# AKHIOK POWER SYSTEM UPGRADE PROJECT
# ITB 20039 - MODULAR POWER PLANT ASSEMBLY

| MODULAR POWER PLANT ASSEMBLY – MECHANICAL DRAWINGS | |
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| OWNER FURNISHED MODULE STRUCTURE APPROVED SHOP DRAWINGS | |
|---|---|
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**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

MODULE STRUCTURE FABRICATION
SCHEDULE OF DRAWINGS

| NO. | REVISION | BY | DATE |
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| 0 | ISSUED FOR CONSTRUCTION | BCG | 1/6/20 |

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G1

## 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) ANALOG THERMOMETER
- (TH) DIGITAL THERMOMETER
- (TT) TEMPERATURE TRANSMITTER
- (PT) PRESSURE TRANSMITTER
- (DP) DIFFERENTIAL PRES GAUGE
- (FM) FLOW METER
- (FS) FLOAT SWITCH
- (LCA) LOW COOLANT SWITCH
- (TLM) TANK LEVEL MONITOR
- (LSP) LEVEL SENSOR PROBE
- (GLS) GLYCOL LEVEL SENSOR

NOTE: SEE ELECTRICAL FOR ADDITIONAL DETAIL ON CONTROL & INSTRUMENTATION DEVICES

## 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 |
| HYR | HYDRONIC RETURN |
| HYS | HYDRONIC 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 |

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.

## ENGINE COOLING SYSTEM EQUIPMENT SCHEDULE

| SYMBOL | SERVICE/FUNCTION | DESCRIPTION | MANUFACTURER/MODEL |
|---|---|---|---|
| R-1<br>R-2 | GLYCOL RADIATOR | SINGLE PASS, 4 ROW, VERTICAL CORE, 3" FLANGED CONNECTIONS, GALVANIZED COATING, EXPANDED METAL GUARD. 6,000 BTU/MIN AT 77°F AMBIENT, 50 GPM 50% ETHYLENE GLYCOL AT 192F IN, 0.22 PSI MAX GLYCOL PRESSURE DROP. 3 HP, 460 V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO. | DIESEL RADIATOR<br>PART NO. DR3490 |
| TV-1 | COOLANT THERMOSTATIC VALVE | 3" ANSI 125# FLAT FACED FLANGES, CAST IRON BODY, FACTORY SET NON-ADJUSTABLE FIELD REPLACEABLE THERMOSTATIC ELEMENTS, 175F NOMINAL TEMPERATURE | FPE<br>PART NO. A3010-175 |
| 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<br>PART NO. AF2012-185 |
| ET-1 | GEN COOLANT EXPANSION TANK | 24 GALLON CAPACITY TANK, 12.75" O.D x 48" LONG FABRICATED STEEL TANK, SEE FABRICATION DETAIL | CUSTOM FABRICATION |
| HP-EC | 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 |
| G-EC | ENGINE COOLANT GLYCOL TANK LEVEL GAUGE | MAGNETIC OPERATED SPIRAL GAUGE FOR #1 DIESEL, 25 PSIG MAX OPERATING PRESSURE, 35" LIQUID COLUMN PLUS 4" RISER. | ROCHESTER MODEL 8660 |

## HEAT RECOVERY & PLANT HEATING EQUIPMENT SCHEDULE:

| | | | |
|---|---|---|---|
| HX-1 | POWER PLANT HEAT EXCHANGER | 316 SS PLATES, BRAZED CONST. 2" SOLDER CUP PORTS, 150 MBH MIN CAPACITY. PRIMARY: 35 GPM 195F EWT (50% ETHYLENE) 1.5 PSI MAX WPD, SECONDARY: 36 GPM 185F LWT (50% PROPYLENE) 1.5 PSI MAX WPD | AMERIDEX<br>SLB-35T-40M |
| P-HR1 | CONTROL ROOM HEAT | 1 GPM AT 18' TDH, 1/25HP, 115V, 1ø. PROVIDE WITH 3/4" SOLDER COMPANION SHUT OFF FLANGES, GASKETS, & BOLTS. | GRUNDFOS<br>UPS 15-58FC, SPEED 3 |
| P-HR2A | HEAT RECOV. PRIMARY | 35 GPM AT 8' TDH, 1/6HP, 115V, 1ø. PROVIDE WITH 2" NPT COMPANION FLANGES, GASKETS, & BOLTS. | GRUNDFOS<br>UPS 50-44F |
| P-HR2B | HEAT RECOV. SECONDARY | 36 GPM AT 17' TDH, 1/2HP, 115V, 1ø. PROVIDE WITH 1-1/4" SOLDER COMPANION FLANGES, GASKETS, & BOLTS. | GRUNDFOS<br>UPS 32-80/2<br>SPEED 3 |
| CUH-1 | CONTROL ROOM HEAT | WALL MOUNTED HOT WATER CABINET UNIT HEATER, 18 MBH AT 1 GPM 180F EWT & 60F EAT. | TOYOTOMI HC-20 WITH WALL MOUNT BRACKET |
| ET-2 | HEAT RECOV. EXP. TANK | BLADDER TYPE EXPANSION TANK, 44 GALLON TANK, 22 GALLON ACCEPTANCE VOL, 125 PSIG WORKING PRESSURE, 12 PSIG PRE-CHARGE. | AMTROL AX-80 |

## VENTILATION EQUIPMENT SCHEDULE:

| | | | |
|---|---|---|---|
| EF-1<br>EF-2 | GENERATION ROOM EXHAUST FANS | DIRECT DRIVE 14"ø PROPELLER SIDEWALL EXHAUST FAN, 2,100 CFM AT 0.375" SP, 1,750 RPM. FURNISH WITH SPECIAL 1/2 HP, 115 V, 1 PH VARIGREEN MOTOR WITH OPTIONAL 0-10V LEADS | GREENHECK<br>SE1-14-436-VG (1/2 HP) |
| EF-1<br>EF-2<br>COMB. | FAN & INTAKE DAMPERS | OPPOSED BLADE LOW-LEAKAGE CONTROL DAMPER, GALVANIZED STEEL CONSTRUCTION, 304 STAINLESS STEEL BEARINGS AND JAMB SEALS, EPDM BLADE SEALS. | GREENHECK VCD-23 |
| (MD) | MOTORIZED DAMPER ACTUATOR | 120V SPRING RETURN ACTUATOR | BELIMO AF-BUP |

## FUEL SYSTEM EQUIPMENT SCHEDULE

| SYMBOL | SERVICE/FUNCTION | DESCRIPTION | MANUFACTURER/MODEL |
|---|---|---|---|
| P-DF1 | DAY TANK FILL PUMP | ROTARY GEAR PUMP, 1/2" FPT INLET AND OUTLET, DUCTILE IRON CONSTRUCTION WITH STAINLESS STEEL SHAFT, BUNA-N LIP SEAL, CARBON BEARINGS, DIRECT FLEX COUPLED TO 1725 RPM ODP THERMALLY PROTECTED, AUTO RESET MOTOR, 1/3 HP, 115 V, 1 PH, 60 HZ, 4.0 GPM @ 20 PSID. | OBERDORFER<br>C992M3E5QF50 |
| P-DF2<br>P-UO1 | DIESEL CIRC, & USED OIL DRAIN PUMPS | ROTARY GEAR PUMP, 1/2" FPT INLET AND OUTLET, BRONZE CONSTRUCTION WITH SS SHAFTS, BUNA-N SEAL, CARBON BEARINGS, DIRECT FLEX COUPLED TO 1150 RPM ODP THERMALLY PROTECTED, AUTO RESET MOTOR, 1/2 HP, 115 V, 1 PH, 60 HZ, 6.6 GPM @ 20 PSID. PROVIDE WITH 40 PSID INTERNAL PRV. | OBERDORFER<br>N994RH-J46 |
| 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 1725 RPM TEFC THERMALLY PROTECTED AUTO RESET MOTOR, 1/4 HP, 115 V, 1 PH, 60 HZ. FURNISH WITH BASE MOUNT S56C FRAME INDUSTRIAL MOTOR. | MICROPUMP<br>GA-V21.J8FS.A PUMP WITH #81518 ADAPTER & BALDOR CFDL3504M MOTOR |
| HP-DT | 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 | 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 | 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 | DAY TANK FILTER | 10 MICRON FILTER FOR DIESEL FUEL, CLEAR BOWL WITH BOTTOM DRAIN VALVE, 150 PSIG MAXIMUM OPERATING PRESSURE, 25 GPM MAXIMUM FLOW. REPLACE FPT HEAD ASSEMBLY WITH CUSTOM FABRICATED STEEL HEAD WITH ANSI 150# FLANGED ENDS. FURNISH COMPLETE WITH WRENCH AND 5 SPARE FILTER ELEMENTS. | SUPERIOR MACHINE & WELDING<br>HEAD WITH GOLDEN ROD NO. 495-4 BOWL, 491 WRENCH, 470-5 ELEMENTS |
| F-UOB | USED OIL BLENDER FILTER | CUSTOM FABRICATED FILTER BANK. FURNISH WITH TWO STAGE ELEMENTS:<br>10 MICRON HYDROSORB II FILTER<br>2 MICRON PARTICULATE FILTER<br>PROVIDE 3 OF EACH ELEMENT TYPE | CIM-TEK #30034<br>CIM-TEK #30066 |

## PIPE/TUBING STRUT CLAMP SCHEDULE

| PIPE/TUBE | CLAMP # | PIPE/TUBE | CLAMP # |
|---|---|---|---|
| 1/2" COPPER | BVT062 | 1/2" STEEL | B2008 |
| 3/4" COPPER | BVT087 | 3/4" STEEL | B2009 |
| 1" COPPER | BVT112 | 1" STEEL | B2010 |
| 1-1/4" COPPER | BVT125 | 1-1/4" STEEL | B2011 |
| 1-1/2" COPPER | BVT162 | 1-1/2" STEEL | B2012 |
| 2" COPPER | BVT212 | 2" STEEL | B2013 |
| 2-1/2" COPPER | BVT262 | 2-1/2" STEEL | B2014 |
| 3" COPPER | BVT312 | 3" STEEL | B2015 |
| 4" COPPER | BVT412 | 4" STEEL | B2017 |

NOTES:
1) ALL CLAMP NUMBERS ARE B-LINE. EQUIVALENT EQUALS ACCEPTABLE.
2) ALL COPPER TUBE CLAMPS TO BE CUSHIONED, VIBRA-CLAMP.
3) ALL STEEL PIPE CLAMPS NOT CUSHIONED. USE FOR ALL STEEL PIPE AND RIGID CONDUIT.
4) SEE PLANS, ELEVATIONS, ISOMETRICS, AND DETAILS FOR ACTUAL PIPE SIZES.

**INSTRUMENTATION:** SEE ELECTRICAL INSTRUMENTATION SCHEDULE ON SHEET E1.1 FOR INSTRUMENTATION DEVICES SHOWN ON THE MECHANICAL DRAWINGS.

## SEQUENCE OF OPERATIONS

DAY TANK WILL HAVE AUTOMATIC FILL CONTROLS WITH REDUNDANT HIGH AND LOW LEVEL ALARMS AND TIMERS. USED OIL/DIESEL FUEL BLENDER WILL RUN ANY TIME DAY TANK FILL PUMP RUNS. SEE FUEL SYSTEM CONTROL PANEL DRAWINGS FOR DETAILED SEQUENCE.

ALL DAMPER MOTORS WILL BE NORMALLY CLOSED SPRING RETURN AND WILL CLOSE ON LOSS OF POWER (FIRE ALARM) IN LESS THAN 30 SECONDS. VENTILATION AIR INTAKE AND EXHAUST MOTORIZED DAMPERS WILL OPEN ANY TIME ASSOCIATED EXHAUST FAN OPERATES. THE COMBUSTION AIR INTAKE MOTORIZED DAMPER WILL BE OPEN ANY TIME PLANT OPERATES (STATION SERVICE POWER ON).

EXHAUST FANS EF-1 AND EF-2 WILL OPERATE 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 TEMPERATURE, 75F, ADJUSTABLE.

CABINET UNIT HEATER CUH-1 AND CIRCULATING PUMP P-HR1 WILL OPERATE ON A CALL FOR HEATING THROUGH THE INTERNAL CUH CONTROLS TO MAINTAIN CONTROL ROOM TEMPERATURE, 65F, ADJUSTABLE.

RADIATOR FAN MOTORS WILL OPERATE UNDER VARIABLE FREQUENCEY DRIVE (VFD) CONTROL. WHEN THE COOLANT RETURN TEMP REACHES THE WAKE UP 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 WAKE UP SETPOINT. THE INITIAL OPERATING SETTINGS SHALL BE SET TO THE FOLLOWING VALUES AND SHALL BE ADJUSTABLE:
170F = PID REFERENCE TEMPERATURE 160F = WAKE UP TEMPERATURE
0.93 = PROPORTIONAL GAIN 0.3 = INTEGRAL GAIN 0 = DERIVATIVE
6 HZ = MINIMUM SPEED 60 SEC = LOW SPEED TIME OUT

HEAT RECOVERY PUMPS P-HR2A AND P-HR2B WILL OPERATE CONTINUOUSLY UNDER MANUAL CONTROL.

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.

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.

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.

ELECTRIC BOILER PUMP P-EB1 WILL OPERATE CONTINUOUSLY UNDER MANUAL CONTROL. PUMP SHALL RUN ANYTIME THE REMOTE ELECTRIC WIND POWER GENERATORS ARE AVAILABLE TO RUN.

ALASKA ENERGY AUTHORITY

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MECHANICAL LEGENDS, SCHEDULES, & SEQUENCE OF OPERATIONS

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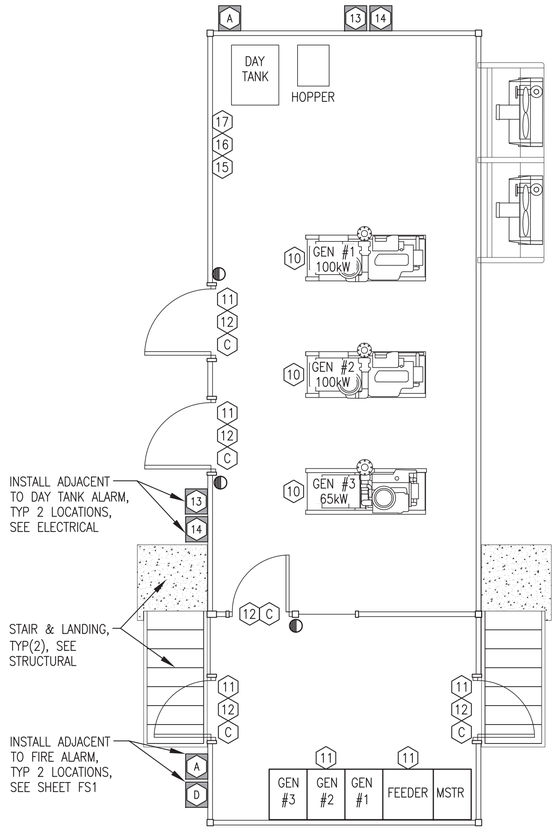



1 M1.2 POWER PLANT WARNING SIGN/PLACARD & FIRE EXTINGUISHER PLAN
1/4"=1'-0"

## WARNING SIGN & INFORMATIONAL PLACARD SCHEDULE:

WARNING SIGNS & INFORMATIONAL PLACARDS – PROVIDE DECALS AND SIGN BOARDS AS INDICATED IN THE SCHEDULE BELOW, QUANTITY & LOCATION WHERE SHOWN ON THE WARNING SIGN/PLACARD PLAN THIS SHEET.

(#) 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. INSTALL ON FACE OF DOORS OR ELECTRICAL ENCLOSURES WHERE INDICATED. CLEAN SURFACES AND APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

(#) 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"

(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"

INFORMATIONAL PLACARDS – BLACK LETTERING ON WHITE BACKGROUND.

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

(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 INTERMEDIATE TANK 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) LOCK & TAG GENERATOR OUT OF SERVICE
2) OPEN NORMALLY CLOSED DRAIN VALVE AT GEN
3) TURN ON PUMP TIMER & PUMP OUT ENGINE OIL
4) CHANGE FILTER & PLACE OLD ONE IN HOPPER
5) CLOSE DRAIN VALVE & REFILL ENGINE
6) RUN ENGINE, SHUT OFF, & CHECK DIPSTICK
7) TOP OFF & PLACE ENGINE BACK IN SERVICE"

## VALVE TAG SCHEDULE:

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.
NOTE: PROVIDE TAGS NOTED AS DECALS WITHOUT ALUMINUM BACKING PLATE.

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"
O.S. (25) "NORMALLY CLOSED, OPEN ONLY FOR TANK FILL"

BROWN (USED OIL)

(41) "NORMALLY CLOSED, OPEN ONLY FOR ENGINE OIL CHANGE"
(42) "BLENDER FILTER #1, 10 MICRON HYDROSORB" (DECAL)
(43) "BLENDER FILTER #2, 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"

ORANGE (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, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF SYSTEM"
O.S. (65) "NORMALLY OPEN, BOILER RETURN TO HX"
O.S. (66) "NORMALLY OPEN, HX TO BOILER"

INSTALLATION – SECURE EACH TAG TIGHT TO VALVE, PIPE, OR DEVICE WITH STAINLESS STEEL CABLE TIES OR SAFETY WIRE THROUGH ALL FOUR CORNERS OR FASTEN TO ADJACENT WALL OR SECTION OF STRUT WITH SCREWS.

NOTES:
1) SEE DRAWINGS THAT FOLLOW FOR LOCATIONS OF ALL SPECIFIC FUNCTION TAGS.
2) FOR ALL VALVES NOT INDICATED WITH A SPECIFIC FUNCTION TAG PROVIDE 1-1/2"ø BRASS TAG LABELED "N.O." FOR NORMALLY OPEN VALVES AND 1"ø BRASS TAG LABELED "N.C." FOR NORMALLY CLOSED VALVES. SECURE TAGS TO VALVE OR ADJACENT PIPE WITH BEADED BRASS CHAIN.

## MODULE SHOP/ON-SITE NOTES:

1) FURNISH AND INSTALL ALL DECALS, SIGN BOARDS. AND FIRE EXTINGUISHERS AS PART OF THE MODULE SHOP FABRICATION WORK.

2) FURNISH AND INSTALL ALL VALVE TAGS AS PART OF THE MODULE SHOP FABRICATION WORK EXCEPT WHERE DESIGNATED ON SITE (O.S.). SEE NOTE 3.

3) FURNISH AND INSTALL ALL VALVE TAGS DESIGNATED O.S. AS PART OF THE ON SITE CONSTRUCTION WORK (NOT PART OF MODULE ASSEMBLY SCOPE). SEE ON SITE WORK DRAWINGS FOR LOCATIONS.

ALASKA ENERGY AUTHORITY

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

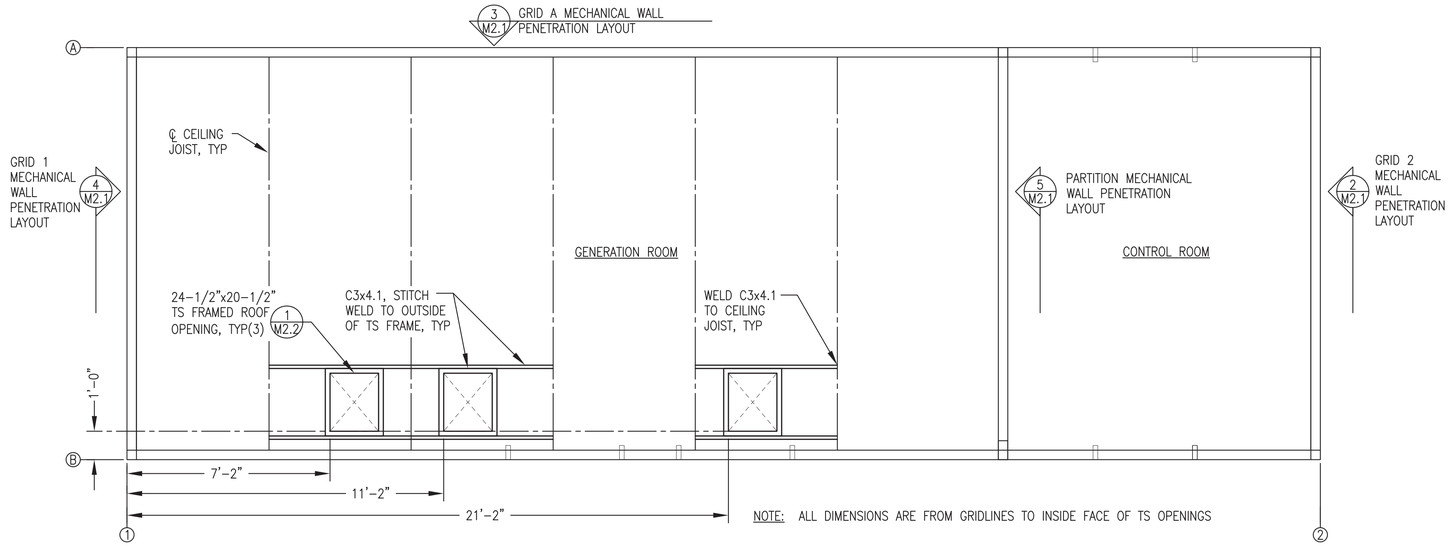
CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
WARNING SIGNS & FIRE EXTINGUISHER PLAN, SIGN & VALVE TAG SCHEDULES

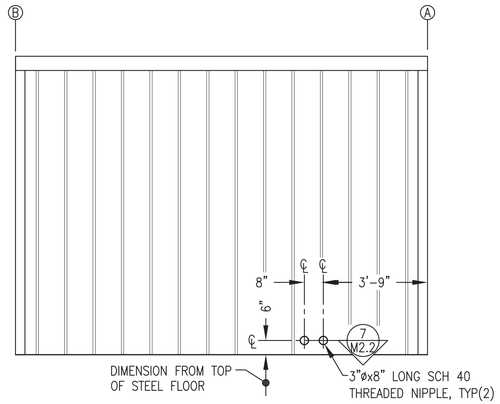
| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 1/6/20 |

Plot Date 1/6/20 | Designed BCG | Drawn JTD | Approved BCG

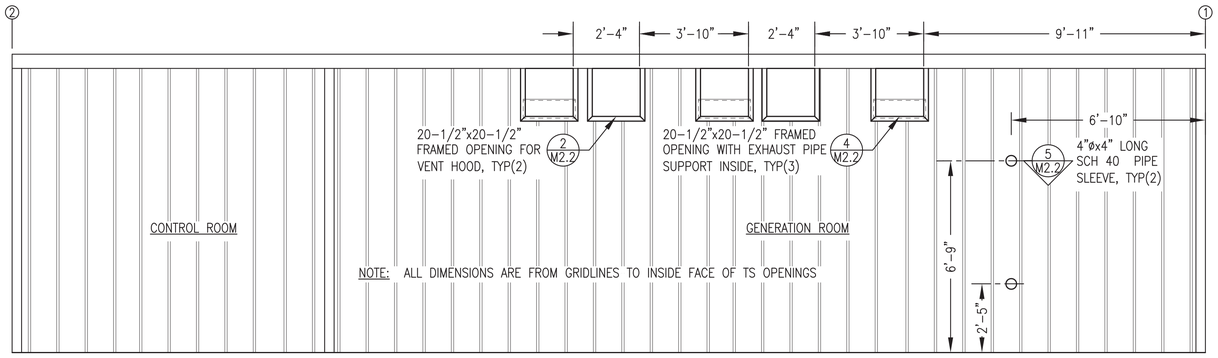
Sheet No. M1.2



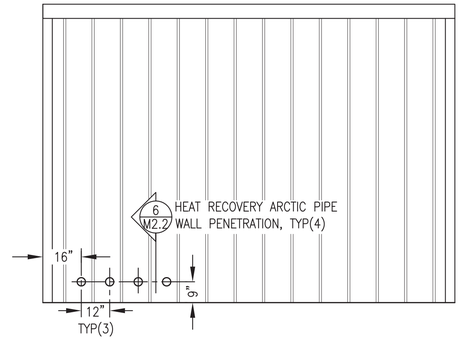

1 M2.1 MECHANICAL PENETRATION LAYOUT & ROOF PLAN
3/8"=1'-0"



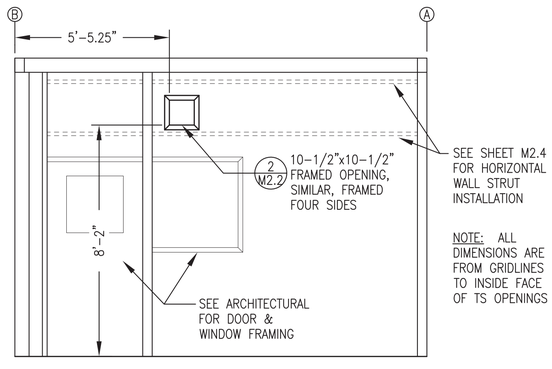

2 M2.1 GRID 2 MECHANICAL WALL PENETRATION LAYOUT – EXTERIOR ELEVATION
3/8"=1'-0"




3 M2.1 GRID A MECHANICAL WALL PENETRATION LAYOUT – EXTERIOR ELEVATION
3/8"=1'-0"




4 M2.1 GRID 1 MECHANICAL WALL PENETRATION LAYOUT – EXTERIOR ELEVATION
3/8"=1'-0"




5 M2.1 PARTITION MECHANICAL WALL PENETRATION LAYOUT – INTERIOR ELEVATION
3/8"=1'-0"

NOTE: THIS DRAWING SHOWS WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY. SEE OWNER FURNISHED MODULE SHOP DRAWINGS FOR ADDITIONAL DETAIL.

ALASKA ENERGY AUTHORITY

STATE OF ALASKA BRIAN C. GRAY 49TH 12-31-2019 REGISTERED PROFESSIONAL ENGINEER ME 8210

CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**

MECHANICAL PENETRATIONS PLAN, ELEVATIONS, & DETAILS

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|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |

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Drawn JTD
Approved BCG

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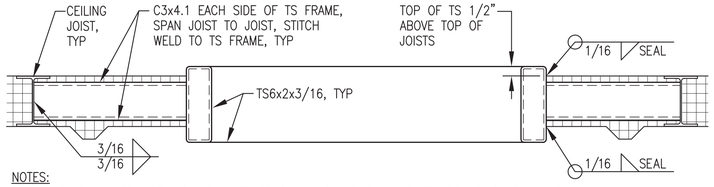
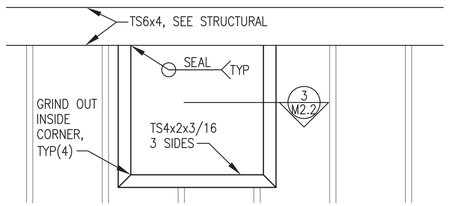


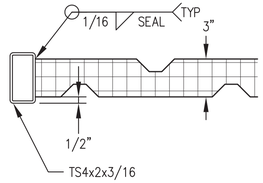

NOTES:
1) FABRICATE FRAMED OPENING WITH MITERED CORNERS AND FULL PENETRATION GROOVE WELDS.
2) FABRICATE TO FINISHED INSIDE (CLEAR) DIMENSIONS INDICATED ON PLANS.
3) GRIND OUT INSIDE OF MITERED CORNERS TO PROVIDE FULL CLEAR OPENING.

## 1 M2.2 TYPICAL ROOF OPENING DETAIL
2"=1'-0"



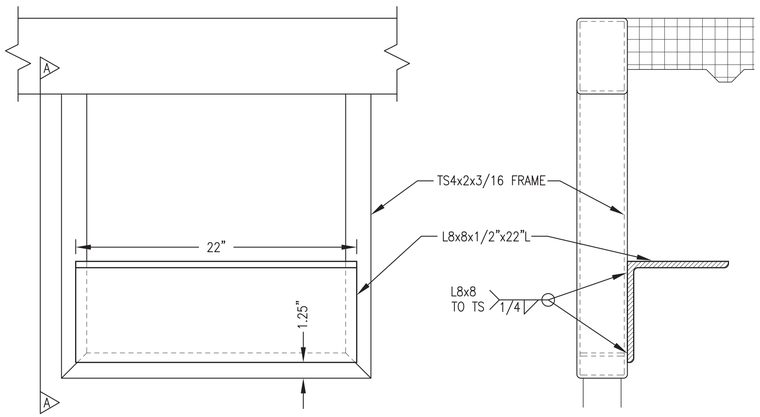

NOTE: SEE ELEVATION FOR INSIDE CLEAR OPENING SIZE.

## 2 M2.2 TYPICAL WALL OPENING – ELEVATION
1"=1'-0"

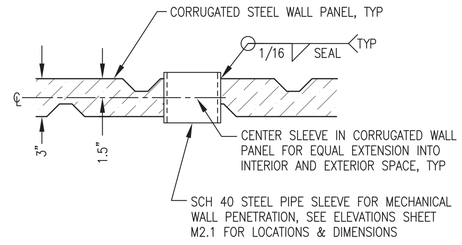



NOTES:
1) FABRICATE FRAMED OPENING WITH MITERED CORNERS AND FULL PENETRATION GROOVE WELDS.
2) FABRICATE TO FINISHED INSIDE (CLEAR) DIMENSIONS INDICATED ON ELEVATIONS.
3) GRIND OUT INSIDE OF MITERED CORNERS TO PROVIDE FULL CLEAR OPENING.

## 3 M2.2 TYPICAL SECTION THROUGH WALL OPENING
2"=1'-0"

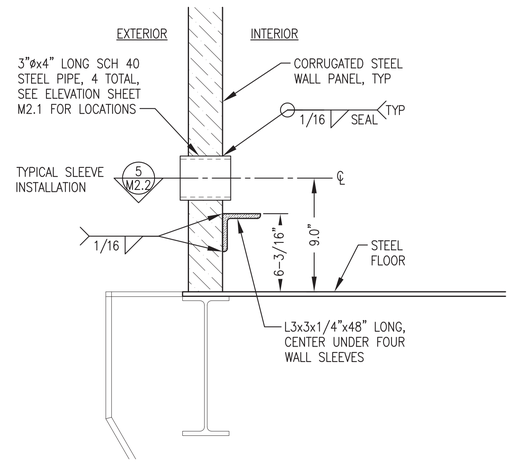



## 4 M2.2 EXHAUST PIPE SUPPORT AT FRAMED OPENING
2"=1'-0"

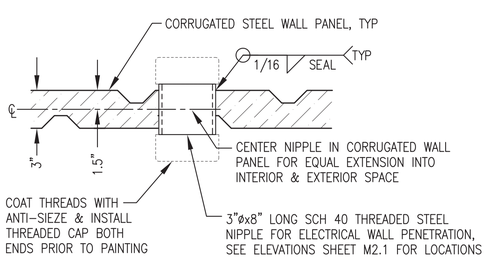



PLAN VIEW

## 5 M2.2 TYPICAL WALL PENETRATION PIPE SLEEVE
2"=1'-0"




## 6 M2.2 TYPICAL HEAT RECOVERY ARCTIC PIPE WALL PENETRATION
2"=1'-0"




PLAN VIEW

## 7 M2.2 TYPICAL PIPE NIPPLE THROUGH WALL
2"=1'-0"

NOTE: THIS DRAWING SHOWS WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY. SEE OWNER FURNISHED MODULE SHOP DRAWINGS FOR ADDITIONAL DETAIL

ALASKA ENERGY AUTHORITY

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

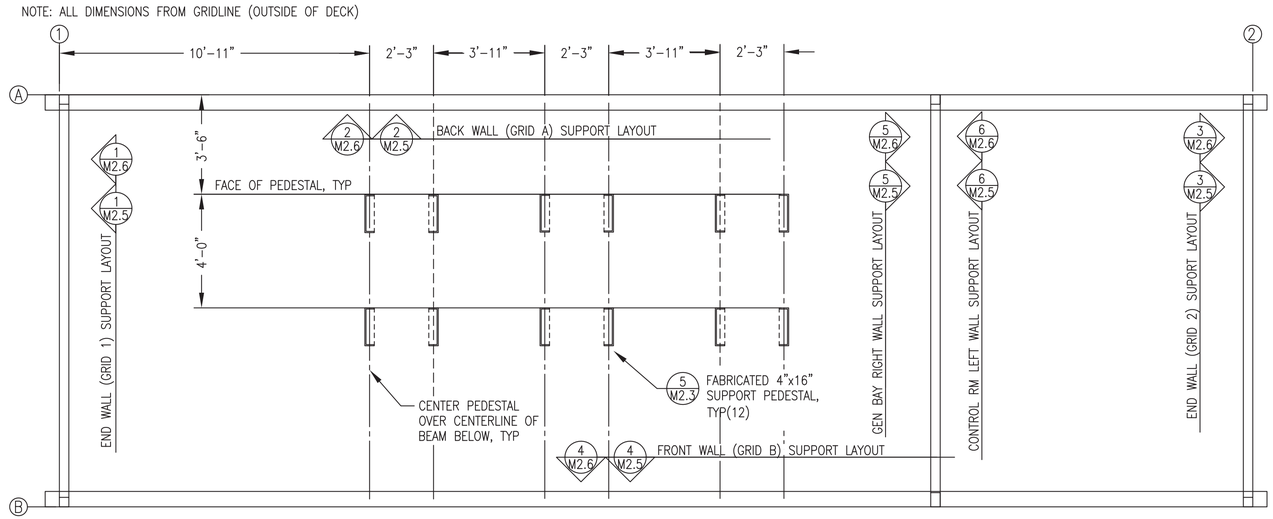
CRW ENGINEERING GROUP LLC — PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
MECHANICAL PENETRATION DETAILS

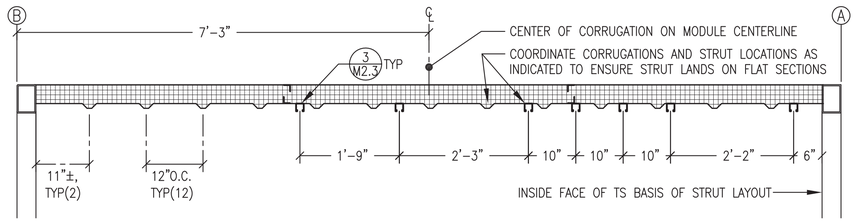
| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |

Plot Date 11/1/19 | Designed BCG | Drawn JTD | Approved BCG

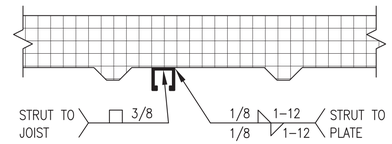
Sheet No. M2.2



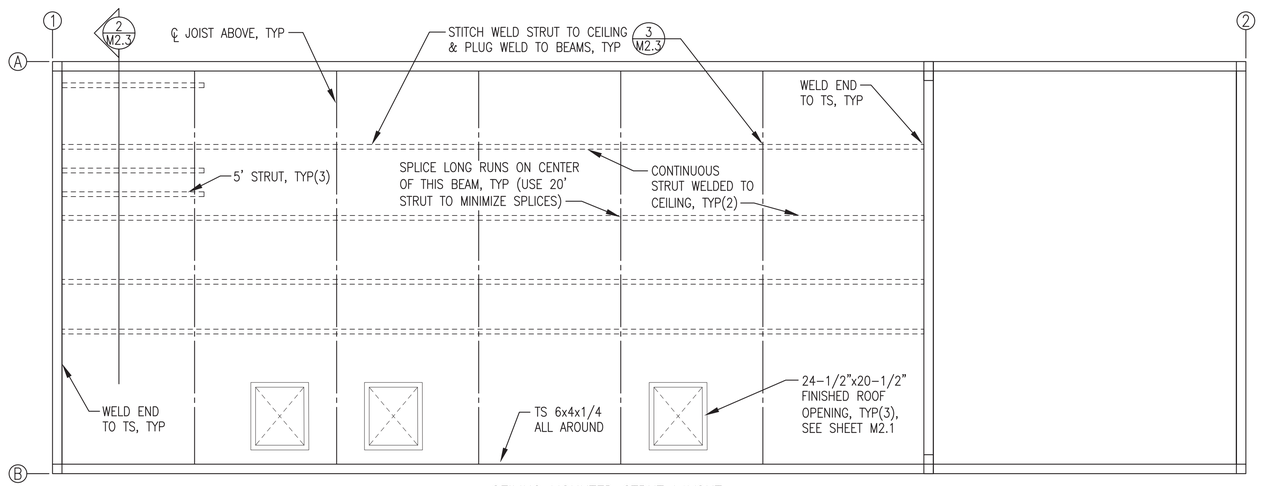

1 M2.3 MODULE MECHANICAL SUPPORT PLAN
3/8"=1'-0"

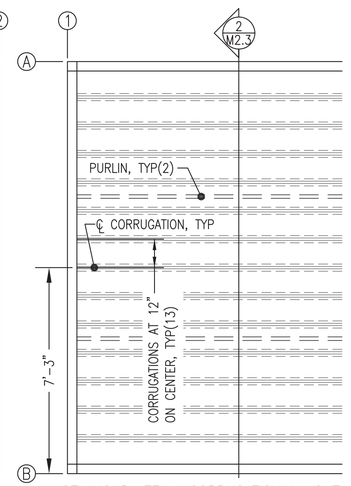



2 M2.3 SECTION THROUGH CEILING – CORRUGATION & STRUT LAYOUT
3/4"=1'-0"

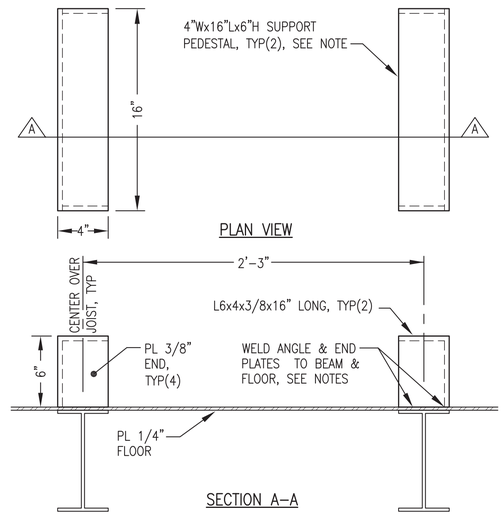



3 M2.3 STRUT ATTACHMENT TO CEILING
NO SCALE




4 M2.3 CEILING STRUT SUPPORT LAYOUT PLAN
3/8"=1'-0"




NOTES: 1) MAKE ALL JOINTS WITH CONTINUOUS GROOVE OR FILLET WELDS.
2) SLOT FLOOR PLATE 3 SIDES, WELD PEDESTAL TO TOP OF BEAM, THEN SEAL WELD TO FLOOR PLATE ALL AROUND.

5 M2.3 SUPPORT PEDESTAL FABRICATION
2"=1'-0"

NOTE: THIS DRAWING SHOWS WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY. SEE OWNER FURNISHED MODULE SHOP DRAWINGS FOR ADDITIONAL DETAIL

**GENERAL NOTES:**

1) FABRICATE PEDESTALS FROM ASTM A36 ANGLE AND PLATES AS SHOWN.
2) ALL STRUT 12 GAUGE 1-5/8"x1-5/8" SOLID BACK PLAIN (UNFINISHED). B-LINE B22-PLN OR EQUAL. PURCHASE IN 20' LENGTHS TO MINIMIZE SPLICES.
3) INSTALL ALL SUPPORTS INDICATED AND GRIND SMOOTH PRIOR TO SANDBLASTING MODULE. SANDBLAST AND PAINT ALL SUPPORTS THIS SHEET EQUIVALENT TO MODULE INTERIOR. SEE SHEET A1 FOR PAINTING SPECIFICATIONS.

ALASKA ENERGY AUTHORITY

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

CRW ENGINEERING GROUP LLC — PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
MECHANICAL SUPPORT PLANS & DETAILS

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| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |

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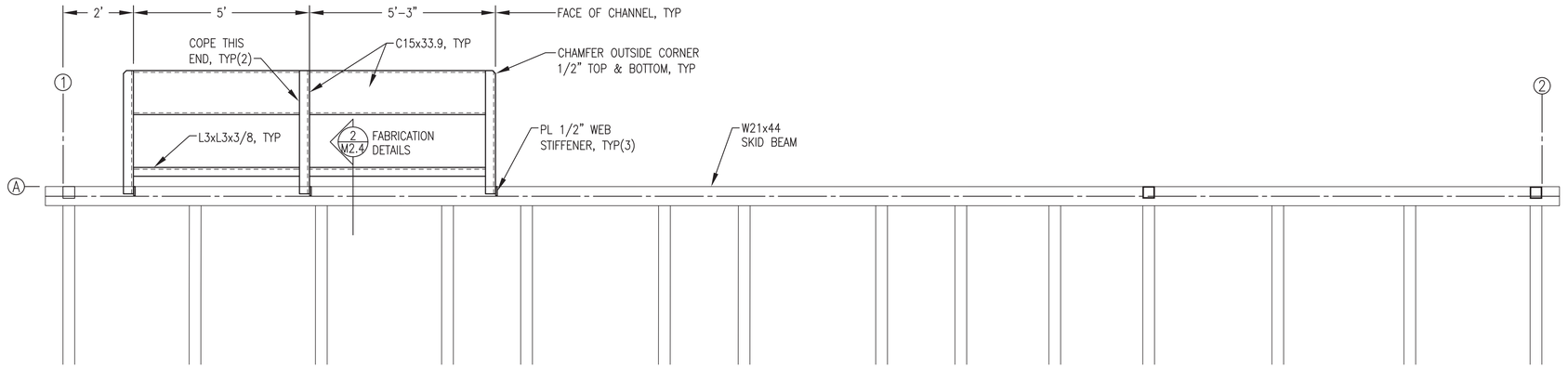
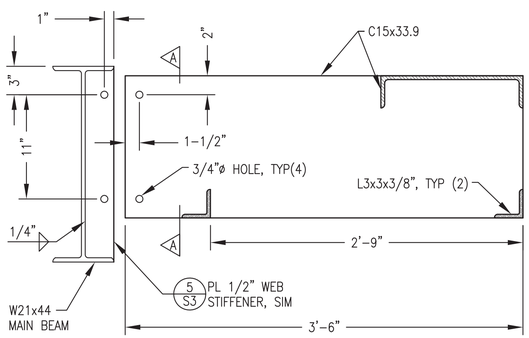
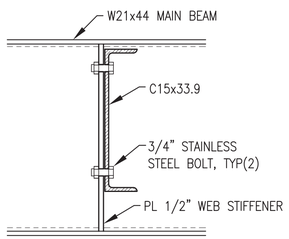
Drawn JTD
Approved BCG

Sheet No. M2.3




1 M2.4 RADIATOR SUPPORT PLAN
1/2"=1'-0"




SECTION A-A

2 M2.4 RADIATOR SUPPORT FABRICATION
1-1/2"=1'-0"

**SUPPORT FABRICATION NOTES:**

1) FABRICATE SUPPORT FROM ASTM A36 ANGLE & CHANNEL AS SHOWN.
2) RACK ALL SUPPORT BRACKETS LEVEL & PERPENDICULAR TO SKID WITH CONNECTIONS BOLTED TIGHT PRIOR TO WELDING.
3) UPON COMPLETION OF WELDING ROUND CORNERS AND GRIND EDGES SMOOTH.
4) PRIOR TO SANDBLASTING MODULE REMOVE SUPPORTS THEN SANDBLAST AND PAINT EQUIVALENT TO MODULE EXTERIOR WALLS. SEE SHEET A1 FOR PAINTING SPECIFICATIONS.

