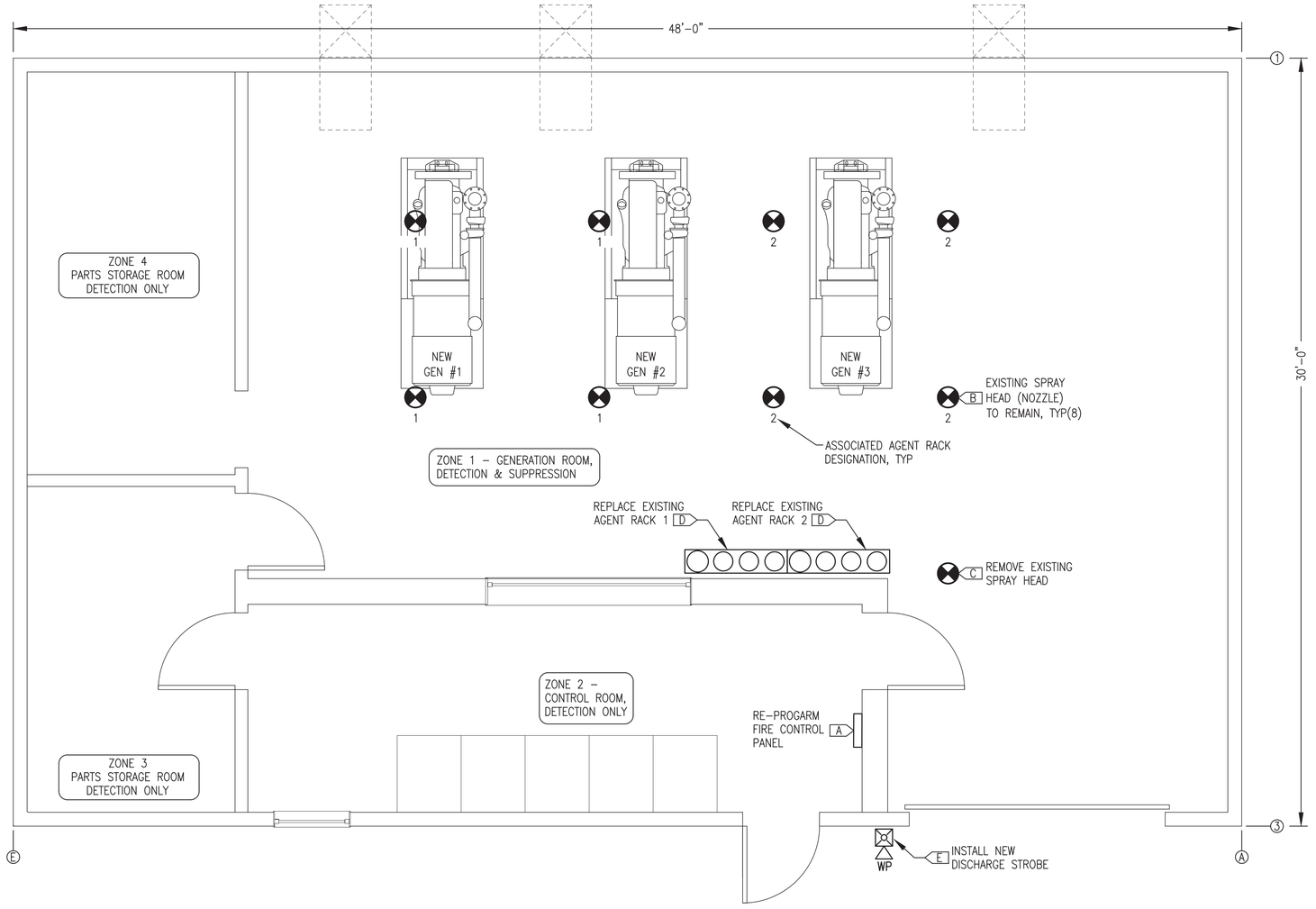
DESIGNED BY: BCG | DATE: 9/2823
FILE NAME: MANO PP FS1-2 | SHEET: FS1
PROJECT NUMBER:



1 FS1 FIRE SUPPRESSION SYSTEM RENOVATION PLAN
3/8"=1'

FIRE SUPPRESSION SYSTEM GENERAL NOTES:

1) THE SCOPE OF THE FIRE SUPPRESSION PROJECT IS TO REPLACE ALL INDICATED EXISTING COMPONENTS WITH NEW IN ORIGINAL LOCATION AND TO COMMISSION AND CERTIFY THE RENOVATED FIRE SUPPRESSION SYSTEM.
2) THE EXISTING, NOZZES, TUBING, RACEWAYS, AND CONDUCTORS ARE TO REMAIN IN ORIGINAL LOCATION TO THE MAXIMUM EXTENT POSSIBLE
3) SEE SPECIFICATIONS FOR SYSTEM DETAILS INCLUDING SEQUENCE OF OPERATION.
4) THE INTERIOR FINISH OF ALL WALLS AND CEILINGS IS FRP. THE INTERIOR FINISH OF ALL FLOORS IS PAINTED CONCRETE. THE CEILING HEIGHT IN ALL ROOMS 12' ABOVE FINISHED FLOOR.
5) ALL DOORS SELF-CLOSING WITH GASKETS. ALL BUILDING PIPING AND CONDUIT PENETRATIONS SEALED LIQUID TIGHT. ALL BUILDING DUCT PENETRATIONS EQUIPPED WITH MOTORIZED DAMPERS THAT CLOSE ON GENERATOR SHUT DOWN.
6) SEE SHEET M1.2 FOR WARNING PLACARD INSTALLATION. IN ADDITION TO ANY MANUFACTURER'S SIGNS FURNISH AND INSTALL ALL FIRE SYSTEM SIGNS AND DECALS INDICATED ON M1.2.

FIRE SUPPRESSION SYSTEM SPECIFIC NOTES:

- [A] RE-PROGRAM THE FIRE CONTROL PANEL TO ADD HI-FOG FIRE SUPPRESSION DISCHARGE FUNCTION.
- [B] EXISTING SPRAY NOZZLE TO REMAIN.
- [C] REMOVE EXISTING SPRAY NOZZLE AND BRANCH TUBING AND PLUG TEE FITTING.
- [D] EXISTING AGENT RACKS HAVE BEEN FROZEN AND FAILED. REPLACE WITH NEW AND CONNECT TO EXISTING DISCHARGE TUBING.
- [E] INSTALL NEW EXTERIOR FIRE SUPPRESSION AGENT DISCHARGE ALARM STROBE.

FIRE SUPPRESSION SYSTEM SYMBOL LEGEND

SYMBOL	DESCRIPTION
WP	EXTERIOR ALARM STROBE

ALL SUPPRESSION THIS SHEET IS INCLUDED UNDER ADDITIVE ALTERNATE #2.

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ALASKA ENERGY AUTHORITY

PROJECT: MANOKOTAK POWER SYSTEM UPGRADE

TITLE: FIRE SUPPRESSION SYSTEM RENOVATION

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