NOTE: THIS DRAWING SHOWS WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY. SEE OWNER FURNISHED MODULE SHOP DRAWINGS FOR ADDITIONAL DETAIL

ALASKA ENERGY AUTHORITY

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

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

Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
RADIATOR SUPPORT PLAN & DETAILS

| NO. | REVISION | BY | DATE |
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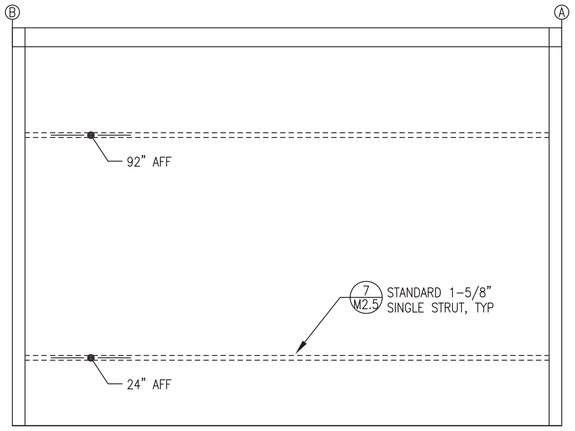
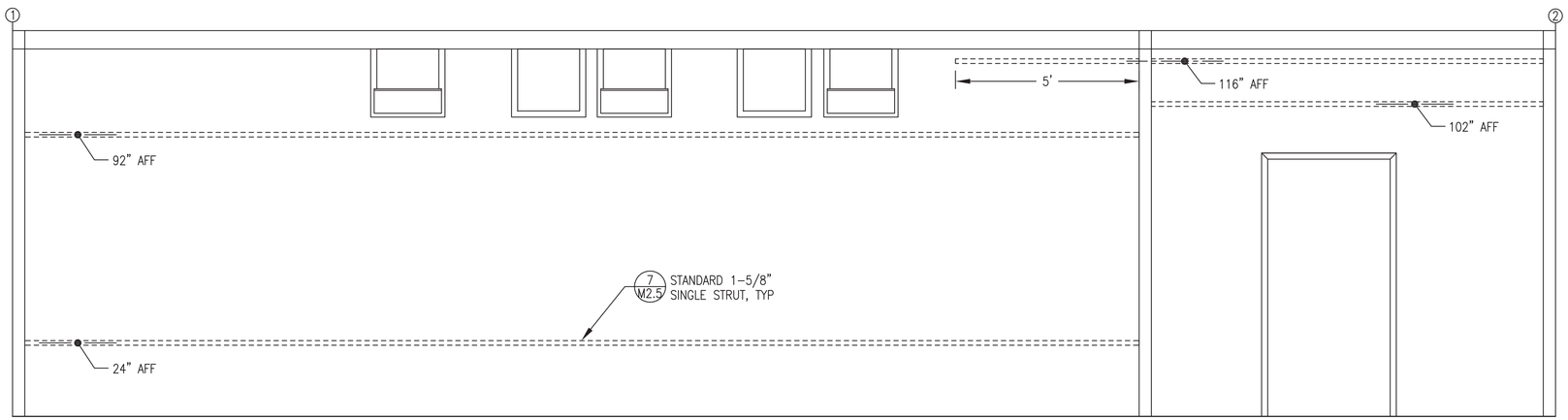
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/9 |

Plot Date 11/1/19
Designed BCG
Drawn JTD
Approved BCG

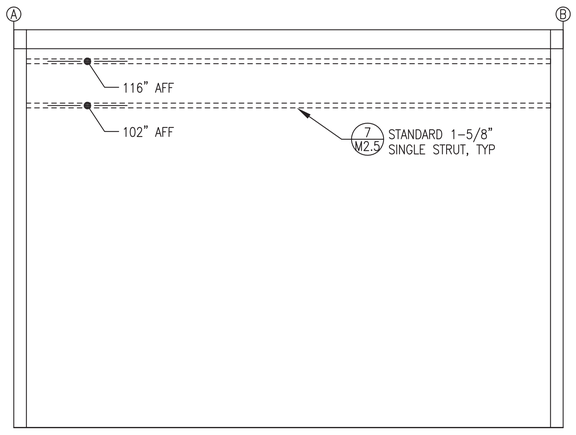
Sheet No. M2.4



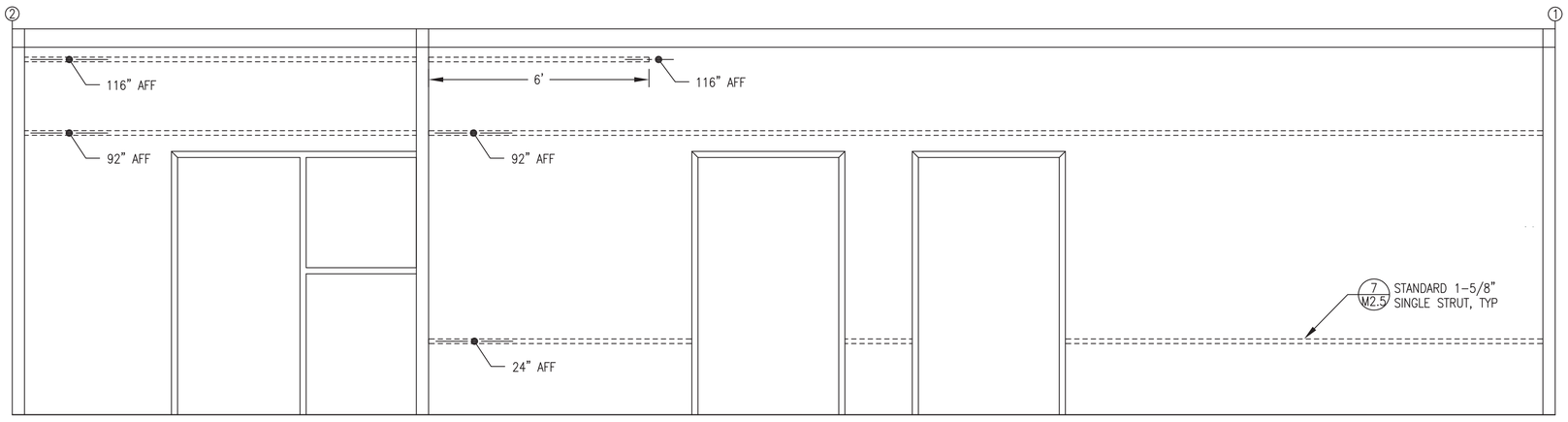

1 M2.5 END WALL (GRID 1) HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"



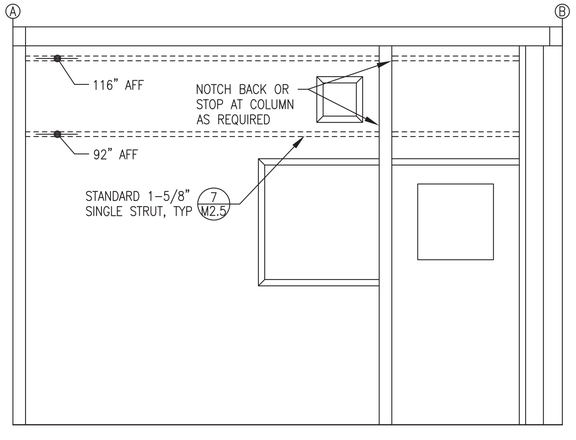

2 M2.5 BACK WALL (GRID A) HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"



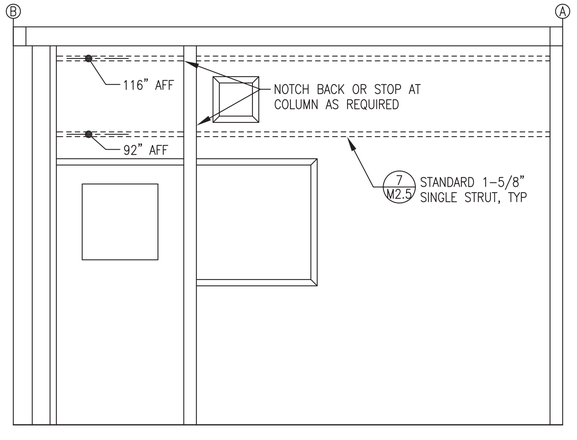

3 M2.5 END WALL (GRID 2) HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"




4 M2.5 FRONT WALL (GRID B) HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"



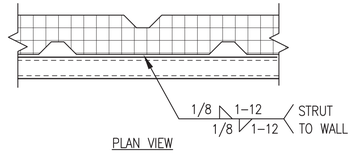

5 M2.5 GEN BAY RIGHT WALL HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"




6 M2.5 CONTROL ROOM LEFT WALL HORIZONTAL WALL STRUT LAYOUT
1/2"=1'-0"

**HORIZONTAL WALL STRUT INSTALLATION NOTES:**

1) ALL LOCATIONS ARE CENTERLINE OF STRUT ABOVE FINISHED FLOOR (AFF).
2) ALL STRUT SHALL BE 12 GAUGE, 1-5/8" x 1-5/8", PLAIN (UN-FINISHED BLACK) WITH SOLID BACK, B-LINE B22-PLN OR EQUAL.
3) PRIOR TO PAINTING MODULE, WELD ALL HORIZONTAL STRUT SECTIONS TO WALLS AS SHOWN. SANDBLAST AND PAINT STRUT WITH MODULE INTERIOR WALLS. SEE SHEET A1 FOR PAINTING SPECIFICATIONS.




7 M2.5 HORIZONTAL WALL STRUT ATTACHMENT
NO SCALE

NOTE: THIS DRAWING SHOWS WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY. SEE OWNER FURNISHED MODULE SHOP DRAWINGS FOR ADDITIONAL DETAIL

ALASKA ENERGY AUTHORITY

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

CRW ENGINEERING GROUP LLC
PHONE: (907) 562-3252
Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
MECHANICAL SUPPORT
HORIZONTAL WALL STRUT INSTALLATION

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |

Plot Date 11/1/19
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Approved BCG

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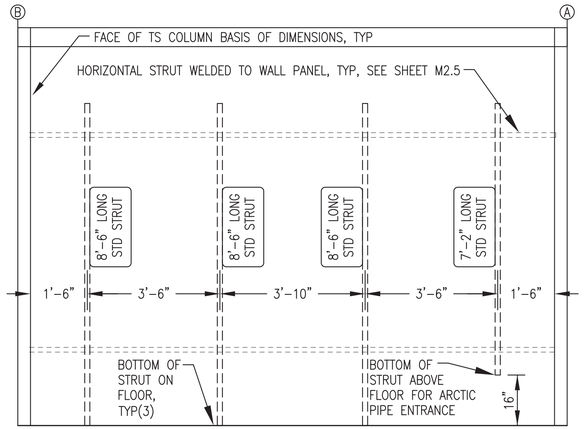
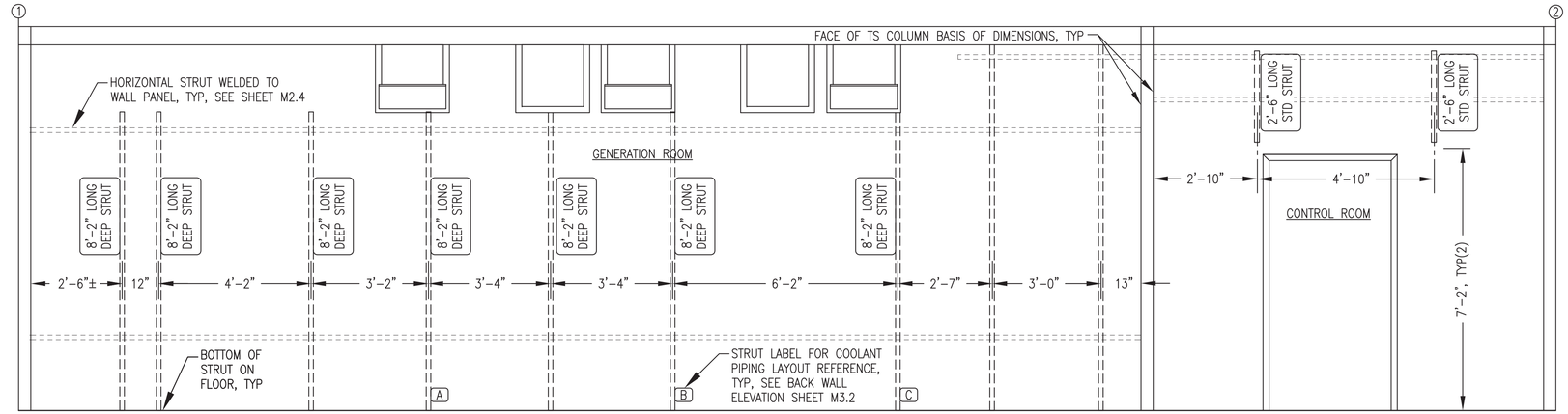
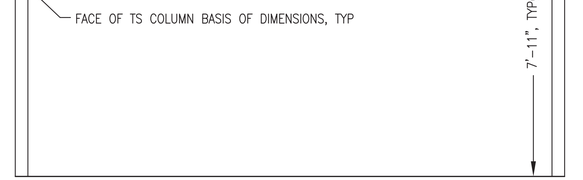
M2.5



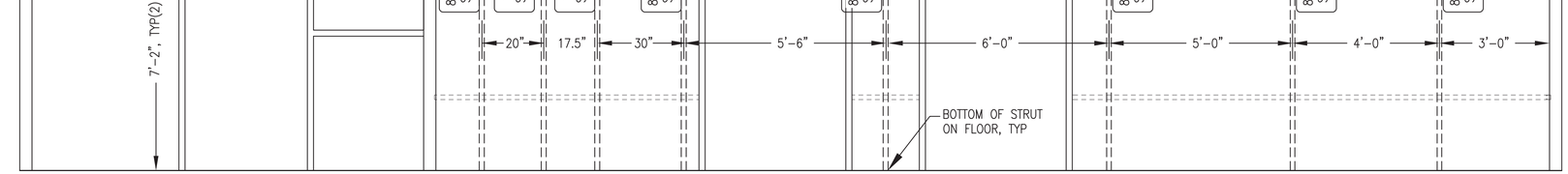

1 M2.6 END WALL (GRID 1) VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"



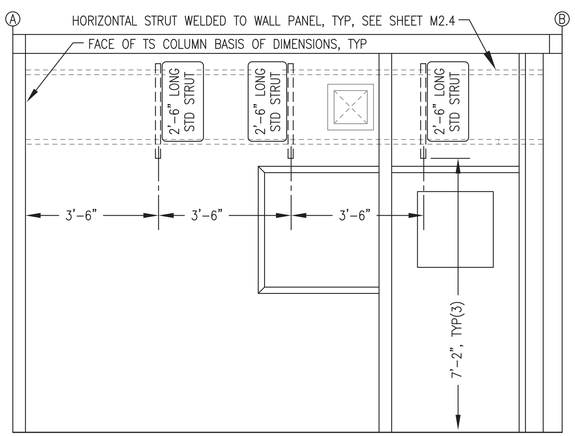

2 M2.6 BACK WALL (GRID A) VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"



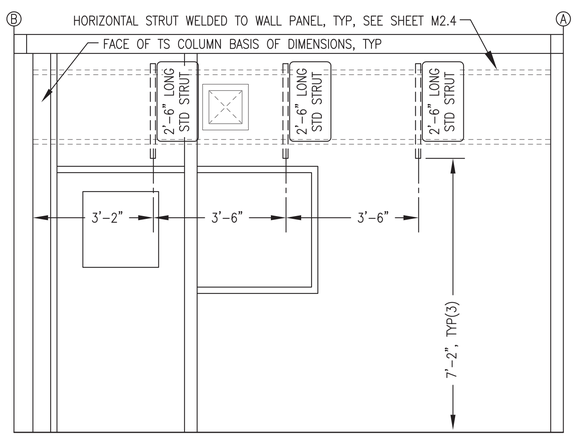

3 M2.6 END WALL (GRID 2) VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"




4 M2.6 FRONT WALL (GRID B) VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"




5 M2.6 GEN BAY RIGHT WALL VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"




6 M2.6 CONTROL ROOM LEFT WALL VERTICAL WALL STRUT LAYOUT
1/2"=1'-0"

**VERTICAL WALL STRUT INSTALLATION NOTES:**

1) ALL HORIZONTAL LOCATIONS ARE CENTERLINE OF STRUT FROM FACE OF TS COLUMNS. ALL VERTICAL LOCATIONS ARE END OF STRUT ABOVE FINISHED FLOOR.

2) ALL STRUT SHALL BE 12 GAUGE, PRE-GALVANIZED FINISH WITH SLOTTED BACK.
"STD" DESIGNATES STANDARD 1-5/8" x 1-5/8" SINGLE STRUT, B-LINE B22-SH-GALV OR EQUAL.
"DEEP" DESIGNATES 3-1/4" x 1-5/8" SINGLE STRUT, B-LINE B11-SH-GALV OR EQUAL.

3) FASTEN ALL VERTICAL STRUT SECTIONS TO HORIZONTAL STRUT WITH 1/2"x1" ALLEN HEAD CAP SCREWS & STRUT NUTS.

4) ONLY MAJOR WALL MOUNTED EQUIPMENT SUPPORT STRUT SHOWN THIS SHEET. SEE MECHANICAL AND ELECTRICAL DRAWINGS FOR OTHER EQUIPMENT, PIPING, AND WIREWAY STRUT SUPPORT DETAILS.

ALASKA ENERGY AUTHORITY


STATE OF ALASKA
BRIAN C. GRAY
ME 8210
REGISTERED PROFESSIONAL ENGINEER
CRW ENGINEERING GROUP LLC
PHONE: (907) 562-3252
Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100


**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
MECHANICAL SUPPORT
VERTICAL WALL STRUT INSTALLATION

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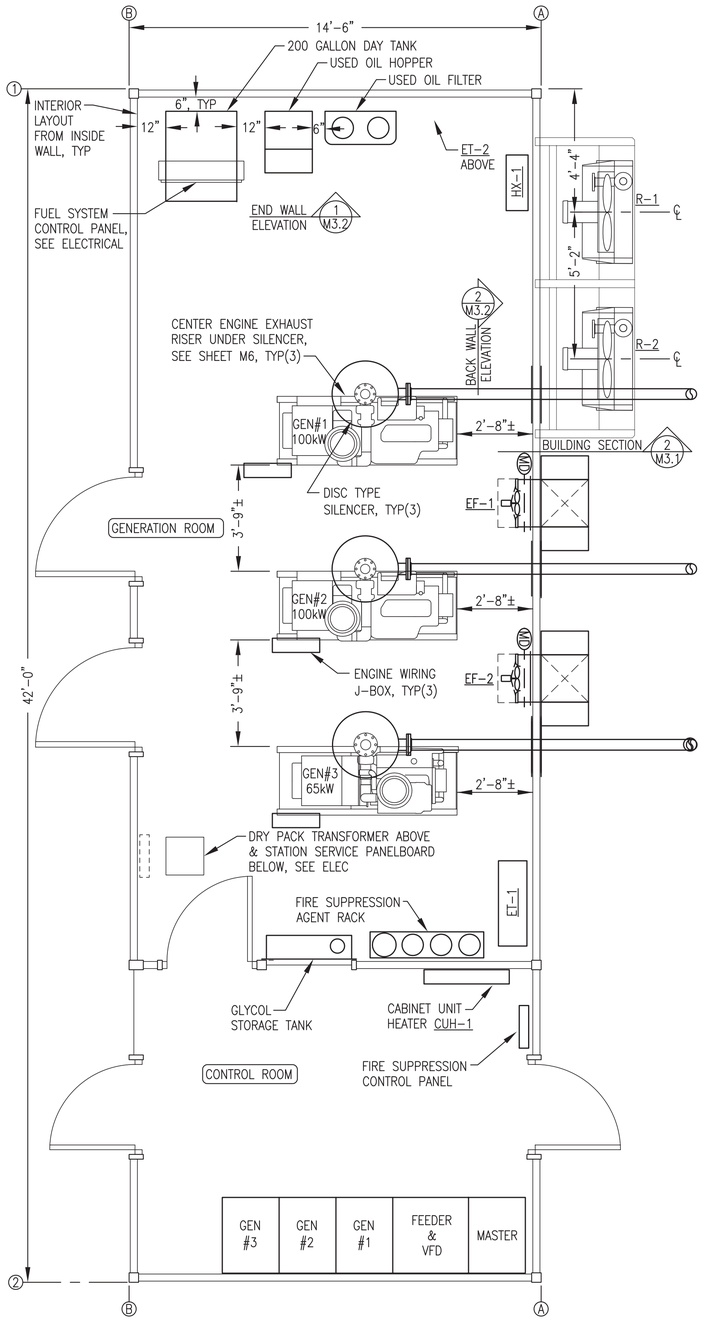
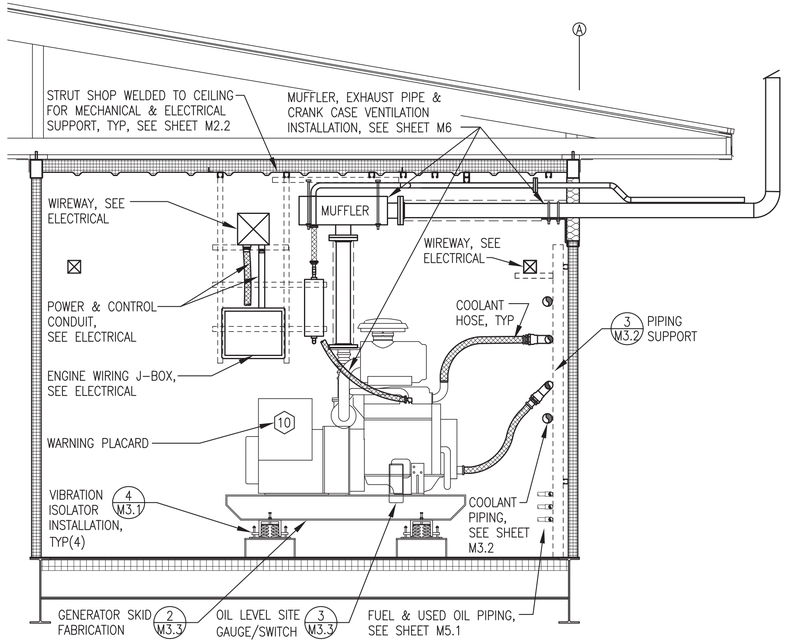
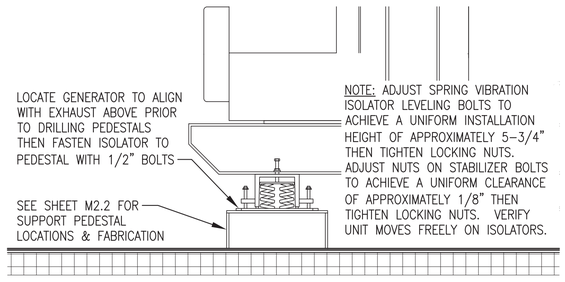
M2.6



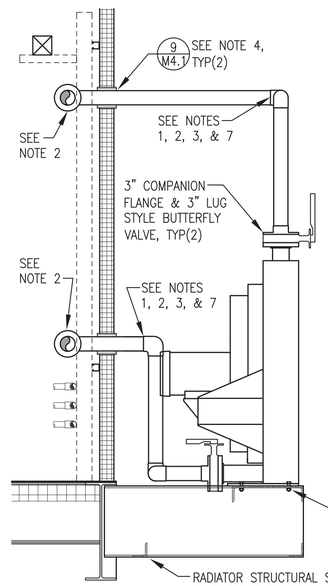

1/M3.1 EQUIPMENT LAYOUT PLAN
3/8"=1'-0"




2/M3.1 TYPICAL MODULE SECTION/GENERATOR INSTALLATION
1/2"=1'-0"




4/M3.1 VIBRATION ISOATOR INSTALLATION
1"=1'-0"




3/M3.1 RADIATOR & PIPING INSTALLATION
3/4"=1'-0"

RADIATOR SHOP/ON-SITE NOTES:

1) DURING SHOP FABRICATION DRY FIT PIPE INTO TEE/EL & USE HOSE FOR TEMPORARY SEAL DURING TESTING.
2) AFTER TESTING REMOVE HOSE & TAKE APART FLANGE AT BUTTERFLY VALVE. REMOVE PIPE & STORE IN MODULE. SEAL WALL PENETRATION FOR SHIPPING.
3) IN FIELD REINSTALL PIPE THROUGH WALL SLEEVE & SOLDER TO EL.
4) IN SHOP LOSE FIT PIPING THROUGH WALL SLEEVE. AFTER FINAL FIELD ASSEMBLY SEAL PENETRATION IN ACCORDANCE WITH DETAIL.
5) DURING SHOP FABRICATION BOLT RADIATOR SUPPORT TO MODULE & RADIATORS TO SUPPORTS.
6) AFTER TESTING REMOVE RADIATOR SUPPORT ASSEMBLY COMPLETE WITH RADIATORS & PIPING MANIFOLD. PACKAGE FOR SHIPPING.
7) IN FIELD BOLT RADIATOR ASSEMBLY TO MODULE, REINSTALL PIPING SECTIONS, & MAKE FINAL SOLDER CONNECTION TO ELS.

ALASKA ENERGY AUTHORITY

STATE OF ALASKA BRIAN C. GRAY 49TH 12-31-2020 REGISTERED PROFESSIONAL ENGINEER

CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
EQUIPMENT LAYOUT PLAN, SECTION, & DETAILS

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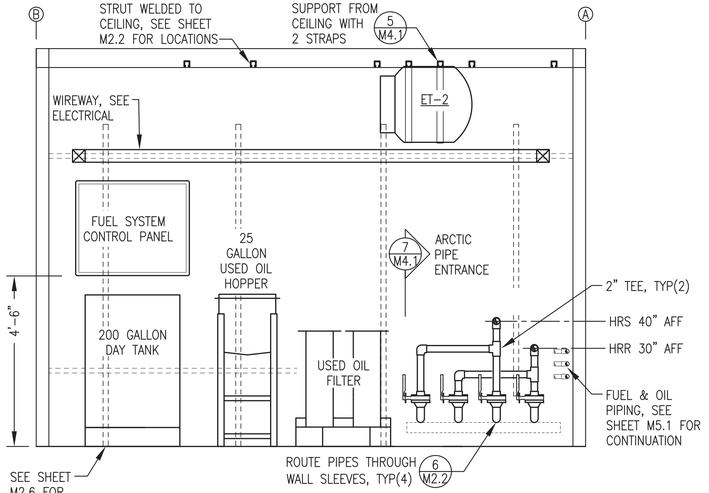
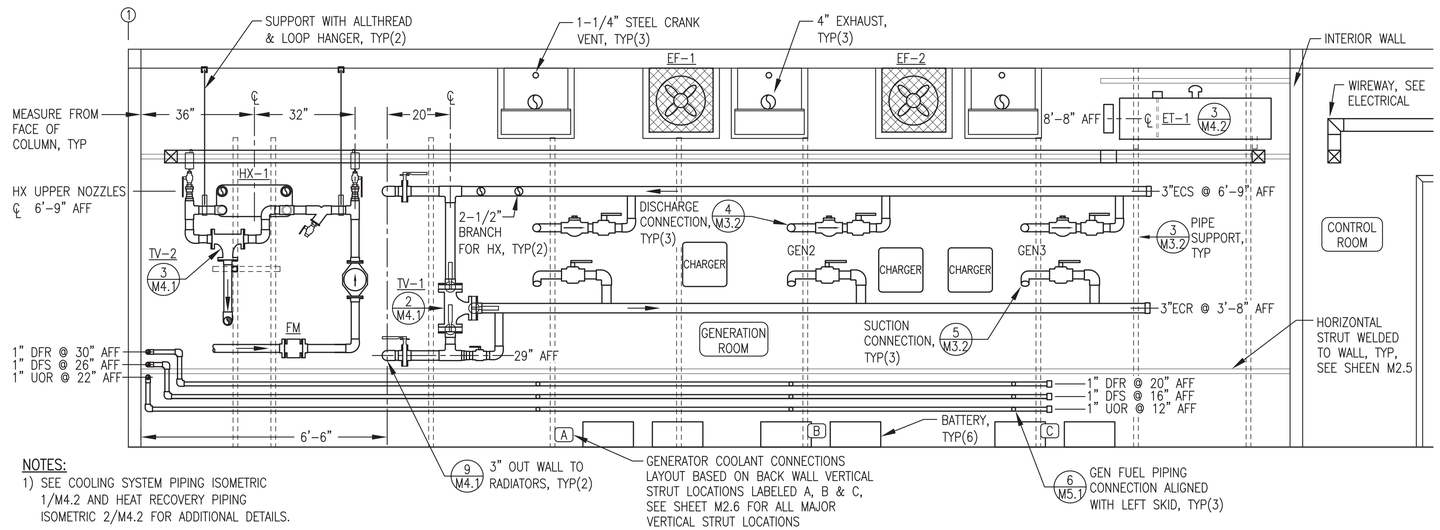
Sheet No.
M3.1




NOTES:
1) SEE HEAT RECOVERY PIPING ISOMETRIC 2/M4.2 FOR ADDITIONAL DETAILS.
2) SEE FUEL SYSTEM PLAN & ELEVATIONS SHEET M5.1 FOR ADDITIONAL DETAILS.

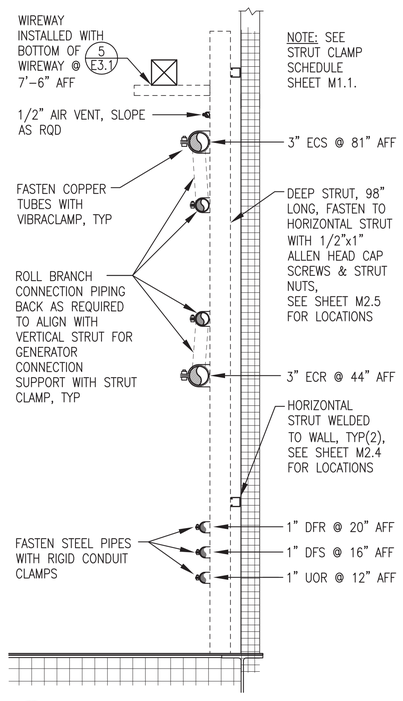
## 1 M3.2 END WALL ELEVATION
1/2"=1'-0"



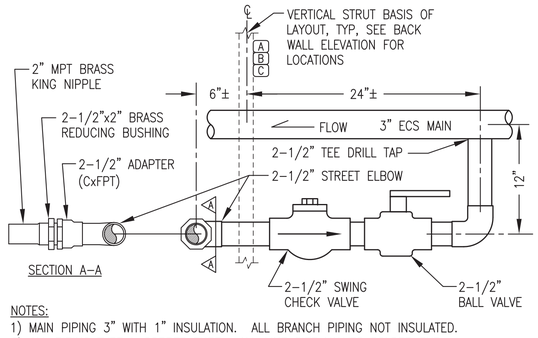

NOTES:
1) SEE COOLING SYSTEM PIPING ISOMETRIC 1/M4.2 AND HEAT RECOVERY PIPING ISOMETRIC 2/M4.2 FOR ADDITIONAL DETAILS.

GENERATOR COOLANT CONNECTIONS LAYOUT BASED ON BACK WALL VERTICAL STRUT LOCATIONS LABELED A, B & C, SEE SHEET M2.6 FOR ALL MAJOR VERTICAL STRUT LOCATIONS

## 2 M3.2 BACK WALL ELEVATION
1/2"=1'-0"

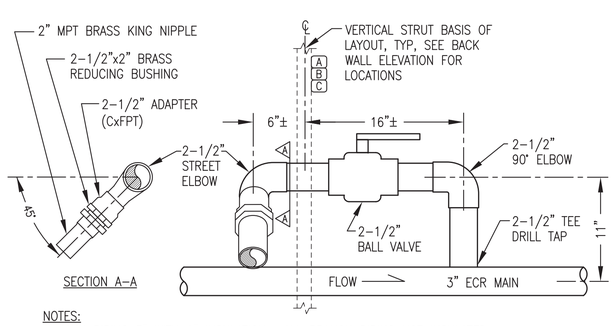



## 3 M3.2 TYPICAL PIPE SUPPORT AT BACK WALL
1"=1'-0"




NOTES:
1) MAIN PIPING 3" WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.
2) ALL PIPING TYPE L COPPER TUBE. ALL LINE SIZE VALVES SOLDER END.

## 4 M3.2 TYPICAL GENERATOR DISCHARGE CONNECTION
NO SCALE




NOTES:
1) MAIN PIPING 3" WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.
2) ALL PIPING TYPE L COPPER TUBE. ALL LINE SIZE VALVES SOLDER END.

## 5 M3.2 TYPICAL GENERATOR SUCTION CONNECTION
NO SCALE

ALASKA ENERGY AUTHORITY

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

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
WALL ELEVATIONS & PPING DETAILS

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| 0 | ISSUED FOR CONSTRUCTION | BCH | 1/6/20 |

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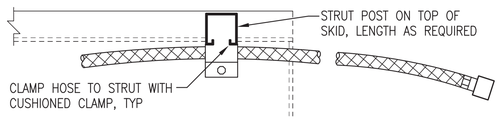
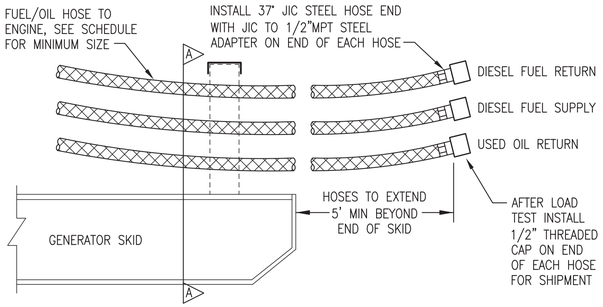
Sheet No. M3.2

| MINIMUM HOSE SIZE SCHEDULE | | |
|---|---|---|
| FUEL SUPPLY | FUEL RETURN | USED OIL |
| #8 | #8 | #10 |

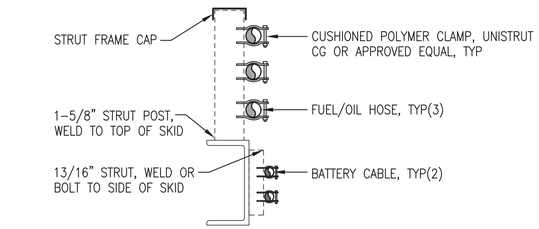
NOTE:
ON 4045'S GROUP HOSES ON LEFT SKID AS SHOWN TO COORDINATE WITH COOLANT HOSES.




LEFT SKID PLAN (TOP) VIEW

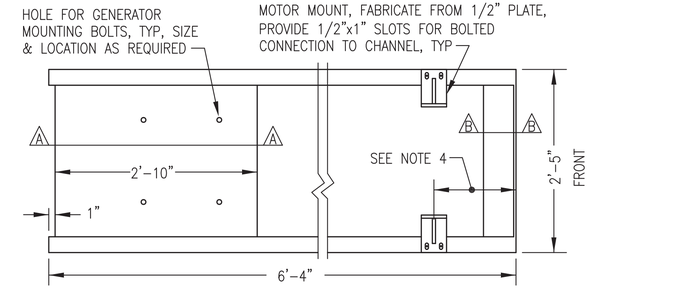



ELEVATION (SIDE) VIEW

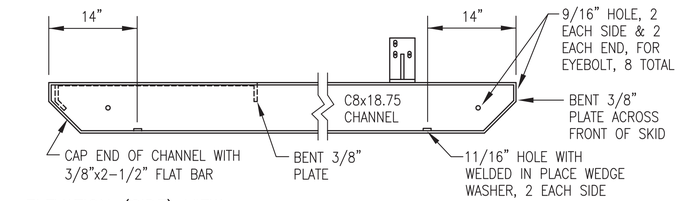



SECTION A–A

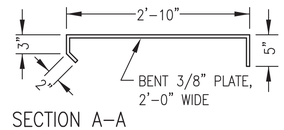
1 M3.3 FUEL/OIL HOSE & BATTERY CABLE INSTALLATION
NO SCALE



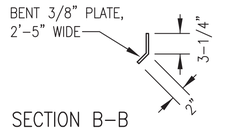

PLAN (TOP) VIEW




ELEVATION (SIDE) VIEW




SECTION A–A

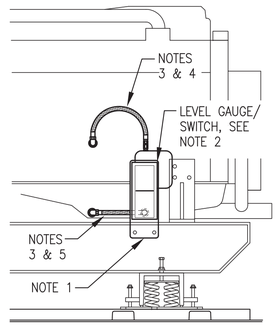



SECTION B–B

NOTES:

1) FABRICATE FROM ASTM A–36 STEEL. BEND PLATES & CUT ENDS OF CHANNELS AT 90° & 45° AS SHOWN.
2) EXCEPT WHERE INDICATED AS BOLTED 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 TO MATCH ENGINE–GENERATOR.
4) PLACE UNIT ON SKID SO THAT THE EXHAUST RISER CENTERLINE IS 3'–3" FROM THE FRONT OF THE SKID.

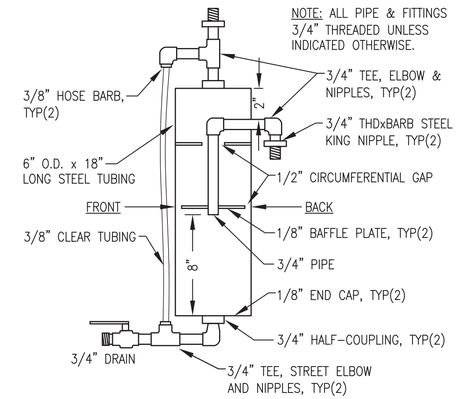
2 M3.3 TYPICAL GENERATOR SKID FABRICATION
NO SCALE




NOTES:

1) 1/4" STEEL SUPPORT PLATE PRE–DRILLED TO MATCH GAUGE/SWITCH MOUNTS, CHANNEL SKID HOLES AND BOTTOM HOSE ENTRANCE. BOLT TO INSIDE (BACK) OF CHANNEL SKID AT HEIGHT AS REQUIRED TO CENTER GAUGE AT NORMAL FULL OIL LEVEL. ADJUST SWITCH CONTACTS 1/2" ABOVE & BELOW.
2) MOUNT OIL LEVEL GAUGE/SWITCH TO STEEL SUPPORT PLATE WITH RUBBER SHOCK MOUNTS .
3) #8 HOSE WITH 1/2" OR 3/8" NPT JIC SWIVEL ENDS AS REQUIRED.
4) CONNECT TOP (VENT) PORT TO ENGINE CRANK CASE WITH HOSE. ROUTE UPPER HOSE TO AVOID LOW POINT TRAPS.
5) CONNECT BOTTOM PORT TO ENGINE OIL PAN WITH HOSE. DO NOT TEE INTO OIL DRAIN LINE. ROUTE LOWER HOSE BACK THROUGH PRE–DRILLED HOLE IN STEEL PLATE.

3 M3.3 TYPICAL OIL LEVEL GAUGE/SWITCH INSTALLATION
NO SCALE




4 M3.3 CONDENSATE TRAP FABRICATION
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA BRIAN C. GRAY 49TH 12670 ENGINEER REGISTERED PROFESSIONAL

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Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

AKHIOK, ALASKA
POWER SYSTEM UPGRADE PROJECT
GENERATOR FABRICATION DETAILS

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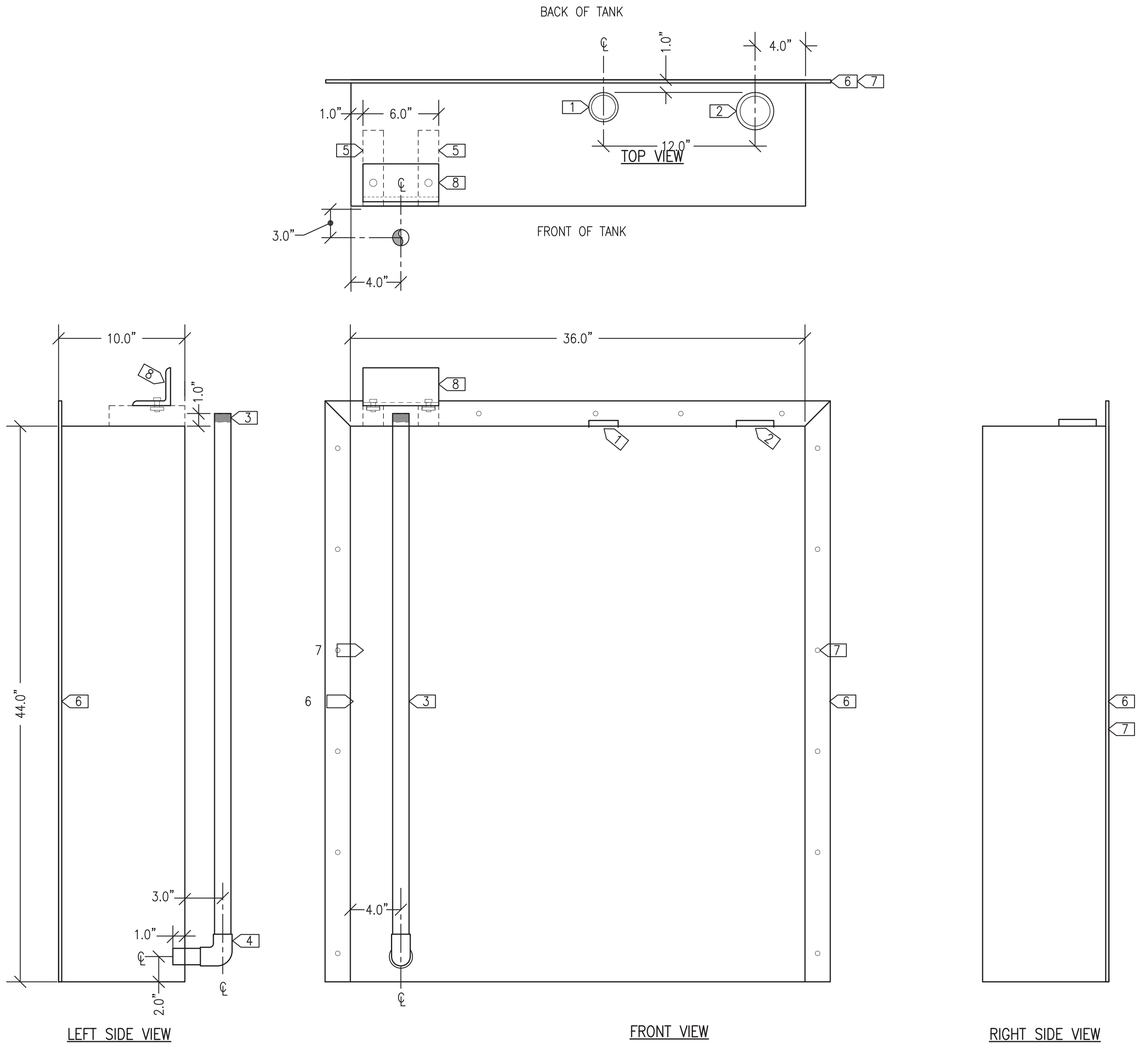
Sheet No.
M3.3

## GLYCOL TANK GENERAL NOTES:

1. FABRICATE SINGLE WALL 60 GALLON NOMINAL CAPACITY GLYCOL TANK.
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.
3. PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. SEAL WELD ALL TANK ATTACHMENTS.
4. ALL FPT OPENINGS TO BE FORGED STEEL HALF COUPLINGS.
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. PRIME AND COVER WITH TWO COATS OF EPOXY, SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, COLOR STRUCTURAL GRAY 4031.
7. UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS AND AIR DRY INTERIOR. INSTALL 2" SCREENED VENT ON 2" FPT FILL CONNECTION WITH 2" CLOSE NIPPLE FOR SHIPPING. SEAL ALL OTHER OPENINGS WITH PLASTIC OR STEEL PLUGS..

## GLYCOL TANK SPECIFIC NOTES:

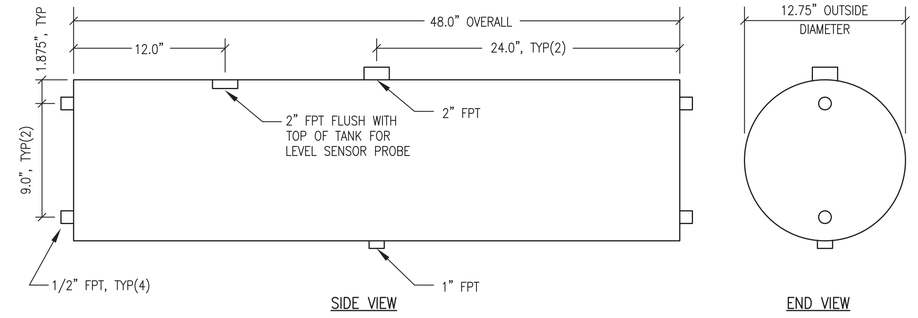
1. 1-1/2" FPT (TANK GAUGE)
2. 2" FPT (VENT) – INSTALL 2" THREADED VENT CAP
3. 1" SCHEDULE 80 PIPE WITH THREADED TOP CONNECTION (WITHDRAWAL)
4. 1" SOCKETWELD 90° ELBOW
5. 6" LONG STRUT, END FLUSH WITH FRONT OF TANK
6. 2x1/4" FLAT BAR CONTINUOUS THREE SIDES
7. 3/8" HOLE AT 8" O.C. ALL AROUND
8. L3x3x1/4"x6" LONG FOR FUTURE CONNECTION TO HAND PUMP BY OTHERS. PAINT TO MATCH TANK AND FASTEN TO STRUTS WITH 1/2" BOLTS & STRUT NUTS.




1 M3.4 60 GALLON GLYCOL STORAGE TANK
1"=6"

## EXPANSION TANK GENERAL NOTES:

1) FABRICATE SINGLE WALL 24 GALLON NOMINAL CAPACITY GLYCOL EXPANSION TANK.
2) FABRICATE SHELL FROM MINIMUM 10 GAUGE ASTM A-36 PLATE STEEL ROLLED AND WELDED OR SCHEDULE 5 LIGHTWALL ASTM A53 STEEL PIPE. FABRICATE HEADS FROM 3/16" 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 OF SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, 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 M3.4 24 GALLON GLYCOL EXPANSION TANK
1"=6"

ALASKA ENERGY AUTHORITY

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
GLYCOL STORAGE & EXPANSION TANKS FABRICATION

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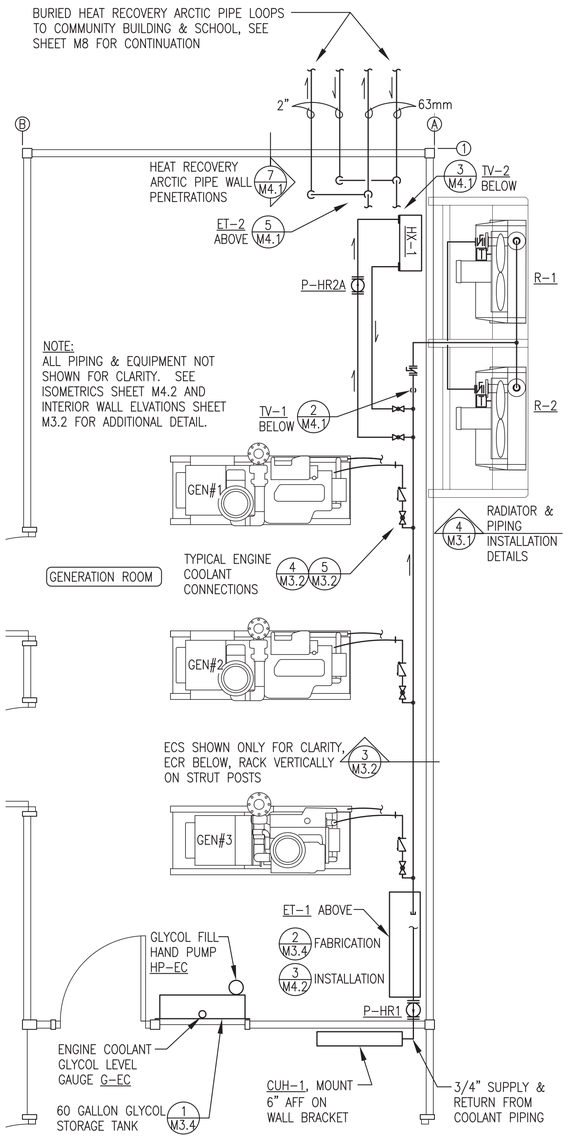
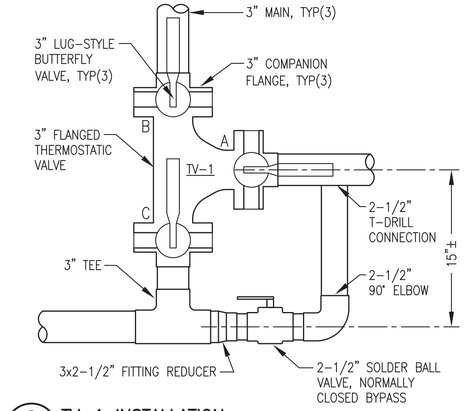
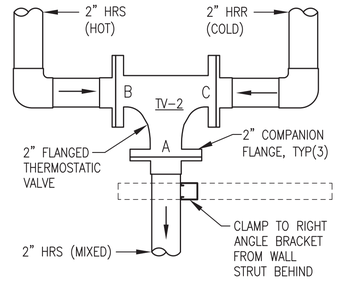


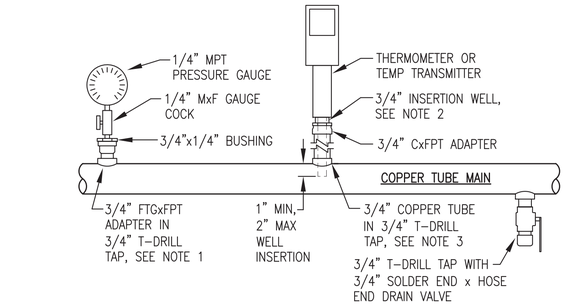

## 1 M4.1 COOLANT AND HEAT RECOVERY PIPING PLAN
3/8"=1'-0"




## 2 M4.1 TV-1 INSTALLATION
NO SCALE

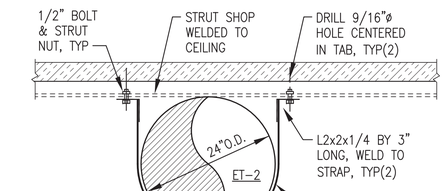



## 3 M4.1 TV-2 INSTALLATION
NO SCALE



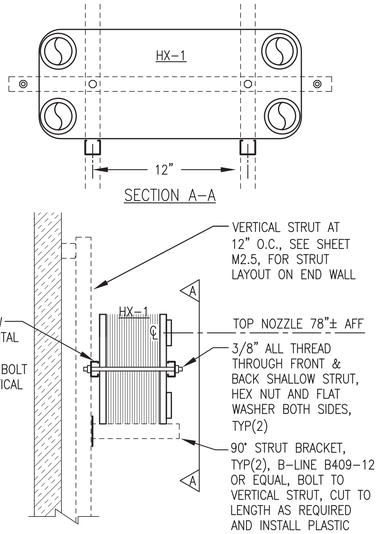

NOTES:
1) USE T-DRILL TAPS AS SHOWN FOR INSTALLATIONS IN 1-1/4" AND LARGER COPPER MAINS. USE LINE SIZE TEE FITTINGS FOR INSTALLING INSTRUMENTATION IN 1" AND SMALLER MAINS.
2) TEMPERATURE TRANSMITTER INSTALLATION SIMILAR TO THERMOMETER EXCEPT USE 3/4"x1/2" BUSHING.
3) FOR MAINS SMALLER THAN 2" USE COPPER TUBE RISER AS SHOWN, LENGTH AS REQUIRED FOR 1" TO 2" WELL INSERTION INTO MAIN. FOR LARGER PIPES OMIT RISER AND INSERT 3/4" FTGxFPT ADAPTER INTO T-DRILL TAP.

## 4 M4.1 TYPICAL INSTRUMENT INSTALLATION
NO SCALE

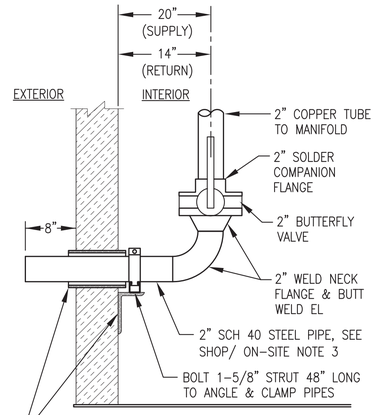



NOTES:
1) SMOOTH EDGES AFTER FABRICATION, WIRE BRUSH, SOLVENT CLEAN, AND PAINT WITH TWO COATS OF DIRECT TO METAL ALKYD ENAMEL, SHERWIN WILLIAMS DTM OR APPROVED EQUAL, COLOR STRUCTURAL GRAY 4031.
2) ONE STRAP SHOWN. INSTALL FOUR IDENTICAL STRAPS.

## 5 M4.1 HEAT RECOVERY EXP TANK ET-2 SUPPORT
NO SCALE




## 6 M4.1 HEAT EXCHANGER SUPPORT FROM WALL
NO SCALE

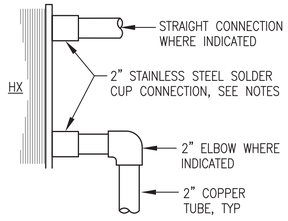



ARCTIC PIPE GENERAL NOTES:
1) SEE ELEVATION 3/M3.2 FOR PENETRATION LOCATIONS.
2) ONE PIPE FOR EACH SIZE SHOWN. PROVIDE TWO IDENTICAL FOR EACH SIZE.

ARCTIC PIPE SHOP/ON-SITE NOTES:
1) SHOP INSTALLATION SHOWN. STUB PIPE 8" MIN BEYOND WALL & TEMPORARILY CONNECT SUPPLY TO RETURN FOR TESTING.
2) AFTER TESTING REMOVE TEMPORARY CONNECTION, BREAK FLANGE JOINT, AND STORE PIPE IN MODULE. PLUG WALL PENETRATION FOR SHIPPING.
3) AS PART OF ON-SITE INSTALLATION REINSTALL PIPE THROUGH WALL AND CONNECT TO ARCTIC PIPE, SEE SHEET M8.

## 7 M4.1 HEAT RECOVERY ARCTIC PIPE WALL PENETRATIONS
NO SCALE

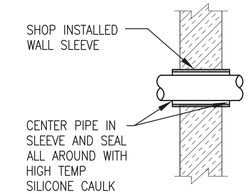
HX CONNECTION NOTES:
1) CONNECT COPPER TUBE TO SS NOZZLE WITH HIGH SILVER BRAZING ROD.
2) PLACE WET RAGS ON HX & COPPER TUBE AS REQUIRED TO LIMT HEAT IMPACT DURING BRAZING.




## 8 M4.1 HX PIPING CONNECTION
NO SCALE

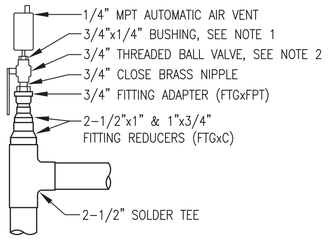
SHOP/ON-SITE NOTES:
1) SEAL OPENINGS AS PART OF ON-SITE WORK.

GENERAL NOTES:
1) THIS DETAIL FOR COOLANT PIPING WITH SHOP INSTALLED WALL SLEEVES.
2) FOR ALL PIPE/CONDUIT LESS THAN 2" O.D. AND WITHOUT A SHOP INSTALLED WALL SLEEVE, HOLE SAW OR DRILL OPENING FOR TIGHT FIT THROUGH WALL AND CAULK ALL AROUND WITH POLYURETHANE SEALANT.




## 9 M4.1 COOLANT PIPING WALL PENETRATION
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 INSTALL BUSHING & AIR VENT & CLOSE BALL VALVE.




## 10 M4.1 TYPICAL AIR VENT INSTALLATION
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA — BRIAN C. GRAY — 10249 — REGISTERED PROFESSIONAL ENGINEER — ME 8210

CRW ENGINEERING GROUP LLC — PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
COOLANT & HEAT RECOVERY PIPING PLAN & DETAILS

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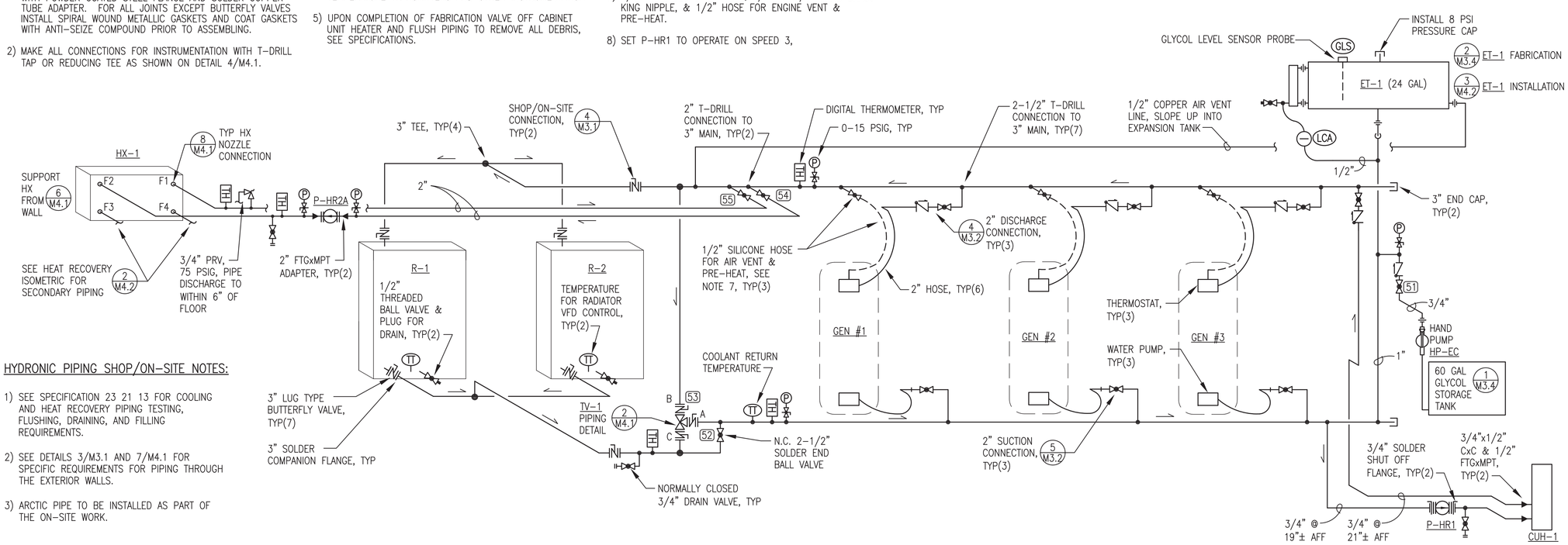
Sheet No. M4.1

## COOLING SYSTEM ISOMETRIC NOTES:

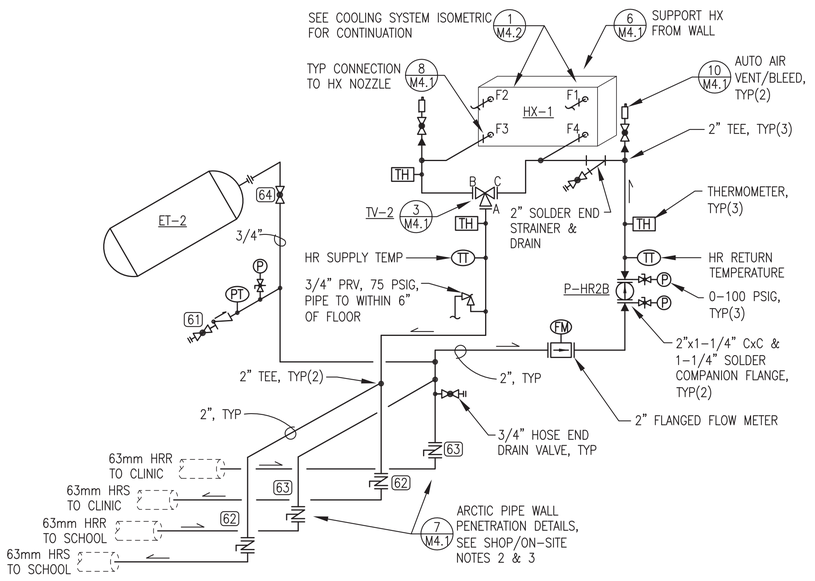
1) ALL PIPING SHOWN THIS ISOMETRIC TYPE "L" COPPER WITH SOLDER JOINTS, 3"ø EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE. ALL FLANGES ANSI 150# PATTERN TWO-PIECE WITH POWDER COATED STEEL FLANGE AND SOLDER COPPER TUBE ADAPTER. FOR ALL JOINTS EXCEPT BUTTERFLY VALVES INSTALL SPIRAL WOUND METALLIC GASKETS AND COAT GASKETS WITH ANTI-SEIZE COMPOUND PRIOR TO ASSEMBLING.
2) MAKE ALL CONNECTIONS FOR INSTRUMENTATION WITH T-DRILL TAP OR REDUCING TEE AS SHOWN ON DETAIL 4/M4.1.
3) ALL COOLANT PRESSURE GAUGES 0-15 PSIG.
4) SEE ELECTRICAL INSTRUMENTATION SCHEDULE FOR TEMPERATURE TRANSMITTERS AND OTHER INSTRUMENTATION.
5) UPON COMPLETION OF FABRICATION VALVE OFF CABINET UNIT HEATER AND FLUSH PIPING TO REMOVE ALL DEBRIS, SEE SPECIFICATIONS.
6) INSULATE COOLANT PIPING MAINS FROM GENERATOR VALVES TO RADIATORS. ALL OTHER PIPING NOT INSULATED.
7) 3/4" THREADED BALL VALVE, 3/4"MPTx5/8" BARB BRASS KING NIPPLE, & 1/2" HOSE FOR ENGINE VENT & PRE-HEAT.
8) SET P-HR1 TO OPERATE ON SPEED 3,

## HYDRONIC PIPING SHOP/ON-SITE NOTES:

1) SEE SPECIFICATION 23 21 13 FOR COOLING AND HEAT RECOVERY PIPING TESTING, FLUSHING, DRAINING, AND FILLING REQUIREMENTS.
2) SEE DETAILS 3/M3.1 AND 7/M4.1 FOR SPECIFIC REQUIREMENTS FOR PIPING THROUGH THE EXTERIOR WALLS.
3) ARCTIC PIPE TO BE INSTALLED AS PART OF THE ON-SITE WORK.



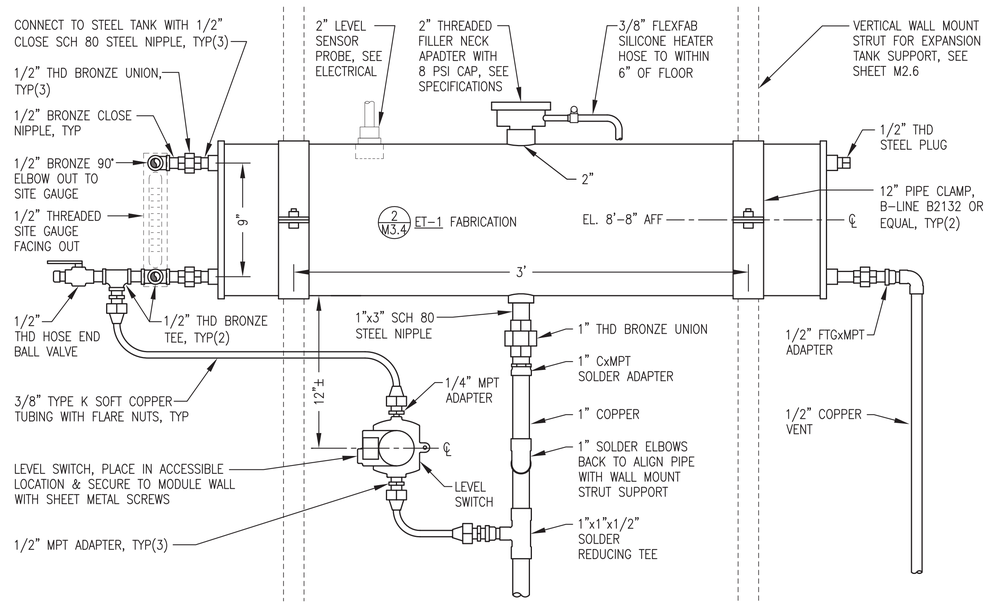

1 M4.2 COOLING SYSTEM PIPING ISOMETRIC
NO SCALE




2 M4.2 HEAT RECOVERY SYSTEM PIPING ISOMETRIC
NO SCALE

## HEAT RECOVERY ISOMETRIC NOTES:

1) 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.
2) MAKE ALL CONNECTIONS FOR INSTRUMENTATION WITH T-DRILL TAP OR REDUCING TEE AS SHOWN ON DETAIL 4/M4.1.
3) ALL HEAT RECOVERY PRESSURE GAUGES 0-100 PSIG.
4) SEE ELECTRICAL INSTRUMENTATION SCHEDULE FOR TEMPERATURE AND PRESSURE TRANSMITTERS AND FLOW METER.
5) UPON COMPLETION OF FABRICATION FLUSH PIPING TO REMOVE ALL DEBRIS, SEE SPECIFICATIONS.
6) INSULATE HEAT RECOVERY PIPING MAINS.
7) SET P-HR2B TO OPERATE ON SPEED 3.




3 M4.2 24 GAL EXPANSION TANK ET-1 INSTALLATION
NO SCALE

ALASKA ENERGY AUTHORITY

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

CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
COOLANT & HEAT RECOVERY ISOMETRICS & DETAILS

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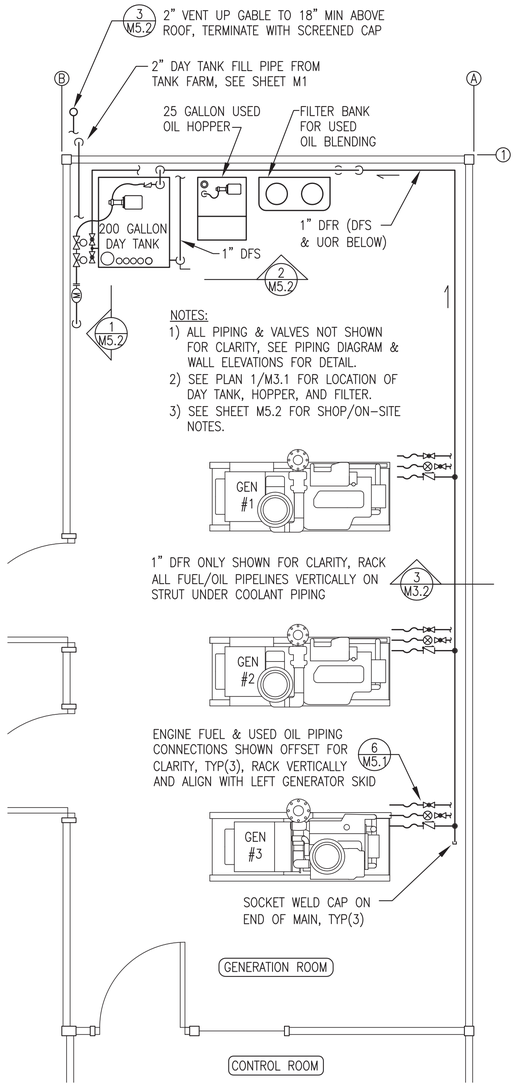
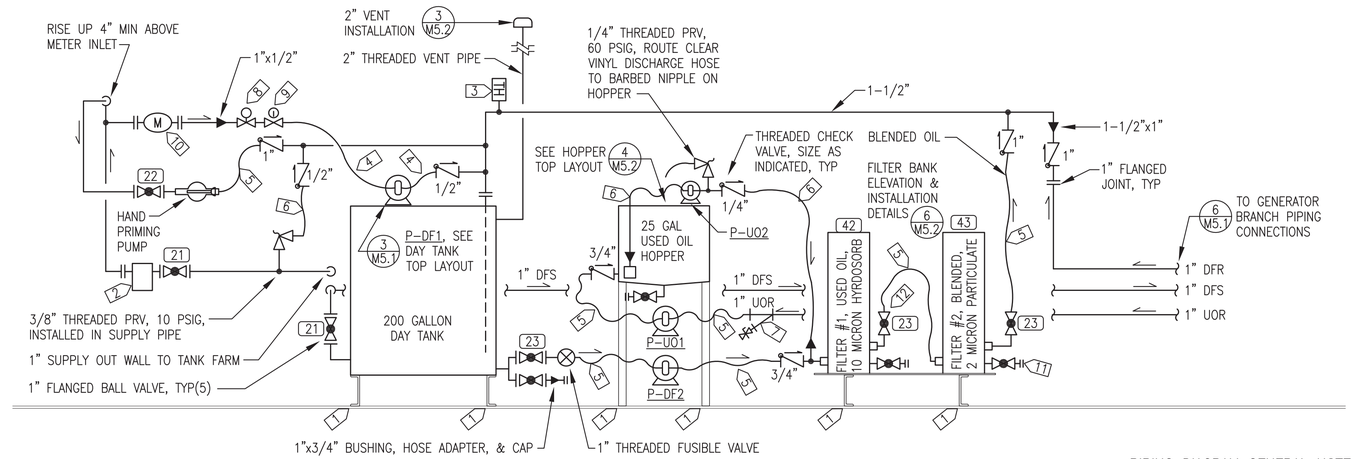



## 1 M5.1 DIESEL FUEL SYSTEM & USED OIL PIPING PLAN

3/8"=1'




## 2 M5.1 DIESEL FUEL & USED OIL PIPING DIAGRAM

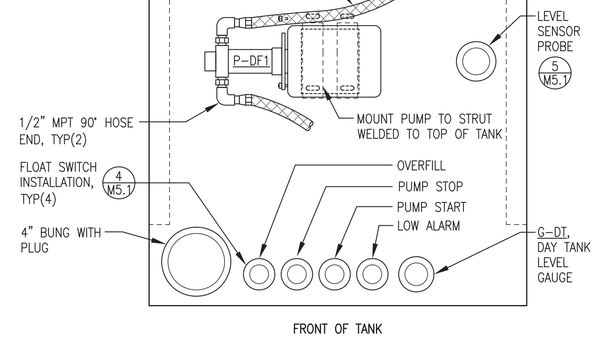
NO SCALE

### PIPING DIAGRAM SPECIFIC NOTES:

1. FASTEN DEVICE TO FLOOR WITH MIN 1"x3/16" FILLET WELD ALL 4 CORNERS, WIRE BRUSH AND RE-PAINT WELD AREA TO MATCH EXISTING.
2. 1" ANSI 150# FLANGED FILTER F-DT, REMOVE DRAIN VALVE & INSTALL 1/8"MxF DRAIN COCK.
3. DIGITAL THERMOMETER, INSTALL WELL IN 3/4" THREAD-O-LET.
4. #10 HOSE WITH 1/2" OR 3/4" NPT ENDS.
5. #12 HOSE WITH 1/2", 3/4", OR 1" NPT ENDS.
6. #6 HOSE WITH 1/8", 1/4", OR 3/8" NPT ENDS.
7. 1" THREADED 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, PROVIDE SOCKET WELD FLANGE ON INLET & THREADED FLANGE ON OUTLET.
11. 3/4" THREADED BALL VALVE WITH HOSE ADAPTER & CAP, TYP(3).
12. 3/4" THREADED BALL VALVE, TYP(2).

### PIPING DIAGRAM GENERAL NOTES:

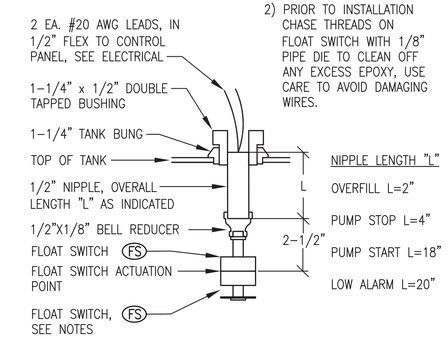
1) FABRICATE DAY TANK, FILTER BANK, & HOPPER IN ACCORDANCE WITH FABRICATION PLANS AND DETAILS.
2) ALL DAY TANK SUPPLY & RETURN PIPING 1" SCH 80 EXCEPT WHERE INDICATED AS 1-1/2". ALL VENT PIPING 2" SCH 40.
3) ALL PIPING JOINTS SOCKET OR BUTT WELD EXCEPT FOR THREADED VENT & CONNECTIONS TO EQUIPMENT & VALVES.
4) ON ALL HOSES INSTALL JICxNPT SWIVEL ENDS, SIZE REQUIRED TO MATCH PIPING OR PUMPS




## 3 M5.1 TOP OF DAY TANK - PLAN VIEW

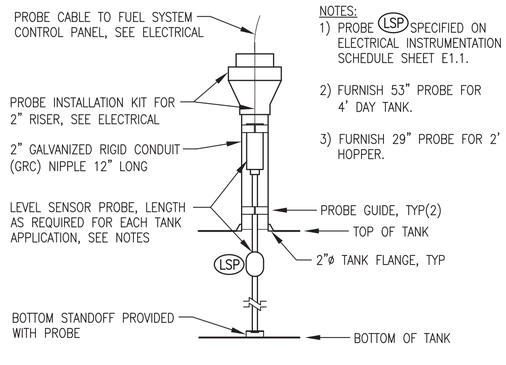
NO SCALE

NOTES:
1) FLOAT SWITCH (FS) SPECIFIED ON ELECTRICAL INSTRUMENTATION SCHEDULE SHEET E1.1.
2) PRIOR TO INSTALLATION CHASE THREADS ON FLOAT SWITCH WITH 1/8" PIPE DIE TO CLEAN OFF ANY EXCESS EPOXY, USE CARE TO AVOID DAMAGING WIRES.



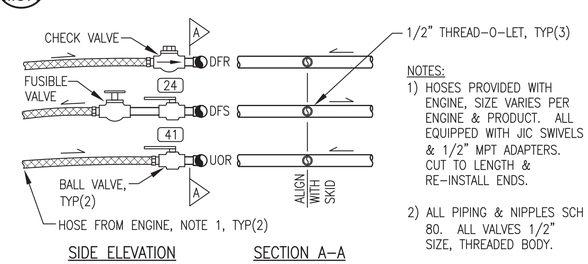

## 4 M5.1 DAY TANK FLOAT SWITCH INSTALLATION

NO SCALE




## 5 M5.1 TYPICAL LEVEL SENSOR PROBE INSTALLATION

NO SCALE




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

## 6 M5.1 ENGINE FUEL PIPING CONNECTION

NO SCALE

ALASKA ENERGY AUTHORITY

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

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

Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

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

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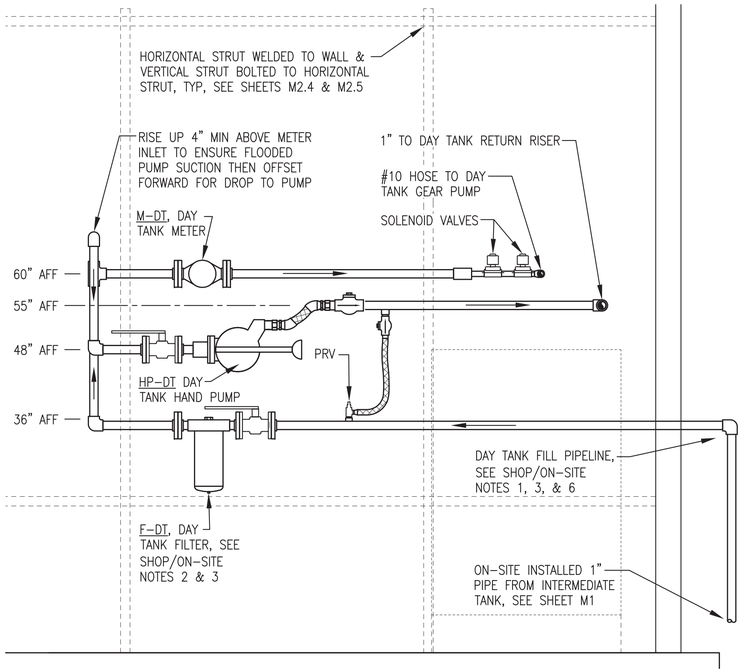
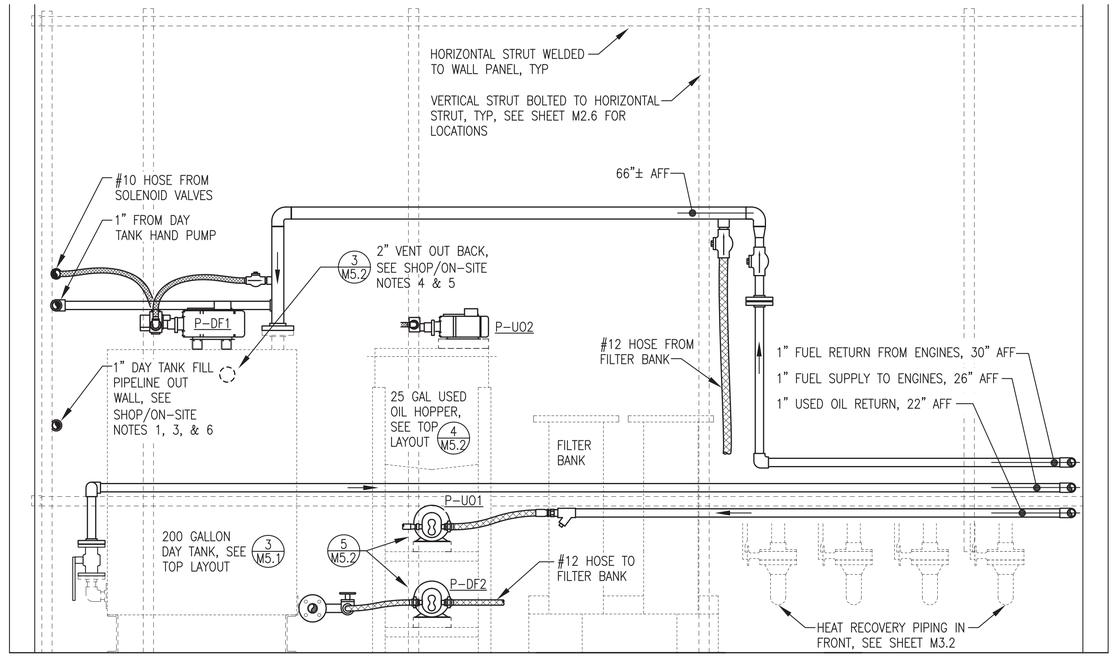


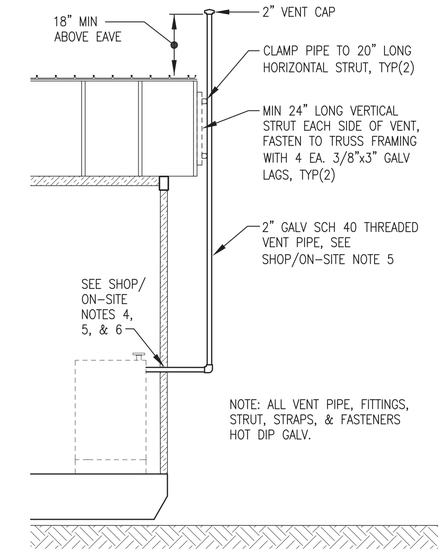

1 M5.2 DIESEL FUEL FRONT WALL ELEVATION
1"=1'

## MODULE SHOP/ON-SITE NOTES:

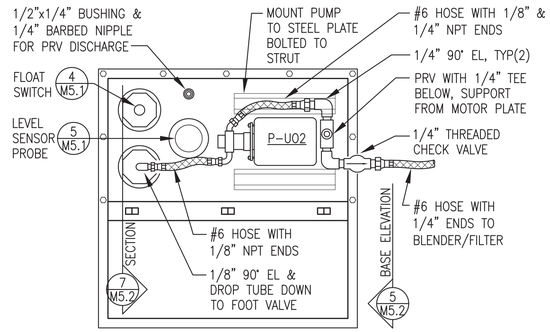
1. DURING SHOP FABRICATION STUB DAY TANK FILL PIPE 8" MIN BEYOND WALL & TERMINATE WITH 1" MALE THREAD FOR TESTING.
2. UPON COMPLETION OF TESTING, DRAIN & REMOVE FILTER & STORE IN MODULE. SLIDE PIPE OVER & SECURE FOR SHIPPING.
3. AS PART OF ON-SITE INSTALLATION REINSTALL FILTER THEN CUT THREADS OFF END OF EXTERIOR PIPE & INSTALL SOCKET WELD ELBOW.
4. DURING SHOP FABRICATION INSTALL TEMPORARY VENT PIPE OUT WALL. REMOVE TEMP PIPE FOR SHIPPING.
5. AS PART OF ON-SITE INSTALLATION INSTALL 2" GALVANIZED THREADED VENT PIPE OUT WALL & UP TO VENT, SEE DETAIL 3/M5.2.
6. DURING SHOP FABRICATION HOLE SAW 1/2"ø OVERSIZE OPENINGS THEN SEAL FOR SHIPPING AFTER REMOVING PIPES. UPON FINAL ON-SITE ASSEMBLY SEAL 1" FILL & 2" VENT PIPES TO EXTERIOR WALL WITH POLYURETHANE CAULKING ALL AROUND.



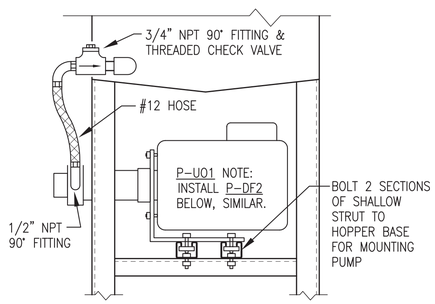

2 M5.2 DIESEL FUEL & USED OIL END WALL ELEVATION
1"=1'



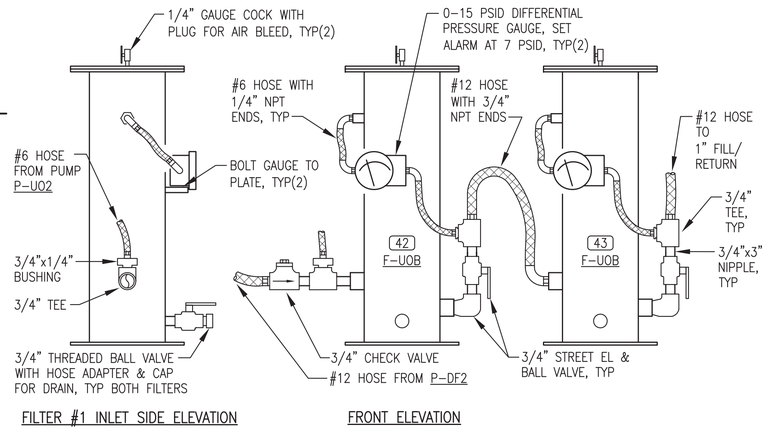

3 M5.2 DAY TANK VENT INSTALLATION
3/8"=1'-0"



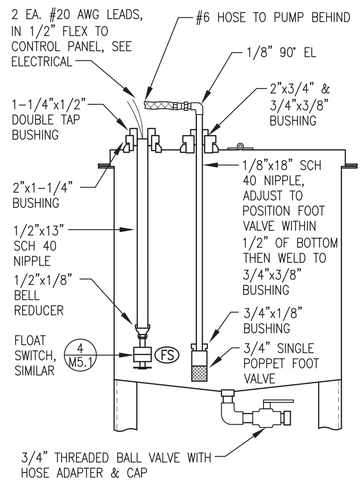

4 M5.2 TOP OF HOPPER – PLAN VIEW
NO SCALE




5 M5.2 HOPPER BASE ELEVATION
NO SCALE




6 M5.2 FILTER BANK ELEVATIONS & INSTALLATION DETAILS
NO SCALE




7 M5.2 SECTION THROUGH HOPPER
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA 49TH BRIAN C. GRAY 10241 REGISTERED PROFESSIONAL ENGINEER

CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
DIESEL FUEL & USED OIL PIPING ELEVATIONS & DETAILS

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M5.2

## 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.

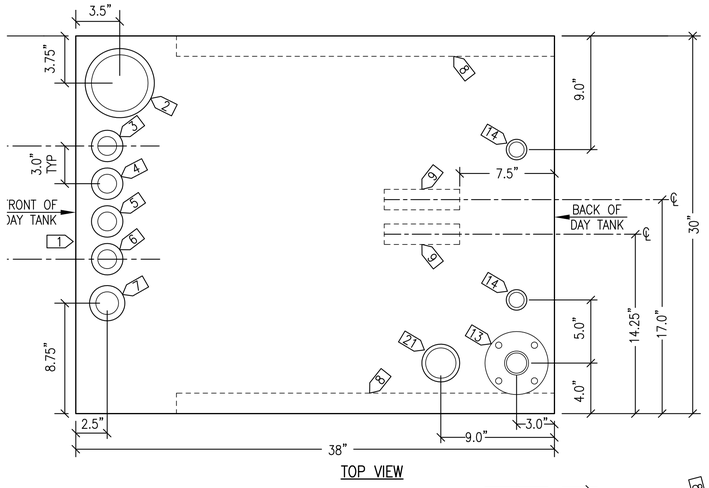
6) UPON COMPLETION OF FABRICATION, ROUND ALL CORNERS AND SHARP EDGES. SANDBLAST TANK EXTERIOR AND ALL ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-6. PAINT WITH TWO COATS OF SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, COLOR STRUCTURAL GRAY 4031.

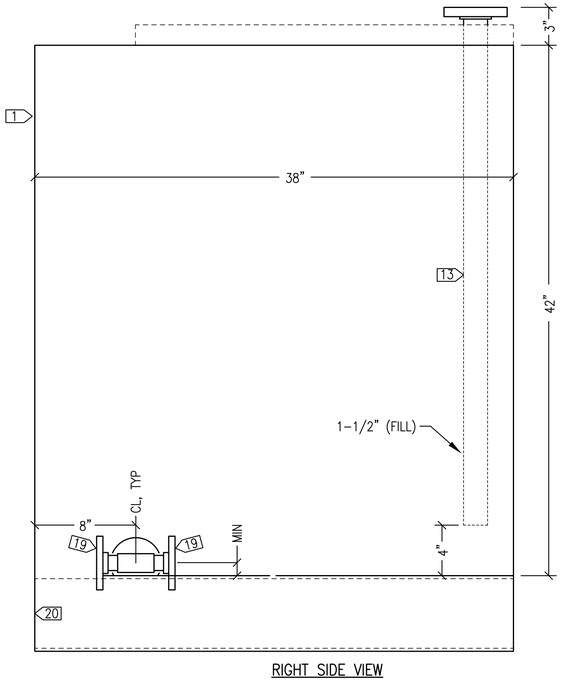
7) LABEL ALL OPENINGS WITH 1/4" BLACK LETTERS INDICATING FUNCTION AS LISTED IN PARENTHESES IN SPECIFIC NOTES.

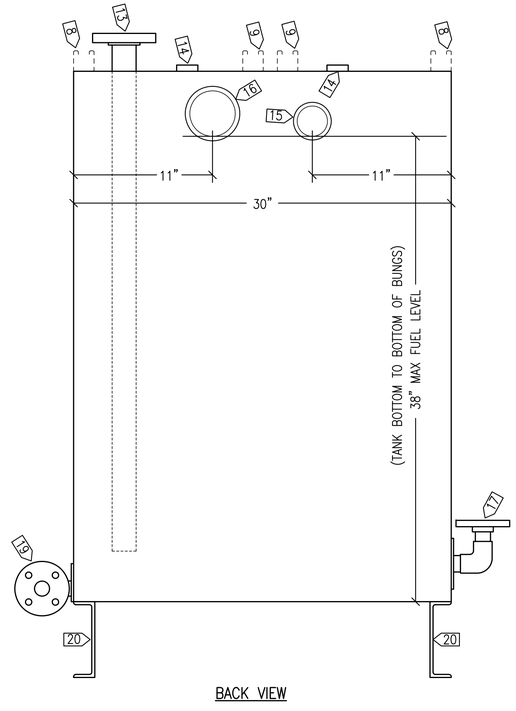
8) UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS AND AIR DRY INTERIOR. SEAL ALL MPT OPENINGS WITH THREADED STEEL CAPS. SEAL FPT TANK OPENINGS WITH THREADED STEEL PIPE PLUGS WHERE INDICATED. INSTALL 1-1/4" VENT CAP WHERE INDICATED. SEAL ALL OTHER FPT OPENINGS WITH PLASTIC OR STEEL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

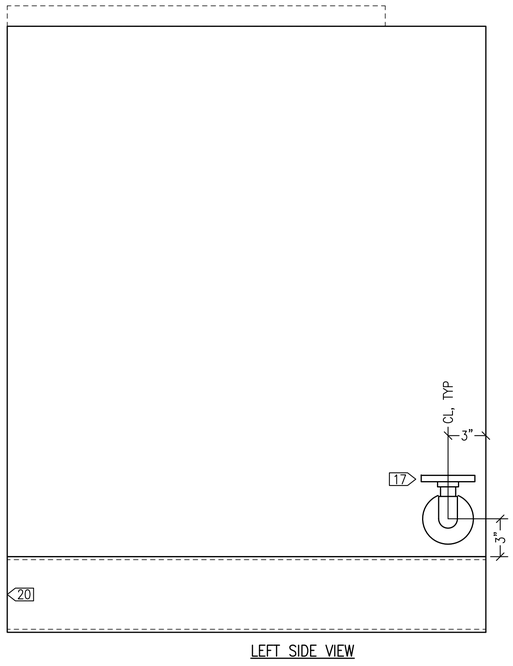
## DAY TANK SPECIFIC NOTES:

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. 30"L STRUT, END FLUSH WITH BACK OF TANK
9. 6"L STRUT
10. NOT USED
11. NOT USED
12. NOT USED
13. 1-1/2" SCH 40 DROP TUBE (FILL) WITH 150# FLANGE
14. 1" FPT (SPARE) - INSTALL THREADED STEEL PLUG
15. 2" FPT (VENT)
16. 3" FPT (EMERGENCY VENT) - INSTALL THREADED STEEL PLUG
17. 1" FLANGE (SUPPLY) - SEE DETAIL 2/M5.3
18. NOT USED
19. 1" FLANGE (DRAIN) - SEE DETAIL 3/M5.3
20. C6x8.2, 38" LONG
21. 2" FPT (TANK LEVEL PROBE)

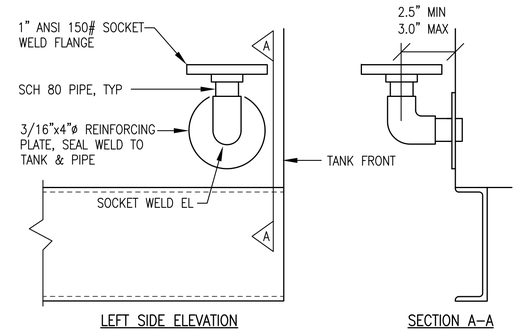


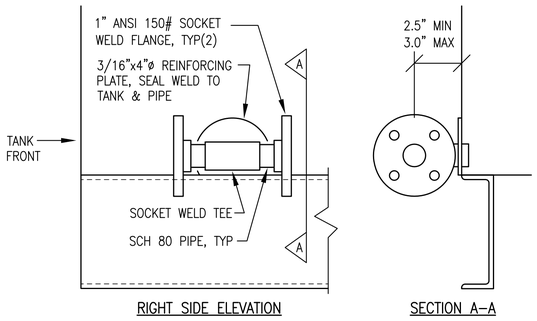




1 M5.3 200 GALLON SINGLE WALL DAY TANK
1"=6"




2 M5.3 1" FLANGED SUPPLY CONNECTION
NO SCALE




3 M5.3 1" FLANGED DRAIN CONNECTION
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA BRIAN C. GRAY 9491 REGISTERED PROFESSIONAL ENGINEER ME 8210

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

Gray Stassel Engineering, Inc. PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
200 GALLON DAY TANK FABRICATION

| NO. | REVISION | BY | DATE |
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| 0 | ISSUED FOR CONSTRUCTION | BCG | 1/6/20 |

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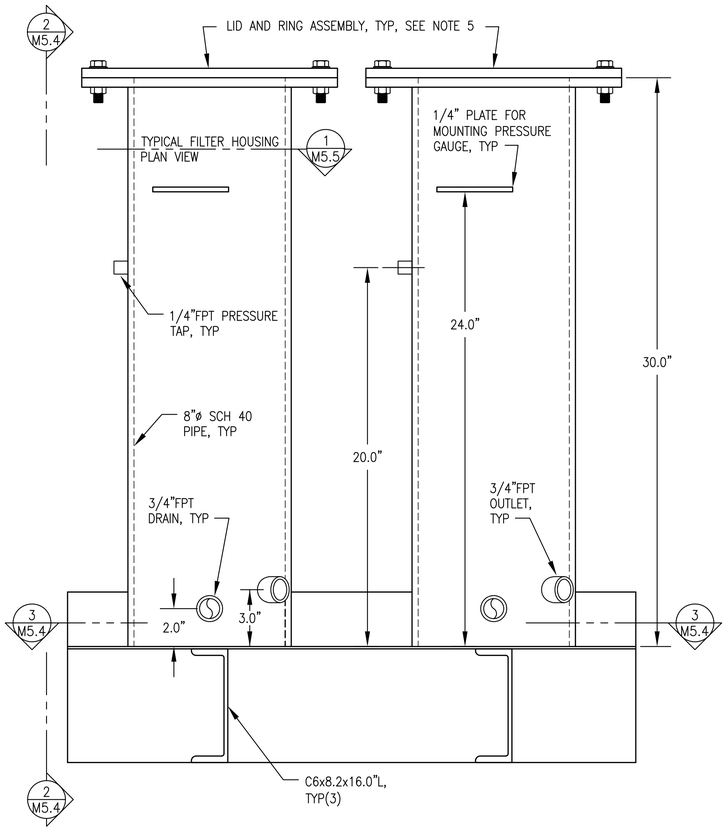
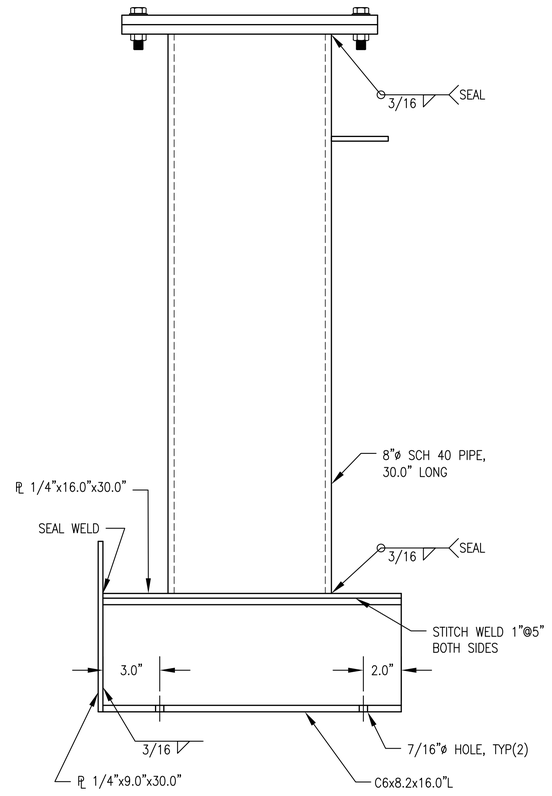
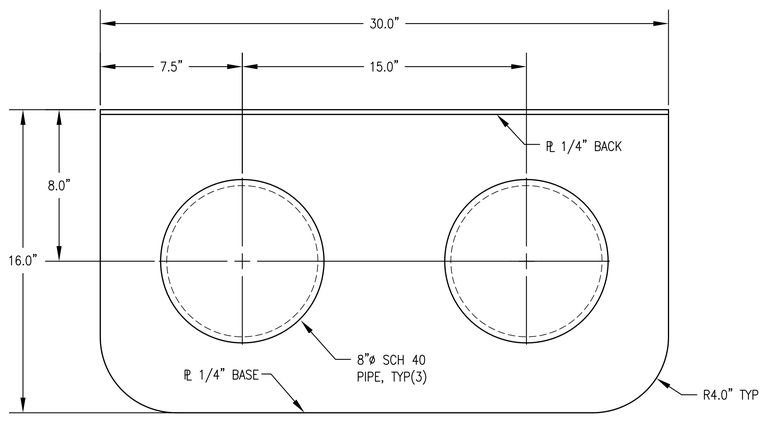
Sheet No. M5.3




1 M5.4 OIL FILTER BANK FRONT ELEVATION
1/4" = 1"




2 M5.4 SECTION THROUGH FILTER & BASE
1/4" = 1"




3 M5.4 OIL FILTER BANK BASE PLAN
1/4" = 1"

## FILTER BANK GENERAL NOTES:

1. FABRICATE TWO CHAMBER FILTER BANK AS INDICATED. SEE SHEET M5.5 FOR INTERNAL DETAILS.
2. FABRICATE FROM ASTM A-36 STEEL PLATE AND SHAPES AND ASTM A-53 PIPE. ALL JOINTS TO BE FULL CONTINUOUS SEAL WELDS EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE.
3. PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. INSTALL MINIMUM 3,000# FORGED STEEL HALF COUPLINGS FOR ALL FPT OPENINGS IN ACCORDANCE WITH UL 142 FIGURE 7.1 – #2.
4. PRESSURE TEST COMPLETED ASSEMBLY TO MINIMUM 50 PSIG USING SOAPY WATER SOLUTION ON ALL WELD JOINTS.
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 OF SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, COLOR STRUCTURAL GRAY 4031.
6. AFTER PAINTING REMOVE LID, WIRE BRUSH MATING SURFACES OF LID AND RING TO REMOVE ALL PAINT AND POLISH SURFACES SMOOTH. APPLY A LIGHT COAT OF GREASE OR ANTI-SIEZE PASTE TO BOTH FACES PRIOR TO INSTALLING GASKET. INSTALL 13.5" O.D. FULL-FACED 1/4" BUNA-N RUBBER GASKET (ALASKA RUBBER OR EQUAL) ON FILTER LIDS.
7. FURNISH FASTENERS AS INDICATED AND COAT WITH ANTI-SIEZE.
8. PRESSURE TEST EACH FILTER HOUSING ASSEMBLY TO 50 PSIG MINIMUM.
9. UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS, AIR DRY INTERIOR, AND SEAL ALL TANK OPENINGS WITH PLASTIC PLUGS.

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
USED OIL BLENDER
FILTER BANK LAYOUT & CONFIGURATION

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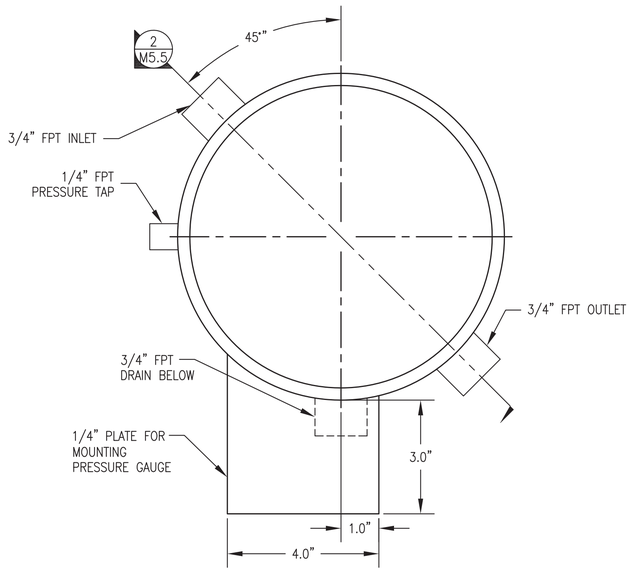
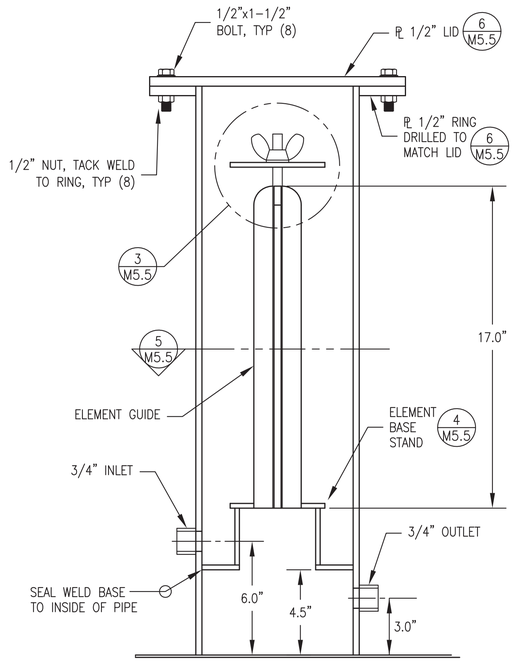
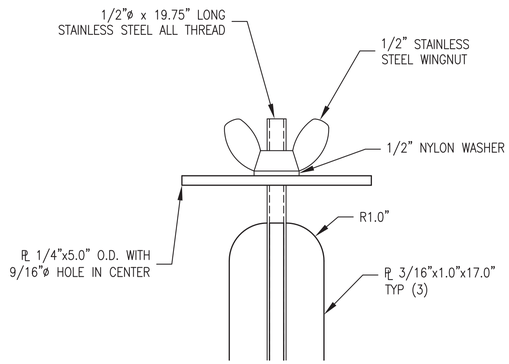


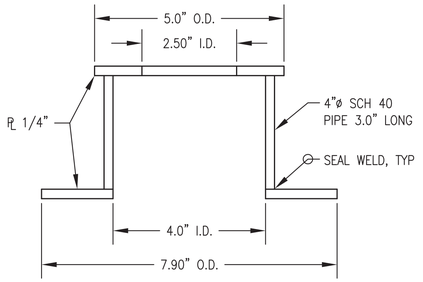

1 M5.5 TYPICAL FILTER HOUSING – PLAN VIEW
1/2" = 1"



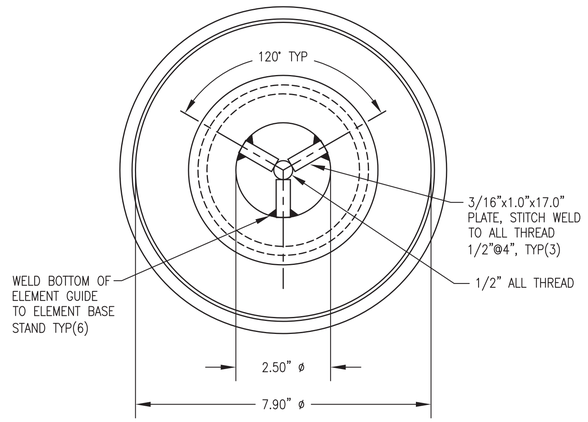

2 M5.5 TYPICAL SECTION THROUGH FILTER HOUSING
1/4" = 1"



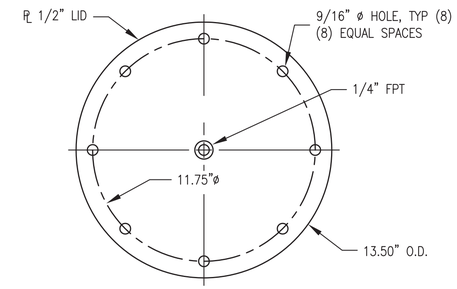

3 M5.5 ELEMENT RETAINER CAP
1/2" = 1"



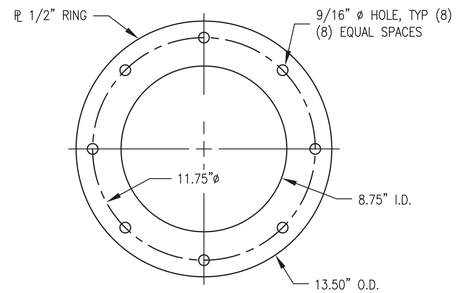

4 M5.5 ELEMENT BASE STAND
1/2" = 1"




5 M5.5 SECTION THROUGH ELEMENT GUIDE
1/2" = 1"




LID




MATING RING

6 M5.5 LID & MATING RING – PLAN VIEW
1/4" = 1"

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**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

USED OIL BLENDER
TYPICAL FILTER HOUSING DETAILS

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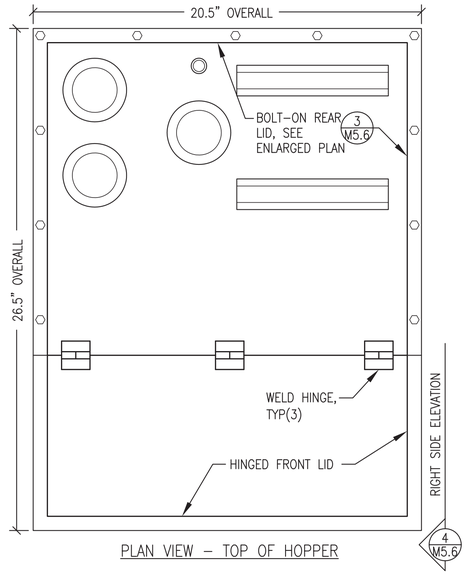
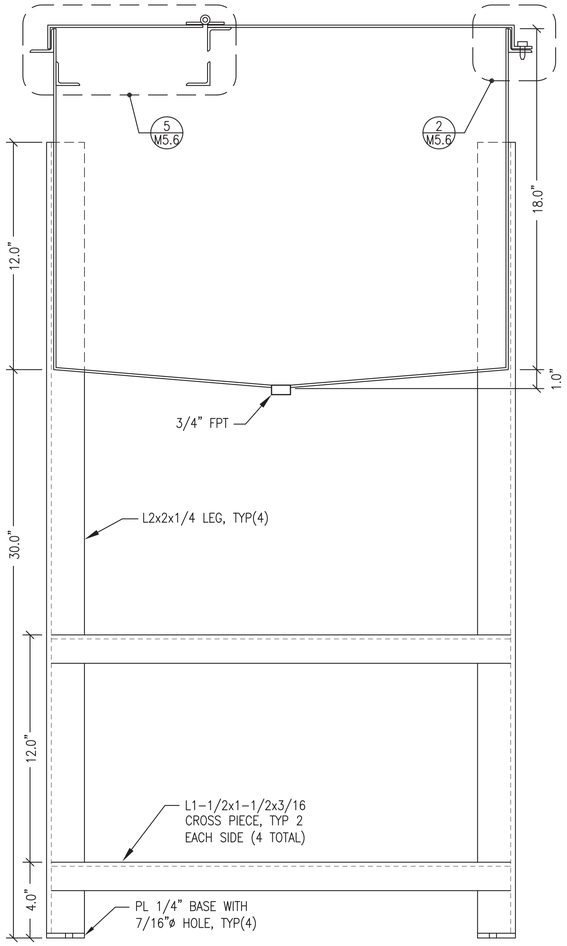
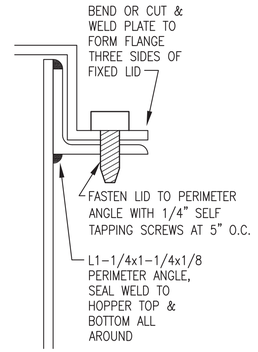


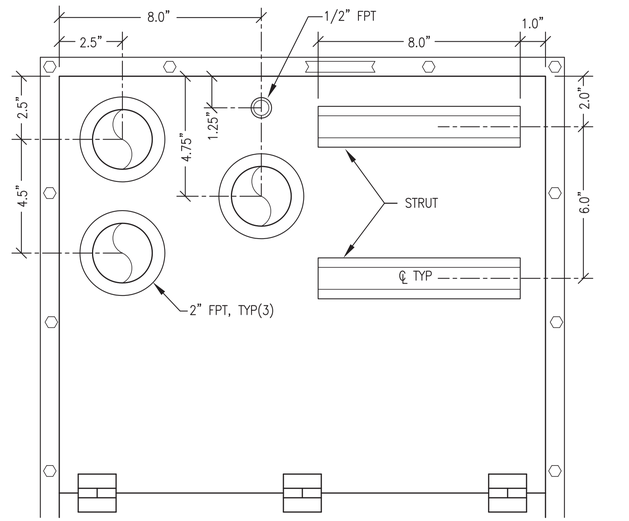

PLAN VIEW – TOP OF HOPPER



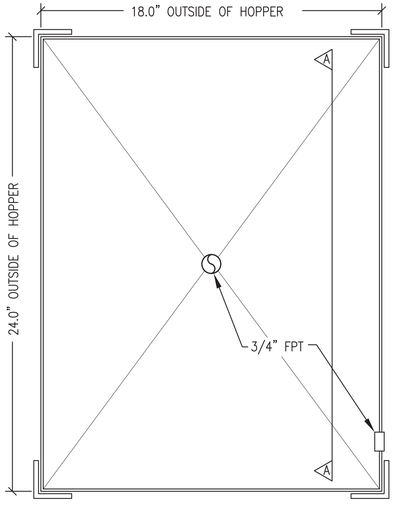

SECTION A-A




2 M5.6 FIXED LID PERIMETER ATTACHMENT
12"=1'-0"

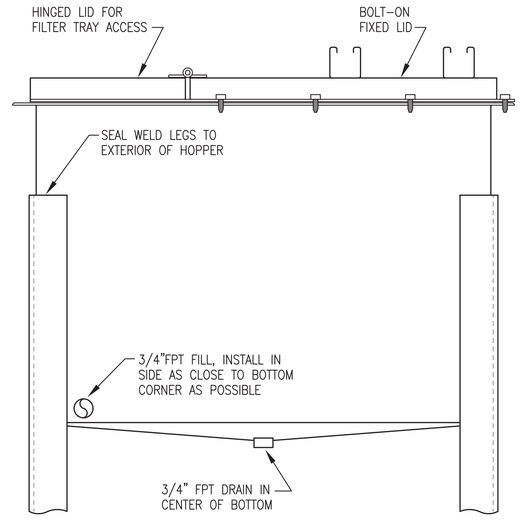



3 M5.6 FIXED LID ENLARGED PLAN VIEW
4"=1'-0"

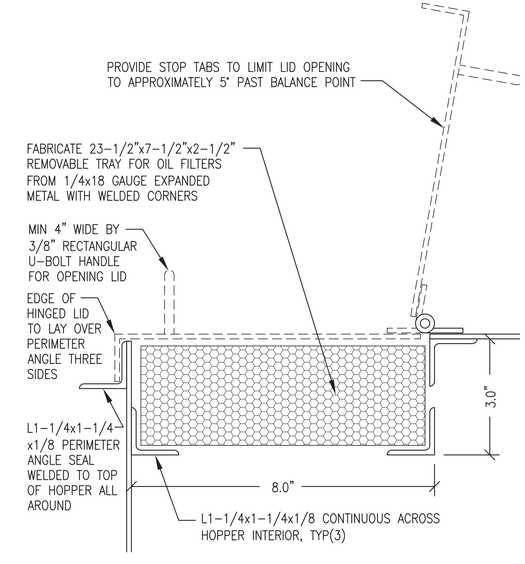



PLAN VIEW – BOTTOM OF HOPPER

1 M5.6 HOPPER PLAN & SECTION
3"=1'-0"




4 M5.6 HOPPER RIGHT SIDE ELEVATION
3"=1'-0"




5 M5.6 HINGED LID & FILTER TRAY DETAIL
6"=1'-0"

## FABRICATION NOTES:

1) FABRICATE SINGLE WALL 25 GALLON USABLE CAPACITY HOPPER.
2) FABRICATE FROM MINIMUM 10 GAUGE ASTM A-36 STEEL PLATE. ALL TANK SEAM JOINTS TO BE FULL CONTINUOUS WELDS. SEAL WELD ALL TANK ATTACHMENTS.
3) PROVIDE WITH ALL OPENINGS AND ATTACHMENTS INDICATED. INSTALL ALL FPT OPENINGS IN ACCORDANCE WITH UL 142 FIGURE 7.1 – #1, #2, #4, OR #6. ALL STRUT TO BE 1-5/8"x1-5/8"x12 GA SOLID BACK PLAIN (BLACK), B-LINE B22 PLN OR EQUAL. FURNISH ALL FASTENERS AS INDICATED.
4) 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 OF SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, COLOR STRUCTURAL GRAY 4031.
5) PRIOR TO SHIPPING, SEAL ALL FPT OPENINGS WITH PLASTIC OR STEEL PLUGS.

ALASKA ENERGY AUTHORITY

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
USED OIL BLENDER
25 GALLON HOPPER FABRICATION

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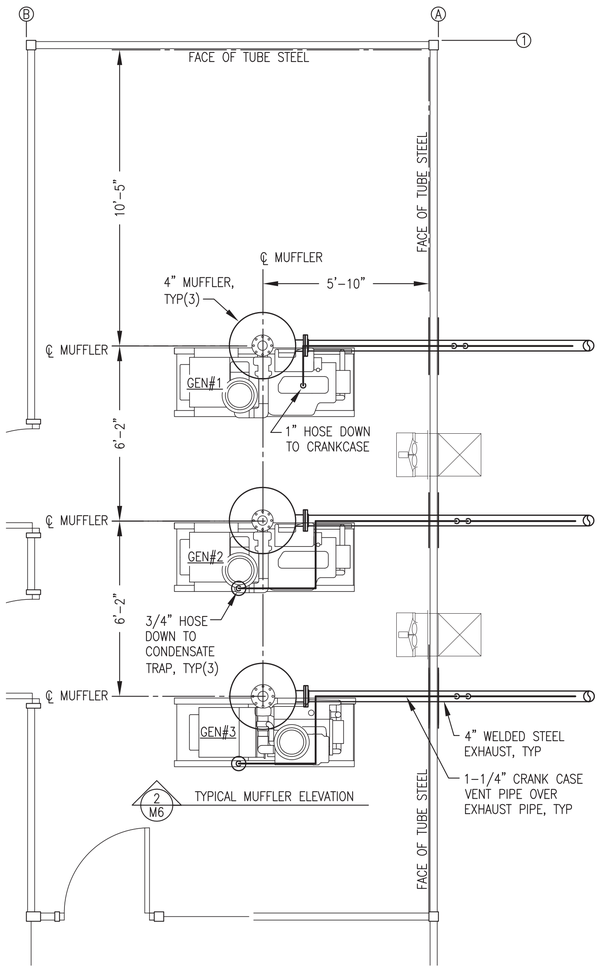



1 M6 MUFFLER, EXHAUST & CRANK VENT PIPE PLAN
3/8"=1'-0"

## EXHAUST & CRANK VENT GENERAL NOTES:

1) ALL EXTERIOR EXHAUST PIPE AND FITTINGS (FROM MUFFLER TO RAIN CAP) TYPE 304L STAINLESS STEEL WITH BUTT WELD FITTINGS. INTERIOR EXHAUST PIPE RISER (FROM FLEX TO MUFFLER) CARBON STEEL OR MAY BE STAINLESS AT CONTRACTORS OPTION. ALL FLANGES ANSI 150# FLAT FACED SLIP ON.

2) ALL EXTERIOR CRANK VENT PIPE AND FITTINGS TYPE 304L STAINLESS STEEL WITH BUTT WELD FITTINGS. ALL INTERIOR CRANK VENT PIPE AND FITTINGS CARBON STEEL WITH SOCKET WELD FITTINGS OR MAY BE STAINLESS AT CONTRACTORS OPTION. ALL FLANGES ANSI 150# FLAT FACED SOCKET WELD.

3) ALL EXHAUST FLANGE BOLTS BLACK OR STAINLESS STEEL. COAT WITH HIGH TEMPERATURE ANTI-SIEZE.

## EXHAUST & CRANK VENT SHOP/ON-SITE NOTES:

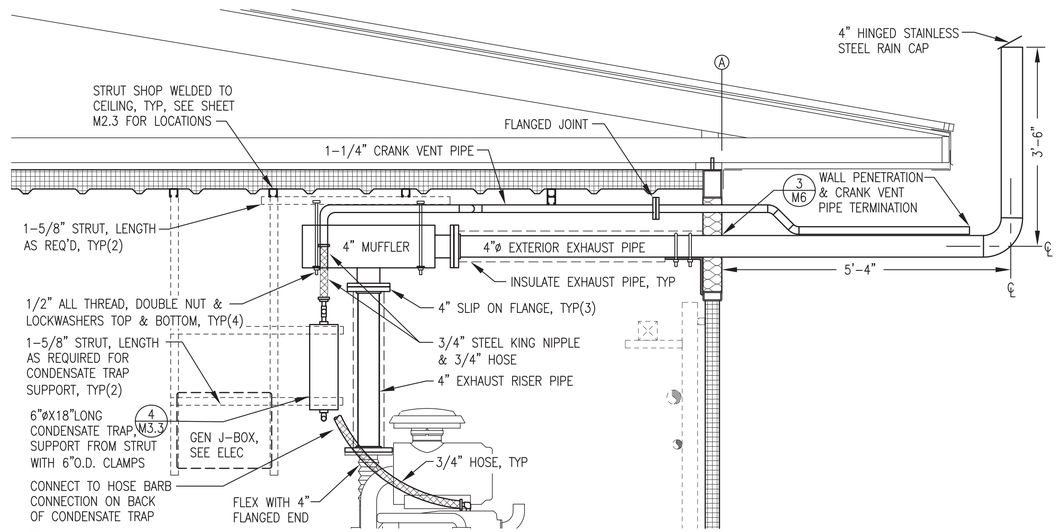
1) SHOP FABRICATE COMPLETE EXHAUST AND CRANK VENT PIPING SYSTEM AS INDICATED.

2) SHOP INSTALL INSULATION FROM FLEX TO MUFFLER. SHOP FIT INSULATION FROM MUFFLER TO WALL, LABEL FOR THE ASSOCIATED GENERATOR AND STORE INSIDE MODULE.

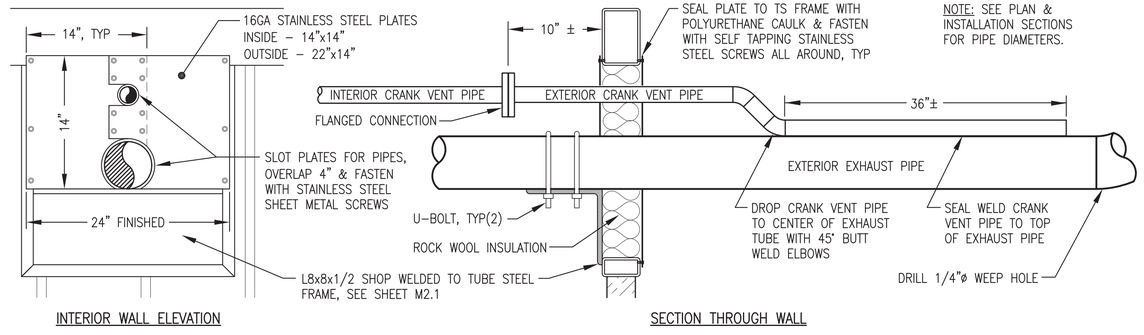
3) SHOP FABRICATE STAINLESS STEEL COVER PLATES BUT DO NOT INSTALL. LABEL COVER PLATES FOR THE ASSOCIATED GENERATOR AND STORE INSIDE MODULE. SHOP FURNISH ROCK WOOL INSULATION AND PACKAGE LOOSE SHIP WITH COVER PLATES.

4) UPON COMPLETION OF TESTING BREAK EXHAUST FLANGE JOINT ON MUFFLER OUTLET AND CRANK VENT FLANGE JOINT AND REMOVE U-BOLTS. REMOVE PIPING FOR SHIPPING AND TEMPORARILY SEAL WALL PENETRATION.

5) IN FIELD REINSTALL PIPING WITH NEW FLANGE GASKETS. RE-INSTALL PIPING INSULATION. INSULATE WALL PENETRATION, INSTALL COVER PLATES, AND SEAL TO WALL.




2 M6 TYPICAL MUFFLER, EXHAUST, CONDENSATE TRAP & CRANK VENT PIPE INSTALLATION
3/4"=1'-0"




3 M6 WALL PENETRATION & CRANK VENT PIPE TERMINATION
NO SCALE

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**POWER SYSTEM UPGRADE PROJECT**

EXHAUST & CRANK VENT PLAN & DETAILS

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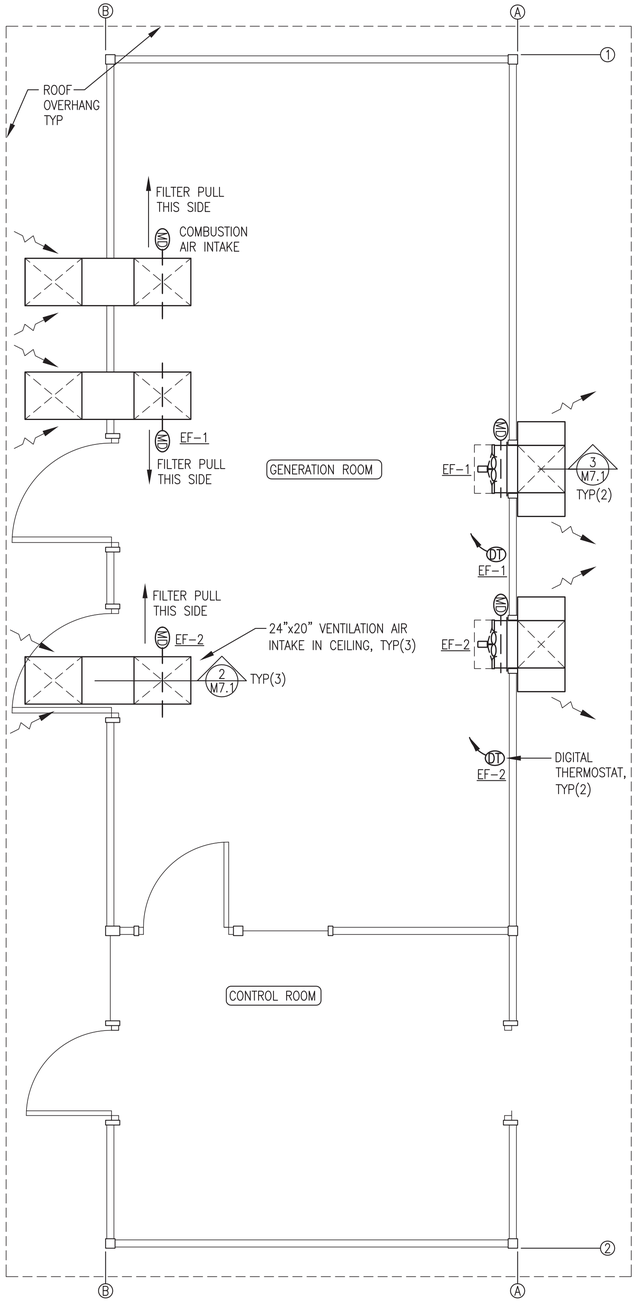
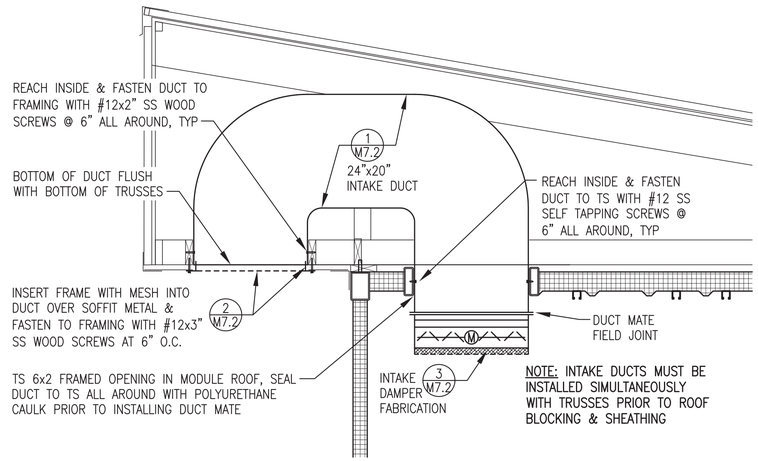
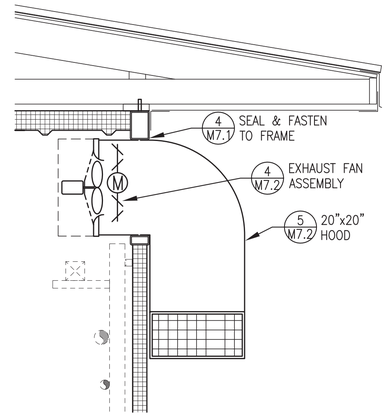


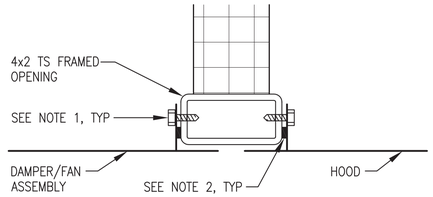

1 M7.1 VENTILATION PLAN
3/8"=1'-0"




2 M7.1 INTAKE DUCT INSTALLATION
3/4"=1'-0"




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




NOTES:

1) FASTEN MOUNTING FLANGE TO TS WITH #12 STAINLESS STEEL SELF TAPPING SCREWS. ON HOODS FASTEN ON TOP AND SIDES ONLY. ON EXHAUST FANS FASTEN ON SIDES ONLY.
2) SEAL MOUNTING FLANGE TO TS WITH CONTINUOUS BEAD OF POLYURETHANE CAULKING ALL AROUND.

4 M7.1 TYPICAL WALL PENETRATION
4"=1'-0"

VENTILATION SYSTEM SHOP/ON-SITE NOTES:

1) FURNISH ENTIRE VENTILATION SYSTEM AS PART OF MODULE SHOP FABRICATION.
2) DURING SHOP FABRICATION INSTALL EXHAUST FAN ASSEMBLY. TEST FIT EXTERIOR HOODS AND INTAKE DUCTS BUT DO NOT INSTALL.
3) DURING SHOP FABRICATION TEMPORARILY CONNECT INTAKE DAMPERS TO ELECTRICAL ROUGH IN AND TEST TO VERIFY FUNCTION. SEE SHEET E4.2.
4) AS PART OF ON-SITE WORK INSTALL EXHAUST HOODS AND INTAKE DUCTING AS INDICATED.

ALASKA ENERGY AUTHORITY

STATE OF ALASKA · BRIAN C. GRAY · 12149 · REGISTERED PROFESSIONAL ENGINEER

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
VENTILATION PLAN & DETAILS

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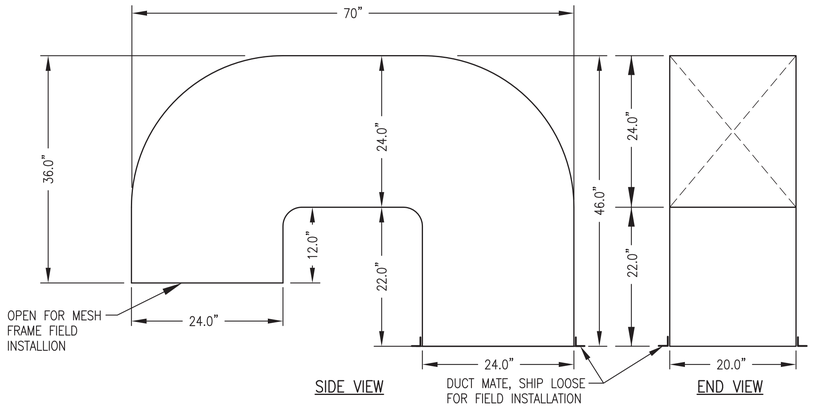
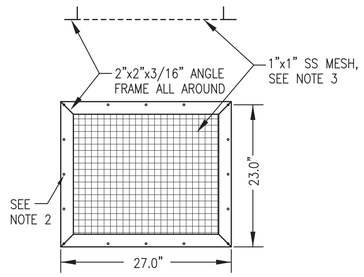



NOTE: FABRICATE 3 IDENTICAL DUCTS FROM MIN 18 GAUGE GALV SHEET METAL WITH SEALED MECHANICAL JOINTS OR AT CONTRACTORS OPTION 0.090" THICK TYPE 5052 ALUMINUM WITH ALL WELDED SEAMS.

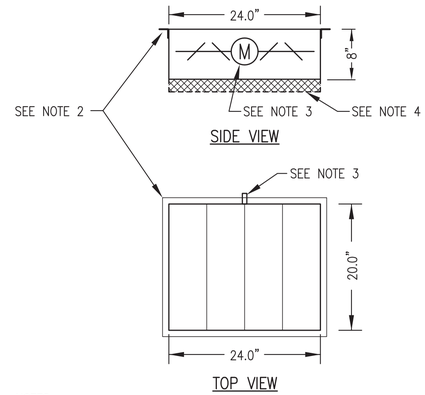
## 1 M7.2 INTAKE DUCT FABRICATION
1"=1'-0"




NOTES:

1. FABRICATE 3 IDENTICAL AIR INTAKE MESH FRAMES.
2. FABRICATE FRAME FROM 2"x2"x3/16" ALUMINUM ANGLE WITH MITERED AND WELDED CORNERS AND 1/4" HOLES AT 6" O.C. ALL AROUND, 1/2" FROM OUTSIDE EDGE OF FRAME.
3. INSTALL 1"x1" STAINLESS STEEL WIRE MESH IN HEMMED STAINLESS STEEL FRAME AND FASTEN TO ANGLE FRAME WITH STAINLESS STEEL SCREWS ALL AROUND.

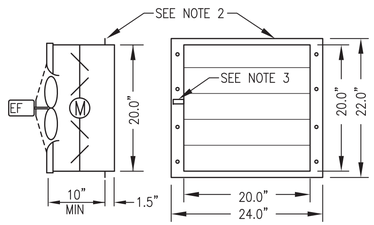
## 2 M7.2 INTAKE MESH FRAME
1"=1'-0"




NOTES:

1. FABRICATE 3 IDENTICAL VENTILATION INTAKE ASSEMBLIES.
2. SHOP MOUNT DUCTMATE FLANGE.
3. PROVIDE MIN 3" DAMPER ROD EXTENSION ON SIDE INDICATED AND FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.
4. INSTALL FRAME FOR REMOVABLE 24"x24"x2" FURNACE FILTERS. FABRICATE FROM "C" CHANNEL THREE SIDES WITH LATCHING HINGED COVER ON FOURTH SIDE TO ALLOW FILTERS TO SLIDE OUT. SEE PLAN VIEW FOR DAMPER ACTUATOR AND FILTER PULL ORIENTATION. EXTEND FILTER FRAME 2"± BEYOND DAMPER FRAME EACH WAY ON NARROW DIMENSION.

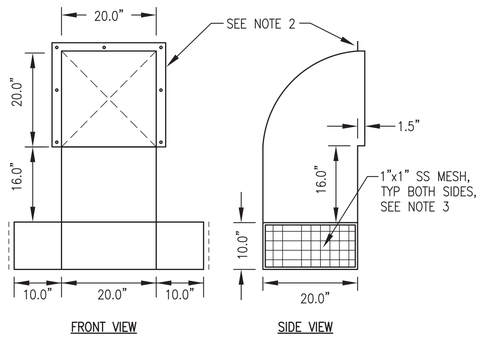
## 3 M7.2 INTAKE AIR DAMPER FABRICATION
1"=1'-0"




NOTES:

1) FABRICATE 2 IDENTICAL ASSEMBLIES COMPLETE WITH FAN AND DAMPER MOUNTED AND SEALED TO DUCT.
2) PROVIDE 2" WIDE MOUNTING FLANGE ON SIDES WITH 1/4" HOLES AT 5" O.C. PROVIDE 1" MOUNTING FLANGE ON TOP AND BOTTOM WITHOUT HOLES.
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON THE LEFT SIDE AND FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.

## 4 M7.2 EXHAUST FAN ASSEMBLY FABRICATION
1"=1'-0"




NOTES: 1) FABRICATE 2 IDENTICAL HOODS FROM 0.090" THICK TYPE 5052 ALUMINUM WITH ALL WELDED SEAMS.

2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 1/4" HOLES AT 9" O.C.

3) INSTALL 1"x1" STAINLESS STEEL WIRE MESH IN HEMMED STAINLESS STEEL FRAME AND FASTEN TO ANGLE FRAME WITH STAINLESS STEEL SCREWS ALL AROUND.

## 5 M7.2 EXHAUST HOOD FABRICATION
3/4"=1'-0"

ALASKA ENERGY AUTHORITY

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

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

Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**

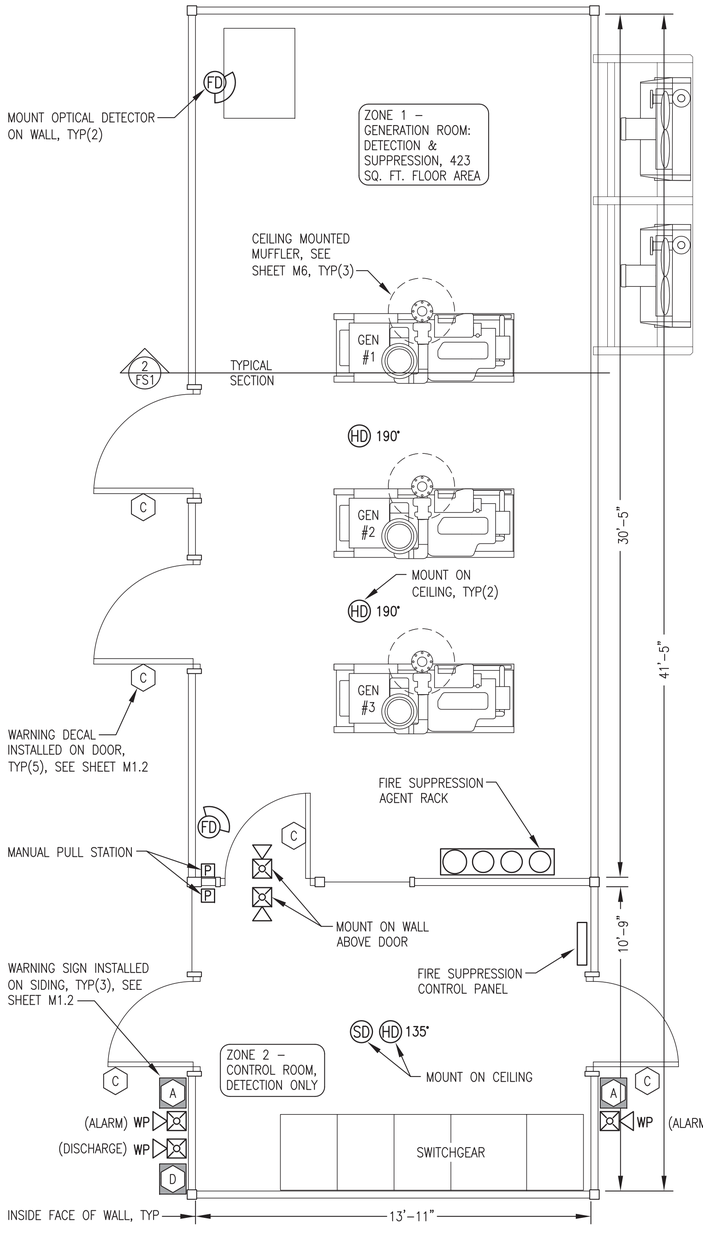
**POWER SYSTEM UPGRADE PROJECT**

SHEET METAL FABRICATION & DETAILS

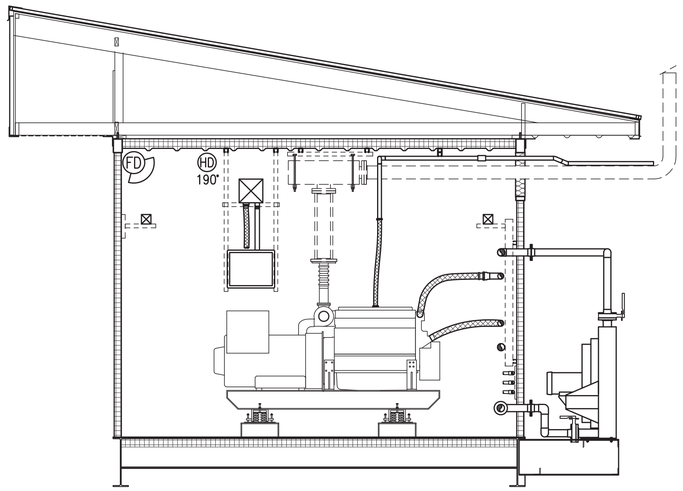
| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 1/6/20 |

Plot Date 1/6/20 | Designed BCG | Drawn JTD | Approved BCG

Sheet No. M7.2




1 FS1 FIRE SUPPRESSION SYSTEM PLAN
3/8"=1'-0"




2 FS1 TYPICAL SECTION THROUGH MODULE
3/8"=1'-0"

## FIRE SUPPRESSION GENERAL NOTES:

1) INTERIOR FINISH OF ALL WALLS, FLOOR, AND CEILING WELDED STEEL PLATE. CEILING HEIGHT IN ALL ROOMS 10'-2" ABOVE FINISHED FLOOR.

2) 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.

## FIRE SUPPRESSION SHOP/ON-SITE NOTES:

1) UPON COMPLETION OF MODULE SHOP TESTING: DISCONNECT BATTERIES. DRAIN ALL WATER OUT OF THE SYSTEM AND BLOW OUT WITH AIR TO PREVENT FREEZE DAMAGE. LEAVE ONE FULLY CHARGED NITROGEN CYLINDER INSTALLED IN THE RACK PLUS ONE LOOSE SHIP FULLY CHARGED SPARE NITROGEN CYLINDER.

2) DURING ON-SITE CONSTRUCTION: FILL BOTTLES WITH CLEAN POTABLE WATER IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS. FULLY TEST AND CERTIFY SYSTEM. TRAIN AEA STAFF AND LOCAL OPERATORS.

| FIRE SUPPRESSION SYMBOL LEGEND | | | |
|---|---|---|---|
| SYMBOL | DESCRIPTION | SYMBOL | DESCRIPTION |
| HD 135° | NORMAL TEMP. (135°F) DETECTOR | P | MANUAL PULL STATION |
| HD 190° | HIGH TEMP. (190°F) DETECTOR | | INTERIOR ALARM HORN/STROBE |
| FD | FLAME (OPTICAL) DETECTOR | WP | EXTERIOR ALARM HORN/STROBE |
| SD | SMOKE (IONIZATION) DETECTOR | | |

| FIRE SUPPRESSION PLACARD SCHEDULE (SEE SHEET M1.2) | |
|---|---|
| SYMBOL | DESCRIPTION |
| 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" |

| FIRE SUPPRESSION WIRE SCHEDULE | | | |
|---|---|---|---|
| SYMBOL | CIRCUIT DESCRIPTION | WIRE TYPE | WIRE COLOR |
| A | 24V DC POWER | #14 AWG SOLID | RED & BLACK |
| B | DETECTION CIRCUITS | #14 AWG SOLID | BLUE & YELLOW |
| C | ANNUNCIATION ALARM | #14 AWG SOLID | BROWN & ORANGE |
| D | ANNUNCIATION DISCHARGE | #14 AWG SOLID | WHITE, & GRAY |
| E | 24V DC AUX POWER | #14 AWG SOLID | RED & BLACK WITH GRAY STRIPE |

ALASKA ENERGY AUTHORITY

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
FIRE SUPPRESSION SYSTEM PLAN, SECTION, LEGEND, & NOTES

| NO. | REVISION | BY | DATE |
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## BUILDING PLANS SYMBOL LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| SS-## | HOME RUN TO PANEL & BREAKER(S) INDICATED. SHORT DASH INDICATES HOT CONDUCTOR, LONG DASH INDICATES NEUTRAL CONDUCTOR, CURVED DASH INDICATES GROUND CONDUCTOR. IF NOT SPECIFICALLY INDICATED, PROVIDE 2#12 AWG & 1#12 AWG GROUND. |
| ◇# | ELECTRICAL ITEM – SEE EQUIPMENT SCHEDULE |
| (1/4) | MOTOR (HORESPOWER INDICATED) |
| (MD) | MOTORIZED DAMPER – SEE MECHANICAL |
| | 125V, 20A, DUPLEX RECEPTACLE |
| (T) | LINE VOLTAGE THERMOSTAT |
| (DT) | DIGITAL THERMOSTAT, MODULATING |
| $ | SNAP SWITCH / SMALL MOTOR DISCONNECT |
| T$ | TIMER SWITCH |
| | GROUND |

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.

## ELECTRICAL EQUIPMENT SCHEDULE

| SYMBOL | SERVICE/FUNCTION | DESCRIPTION | MANUFACTURER/MODEL |
|---|---|---|---|
| ◇1 | DAY TANK ALARM HORN/STROBE | MULTI-TONE ALARM WITH STROBE, 115V, NEMA 3R, WEATHER RESISTANT SURFACE MOUNT BELL BOX | WHEELOCK MT4-115-WH-VNS |
| ◇2 | DIGITAL THERMOSTAT | MULTIPLE OUTPUT MODULATING DIGITAL THERMOSTAT | HONEYWELL TB7980B |
| ◇3 | LINE VOLTAGE THERMOSTAT | HEATING/COOLING THERMOSTAT, 16 FLA @ 120V, SPDT, 50F TO 80F RANGE. | DAYTON 1UHH2 |
| ◇4 | AREA LIGHT | AREA LIGHT, WIDE DISPERSION WALL PACK WITH PHOTO CONTROL. LED, 17.7W, 120-277V DRIVER | HUBBELL NRG-356L-5K-U-PC |
| ◇5 | EMERGENCY LIGHT | WALL MOUNT, WHITE 20 GA STEEL ENCLOSURE, 277/120VAC, 8.4A INPUT, SEALED LEAD-ACID BATTERY, DUAL 5.3W 6VDC LED LAMPS | HUBBEL DUAL-LITE CCU2 |
| ◇6 | EMERGENCY/EXIT LIGHT COMBO | WHITE PLASTIC ENCLOSURE, RED EXIT SIGN, 277/120V INPUT, DUAL 1.5W 9.6V LED LAMPS. OPTIONAL HIGH OUTPUT NI-CAD BATTERY | LITHONIA LHQM-LED-R-HO OR EQUAL |
| ◇7 | NOT USED | NOT USED | NOT USED |
| ◇8 | MODULE INTERIOR LIGHTING | SURFACE MOUNTED LED STRIPLIGHT FIXTURE, 48" LONG, 34W, 5000'K WITH SNAP ON FROSTED DIFFUSER | LITHONIA L1N-L48-5000LM-FST |
| ◇9 | TIMER SWITCH | 0-5 MINUTE , 120V, 20A, 1HP RATED, INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER. | INTERMATIC FF5M |
| ◇10 | LIGHT SWITCH | SINGLE POLE SNAP SWITCH, 120V, 20A, METAL, 1-1/2HP RATED, INSTALL IN 4"x4" STEEL BOX WITH METAL COVER, IVORY. | HUBBELL 1221-I |
| ◇11 | 1ø SMALL MOTOR DISCONNECT | SINGLE POLE SNAP SWITCH WITH RED PILOT LIGHT, 120V, 20A, 1HP RATED, INSTALL IN 4"x4" STEEL BOX WITH METAL COVER | HUBBELL 1221-PL |
| ◇12 | NOT USED | NOT USED | |
| ◇13 | STATION SERVICE TRANSFORMER | DRY TYPE, ENERGY STAR, ENCLOSURE TYPE 3R WITH INTEGRAL WALL MOUNT BRACKETS, 9 kVA, HV 480 DELTA, LV 208Y/120 | HAMMOND HPS C3F009KBS WITH NQT6 CASE |
| ◇14 | STATION SERVICE PANELBOARD | COPPER BUS, 3 PHASE, 4 WIRE, 120/208V, 100A, 30 CIRCUITS, BOLT-IN BREAKERS, SURFACE MOUNT, NEMA 1 | SIEMENS OR SQUARE D |
| ◇15 | STANDARD RECEPTACLE | SURFACE MOUNT 125V NEMA 5-20R RECEPTACLE. INSTALL IN 4"x4" STEEL BOX WITH METAL COVER | PASS & SEYMOUR 5362W |
| ◇16 | EXTERIOR GFCI RECEPTACLE | 125V NEMA 5-20R GFCI RECEPTACLE. MOUNT IN CAST FDA BOX WITH WEATHERPROOF COVER | PASS & SEYMOUR 2095-W |
| ◇17 | BATTERY CHARGER | 12/24-VOLT SOLID STATE 20-AMP AUTO-EQUALIZING BATTERY CHARGER FOR 120 VAC INPUT, WITH OPTIONAL HIGH/LOW VOLTAGE, AC POWER FAILURE, & REMOTE SUMMARY ALARM RELAYS | SENS NRG22-20-RCLS OR CHARLES 93-INCHGR20-A |
| ◇18 | WELDER/COMPR. RECEPTACLE | NEMA 6-30R , BLACK, 250V, 30A, 2 POLE, WITH GROUND. INSTALL IN DEEP 4"x4" STEEL BOX WITH 2.15"ø HOLE METAL COVER | PASS & SEYMOUR 3801 |
| ◇19 | NOT USED | NOT USED | NOT USED |
| ◇20 | RADIATOR MOTOR DISCONNECT | NON-FUSED LOCKABLE SAFETY SWITCH, NEMA 3R ENCLOSURE, 3PST, 600V, 30A, MIN 5HP RATED | SIEMENS HNF361R OR SQUARE D HU361R |
| ◇21 | 24VAC CONTROL TRANSFORMER | 120V PRIMARY, 24V SECONDARY, 75VA OUTPUT, PLATE MOUNT, INSTALL ON 4"x4" PRESSED STEEL BOX | HONEYWELL AT175A1008 |
| ◇22 | ENCLOSED POWER RELAY | 20A, 1HP RATED CONTACT, SPDT, 24VAC COIL, NEMA 1 ENCLOSURE, RED LED PILOT LIGHT | FUNCTIONAL DEVICES RIB2401B |

## ELECTRICAL CONDUCTOR SCHEDULE

| SERVICE/FUNCTION | DESCRIPTION | MANUFACTURER/MODEL | NOTES: |
|---|---|---|---|
| GENERATOR LEADS & FEEDERS (480V) & ENGINE STARTER CABLES (24VDC) | HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE, TIN COATED COPPER CONDUCTOR. THERMOSET EPDM INSULATION, UL 3340/3374, MINIMUM 600V, LISTED 150°C FOR NON-FLEXING | COBRA CABLE, BELDEN, OR OMINI | TERMINATE WITH COPPER COMPRESSION LUGS RATED FOR THE FULL AMPACITY OF THE CABLE AT 150°C. |
| GENERAL USE CONDUCTORS | CLASS B CONCENTRIC STRANDED, SOFT DRAWN COPPER. TYPE XHHW INSULATION, 600V AND 75C RATED. | | |
| SHIELDED/TWISTED INSTRUMENT & CONTROL & CANBUS CONDUCTORS | #18 AWG STRANDED TINNED COPPER CONDUCTORS, 600V POLYETHYLENE INSULATION, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH STRANDED TINNED COPPER DRAIN WIRE & PVC OUTER JACKET | BELDEN PART #'S<br>SINGLE PAIR: #1120A<br>FOUR PAIR: #1049A<br>SINGLE TRIAD: #1121A | GROUND SHIELD DRAIN WIRE AT PANEL END ONLY. |
| DEVICENET COMMUNICATION CONDUCTORS | STRANDED TINNED COPPER CONDUCTORS, 300V PVC & FRFPE INSULATION, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH TINNED COPPER BRAID & PVC OUTER JACKET | TWO PAIR #22 & #24 BELDEN 3084A | GROUND SHIELD DRAIN WIRE AT PANEL END ONLY. ROUTE ALL DEVICENET & CAT5e CABLES IN SEPARATE DEDICATED RACEWAY. |
| EHTERNET (CAT5e) COMMUNICATION CONDUCTORS | SOLID BARE COPPER CONDUCTORS, 300V FEP INSULATION & JACKET, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH STRANDED TINNED COPPER DRAIN WIRE | FOUR PAIR #24 BELDEN 1585LC | GROUND SHIELD DRAIN WIRE AT PANEL END ONLY. ROUTE ALL DEVICENET & CAT5e CABLES IN SEPARATE DEDICATED RACEWAY. |

COLOR CODING – UNLESS SPECIFICALLY INDICATED OTHERWISE CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:
- 480-VOLT POWER CONDUCTORS
  - PHASE A – BROWN
  - PHASE B – ORANGE
  - PHASE C – YELLOW
  - NEUTRAL – WHITE WITH YELLOW STRIPE
- 120/208-VOLT POWER CONDUCTORS
  - PHASE A – BLACK
  - PHASE B – RED
  - PHASE C – BLUE
  - NEUTRAL – WHITE
- 24 VOLT DC CONDUCTORS
  - +24VDC – RED or RED WITH GRAY STRIPE
  - -24VDC – BLACK or BLACK WITH GRAY STRIPE
- CONTROL & INSTRUMENT CONDUCTORS
  - COLOR CODED PER MANUFACTURER'S STANDARD

NOTES:
1) FOR NO. 6 AWG AND SMALLER CONDUCTORS COLOR CODING SHALL BE PROVIDED BY USING CONDUCTORS WITH CONTINUOUS COLOR EMBEDDED IN THE INSULATION. FOR ALL CONDUCTORS LARGER THAN NO. 6 SCOTCH 35 MARKING TAPE OR EQUIVALENT MAY BE USED TO COLOR CODE THE CABLE. WHERE MARKING TAPE IS USED THE CABLE SHALL BE IDENTIFIED AT EVERY ACCESSIBLE LOCATION. PROVIDE A MINIMUM OF 2 INCHES OF TAPE AT EACH LOCATION.

2) GROUNDING – PROVIDE A SEPARATE EQUIPMENT GROUNDING CONDUCTOR IN EACH RACEWAY. DO NOT USE THE CONDUIT AS AN EQUIPMENT GROUNDING CONDUCTOR. EQUIPMENT GROUNDING CONDUCTORS SHALL BE CLASS B CONCENTRIC STRANDED, SOFT-DRAWN COPPER OF THE SIZES INDICATED ON THE DRAWINGS. CONDUCTORS NOT INDICATED SHALL BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

## ELECTRICAL 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 |
| (PT) | PRESSURE TRANSMITTER | 0-60 PSIG RANGE, 4-20mA OUTPUT, 1/4" NPT PIPING CONNECTION, HIRSCHMANN ELECTRICAL CONNECTION | NOSHOK 100-60-1-1-2-7 |
| (FM) | HEAT RECOVERY FLOW METER | 150# ANSI FLANGED CONNECTION, SIZE AS INDICATED, PTFE LINER, HASTELLOY C ELECTRODES, RATED FOR 210F OPERATION. FURNISH WITH TRANSMITTER FOR DIRECT AND REMOTE MOUNTING, 115/230 VAC, 50/60 HZ, AND NEMA 4X BODY. | SIEMENS SITRANS<br>METER: FM MAGFLO MAG 3100<br>TRANSMITTER: F M MAGFLO MAG 5000, CODE NO. FDK: 7ME6910, OPTION 1AA10-1AA0 |
| (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 |
| (TLM) | TANK LEVEL MONITOR PANEL | TANK LEVEL MONITOR CONSOLE FOR UP TO SIX TANKS, COLOR LCD SCREEN, ETHERNET CONNECTION WITH WEB INTERFACE, PROGRAMMABLE VOLUME CALCULATIONS WITH TEMPERATURE COMPENSATION | FRANKLIN FUELING EVO 200 |
| (LSP) | FUEL/OIL TANK LEVEL SENSOR PROBE | TOP-MOUNT TANK PROBE WITH INSTALLATION KIT FOR 2" NPT RISER, WATER TIGHT COMPRESSION GLAND FITTING FOR CABLE ENTRANCE. FRANKLIN FUEL SYSTEMS, NO SUBSTITUTES. PROBE AND RISER LENGTH AS INDICATED ON INSTALLATION DETAILS. | 4' TANK PROBE: FMP-LL3-53-I<br>2' TANK PROBE: FMP-LL3-29-I<br>FLOAT: TSP-IDF2 2" FOR DIESEL<br>INSTALLATION KIT: TSP-C2A |
| (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 |

ALASKA ENERGY AUTHORITY

STATE OF ALASKA 49TH — JAMES T. DINNEL — 12-31-2020 — REGISTERED PROFESSIONAL ENGINEER

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
ELECTRICAL LEGENDS & SCHEDULES

| NO. | REVISION | BY | DATE |
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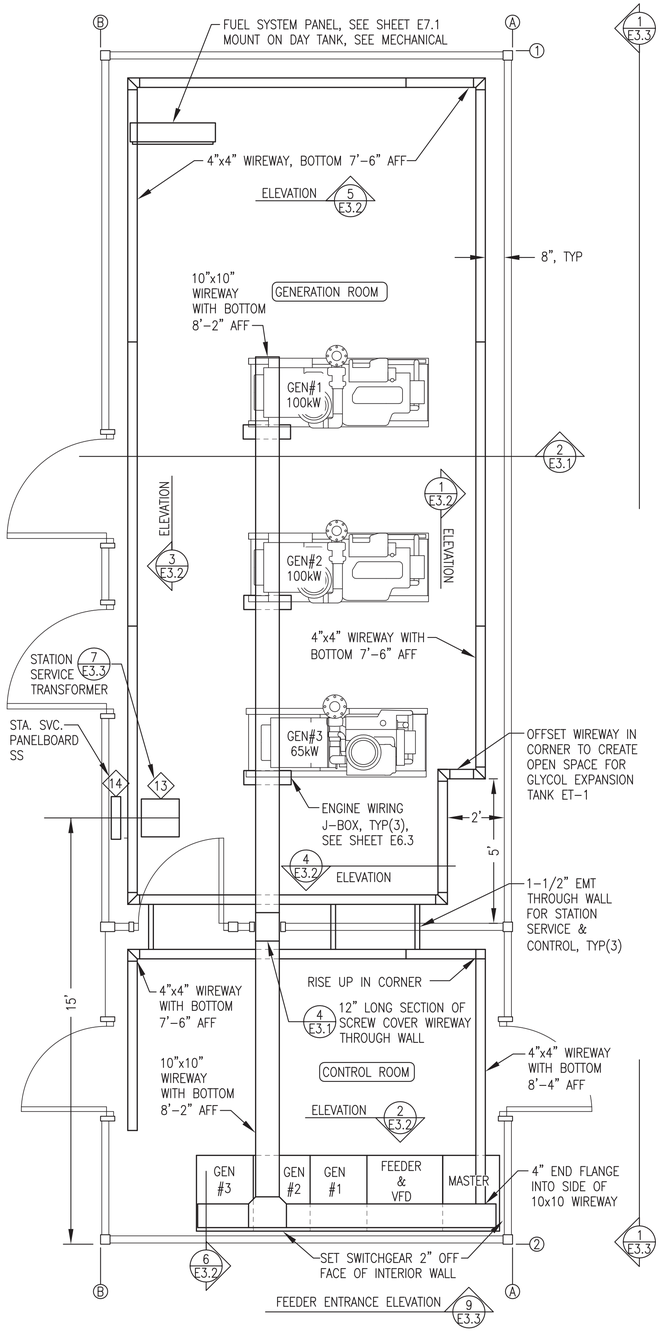
| 0 | ISSUED FOR CONSTRUCTION | CWV | 1/6/20 |

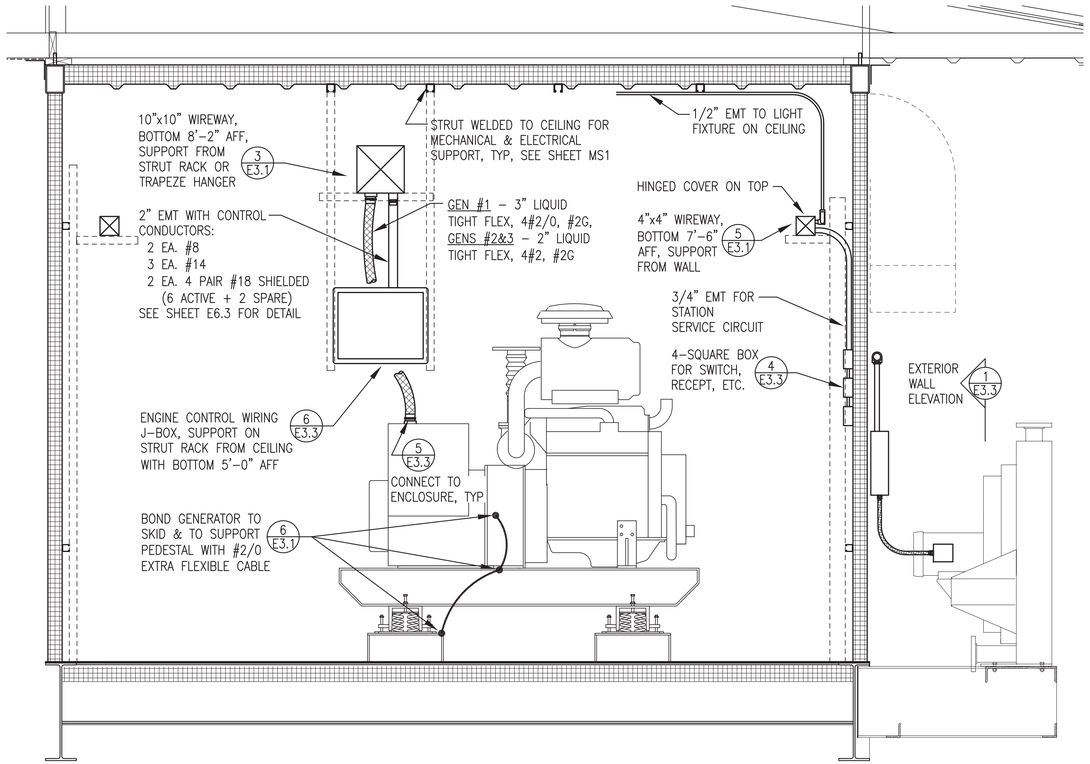
Plot Date 1/6/20 | Designed CWV/BCG | Drawn JTD | Approved CWV

Sheet No. E1



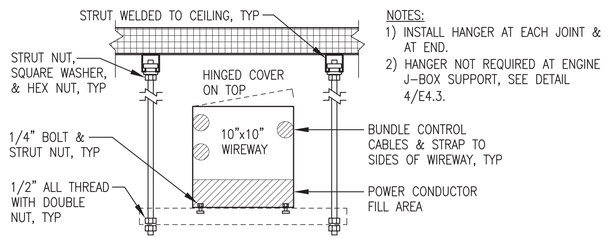

## 1 E3.1 EQUIPMENT LAYOUT & WIREWAY PLAN

3/8"=1'-0"



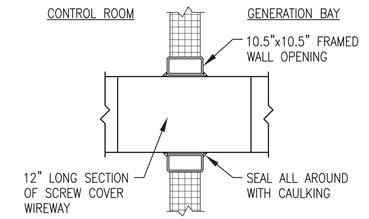

## 2 E3.1 TYPICAL MODULE SECTION

3/4"=1'-0"



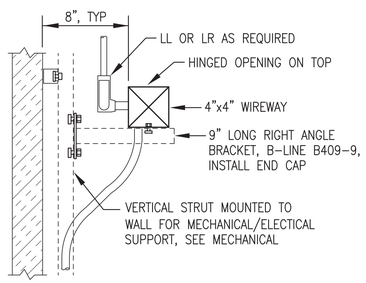

## 3 E3.1 10" WIREWAY TRAPEZE HANGER

NO SCALE



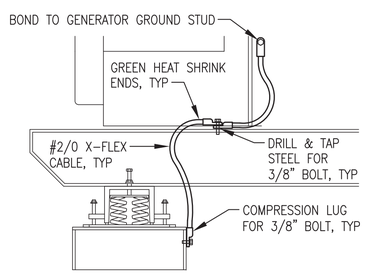

## 4 E3.1 WIREWAY WALL PENETRATION

NO SCALE




## 5 E3.1 4" WIREWAY SUPPORT FROM WALL

NO SCALE




## 6 E3.1 GENERATOR GROUNDING

NO SCALE

ALASKA ENERGY AUTHORITY

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
WIREWAY PLAN, MODULE SECTION, & DETAILS

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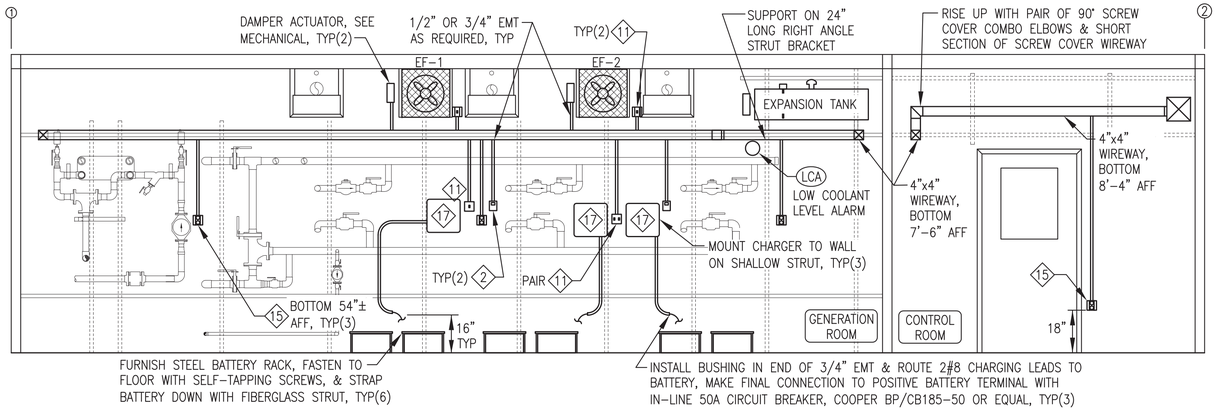
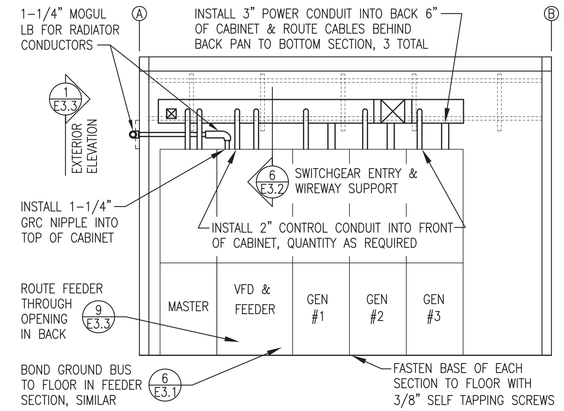
Designed: CWV/BCG
Drawn: JTD
Approved: CWV

Sheet No.
E3.1




1 E3.2 WALL ELEVATION AT GRID A
3/8"=1'-0"

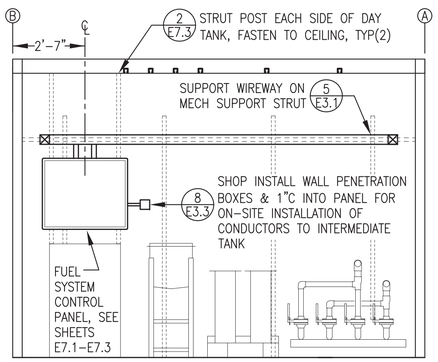



2 E3.2 WALL ELEVATION AT GRID 2
3/8"=1'-0"

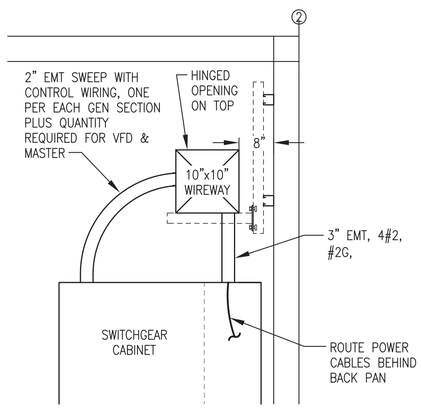



3 E3.2 WALL ELEVATION AT GRID B
3/8"=1'-0"


4 E3.2 INTERIOR WALL ELEVATION
3/8"=1'-0"




5 E3.2 WALL ELEVATION AT GRID 1
3/8"=1'-0"




6 E3.2 SWITCHGEAR ENTRY & WIREWAY SUPPORT
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA
JAMES T. DUNCAN
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LICENSED PROFESSIONAL ENGINEER
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AKHIOK, ALASKA
POWER SYSTEM UPGRADE PROJECT
ELEVATIONS & DETAILS

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Approved CWV

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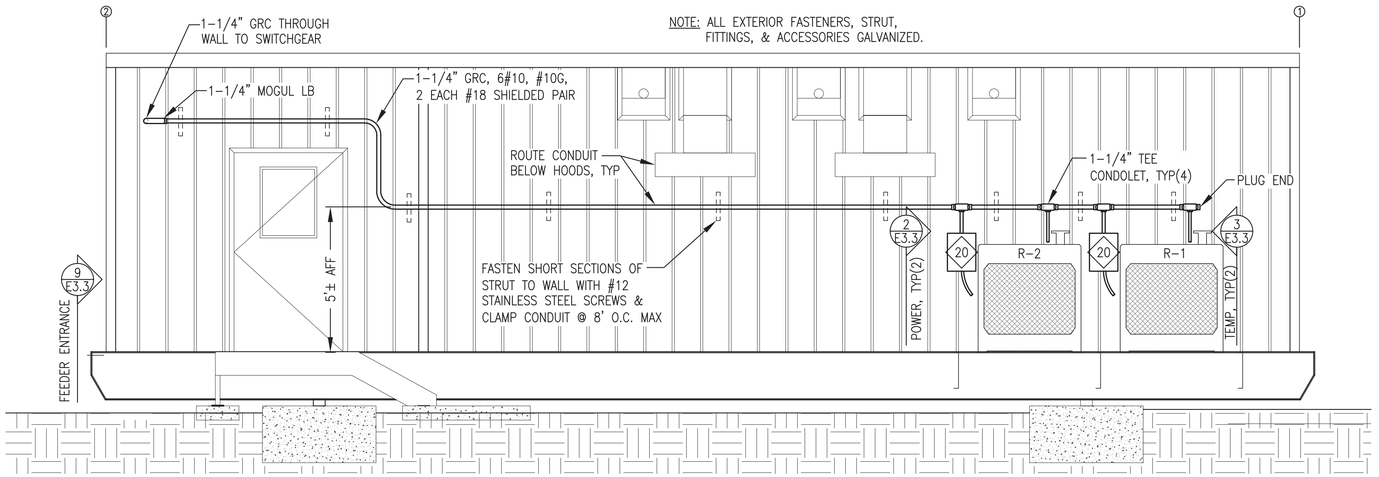
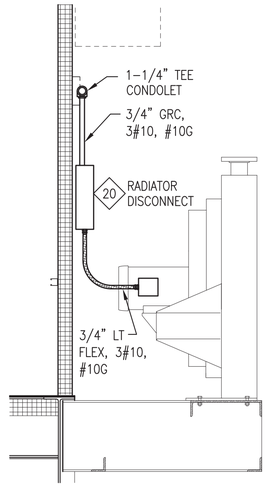
E3.2

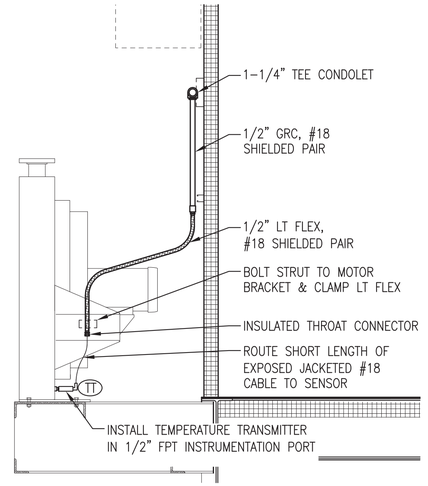



NOTE: ALL EXTERIOR FASTENERS, STRUT, FITTINGS, & ACCESSORIES GALVANIZED.

## 1 E3.3 BACK WALL EXTERIOR ELEVATION
3/8"=1'-0"

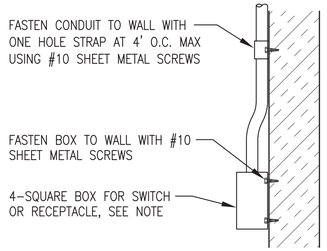



## 2 E3.3 RADIATOR POWER CONNECTION
3/4"=1'-0"




## 3 E3.3 RADIATOR TEMPERATURE TRANSMITTER
3/4"=1'-0"

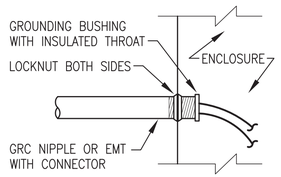
RADIATOR SHOP/ON-SITE NOTES:
1) DURING SHOP FABRICATION INSTALL ALL DEVICES AND RACEWAYS AS INDICATED.
2) AS PART OF ON-SITE WORK, IF RADIATORS ARE REMOVED FOR SHIPPING DISCONNECT LIQUID TIGHT FLEXES AND SEAL ENDS. COIL AND SECURE CONDUCTORS AND FLEXES FOR SHIPPING.
3) AS PART OF ON-SITE WORK REINSTALL AS INDICATED.



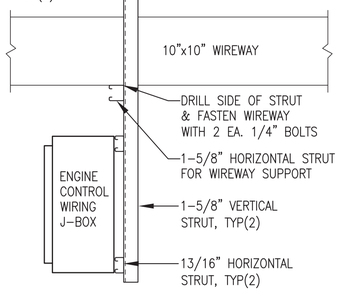

NOTE: INSTALL THERMOSTATS & TIMER SWITCHES IN DEEP SINGLE GANG BELL BOX INSTEAD OF 4-SQUARE BOX.

## 4 E3.3 TYPICAL INTERIOR DEVICE MOUNTING
NO SCALE

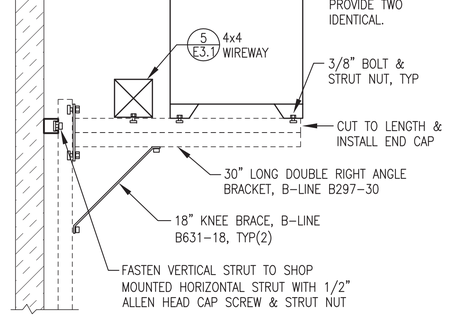
NOTES:
1) THIS DETAIL APPLIES TO CONNECTIONS TO WIREWAY, GENERATOR ENCLOSURES, SWITCHGEAR, AND PANELS.
2) AT A MINIMUM INSTALL GROUNDING BUSHING ON ALL GENERATOR POWER CONDUIT, COMMUNITY FEEDER CONDUIT, STATION SERVICE FEEDERS, AND WHERE OTHERWISE INDICATED OR REQUIRED. BOND GROUNDING BUSHING TO EQUIPMENT GROUNDING CONDUCTOR.
3) INSTALL PLASTIC BUSHING WHERE GROUNDING BUSHING IS NOT REQUIRED.
4) ON GENERATOR ENCLOSURES MAKE ALL CONNECTIONS AS TIGHT AS POSSIBLE.




## 5 E3.3 TYP ENCLOSURE CONNECTION
NO SCALE

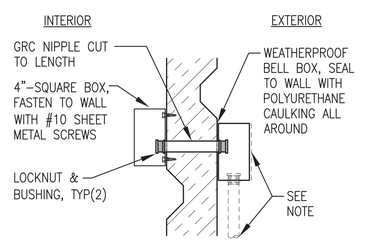



## 6 E3.3 ENGINE WIRING J-BOX SUPPORT
NO SCALE



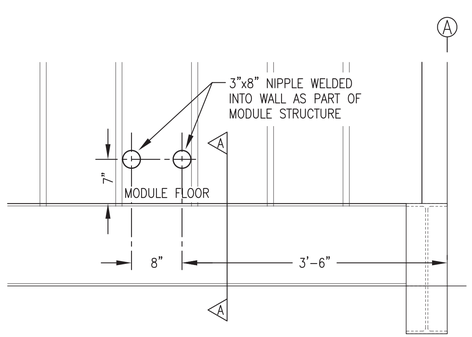

NOTE: ONE SUPPORT SHOWN, PROVIDE TWO IDENTICAL.

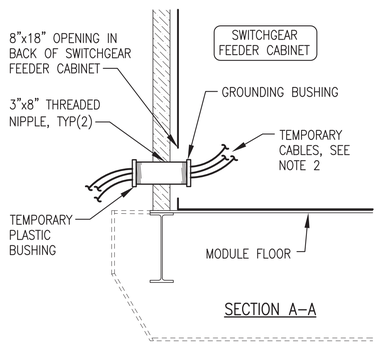
## 7 E3.3 STATION SERVICE TRANSFORMER SUPPORT
NO SCALE




NOTE: FOR CONDUIT PENETRATIONS WITHOUT BELL BOX SEAL ALL AROUND CONDUIT WITH POLYURETHANE CAULK.

## 8 E3.3 TYP EXTERIOR WALL-MOUNT DEVICE
NO SCALE




SECTION A-A

FEEDER SHOP/ON-SITE NOTES:
1) DURING SHOP FABRICATION INSTALL TEMPORARY FEEDER CABLES THROUGH ONE NIPPLE AS SHOWN. SPARE NIPPLE TO REMAIN CAPPED.
2) ROUTE TEMPORARY CABLES TO LOAD BANK FOR TESTING. AFTER TESTING INSTALL THREADED CAP ON EXTERIOR END OF NIPPLE.
3) INSTALL FEEDER TO TRANSFORMER AS PART OF ON-SITE WORK, SEE SHEET E2 FOR CONTINUATION.

## 9 E3.3 FEEDER ENTRANCE DETAIL
1"=1'-0"

ALASKA ENERGY AUTHORITY

CRW ENGINEERING GROUP LLC
PHONE: (907) 562-3252
Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100

AKHIOK, ALASKA
POWER SYSTEM UPGRADE PROJECT
ELEVATIONS & DETAILS

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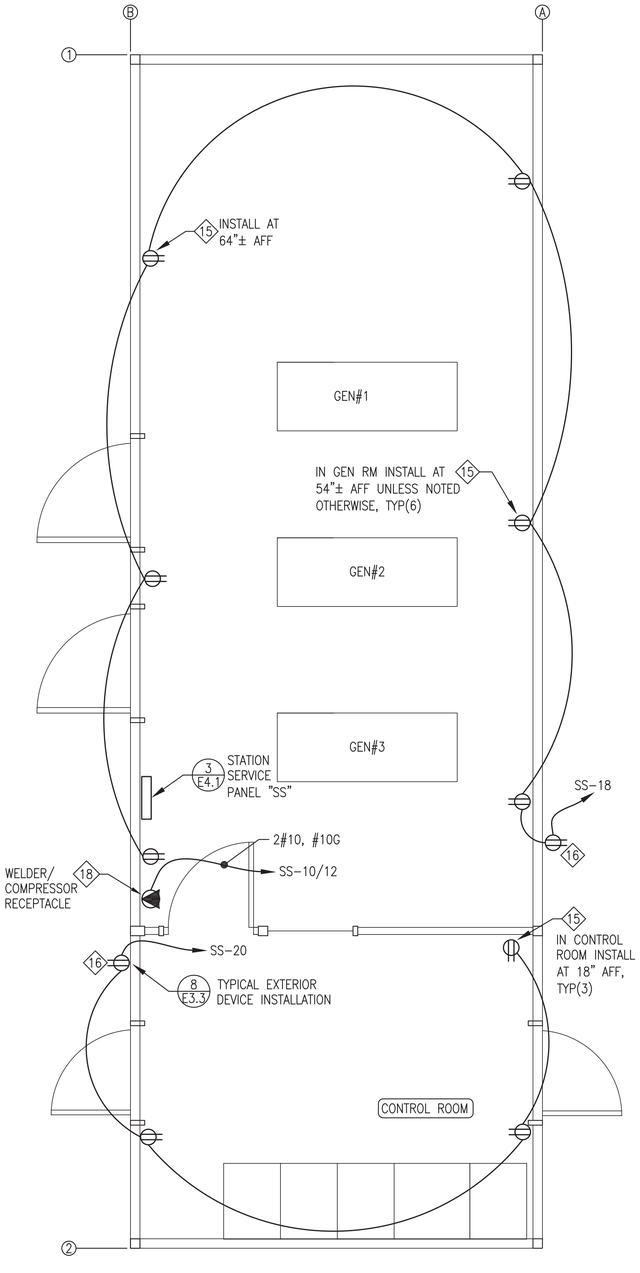
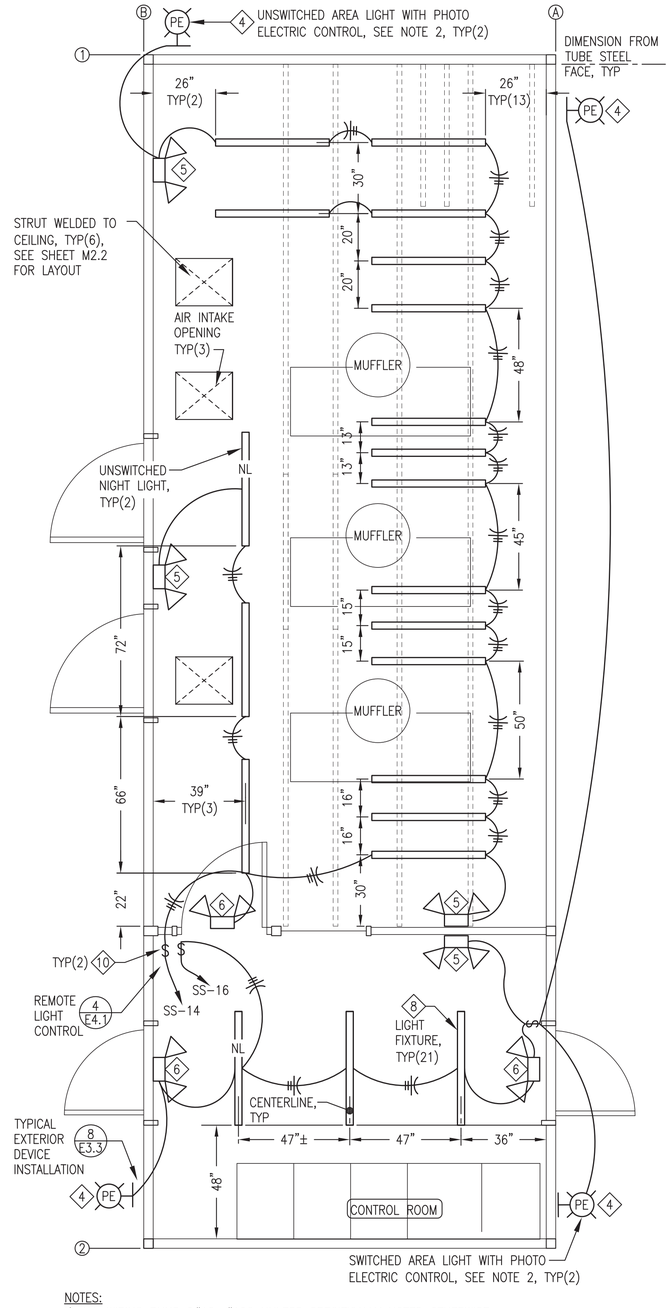
Sheet No.
E3.3



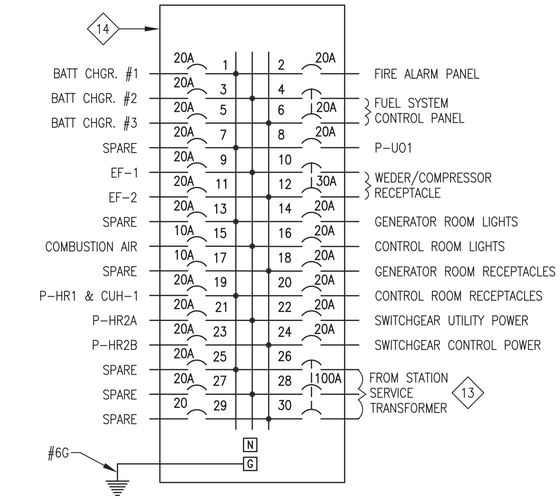

NOTES:
1) ALL WIRING RUNS 2#12, #12G UNLESS SPECIFICALLY NOTED OTHERWISE.

## 1 E4.1 RECEPTACLE PLAN
3/8"=1'-0"

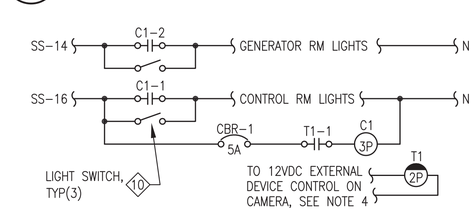



NOTES:
1) ALL WIRING RUNS 2#12, #12G UNLESS SPECIFICALLY NOTED OTHERWISE.
2) MOUNT EXTERIOR AREA LIGHTS WITH TOP 9'-0" AFF.
3) FASTEN INTERIOR LIGHTS TO CEILING WITH #12 SHEET METAL SCREWS EXCEPT WHERE LIGHTS CROSS STRUT USE 1/4" BOLTS & STRUT NUTS, TYP

## 2 E4.1 LIGHTING PLAN
3/8"=1'-0"




## 3 E4.1 STATION SERVICE PANEL "SS"
NO SCALE




NOTES:
1) INSTALL CONTACTOR, TIMER RELAY, AND CIRCUIT BREAKER IN 12"x12"x6" NEMA 1 JUNCTION BOX ON WALL ABOVE LIGHT SWITCHES.
2) ALL LIGHTING CIRCUIT WIRING MIN #12 AWG. ALL 5A CONTROL CIRCUIT WIRING MIN #16AWG.
3) SET TIMER FOR 5 MINUTES, SINGLE SHOT MODE.
4) CONNECT TO CONFIGURABLE OUTPUT PINS ON CAMERA AND PROGRAM TO POWER RELAY ON CAMERA OPERATION.

BILL OF MATERIALS:
CBR1: 5A, 1P, RAIL MOUNT CIRCUIT BREAKER. ALLEN BRADLEY 1489-A1-050.
C1: 23A, 3P CONTACTOR, 120V COIL. ALLEN BRADLEY 100-C23D10.
T1: 10A, DPDT RELAY, 12VDC COIL, WITH SOCKET BASE AND TIMING MODULE. ALLEN BRADLEY 700-HA32Z12 RELAY WITH 700HN204 BASE AND 700HT3 SERIES B TIMING MODULE.

## 4 E4.1 LIGHTING REMOTE CONTROL SCHEMATIC
NO SCALE

| BUILDING PLANS SYMBOL LEGEND | | | |
|---|---|---|---|
| SYMBOL | DESCRIPTION | SYMBOL | DESCRIPTION |
| SS-## | HOME RUN TO PANEL & BREAKER(S) INDICATED. SHORT DASH INDICATES HOT CONDUCTOR, LONG DASH INDICATES NEUTRAL CONDUCTOR, CURVED DASH INDICATES GROUND CONDUCTOR. IF NOT SPECIFICALLY INDICATED, PROVIDE 2#12 AWG & 1#12 AWG GROUND. | | 125V, 20A, DUPLEX RECEPTACLE |
| | | T | LINE VOLTAGE THERMOSTAT |
| # | ELECTRICAL ITEM – SEE EQUIPMENT SCHEDULE ON SHEET E6 | DT | DIGITAL THERMOSTAT, MODULATING |
| | | | SNAP SWITCH / SMALL MOTOR DISCONNECT |
| 1/4 | MOTOR (HORESPOWER INDICATED) | T$ | TIMER SWITCH |
| MD | MOTORIZED DAMPER – SEE MECHANICAL | | GROUND |

ALASKA ENERGY AUTHORITY

STATE OF ALASKA 49TH — JAMES T. HEMMINGER — REGISTERED PROFESSIONAL ENGINEER — LE 7802

CRW ENGINEERING GROUP LLC — PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
RECEPTACLE & LIGHTING PLANS, & STATION SERVICE PANEL

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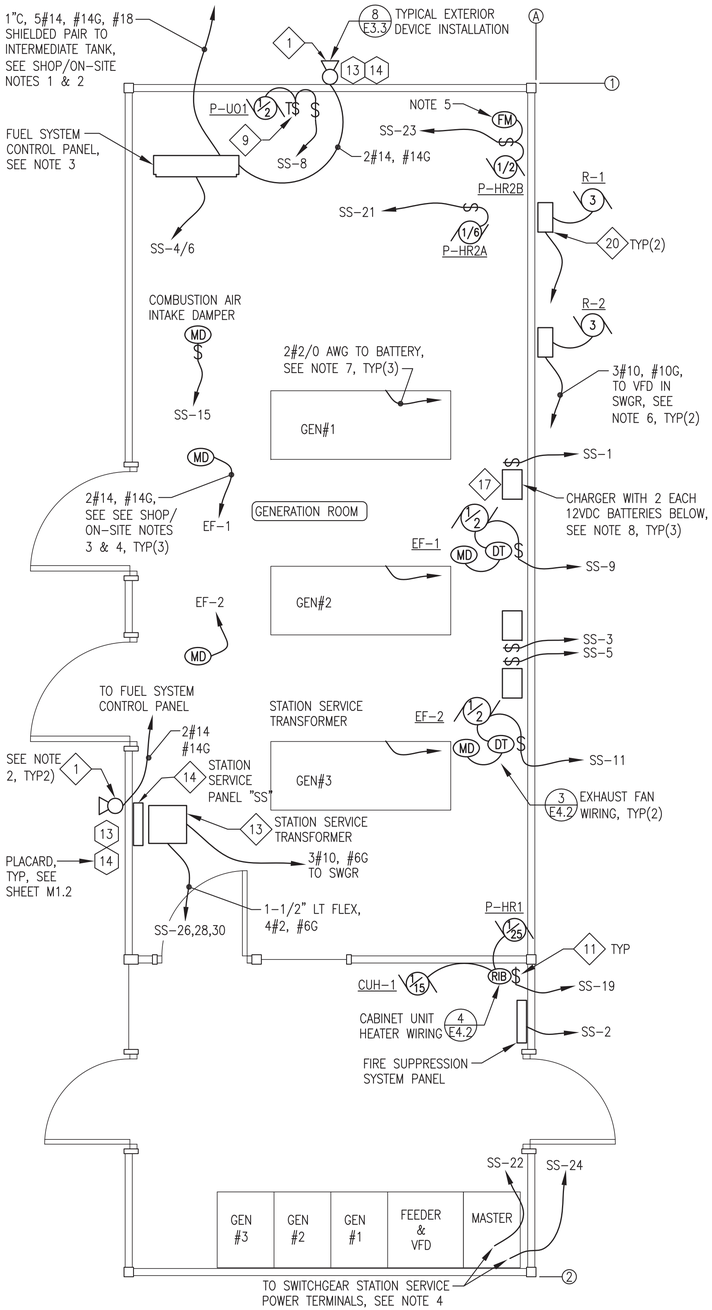
Sheet No. E4.1




1 E4.2 STATION SERVICE PLAN
3/8"=1'-0"

## STATION SERVICE GENERAL NOTES:

1) ALL WIRING RUNS 2#12, #12G UNLESS SPECIFICALLY NOTED OTHERWISE.

2) MOUNT ALARMS HORNS WITH TOP AT 9'-0" AFF TO MATCH EXTERIOR LIGHTS, SEE SHEET E4.1

3) SEE SHEETS E7.1-E7.3 FOR DAY TANK CONTROL PANEL DESIGN. ALL ACCESSORIES NOT SHOWN ON PLANS. SEE LOGIC DIAGRAMS FOR ADDITIONAL DETAIL.

4) SEE SWITCHGEAR SHOP DRAWINGS FOR TERMINATION OF ALL POWER AND CONTROL WIRING.

5) INSTALL FLOW METER FOR HEAT RECOVERY MONITORING WHERE SHOWN ON HEAT RECOVERY PIPING ISOMETRIC. PROVIDE POWER FROM P-HR2B DISCONNECT.

6) RADIATOR VFD POWER CONDUCTORS OVERSIZED FOR 80% DE-RATE. DO NOT ROUTE IN WIREWAY. ROUTE IN SEPARATE EXTERIOR CONDUIT, SEE ELEVATION 1/E3.3.

7) ROUTE BATTERY CABLES TO FRONT OF SKID SUPPORTED WITH CUSHIONED CLAMPS, SEE SHEET M3.3. ROUTE FROM SKID DIRECTLY UNDER FUEL HOSES TO WALL AND TYWRAP CABLES TO FUEL PIPES ALONG WALL. CUT TO PROVIDE 6"± SERVICE LOOP FOR FINAL TERMINATION ON BATTERIES.

8) MOUNT BATTERY CHARGER TO WALL ON SHALLOW STRUT AND INSTALL BATTERIES ON FLOOR BELOW, SEE ELEVATION 1/E3.2.

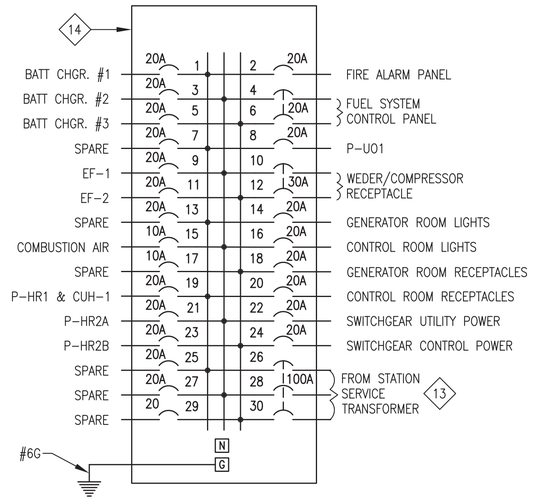
## STATION SERVICE SHOP/ON-SITE NOTES:

1) DURING SHOP FABRICATION INSTALL WALL PENETRATION AND CONDUIT INTO DAY TANK PANEL. SEE ELEVATION 5/E3.2.

2) AS PART OF ON-SITE WORK INSTALL CONDUIT AND CONDUCTORS TO TANK FARM, SEE SHEET E2.

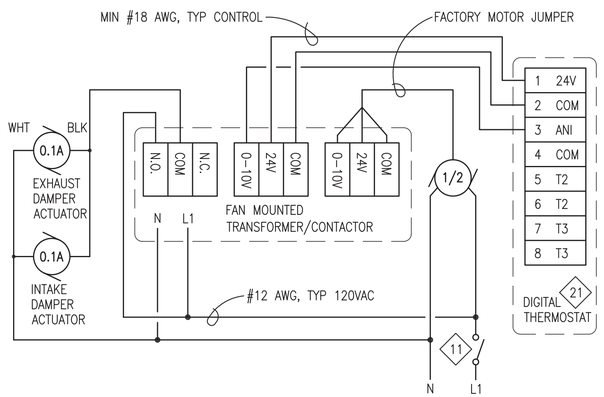
3) DURING SHOP FABRICATION INSTALL CEILING MOUNTED BOX ADJACENT TO DAMPER ACTUATOR AND TEMPORARILY CONNECT DAMPER TO VERIFY OPERATION.

4) AS PART OF ON-SITE WORK INSTALL CONDUIT AND CONDUCTORS TO DAMPER ACTUATOR. SEE SHEET M7.

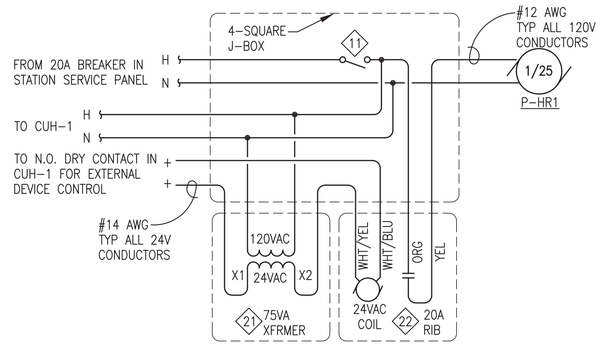



2 E4.2 STATION SERVICE PANEL "SS"
NO SCALE

MAKE THE FOLLOWING SETTINGS ON DIGITAL THERMOSTAT:
APPLICATION = 0 (INTERNAL SENSOR)
OUTPUT 1 = 0 (COOL/0-10V)
OUTPUT 2 = 0 (NOT USED)
OUTPUT 3 = 0 (NOT USED)
OUTPUT 3 ACTIVATION = 0 (100%)
NSB VALUE = 3 (6°F)
OUTPUT 1 MIN = 0 (0%)
MAX SETPOINT = 90°F
MIN SETPOINT = 50°F




3 E4.2 EXHAUST FAN WIRING DIAGRAM
NO SCALE




4 E4.2 CUH-1 WIRING DIAGRAM
NO SCALE

ALASKA ENERGY AUTHORITY

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

Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
STATION SERVICE PLAN, DETAILS, & PANEL

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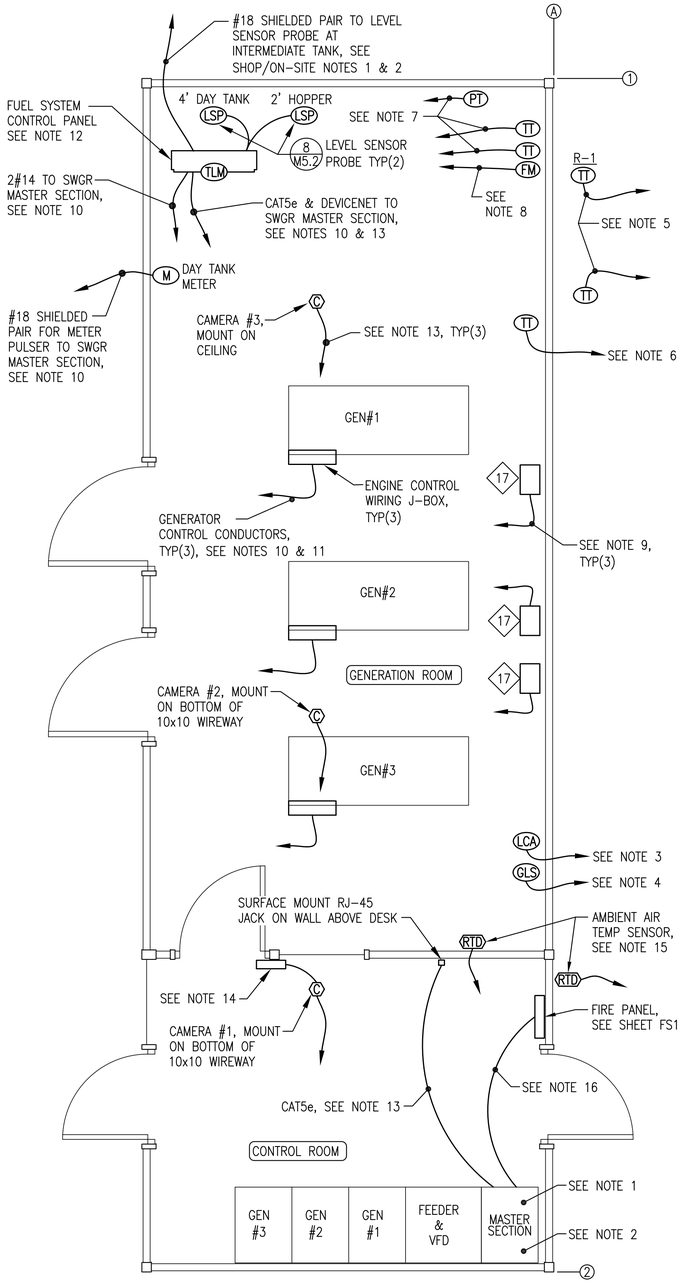



1 E5 INSTRUMENTATION & DATA PLAN
3/8"=1'-0"

## INSTRUMENTATION & DATA INSTALLATION & WIRING NOTES:

1. INSTALL CAMERA POE+ SWITCH INSIDE MASTER SECTION. CONNECT TO 120VAC CONTROL POWER AND TO ETHERNET SWITCH, SEE NOTE 10.
2. INSTALL ROUTER ON TOP OF MASTER SECTION IN RACK OR CABINET. CONNECT TO 120VAC UPS AND TO ETHERNET SWITCH, SEE NOTE 10.
3. LOW COOLANT LEVEL ALARM SWITCH INSTALLED AT EXPANSION TANK, SEE MECHANICAL. CONNECT TO N.C. SWITCH (WHITE & RED) AND ROUTE 2#14 TO SWITCHGEAR MASTER SECTION. SEE NOTE 10.
4. GLYCOL LEVEL SENSOR PROBE INSTALLED IN EXPANSION TANK, SEE MECHANICAL. ROUTE #18 SHIELDED PAIR TO SWITCHGEAR. SEE NOTE 10.
5. INSTALL TEMP TRANSMITTER IN EACH RADIATOR, SEE DETAIL 3/E3.3. ROUTE #18 SHIELDED PAIR FROM EACH TO SWITCHGEAR VFD SECTION, SEE NOTE 10.
6. INSTALL COOLANT RETURN TEMP TRANSMITTER IN PIPING MAIN WHERE SHOWN ON COOLING PIPING ISOMETRIC 1/M4.2. ROUTE #18 SHIELDED PAIR TO SWITCHGEAR MASTER SECTION, SEE NOTE 10.
7. INSTALL TWO TEMP TRANSMITTERS AND ONE PRESSURE TRANSMITTER FOR HEAT RECOVERY MONITORING WHERE SHOWN ON HEAT RECOVERY PIPING ISOMETRIC 2/M4.2. ROUTE #18 SHIELDED PAIR FROM EACH TO SWITCHGEAR MASTER SECTION. SEE NOTE 10.
8. INSTALL FLOW METER FOR HEAT RECOVERY MONITORING WHERE SHOWN ON HEAT RECOVERY PIPING ISOMETRIC. PROVIDE POWER FROM P-HR2B DISCONNECT. ROUTE #18 SHIELDED PAIR TO SWITCHGEAR MASTER SECTION. SEE NOTE 10.
9. ROUTE 2#14 FROM BATTERY CHARGER ALARM CONTACTS TO ASSOCIATED SWITCHGEAR GENERATOR SECTION, SEE NOTE 10 AND WIRING DIAGRAM 2/E5.
10. SEE SWITCHGEAR SHOP DRAWINGS FOR TERMINATION OF ALL INSTRUMENTATION AND DATA WIRING INCLUDING CONTROL POWER.
11. ROUTE GENERATOR CONTROL CONDUCTORS TO SWITCHGEAR IN 10x10 WIREWAY WITH POWER CONDUCTORS. SEE SHEETS E3.1, E6.3, AND NOTE 10.
12. SEE SHEETS E7.1-E7.3 FOR FUEL SYSTEM CONTROL PANEL DESIGN. ALL ACCESSORIES NOT SHOWN ON PLANS. SEE LOGIC DIAGRAMS FOR ADDITIONAL DETAIL.
13. ROUTE CAT5e CONDUCTORS FROM EACH CAMERA TO POE+ SWITCH IN MASTER SECTION. ROUTE CAT5e AND DEVICENET CONDUCTORS FROM FUEL SYSTEM PANEL TO ETHERNET SWITCH AND PLC IN MASTER SECTION. ROUTE CAT5e FROM RJ-45 JACK TO ETHERNET SWITCH IN MASTER SECTION. SEE NOTE 10. INSTALL ALL 300V CAT5e AND DEVICENET CONDUCTORS IN SEPARATE DEDICATED RACEWAYS - DO NOT ROUTE WITH STATION SERVICE OR POWER CONDUCTORS.
14. INSTALL CONTACTOR WITH TIMER RELAY FOR REMOTE LIGHTING CONTROL. OPERATE FROM DRY CONTACT ON CAMERA #1. TIMER TO TURN LIGHTS ON FOR 5 MINUTES EACH TIME CAMERA IS OPERATED. SEE SCHEMATIC 4/E4.1.
15. RTD TEMPERATURE SENSOR PROVIDED WITH SWITCHGEAR. ROUTE #18 SHIELDED PAIR TO SWITCHGEAR MASTER SECTION. SEE DETAIL 3/E5 AND NOTE 10.
16. ROUTE CAT5e FOR DATA AND 2#14 FOR GENERATOR SHUT DOWN FROM FIRE PANEL TO SWITCHGEAR MASTER SECTION, SEE NOTE 10. INSTALL IN SEPARATE DEDICATED RACEWAY - DO NOT ROUTE WITH STATION SERVICE OR POWER CONDUCTORS.

## INSTRUMENTATION & DATA EQUIPMENT PROGRAMMING NOTES:

1. THE AUTHORITY WILL PROVIDE PROGRAMMING FOR THE CAMERAS FROM A RECENT PROJECT. UPLOAD PROGRAMMING AND REVISE AS REQUIRED TO PROVIDE FULL CAMERA FUNCTION.
2. THE AUTHORITY WILL PROVIDE PROGRAMMING FOR THE TANK LEVEL MONITOR (TLM) FROM A RECENT PROJECT. UPLOAD PROGRAMMING AND REVISE AS REQUIRED TO PROVIDE FULL LEVEL MONITORING FUNCTION.

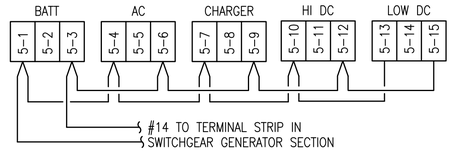
## INSTRUMENTATION & DATA SHOP/ON-SITE NOTES:

1. DURING SHOP FABRICATION INSTALL WALL PENETRATION AND CONDUIT INTO DAY TANK PANEL. SEE ELEVATION 5/E3.2.
2. AS PART OF ON-SITE WORK INSTALL CONDUIT AND CONDUCTORS TO TANK FARM, SEE SHEET E2.

**DATA DEVICE SCHEDULE**

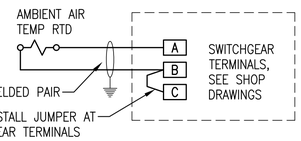
| DEVICE/FUNCTION | DESCRIPTION | MANUFACTURER/MODEL |
|---|---|---|
| ROUTER - HIGH SPEED INTERNET | 4-PORT GIGABIT ROUTER, DUAL 2.4 AND 5 GHz WIFI WITH ADJUSTABLE ANTENNAS, 4 GIGABIT LAN, 1 GIGBIT WAN, USB 2.0 AND USB 4.0, MINIMUM 256 MB RAM | ASUS RT-ACI-900P OR APPROVED EQUAL |
| POE+ - POWER OVER ETHERNET CAMERA SWITCH | MINIMUM 4 PORT MANAGED GIGABIT SWITCH, MINIMUM 14 GBPS THROUGHPUT, MINIMUM 30W POWER OVER ETHERNET PER PORT, MINIMUM 130W TOTAL, 120VAC POWER | AXIS T8508 POE+ OR APPROVED EQUAL |
| CAMERAS | NETWORK CAMERA, HDTV 1080P RESOLUTION, 360 DEGREE PAN, MINIMUM 90 DEGREE TILT, 10X ZOOM, AUTO FOCUS, POWER OVER ETHERNET, WITH PROGRAMMABLE OUTPUT CONNECTIONS FOR EXTERNAL CONTROL OF LIGHTING | AXIS M5525-E PTZ OR APPROVED EQUAL |

NOTE: 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.




NOTE: PRIOR TO ENERGIZING MAKE THE FOLLOWING SETTINGS ON CHARGER:
1) AC LINE VOLTAGE SWITCH TO "115V".
2) AUTO BOOST JUMPER TO "NORM".
3) FLOAT VOLTAGE JUMPER TO "13.50/27.00" (FOR GEL CELL).
4) BATTERY RANGE JUMPER TO "24V".

2 E5 BATTERY CHARGER ALARM WIRING DIAGRAM
NO SCALE




3 E5 AMBIENT AIR TEMP RTD TERMINATION
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA
CHRISTOPHER W. WOOLEY
LICENSED PROFESSIONAL ENGINEER
LIC. NO. 49TH
CLOUD PEAK ENERGY SERVICES
LE 7802

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Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
INSTRUMENTATION & DATA PLAN & DETAILS

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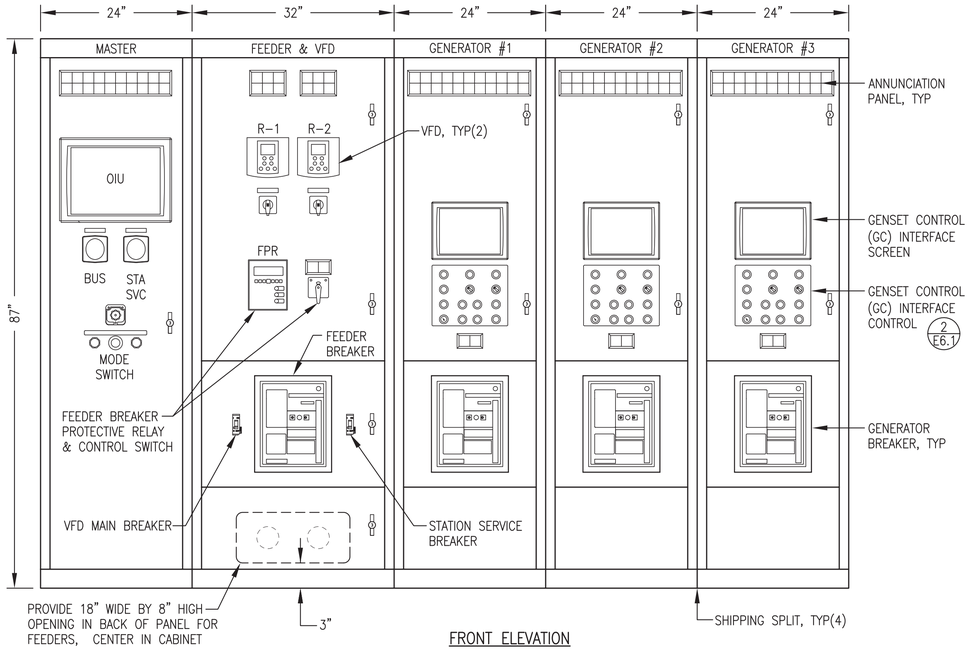
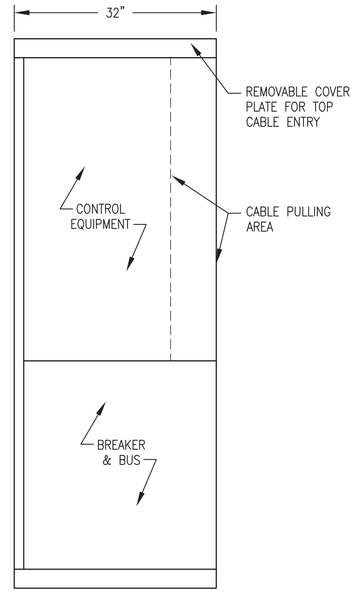


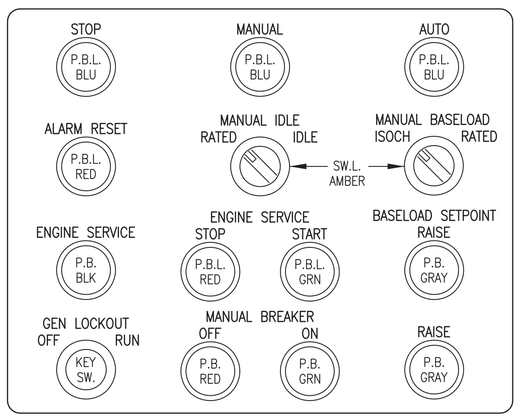

FRONT ELEVATION




TYPICAL CROSS SECTION

## 1 / E6.1 SWITCHGEAR ENCLOSURE LAYOUT

NO SCALE




INTERFACE CONTROLS LEGEND:

| | |
|---|---|
| P.B. | PUSH BUTTON |
| P.B.L. | PUSH BUTTON WITH LIGHT |
| SW.L. | KNOB OPERATED SWITCH WITH LIGHT |
| KEY SW. | KEY OPERATED LOCKABLE SWITCH |

## 2 / E6.1 GENSET CONTROL (GC) INTERFACE CONTROLS

NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA — 49TH — BRIAN W. WILKINSON — REGISTERED PROFESSIONAL ENGINEER — LIC. NO. 7802

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

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**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

SWITCHGEAR ENCLOSURE LAYOUT

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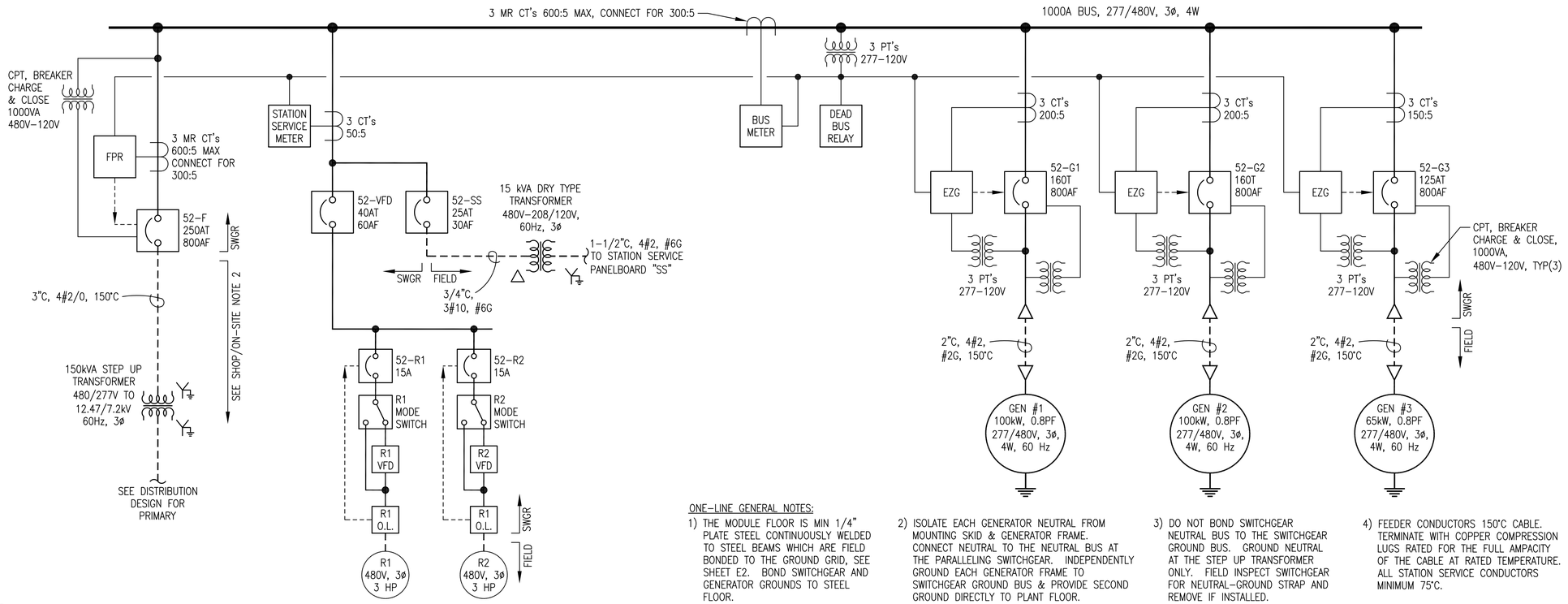


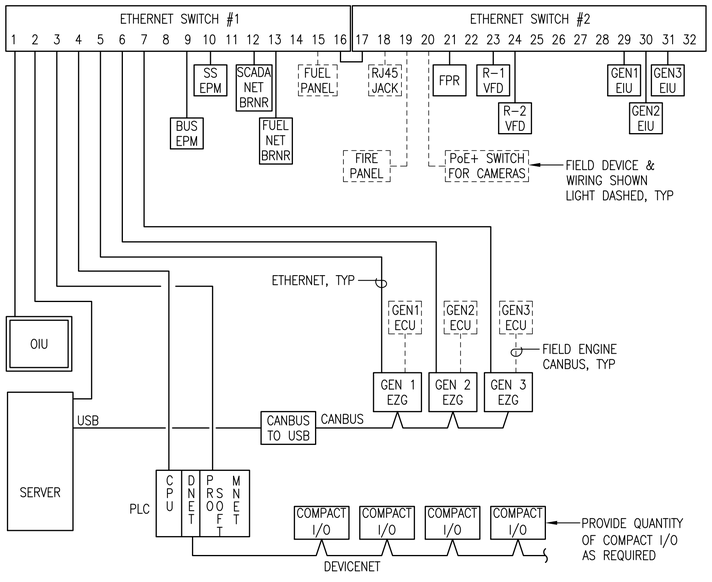

1 E6.2 SWITCHGEAR ONE–LINE DIAGRAM
NO SCALE

ONE–LINE GENERAL NOTES:

1) THE MODULE FLOOR IS MIN 1/4" PLATE STEEL CONTINUOUSLY WELDED TO STEEL BEAMS WHICH ARE FIELD BONDED TO THE GROUND GRID, SEE SHEET E2. BOND SWITCHGEAR AND GENERATOR GROUNDS TO STEEL FLOOR.
2) ISOLATE EACH GENERATOR NEUTRAL FROM MOUNTING SKID & GENERATOR FRAME. CONNECT NEUTRAL TO THE NEUTRAL BUS AT THE PARALLELING SWITCHGEAR. INDEPENDENTLY GROUND EACH GENERATOR FRAME TO SWITCHGEAR GROUND BUS & PROVIDE SECOND GROUND DIRECTLY TO PLANT FLOOR.
3) DO NOT BOND SWITCHGEAR NEUTRAL BUS TO THE SWITCHGEAR GROUND BUS. GROUND NEUTRAL AT THE STEP UP TRANSFORMER ONLY. FIELD INSPECT SWITCHGEAR FOR NEUTRAL–GROUND STRAP AND REMOVE IF INSTALLED.
4) FEEDER CONDUCTORS 150°C CABLE. TERMINATE WITH COPPER COMPRESSION LUGS RATED FOR THE FULL AMPACITY OF THE CABLE AT RATED TEMPERATURE. ALL STATION SERVICE CONDUCTORS MINIMUM 75°C.

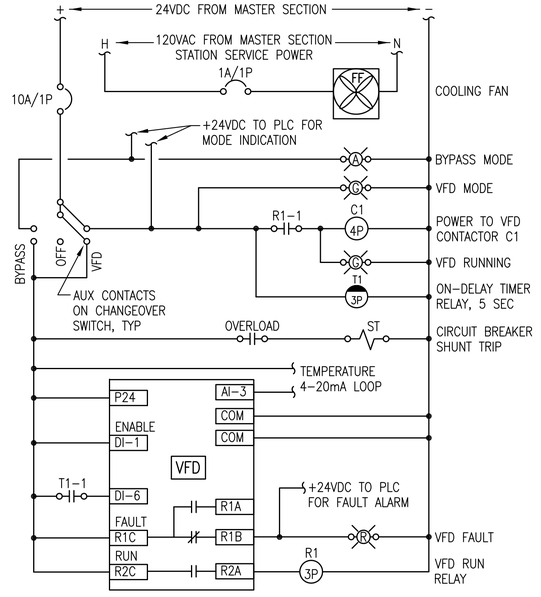
NOTES:

1) PROVIDE 120VAC POWER FOR SERVER FROM UPS. ALL OTHER DEVICES 24VDC.
2) ASSIGN I.P. ADDRESSES IN ACCORDANCE WITH THE SCHEDULE.




2 E6.2 COMMUNICATION SCHEMATIC
NO SCALE

| I.P. ADDRESS SCHEDULE | |
|---|---|
| DEVICE | I.P. ADDRESS |
| SERVER | 192.168.1.142 |
| FPR | 192.168.1.155 |
| R1 VFD | 192.168.1.171 |
| R2 VFD | 192.168.1.172 |
| OIU | 192.168.1.182 |
| PLC CPU | 192.168.1.183 |
| PLC PROSOFT | 192.168.1.187 |
| BUS EPM | 192.168.1.190 |
| SS EPM | 192.168.1.191 |
| G1 EASYGEN XT | 192.168.1.161 |
| G2 EASYGEN XT | 192.168.1.162 |
| G3 EASYGEN XT | 192.168.1.163 |
| G1 EIU | 192.168.1.151 |
| G2 EIU | 192.168.1.152 |
| G3 EIU | 192.168.1.153 |
| ROUTER | 192.168.1.1 |
| CONTROL RM. CAMERA | 192.168.1.104 |
| GEN RM. CAMERA #1 | 192.168.1.105 |
| GEN RM. CAMERA #2 | 192.168.1.106 |
| SCADA NETBURNER | 192.168.1.185 |
| FUEL NETBURNER | 192.168.1.199 |
| FUEL PANEL | 192.168.1.198 |
| FIRE PANEL | 192.168.1.110 |




3 E6.2 TYPICAL RADIATOR VFD LOGIC DIAGRAM
NO SCALE

SWITCHGEAR SHOP/ON–SITE NOTES:

1) DEVICES AND WIRING NOTED AS FIELD ARE EXTERNAL TO THE SWITCHGEAR BUT ARE INCLUDED IN THE MODULE SHOP FABRICATION WORK.
2) THE FEEDER, STEP UP TRANSFORMER, AND DISTRIBUTION ARE TO BE INSTALLED AS PART OF THE ON–SITE WORK AND ARE NOT PART OF THE MODULE SHOP FABRICATION WORK.

**SWITCHGEAR SYMBOL LEGEND**

- TRANSFORMER PT=POTENTIAL XFRMR CPT=CONTROL POWER XFRMR
- CURRENT TRANSFORMER M.R. – INDICATES MULTIRATIO CT'S RATING FACTOR RF=2.0
- CIRCUIT BREAKER AT=AMP TRIP RATING AF=AMP FRAME RATING
- EZG — WOODWARD EASYGEN GENSET CONTROLLER
- FPR — FEEDER PROTECTION RELAY
- SHOP INSTALLED POWER WIRING/BUS
- FIELD INSTALLED POWER WIRING
- SHOP INSTALLED CONTROL WIRING

ALASKA ENERGY AUTHORITY

STATE OF ALASKA 49TH — JAMES W. HENDERSON — LICENSED PROFESSIONAL ENGINEER — LE 7802

CRW ENGINEERING GROUP LLC PHONE: (907) 562-3252
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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
SWITCHGEAR ONE–LINE & SCHEMATICS

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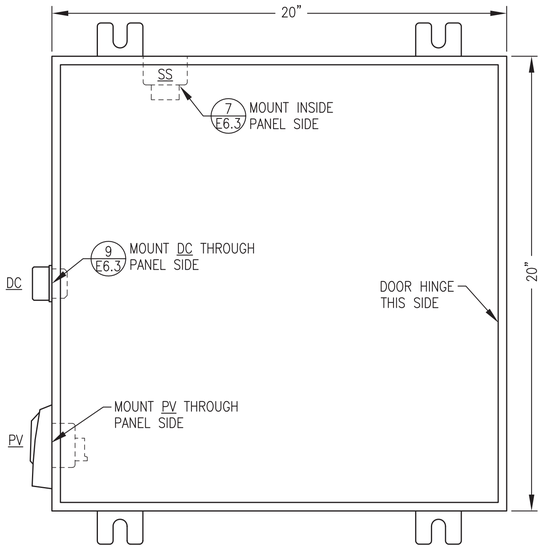
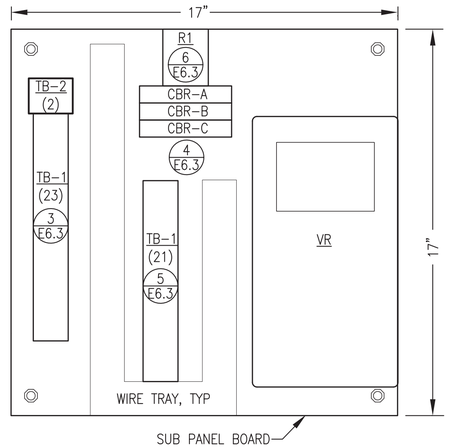



1 E6.3 JUNCTION BOX FRONT PANEL LAYOUT
NO SCALE




2 E6.3 JUNCTION BOX SUB PANEL LAYOUT
NO SCALE

| BILL OF MATERIALS | | | |
|---|---|---|---|
| TAG | MANUFACTURER | MODEL | DESCRIPTION |
| ENCL. | HOFFMAN | A20H20ALP | 20x20x8" NEMA 12 |
| | HOFFMAN | A20P20 | BACK PANEL |
| VR | BASLER | DECS-150 5NS1V1N1S | DIGITAL VOLTAGE REGULATOR |
| CBR | ALLEN-BRADLEY | 1489-M1-C010 | RAIL MOUNT CIRCUIT BREAKER, 1-POLE, 1A |
| DC | JOHN DEERE | 57M7919 | DIAGNOSTIC CONNECTOR, 9-PIN, CAN-BUS |
| | DEUTSCH | HD18-009 | CONNECTOR STRAIN RELIEF |
| | DEUTSCH | HDC16-9 | CONNECTOR PROTECTIVE DUST CAP |
| | DEUTSCH | HD10-9-GKT | CONNECTOR GASKET |
| | DEUTSCH | JDL062397 | CONNECTOR LANYARD |
| PV | MURPHY | PV101-C-MSTD | POWER VIEW W/HARNESS |
| R1 | ALLEN-BRADLEY | 700HAB2Z24 | DPDT RELAY, 24VDC COIL |
| | ALLEN-BRADLEY | 700HN101 | 8 PIN SOCKET BASE |
| SS | CATERPILLAR | 9X-8124 | STARTER AUXILIARY SOLENOID, 24V |
| TB-1 | IDEC | BNH15LW | 15A DIN RAIL-MOUNT TERMINAL BLOCK |
| TB-2 | IDEC | BNH50W | 50A DIN RAIL-MOUNT TERMINAL BLOCK |

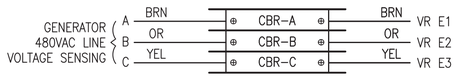
NOTE: SPECIFIC PARTS MANUFACTURER AND MODEL SELECTED NOT ONLY TO MEET PERFORMANCE FUNCTION BUT ALSO TO COORDINATE AND INTERFACE WITH OTHER DEVICES AND SYSTEMS. APPROVED EQUAL SUBSTITUTIONS WILL BE ALLOWED ONLY BY ENGINEER'S APPROVAL. TO OBTAIN APPROVAL, SUBMITTALS MUST CLEARLY DEMONSTRATE HOW SUBSTITUTE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

## SHOP FABRICATION NOTES:

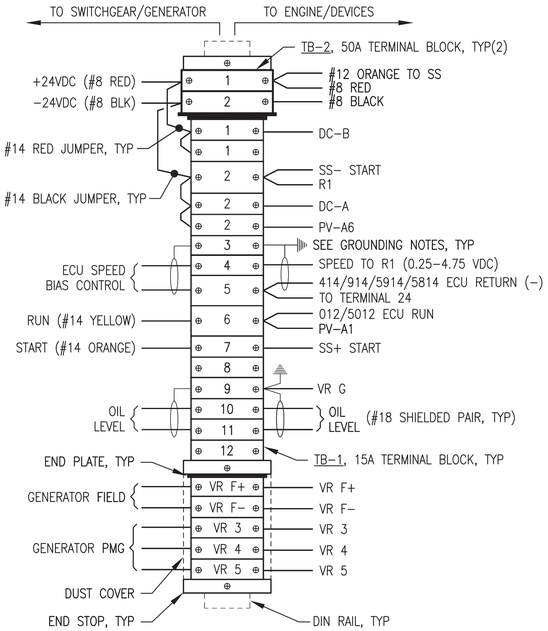
1) PROVIDE ASSEMBLY WITH ALL DEVICES AND WIRING INDICATED.
2) INSTALL IN A NEMA 12 ENCLOSURE WITH MOUNTING FLANGES AT BACK, A MIN 14 GAUGE INTERIOR BACK PANEL AND HINGED LOCKABLE DOOR. SIZE AS INDICATED.
3) PROVIDE DIN RAIL, TERMINAL END PLATES, TERMINAL END STOPS, TERMINAL DUST COVERS AND OTHER MISCELLANEOUS HARDWARE AS REQUIRED TO MATCH TERMINALS. LABEL ALL TERMINALS EXACTLY AS INDICATED ON THE DETAILS.
4) ALL WIRE #14AWG EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE. LABEL BOTH ENDS OF ALL JUMPERS WITH THE ENGINE PANEL TERMINAL NUMBER.
5) PROVIDE MECHANICAL GROUND LUGS FASTENED TO BACK PANEL AND GROUNDED TO ENGINE-GENERATOR. GROUND ALL SHIELD DRAIN WIRES TO LUGS AT PANEL END ONLY.
6) PROVIDE WIRING HARNESSES FOR CONNECTION TO GENERATOR AND TO ENGINE. INSTALL WIRES IN LIQUID TIGHT FLEX OR FLEXIBLE PLASTIC WIRE LOOM AND PROVIDE SERVICE LOOPS IN ACCORDANCE WITH SPECIFICATIONS.
7) SHOP TEST EACH ENGINE-GENERATOR WITH ASSOCIATED JUNCTION BOX PERMANENTLY CONNECTED. UPON COMPLETION OF TESTING, COIL WIRING HARNESSES AND SECURE JUNCTION BOX TO GENERATOR FOR SHIPPING.

## FIELD INSTALLATION NOTES:

1) PERFORM ALL FIELD WIRING IN ACCORDANCE WITH SPECIFICATIONS. LABEL BOTH ENDS OF ALL FIELD WIRING WITH THE ENGINE PANEL TERMINAL NUMBER.
2) ON SHIELDED CONDUCTORS GROUND ALL SHIELD DRAIN WIRES TO LUGS AT PANEL END ONLY.

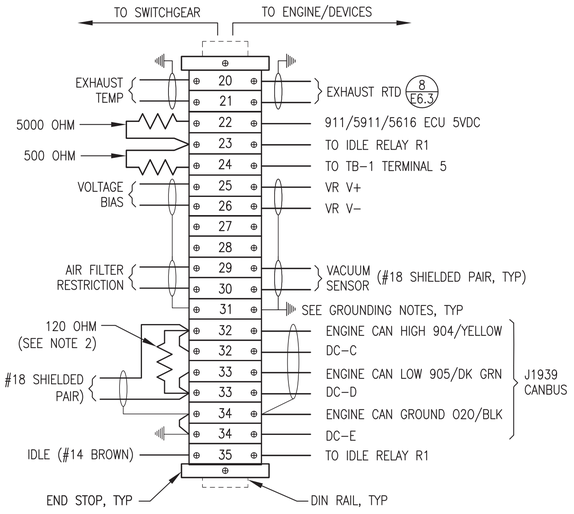



4 E6.3 CIRCUIT BREAKER CONNECTIONS
NO SCALE




NOTE: TYPICAL JOHN DEERE ECU CONNECTION NUMBERS SHOWN. SEE WIRING HARNESS FOR EACH ENGINE FOR ACTUAL ECU CONNECTIONS.

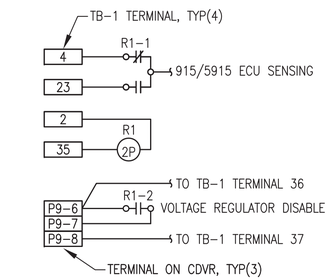
3 E6.3 TERMINAL STRIP CONNECTIONS
NO SCALE



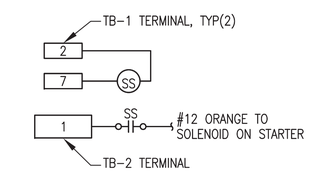

NOTES: 1) ALL RESISTORS 0.25W.
2) REMOVE RESISTOR IF ENGINE WIRING HARNESS HAS 120 OHM END OF LINE RESISTOR.

5 E6.3 TERMINAL STRIP CONNECTIONS
NO SCALE

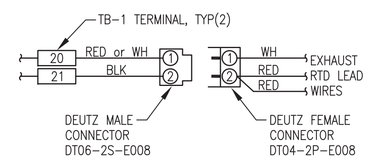
DC-B



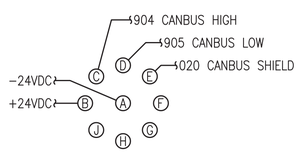

6 E6.3 IDLE RELAY R1 WIRING DIAGRAM
NO SCALE




7 E6.3 STARTER AUX SOLENOID SS WIRING
NO SCALE




8 E6.3 EXHAUST RTD CONNECTOR
NO SCALE




9 E6.3 DIAGNOSTIC CONNECTOR WIRING
NO SCALE

ALASKA ENERGY AUTHORITY

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
24VDC ENGINE WIRING JUNCTION BOX

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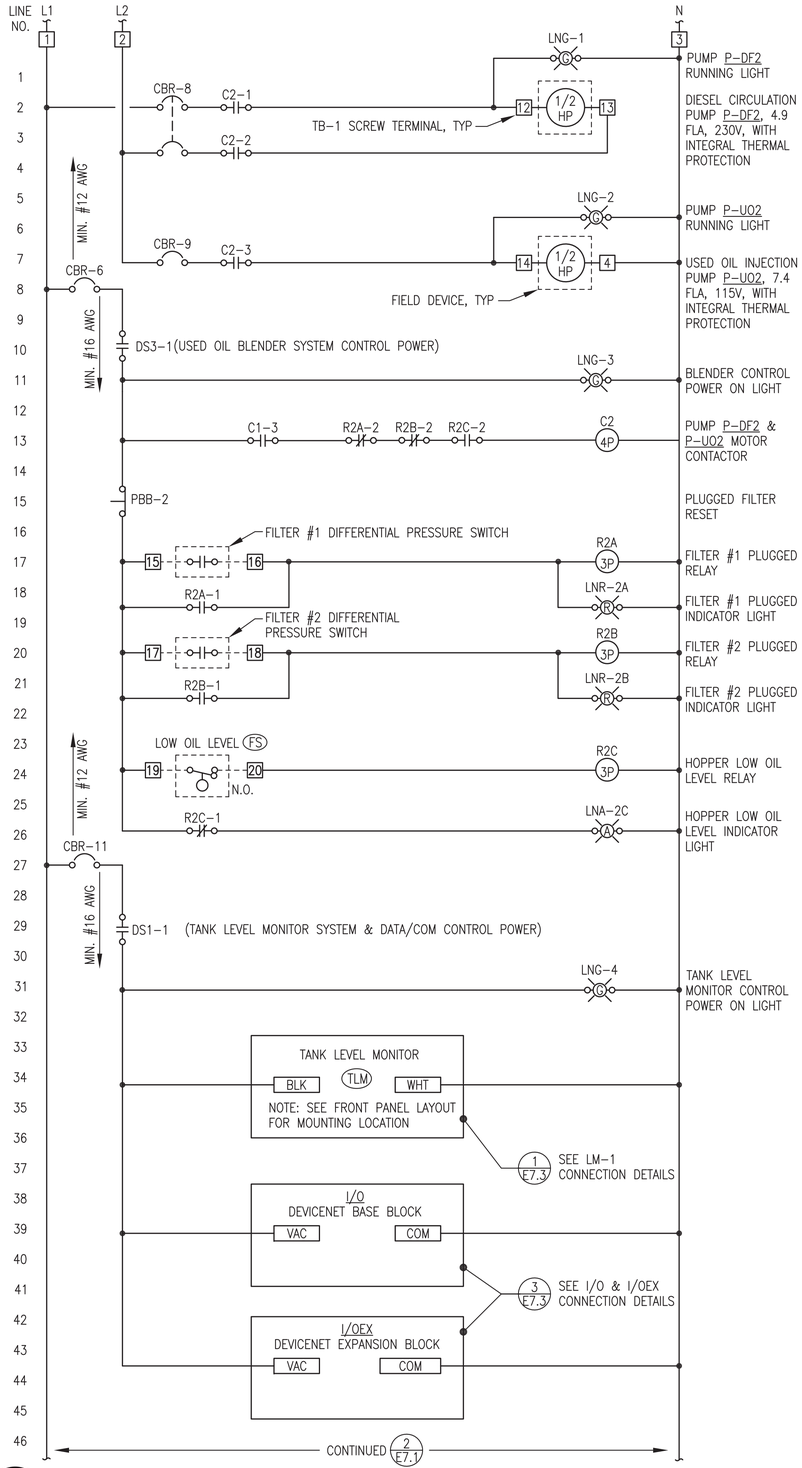
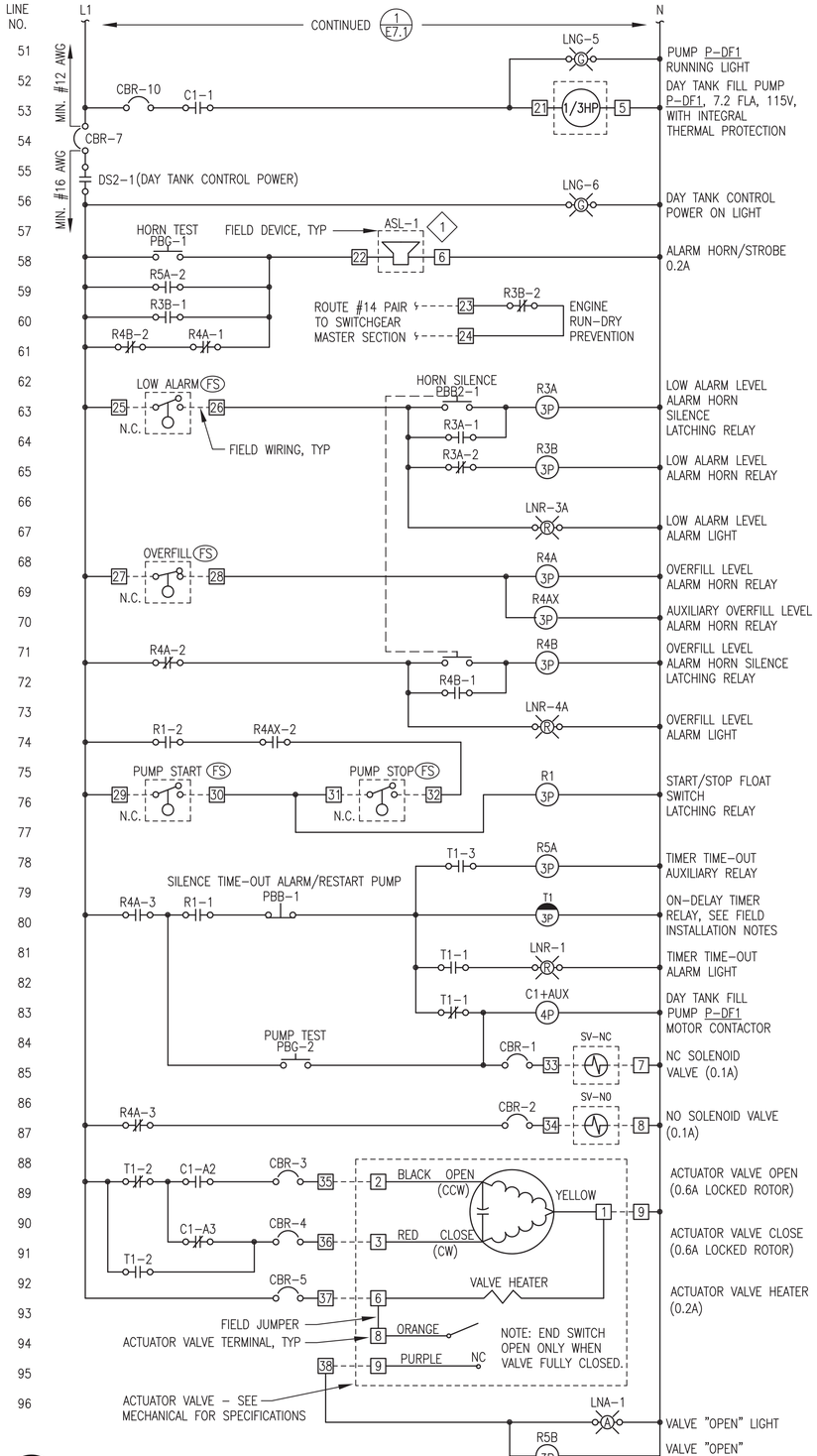



1 E7.1 USED OIL BLENDER SYSTEM LOGIC DIAGRAM

NO SCALE




2 E7.1 DAY TANK LOGIC DIAGRAM

NO SCALE

## BILL OF MATERIALS

NOTE: 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.

| TAG | MANUFACTURER | MODEL | DESCRIPTION |
|---|---|---|---|
| AUX | ALLEN-BRADLEY | 100SA11 | AUXILIARY CONTACT FOR CONTACTOR, 2 POLE, NO, NC |
| C | ALLEN-BRADLEY | 100C23D10 | CONTACTOR, 120V COIL, 23A, 3 POLE WITH 1 NO AUX |
| CBR-1,2,3,4,5 | ALLEN-BRADLEY | 1489-M1-C010 | RAIL-MOUNT CIRCUIT BREAKER, 1 POLE, 1A |
| CBR-6,7,11 | ALLEN-BRADLEY | 1489-M1-C050 | RAIL-MOUNT CIRCUIT BREAKER, 1 POLE, 5A |
| CBR-8 | ALLEN-BRADLEY | 1489-M2-C150 | RAIL-MOUNT CIRCUIT BREAKER, 2 POLE, 15A |
| CBR-9,10 | ALLEN-BRADLEY | 1489-M1-C150 | RAIL-MOUNT CIRCUIT BREAKER, 1 POLE, 15A |
| DS | ALLEN-BRADLEY | 194LE201753 | DISCONNECT, 2 POSITION, 3 N.O., 20A, FACE MOUNT |
| | ALLEN-BRADLEY | 194LHC4E1751 | KNOB ACTUATOR FOR LOAD SWITCH, ON/OFF, LOCKABLE |
| LNG | ALLEN-BRADLEY | 800HQRH2G | GREEN LED PILOT LIGHT, 12-130V, NEMA 4X |
| LNR | ALLEN-BRADLEY | 800HQRH2R | RED LED PILOT LIGHT, 12-130V, NEMA 4X |
| LNA | ALLEN-BRADLEY | 800HQRH2A | AMBER LED PILOT LIGHT, 12-130V, NEMA 4X |
| I/O | ALLEN-BRADLEY | 1790D-T8A0 | 120VAC DEVICENET 8 INPUT BASE TERM. BLOCK |
| I/OEX | ALLEN-BRADLEY | 1790D-T8A0X | 120VAC DEVICENET 8 INPUT EXPANSION TERM. BLOCK |
| PBB | ALLEN-BRADLEY | 800HAR2D2 | MOMENTARY PUSH BUTTON, 1 NO, NEMA 4X, BLACK |
| PBB2 | ALLEN-BRADLEY | 800HAR2A2 | MOMENTARY PUSH BUTTON, 2 NO, NEMA 4X, BLACK |
| PBG | ALLEN-BRADLEY | 800HAR1D1 | MOMENTARY PUSH BUTTON, 1 NO, NEMA 4X, GREEN |
| PP | PHOENIX CONTACTS | FLPPRJ45/RJ45 | ETHERNET PATCH PANEL, RJ45xRJ45, DIN RAIL MOUNT |
| R | ALLEN-BRADLEY | 700HA33A1 | 3PDT RELAY |
| | ALLEN-BRADLEY | 700HN101 | 11 PIN SOCKET BASE |
| T | ALLEN-BRADLEY | 700HT3 | SERIES B TIMING MODULE |
| | ALLEN-BRADLEY | 700HA33A1 | 3PDT RELAY |
| | ALLEN-BRADLEY | 700HN205 | 11 PIN RELAY SOCKET BASE FOR TIMER |
| TB-1,2 | ALLEN-BRADLEY | 1492CAM1L | 35A, 600V, LARGE-HEAD SCREW TERMINALS |
| *TLM | TANK LEVEL MONITOR, SEE INSTRUMENTATION SCHEDULE ON E1.1 | | |

## LEGEND

| | | | |
|---|---|---|---|
| | PANEL WIRING | | FIELD WIRING |
| R# | CONTROL RELAY | R#-# | NORMALLY OPEN CONTACT |
| T# | TIME DELAY RELAY | SS-# | 2-POSITION SELECTOR SWITCH |
| C# | CONTACTOR | R#-# | NORMALLY CLOSED CONTACT |
| # | TERMINAL BLOCK | O.L. | OVERLOADS |
| CB-# | CIRCUIT BREAKER | PB-# | NORMALLY OPEN MOMENTARY PUSH BUTTON |
| SW-# | NORMALLY OPEN FLOAT SWITCH | PB-# | NORMALLY CLOSED MOMENTARY PUSH BUTTON |
| SW-# | NORMALLY CLOSED FLOAT SWITCH | SV# | SOLENOID VALVE |
| | | ASL-# | ALARM & STROBE LIGHT |

ALASKA ENERGY AUTHORITY

STATE OF ALASKA 49TH ENGINEER CHRISTOPHER W. WILLIAMS LICENSED PROFESSIONAL ENGINEER LE 7802

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**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**

FUEL SYSTEM CONTROL PANEL
LOGIC DIAGRAM & BILL OF MATERIALS

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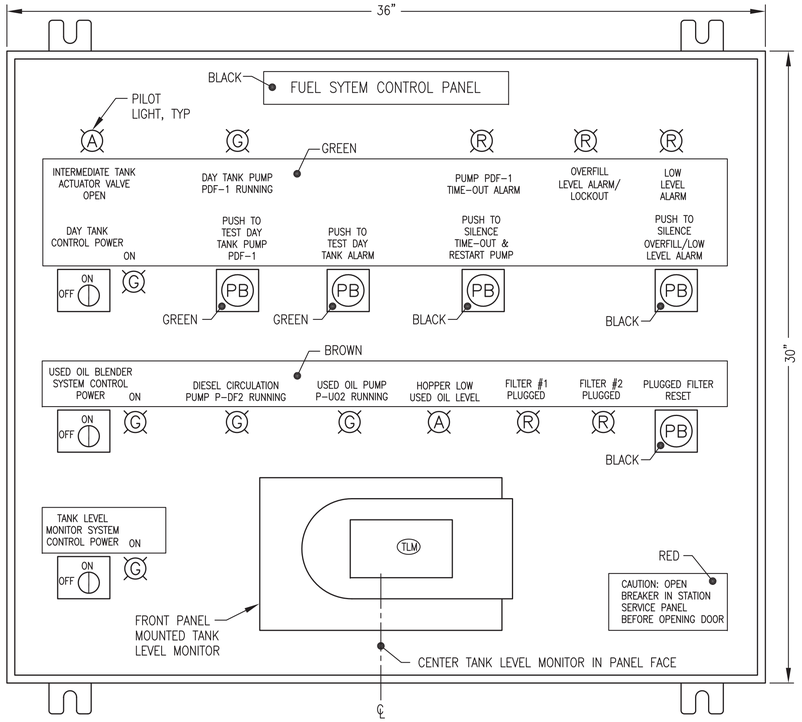
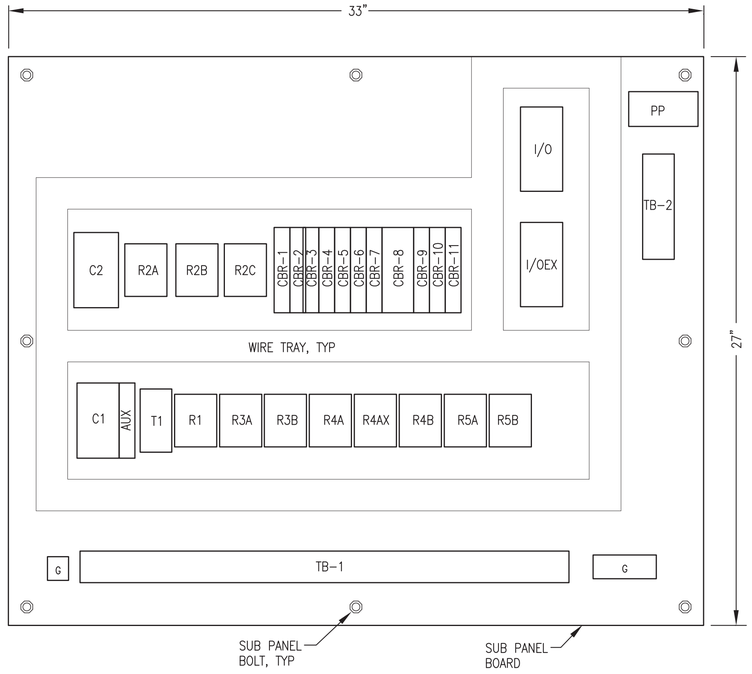
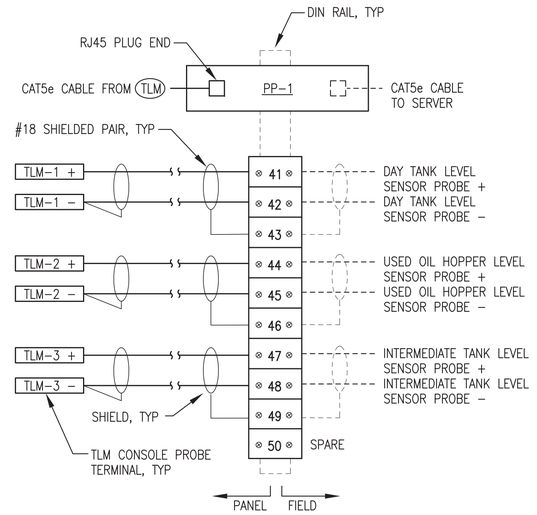


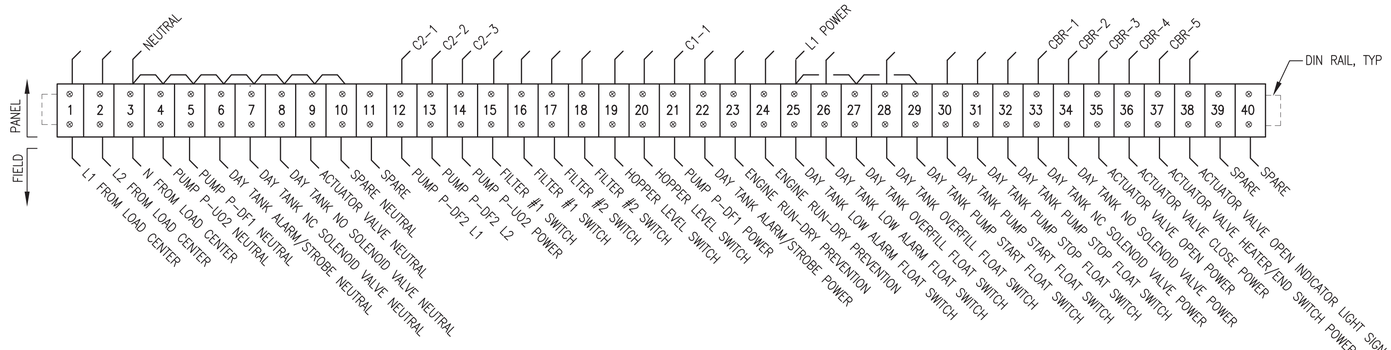

NOTES:

1. INSTALL TERMINAL STRIP TB-2 AND ETHERNET PATCH PANEL PP-1 ON VERTICAL DIN RAIL AS SHOWN. LOCATE TERMINAL STRIP IN THE UPPER RIGHT CORNER OF PANEL TO ACCOMMODATE CONDUCTOR ENTRY THROUGH RIGHT SIDE OF PANEL, SEE SUB-PANEL LAYOUT.

1 E7.2 FRONT PANEL LAYOUT
NO SCALE

2 E7.2 SUB PANEL LAYOUT
NO SCALE

3 E7.2 TB-2 TERM STRIP & PP-1 ENTHERNET PANEL LAYOUT
NO SCALE




NOTES:

1) INSTALL TERMINAL STRIP TB-1 ON HORIZONTAL DIN RAIL AS SHOWN. LOCATE TERMINAL STRIP BELOW PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO BOTTOM OF PANEL, SEE SUB-PANEL LAYOUT.

2) IN ADDITION TO THE TERMINAL STRIPS SHOWN, PROVIDE 6 EACH 35A SCREW TERMINAL GROUNDING BUS.

4 E7.2 TB-1 TERMINAL STRIP LAYOUT
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA
CHRISTOPHER W. WILLIAMSON
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**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

FUEL SYSTEM CONTROL PANEL LAYOUT & TERMINAL STRIPS

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E7.2

## PANEL NOTES:

1) PROVIDE COMPLETE LISTED PANEL ASSEMBLY WITH ALL DEVICES INDICATED IN LOGIC DIAGRAM EXCEPT FOR FIELD DEVICES. INSTALL IN A NEMA 12 ENCLOSURE WITH 4 EACH INTEGRAL MOUNTING LUGS AT BACK. SEE SHEET E7.2 FOR PANEL LAYOUT DETAILS.

2) USE MIN #12 WIRE FOR ALL CIRCUITS UP TO FIRST IN-LINE PANEL BREAKERS (FOR 20A FEED). USE MIN #16 AWG ON ALL 5 AMP CIRCUITS AND MIN #14 AWG WIRE ON ALL 15A CIRCUITS. TAG EACH END OF ALL JUMPERS WITH DEVICE OR TERMINATION DESIGNATOR OF LANDING OF OPPOSITE END OF JUMPER (REVERSE ADDRESS).

3) LABEL ALL PANEL DEVICES ON BASE OR BACK PANEL ADJACENT TO ITEM. LABEL REMOTE EQUIPMENT CONNECTIONS AT EACH TERMINAL BLOCK BY THE ITEM TITLE AS SHOWN ON THE FIELD SIDE OF THE TERMINAL STRIP DRAWING. PROVIDE BEVELED EDGE WHITE CORE NAMEPLATES AS SHOWN ON THE PANEL FACE LAYOUT AND SECURE TO PANEL FACE WITH A MINIMUM OF TWO STAINLESS STEEL MOUNTING SCREWS, COLOR AS INDICATED.

4) BENCH TEST COMPLETED UNIT. PROVIDE MIN 48 HOURS NOTICE TO ENGINEER TO SCHEDULE OBSERVATION OF BENCH TEST. PROVIDE SWITCHES AND LAMPS TO SIMULATE OPERATION OF ALL FIELD DEVICES.

5) DEVICES AND WIRING NOTED AS "FIELD" AND SHOWN WITH DASHED LINES WILL BE FIELD INSTALLED AND ARE NOT PART OF THE PANEL SHOP FABRICATION. FOR BENCH TEST, PROVIDE TEMPORARY DEVICES AND WIRING AS REQUIRED TO SIMULATE FIELD DEVICES.

6) POWER TO PANEL PROVIDED FROM DEDICATED 20A 2-POLE CIRCUIT BREAKER IN LISTED LOAD CENTER. SEE FIELD INSTALLATION NOTE #3.

## FIELD INSTALLATION NOTES:

1) SEE MECHANICAL FOR DAY TANK INSTALLATION & PIPING. INSTALL CONTROL PANEL & FIELD DEVICES AS INDICATED TO PROVIDE REDUNDANT HIGH & LOW LIMIT CONTROLS & OVERFILL PROTECTION.

2) FIELD WIRING TO FLOAT SWITCHES, SOLENOID VALVES, ACTUATOR VALVE, & ALARM HORN #14 AWG. ALL OTHER FIELD WIRING #12 AWG. LABEL BOTH ENDS OF ALL CONDUCTORS WITH CONTROL PANEL TERMINAL BLOCK TERMINATION NUMBERS. WHEN NOT IN CONDUIT, MAKE JACKETED COM CABLE ENCLOSURE ENTRIES WITH CABLE GLAND CONNECTORS.

3) PERFORM ALL FIELD WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS ON SHEET E2. PROVIDE POWER TO DAY TANK PANEL FROM DEDICATED 20A 2-POLE CIRCUIT BREAKER IN STATION SERVICE PANELBOARD.

4) VERIFY THAT ALL DAY TANK FLOAT SWITCHES ARE ORIENTED FOR N.C. (OPEN ON RISE) OPERATION PRIOR TO INSTALLATION. ALL FLOATS SHOWN ON LOGIC DIAGRAM WITH TANK AT FULL (PUMP STOP) LEVEL. VERIFY THAT THE HOPPER FLOAT SWITCH IS ORIENTED FOR N.O. (CLOSE ON RISE) OPERATION.

5) FILL PUMP CAVITIES WITH LUBE OIL PRIOR TO INITIAL OPERATION. VERIFY PROPER ROTATION OF PUMPS. PRIME SYSTEM WITH HAND PRIMING PUMP PRIOR TO BEGINNING DAY TANK FILL.

6) FIELD TEST COMPLETED UNIT TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. MANIPULATE FLOAT SWITCHES BY REACHING IN THROUGH ADJACENT 4" BUNG. TEMPORARILY SET TIMING RELAY TO 30 SECONDS TO VERIFY TIME-OUT AND RESET FUNCTIONS.

7) SET TIMING RELAY TIME DELAY TO 30 MINUTES (APPROX. 55 GALS. REQUIRED FROM PUMP START TO PUMP STOP LEVEL @ APPROX. 4 GPM). ON THE INITIAL TANK FILL, THE PUMP TEST/RESET BUTTON MAY HAVE TO BE MANUALLY RESET IN ORDER TO GET THE FUEL LEVEL TO WITHIN THE NORMAL OPERATING RANGE. SEE SEQUENCE OF OPERATIONS.

## DAY TANK FILL SEQUENCE OF OPERATIONS:

1) WHEN THE DAY TANK CIRCUIT BREAKER AND CONTROL POWER SWITCH ARE CLOSED, THE POWER LIGHT IS ON AND POWER IS PROVIDED TO THE REMOTE ACTUATOR VALVE HEATER/OPEN LIGHT CIRCUIT.

2) WHEN THE DAY TANK IS NOT CALLING FOR FUEL, POWER IS PROVIDED TO THE REMOTE ACTUATOR VALVE CLOSE CIRCUIT. WHEN THE ACTUATOR IS IN THE FULLY CLOSED POSITION, THE CLOSING CIRCUIT IS BROKEN BY INTERNAL ACTUATOR LIMIT SWITCH #2 AND THE REMOTE ACTUATOR VALVE "OPEN" LIGHT IS OFF.

3) NORMAL FILL OPERATION – WHEN THE FUEL LEVEL DROPS TO THE "PUMP START" SWITCH, THE TIMER IS STARTED, THE N.C. DAY TANK SOLENOID VALVE OPENS, THE REMOTE ACTUATOR VALVE OPENS & THE VALVE "OPEN" LIGHT TURNS ON, THE DAY TANK PUMP IS ENERGIZED, THE PUMP "ON" LIGHT TURNS ON, AND THE USED OIL BLENDER RUN SIGNAL DRY CONTACT CLOSES. WHEN THE ACTUATOR IS IN THE FULLY OPEN POSITION, THE OPENING CIRCUIT IS BROKEN BY INTERNAL ACTUATOR LIMIT SWITCH #7 AND THE REMOTE ACTUATOR VALVE "OPEN" LIGHT REMAINS ON. WHEN FUEL REACHES THE "PUMP STOP" FLOAT SWITCH BEFORE THE TIMER TIMES-OUT, THE TIMER IS RESET, THE N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE REMOTE ACTUATOR VALVE "OPEN" LIGHT TURNS OFF, THE PUMP DE-ENERGIZES, THE PUMP "ON" LIGHT TURNS OFF, AND THE USED OIL BLENDER RUN SIGNAL DRY CONTACT OPENS.

4) TIMER OPERATION – IF THE TIMER TIMES-OUT THE N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE REMOTE ACTUATOR VALVE "OPEN" LIGHT TURNS OFF, THE PUMP DE-ENERGIZES, THE PUMP "ON" LIGHT TURNS OFF, THE USED OIL BLENDER RUN SIGNAL DRY CONTACT OPENS, THE "TIME-OUT" ALARM LIGHT TURNS ON, AND THE TIME-OUT ALARM HORN SOUNDS. PRESSING THE "TIME-OUT ALARM SILENCE / PUMP RESTART" BUTTON RESETS THE TIMER, SILENCES THE ALARM HORN, AND STARTS THE NORMAL FILL OPERATION. SEE FIELD INSTALLATION NOTES FOR TIMER SETTING.

5) OVERFILL FUEL LEVEL – IF THE TANK OVERFILLS AND THE FUEL LEVEL REACHES THE "OVERFILL" FLOAT SWITCH, THE N.O. DAY TANK SOLENOID VALVE CLOSES, THE "OVERFILL LEVEL" ALARM LIGHT TURNS ON, THE N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE VALVE "OPEN" LIGHT TURNS OFF, THE PUMP DE-ENERGIZES, THE PUMP "ON" LIGHT TURNS OFF, THE USED OIL BLENDER RUN SIGNAL DRY CONTACT OPENS, THE "OVERFILL LEVEL" ALARM LIGHT TURNS ON, AND THE ALARM HORN SOUNDS. PRESSING THE LEVEL ALARM HORN "SILENCE" BUTTON SILENCES THE ALARM HORN WHILE LEAVING THE "OVERFILL LEVEL" ALARM LIGHT ON. WHEN THE FUEL LEVEL FALLS BELOW THE "OVERFILL" FLOAT SWITCH, THE "OVERFILL LEVEL" ALARM LIGHT TURNS OFF, THE N.O. DAY TANK SOLENOID VALVE OPENS AND THE ALARM HORN TURNS OFF (IF NOT PREVIOUSLY SILENCED). WHEN THE FUEL LEVEL REACHES THE "PUMP START" FLOAT SWITCH, THE NORMAL FILL OPERATION IS REPEATED.

6) LOW FUEL LEVEL – IF THE FUEL LEVEL FALLS BELOW THE "LOW ALARM" FLOAT SWITCH, THE "LOW FUEL LEVEL" ALARM LIGHT TURNS ON, THE ENGINE RUN-DRY PREVENTION DRY CONTACT OPENS, AND THE ALARM HORN SOUNDS. THE LEVEL ALARM HORN "SILENCE" BUTTON SILENCES THE ALARM HORN WHILE LEAVING THE "LOW FUEL LEVEL" ALARM LIGHT ON. WHEN THE FUEL LEVEL RISES ABOVE THE "LOW ALARM" FLOAT SWITCH THE "LOW FUEL LEVEL" ALARM LIGHT TURNS OFF, THE ENGINE RUN-DRY PREVENTION DRY CONTACT CLOSES, AND THE ALARM HORN TURNS OFF (IF NOT PREVIOUSLY SILENCED).

7) PUMP & HORN TEST – MOMENTARY CONTACT BUTTONS ARE PROVIDED TO TEST FUNCTION OF THE DAY TANK PUMP AND ALARM HORN. PRESSING THE "PUSH TO TEST DAY TANK PUMP" BUTTON STARTS THE TIMER, MOMENTARILY OPENS THE N.C. DAY TANK SOLENOID VALVE & ACTUATED BALL VALVE, ENERGIZES THE DAY TANK PUMP, TURNS ON THE DAY TANK PUMP "RUNNING" LIGHT AND CLOSES THE USED OIL BLENDER RUN SIGNAL DRY CONTACT. THE "PUSH TO TEST DAY TANK PUMP" BUTTON IS LOCKED OUT IF THE DAY TANK IS AT THE OVERFILL LEVEL. PRESSING THE "PUSH TO TEST DAY TANK ALARM" BUTTON MOMENTARILY ENERGIZES THE ALARM HORN/STROBE.

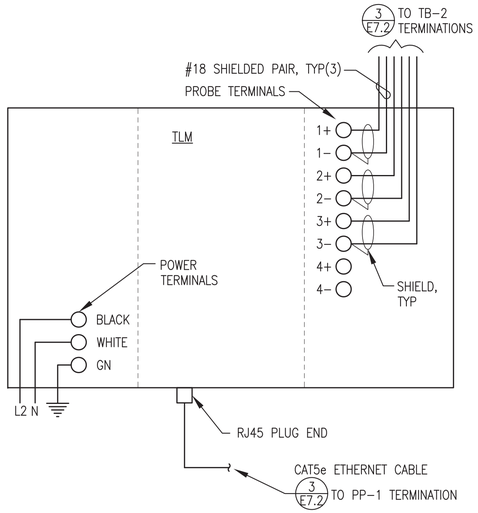
## USED OIL BLENDER SYSTEM SEQUENCE OF OPERATIONS:

1) WHEN THE BLENDER CIRCUIT BREAKER AND CONTROL POWER SWITCH ARE CLOSED; THE GREEN POWER LIGHT IS ON AND POWER IS PROVIDED TO ALL CONTROL DEVICES.

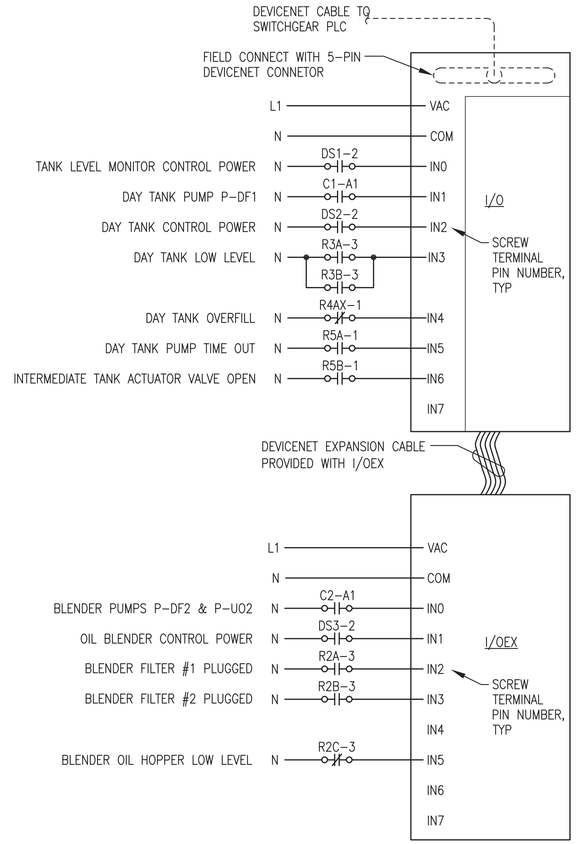
2) NORMAL OPERATION – WHENEVER THE DAY TANK FILL SEQUENCE IS INITIATED, BOTH THE DIESEL CIRCULATING PUMP P-DF2 AND THE USED OIL INJECTION PUMP P-UO2 RUN AND THE ASSOCIATED GREEN PUMP RUNNING LIGHTS ARE ON.

3) PLUGGED FILTER – IF THE DIFFERENTIAL PRESSURE ACROSS A FILTER REACHES THE ALARM SETPOINT, BOTH PUMPS STOP RUNNING AND THE RED FILTER PLUGGED LIGHT FOR THE ASSOCIATED FILTER TURNS ON. THE ALARM LATCHES AND THE SYSTEM WILL NOT OPERATE UNTIL THE PROBLEM IS CORRECTED. AFTER THE FILTER ELEMENT HAS BEEN CHANGED THE BLACK RESET BUTTON MUST BE PRESSED TO RESUME NORMAL OPERATION.

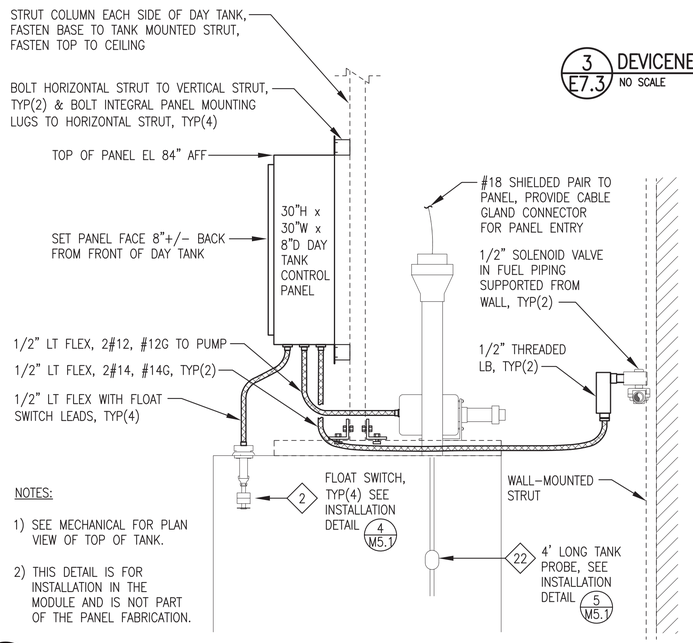
4) HOPPER LOW OIL LEVEL – WHEN THE OIL LEVEL FALLS BELOW THE LOW LEVEL FLOAT SWITCH, BOTH PUMPS STOP RUNNING AND THE AMBER HOPPER LOW OIL LEVEL LIGHT TURNS ON. THE SYSTEM WILL NOT OPERATE UNTIL THE USED OIL LEVEL IN THE HOPPER RISES ABOVE THE LOW LEVEL. RESET IS NOT REQUIRED.




1 E7.3 TANK LEVEL MONITOR (TLM) CONSOLE CONNECTIONS
NO SCALE




3 E7.3 DEVICENET TERMINAL BLOCKS (I/O & I/OEX) CONNECTIONS
NO SCALE




2 E7.3 DAY TANK CONTROL PANEL & DEVICE INSTALLATION
NO SCALE

ALASKA ENERGY AUTHORITY

STATE OF ALASKA
JAMES T. DUNKER
LICENSED PROFESSIONAL ENGINEER
LE 7802
REGISTERED PROFESSIONAL ENGINEER

CRW ENGINEERING GROUP LLC
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Gray Stassel Engineering, Inc.
PHONE: (907) 349-0100

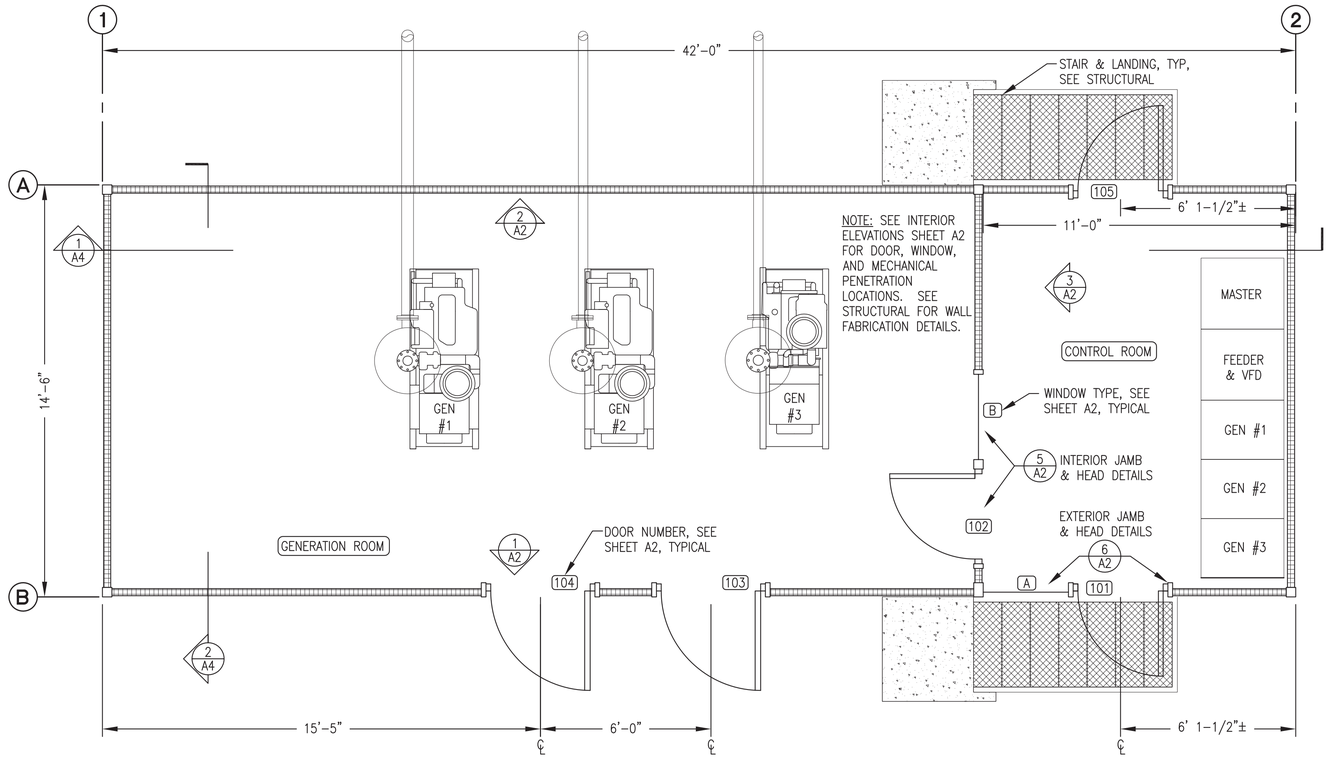
**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**

FUEL SYSTEM CONTROL PANEL SEQUENCE OF OPERATIONS & DETAILS

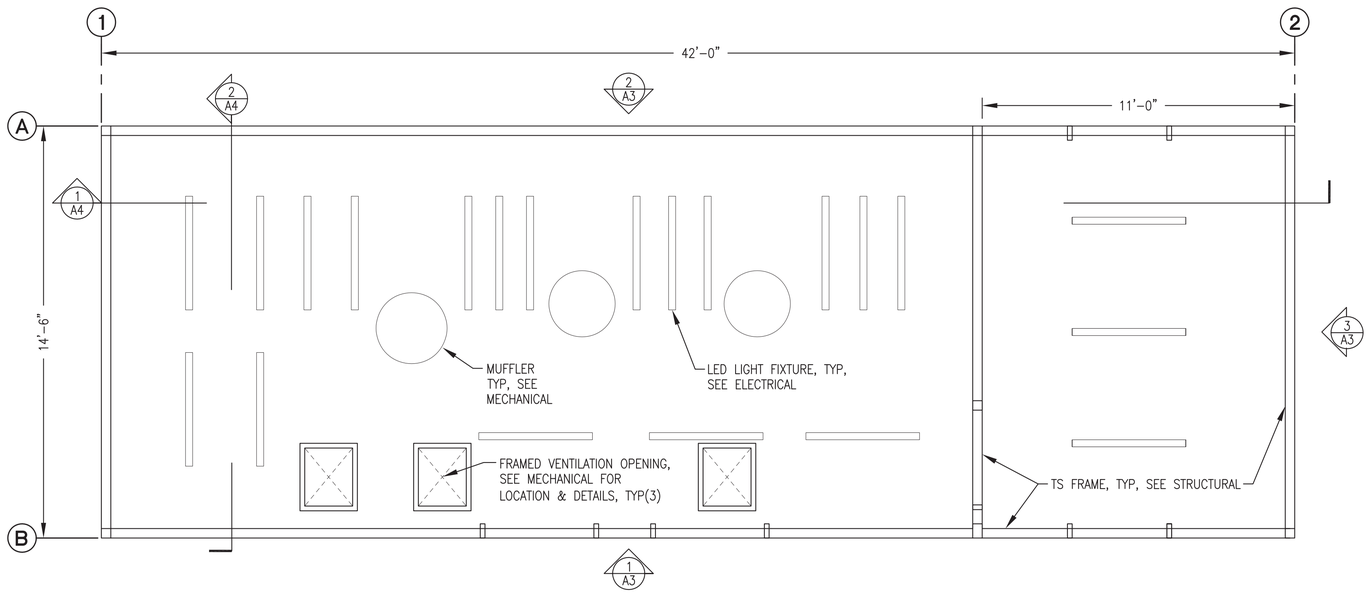
| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | CWV | 1/6/20 |

Plot Date 1/6/20
Designed CWV/BCG
Drawn JTD
Approved CWV

Sheet No.
E7.3




1 A1 FLOOR PLAN
3/8"=1'-0"




2 A1 REFLECTED CEILING PLAN
3/8"=1'-0"

## CODE ANALYSIS – 2012 EDITION INTERNATIONAL BUILDING CODE

OCCUPANCY CLASSIFICATION
GROUP F-1: FACTORY INDUSTRIAL MODERATE HAZARD – ELECTRIC GENERATION PLANT — REF: IBC-2012, SEC. 306.2

TYPE OF CONSTRUCTION — REF: IBC-2012, TABLE 601
TYPE V-B (NON-RATED) — REF: IBC-2012, SEC. 602.5

BUILDING HEIGHTS AND AREAS — REF: IBC-2012, TABLE 503
ALLOWED 40'-0" 1 STORY 8,500 S.F. PROVIDED: 17'-0" 1 STORY 610 S.F.

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS — REF: IBC-2012, TABLE 601
STRUCTURAL FRAME 0 HR BEARING WALLS 0 HR INTERIOR PARTITIONS 0 HR FLOOR 0 HR ROOF 0 HR

FIRE RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS — REF: IBC-2012, TABLE 602
EXTERIOR WALLS $10' \leq X \leq 30'$ 0 HR

FIRE PROTECTION SYSTEM — REF: IBC-2012, SEC. 903.2.4
FIRE PROTECTION NOT REQUIRED. WATER MIST FIRE SUPPRESSION SYSTEM PROVIDED (SEE MECHANICAL).

OCCUPANT LOAD — REF: IBC-2012, TABLE 1004.1.2
MECHANICAL/STORAGE = 300 S.F./PERSON 610 S.F./300 S.F. PER OCCUPANT = 2 OCCUPANTS

MEANS OF EGRESS – TRAVEL DISTANCE — REF: IBC-2012, TABLE 1016.2
REQUIRED 200' PROVIDED 20'

## ARCHITECTURAL GENERAL NOTES:

1) SEE CIVIL SITE PLAN FOR LOCATION AND LAYOUT. PROVIDE SEPARATION TO PROPERTY BOUNDARIES IN ACCORDANCE WITH CODE ANALYSIS.
2) PROVIDE A COMPLETE AND OPERATIONAL FACILITY. ALL WORK TO BE IN ACCORDANCE WITH CURRENT APPROVED EDITIONS OF THE IBC, IMC, IFC, AND NEC INCLUDING STATE OF ALASKA AMENDMENTS.
3) SEE SHEET A2 FOR DOOR AND WINDOW DETAILS AND SCHEDULE. SEE SHEETS A3 AND A4 FOR DESCRIPTION OF FIELD INSTALLED ROOF SYSTEM.
4) INSULATE ALL WALLS, FLOORS, AND CEILINGS WITH HIGH TEMPERATURE MINERAL FIBER ACOUSTICAL FIRE BATT INSULATION, MIN R VALUE 4 PER INCH, MIN 2000F MELTING TEMP. ROXUL AFB OR EQUAL. FILL ALL PANEL VOIDS OR PROVIDE THICKNESS AS INDICATED ON DRAWINGS. MECHANICALLY FASTEN FLOOR INSULATION TIGHT TO FLOOR.
5) UPON COMPLETION OF FABRICATION ROUND ALL CORNERS AND GRIND EDGES SMOOTH AND PAINT ALL INTERIOR AND EXTERIOR EXPOSED STEEL. PERFORM ALL PAINTING IN A WARM DRY ENVIRONMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INCLUDING DRYING TIME TO RE-COAT.
6) SANDBLAST EXTERIOR SURFACE TO SSPC-SP-10. PRIME WITH ONE COAT OF REINFORCED INORGANIC ZINC PRIMER, DEVOE CATHA-COAT 302 OR APPROVED EQUAL, COLOR GREEN, TO 3 MILS DRY FILM THICKNESS. COVER WITH TWO COATS OF EPOXY, DEVOE BAR-RUST 236 OR APPROVED EQUAL, TO 12 MILS DRY FILM THICKNESS. FIRST COAT COLOR GRAY, SECOND COAT COLOR WHITE.
7) FINISH EXTERIOR WALLS AND SKIDS (ALL EXPOSED VERTICAL EXTERIOR SURFACES) WITH ONE COAT OF ALIPHATIC URETHANE ENAMEL, DEVOE DEVTHANE 389 OR APPROVED EQUAL, COLOR WHITE, TO 3 MILS DRY FILM THICKNESS.
8) SANDBLAST INTERIOR SURFACE TO SSPC-SP-6. PRIME AND FINISH WITH TWO COATS OF EPOXY, SHERWIN WILLIAMS MACROPOXY 646 OR APPROVED EQUAL, TO 8 MILS TOTAL DRY FILM THICKNESS. CEILING COLOR WHITE. WALL AND FLOOR COLOR STRUCTURAL GRAY 4031. NOTE THAT FIRST COAT ON WALLS AND FLOOR MAY BE WHITE.

NOTE: THIS DRAWING INCLUDES DETAILS THAT ARE NOT PART OF THE MODULE ASSEMBLY SCOPE AND IS PROVIDED STRICTLY FOR IDENTIFYING LOCATIONS, INSTALLATION DETAILS, AND SPECIFICATIONS FOR DOORS AND WINDOWS.

ALASKA ENERGY AUTHORITY

STATE OF ALASKA — 49 THI — David G. Thompson — 7034 — 11/5/19 — REGISTERED PROFESSIONAL ENGINEER

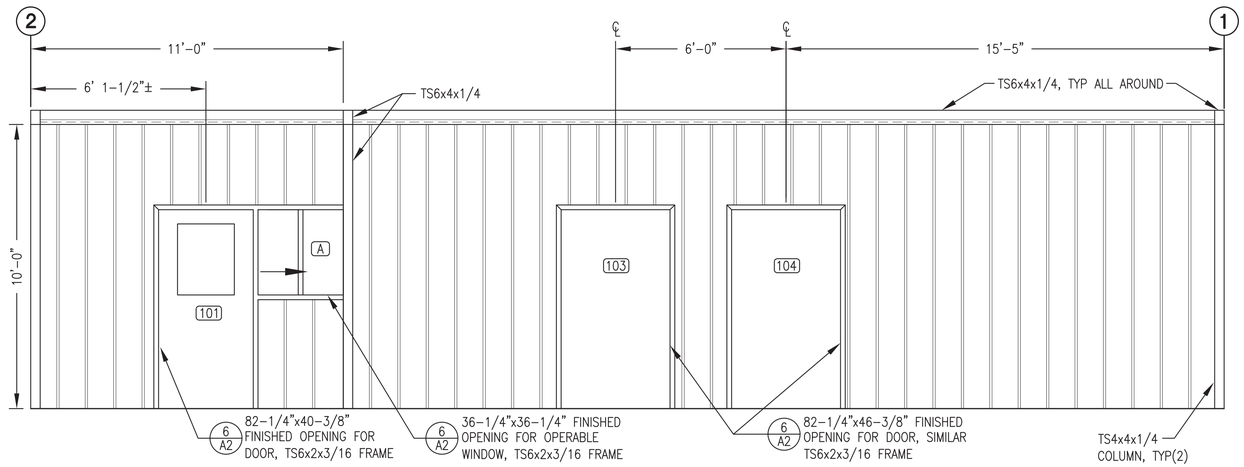
CRW ENGINEERING GROUP LLC — PHONE: (907) 562-3252
Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**
**POWER SYSTEM UPGRADE PROJECT**
FLOOR PLAN, REFLECTED CEILING PLAN, CODE ANALYSIS, & GENERAL NOTES

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |
| 1 | REVISED PAINT SPECIFICATIONS | BCG | 11/5/19 |

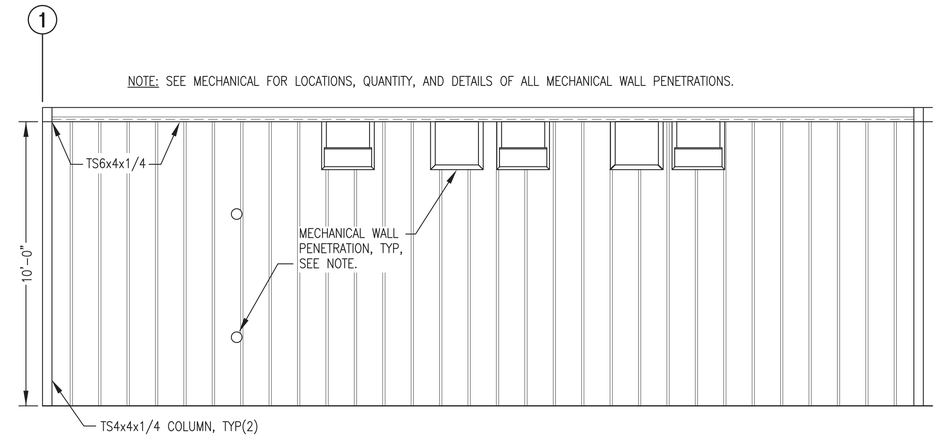
Plot Date 11/5/19
Designed DGT/BCG
Drawn JTD
Approved DGT

Sheet No. A1




## 1 A2 FRONT WALL INTERIOR ELEVATION

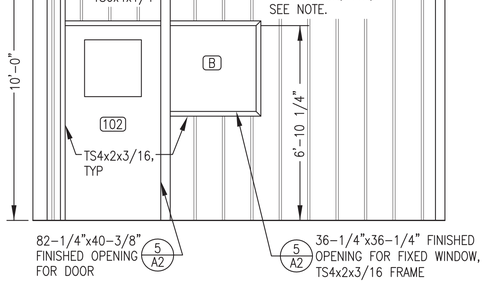
3/8"=1'-0"




## 2 A2 PARTIAL GENERATOR ROOM BACK WALL INTERIOR ELEVATION

3/8"=1'-0"

NOTE: SEE MECHANICAL FOR LOCATIONS, QUANTITY, AND DETAILS OF ALL MECHANICAL WALL PENETRATIONS.




## 3 A2 CONTROL ROOM WALL INTERIOR ELEVATION

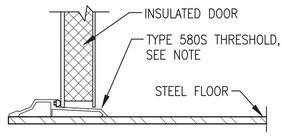
3/8"=1'-0"

### FRAMED OPENING NOTES:

1) FABRICATE FRAMED OPENINGS FOR DOORS, WINDOWS, ETC, WITH MITERED CORNERS AND FULL PENETRATION GROOVE WELDS. GRIND OUT INSIDE OF MITERED CORNERS TO PROVIDE FULL CLEAR OPENING.

2) FABRICATE TO FINISHED INSIDE (CLEAR) DIMENSIONS INDICATED AND LOCATE TO INSIDE EDGE OR CENTERLINE AS INDICATED.

NOTE: SET THRESHOLD IN CONTINUOUS BED OF POLYURETHANE CAULK & CAULK ENDS TO JAMB TO FORM LIQUID TIGHT CONTAINMENT.




## 4 A2 TYPICAL DOOR THRESHOLD

NO SCALE

| DOOR CONSTRUCTION | | | | | | | FRAME CONSTRUCTION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DOOR NO. | WIDTH | HEIGHT | THICK NESS | MATERIAL | CORE | REMARKS | WALL THICK. | MATERIAL | TYPE | PROFILE | PREP. | FIRE RATING | HDWR. GROUP |
| 101 | 3'-0" | 6'-8" | 1-3/4" | 16 GA. H.M. | POLYURETHANE | 24"x24" RE-LIGHT {4} | N/A | 16 GA. H.M. | WELDED | SINGLE RABBETED | DIMPLE & PUNCH | NONE | HW-1 |
| 102 | 3'-0" | 6'-8" | 1-3/4" | 16 GA. H.M. | POLYURETHANE | 24"x24" RE-LIGHT {4} | N/A | 16 GA. H.M. | WELDED | SINGLE RABBETED | DIMPLE & PUNCH | NONE | HW-2 |
| 103 | 3'-6" | 6'-8" | 1-3/4" | 16 GA. H.M. | POLYURETHANE | | N/A | 16 GA. H.M. | WELDED | SINGLE RABBETED | DIMPLE & PUNCH | NONE | HW-3 |
| 104 | 3'-6" | 6'-8" | 1-3/4" | 16 GA. H.M. | POLYURETHANE | | N/A | 16 GA. H.M. | WELDED | SINGLE RABBETED | DIMPLE & PUNCH | NONE | HW-3 |
| 105 | 3'-0" | 6'-8" | 1-3/4" | 16 GA. H.M. | POLYURETHANE | 24"x24" RE-LIGHT {4} | N/A | 16 GA. H.M. | WELDED | SINGLE RABBETED | DIMPLE & PUNCH | NONE | HW-1 |

### DOOR HARDWARE:

HW-1

| | | | |
|---|---|---|---|
| 3 EA | HINGES | HAGER | BB1191 4.5 x 4.5NRP x 630 |
| 1 EA | EXIT DEVICE | PRECISION | 2108 x 4908AX3 x 630 |
| 1 EA | CORE | BEST | BROWN CONSTRUCTION CORE |
| 1 EA | DOOR CLOSER | LCN | 4040 x CUSH x 689 |
| 1 EA | KICK PLATE | ROCKWOOD | K1050 10 x 34 x 630 |
| 1 EA | WEATHER STRIP | PEMKO | 2891AS x 36 (HEAD) |
| 2 EA | WEATHER STRIP | PEMKO | 290AS x 80 (SIDE JAMBS) |
| 1 EA | THRESHOLD | HAGER | 580S x 36 |

HW-2

| | | | |
|---|---|---|---|
| 3 EA | HINGES | HAGER | BB1191 4.5 x 4.5 x 630 |
| 1 EA | EXIT DEVICE | PRECISION | 2108 x 4908AX3 x 630 |
| 1 EA | DOOR CLOSER | LCN | 4040 x CUSH x 689 |
| 1 EA | KICK PLATE | ROCKWOOD | K1050 10 x 34 x 630 |
| 1 EA | MOP PLATE | ROCKWOOD | K1050 10 x 35 x 630 |
| 1 EA | SOUND SEAL | PEMKO | 2891AS x 36 (HEAD) |
| 2 EA | SOUND SEAL | PEMKO | 290AS x 80 (SIDE JAMBS) |
| 1 EA | THRESHOLD | HAGER | 580S x 36 |

HW-3

| | | | |
|---|---|---|---|
| 3 EA | HINGES | HAGER | BB1191 4.5 x 4.5NRP x 630 |
| 1 EA | EXIT LOCK | SCHLAGE | ND25D x RHODES x 626 |
| 1 EA | OVERHEAD STOP | ROCKWOOD | OH1004M x US32D |
| 1 EA | WEATHER STRIP | PEMKO | 2891AS x 42 (HEAD) |
| 2 EA | WEATHER STRIP | PEMKO | 290AS x 80 (SIDE JAMBS) |
| 1 EA | THRESHOLD | HAGER | 580S x 42 |

NOTES:

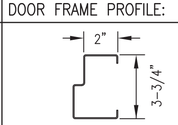
{1} DOORS AND HOLLOW METAL FRAMES GALVANIZED AND FACTORY PRIMED. ALL FRAMES WELDED CONSTRUCTION, DIMPLED AND PUNCHED.

{2} DOORS TO HAVE SOLID POLYURETHANE INSULATION CORE WITH TOPS INVERTED AND CAULKED WATER TIGHT.

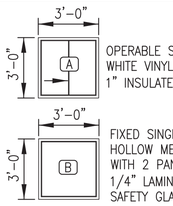
{3} FINISH ALL DOORS AND HOLLOW METAL FRAMES WITH TWO COATS OF PAINT IDENTICAL TO INTERIOR WALLS AND FLOORS AS SPECIFIED ON SHEET A1.

{4} INSTALL INSULATED RE-LIGHT WITH TWO PANES OF 1/4" LAMINATED SAFETY GLASS WITH 1/2" AIR GAP IN EACH DOOR PANEL, 24"x24" OR 24"x18" AS INDICATED.

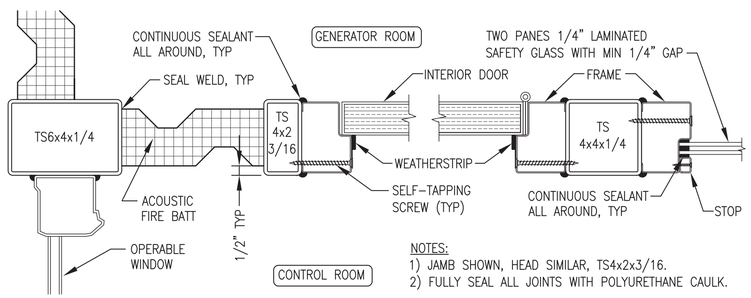
### DOOR FRAME PROFILE:




### WINDOW TYPES:



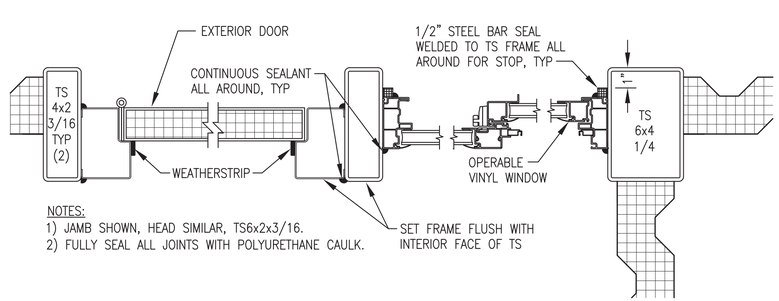

NOTE: DIMENSIONS ARE OVERALL FRAME SIZE.




NOTES:
1) JAMB SHOWN, HEAD SIMILAR, TS4x2x3/16.
2) FULLY SEAL ALL JOINTS WITH POLYURETHANE CAULK.

## 5 A2 INTERIOR DOOR AND WINDOW JAMB/HEAD

3"=1'-0"




NOTES:
1) JAMB SHOWN, HEAD SIMILAR, TS6x2x3/16.
2) FULLY SEAL ALL JOINTS WITH POLYURETHANE CAULK.

## 6 A2 TYPICAL EXTERIOR DOOR AND WINDOW JAMB/HEAD

3"=1'-0"

NOTE: THIS DRAWING INCLUDES DETAILS THAT ARE NOT PART OF THE MODULE ASSEMBLY SCOPE AND IS PROVIDED STRICTLY FOR IDENTIFYING LOCATIONS, INSTALLATION DETAILS, AND SPECIFICATIONS FOR DOORS AND WINDOWS.

ALASKA ENERGY AUTHORITY

STATE OF ALASKA — 49 THI — REGISTERED PROFESSIONAL ENGINEER — David G. Thompson — 7034 — 11/5/19

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

Gray Stassel Engineering, Inc. — PHONE: (907) 349-0100

**AKHIOK, ALASKA**

**POWER SYSTEM UPGRADE PROJECT**

INTERIOR ELEVATIONS & DOOR/WINDOW DETAILS & SCHEDULE

| NO. | REVISION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CONSTRUCTION | BCG | 11/1/19 |
| 1 | REVISED DOOR PAINT NOTE | BCG | 11/5/19 |

| | |
|---|---|
| Plot Date | 11/5/19 |
| Designed | DGT/BCG |
| Drawn | JTD |
| Approved | DGT |

Sheet No. A2

# POWER SYSTEM UPGRADE PROJECT

## AKHIOK, ALASKA

NOTE: THIS DRAWING AND THE ELEVEN SHEETS WHICH FOLLOW SHOW WORK THAT WAS PERFORMED BY OTHERS AS PART OF THE FABRICATION OF THE OWNER FURNISHED MODULE STRUCTURE AND IS PROVIDED FOR REFERENCE ONLY.

GENERAL NOTES:

STRUCTURAL STEEL

1.) THE DESIGN, FABRICATION, AND ERECTION OF ALL STRUCTURAL STEEL SHALL COMPLY WITH THE CODE OF STANDARD PRACTICE OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION.

2.) ALL STEEL PLATE, SHAPES AND ROLLED SECTIONS SHALL BE ASTM A36. ALL STEEL TUBING SHALL BE ASTM A500, GRADE B.

3.) ALL METAL TO METAL CONNECTIONS SHALL BE EQUAL TO STANDARD CONNECTION, OR AS DETAILED USING A325 BOLTS (BEARING TYPE CONNECTIONS). TIGHTEN HIGH STRENGTH BOLTS WITH PROPERLY CALIBRATED WRENCHES, BY TURN–OF–THE–NUT METHOD, OR BY LOAD WASHERS. ALL CONNECTIONS UNLESS OTHERWISE DETAILED, SHALL HAVE THE MAXIMUM NUMBER OF 3/4" BOLTS USING STANDARD GAUGES AND CLEARANCES.

4.) ALL WELDING SHALL BE DONE IN ACCORDANCE WITH THE CURRENT CODE OF THE AMERICAN WELDING SOCIETY. USE AWS 5.1 E70XX ELECTRODES. MINIMUM FILLET WELDS SHALL BE 3/16" EXCEPT FOR SEAL WELDS TO GAUGE METAL AS INDICATED.

FINISH

A.) INSULATE ALL WALLS, FLOORS, AND CEILINGS WITH HIGH TEMPERATURE MINERAL FIBER ACOUSTICAL FIRE BATT INSULATION, MIN. R VALUE 4 PER INCH, MIN. 2000F. MELTING TEMP, ROXUL AFB OR EQUAL. FILL ALL PANEL VOIDS OR PROVIDE THICKNESS AS INDICATED ON DRAWINGS. MECHANICALLY FASTEN FLOOR INSULATION TO TIGHT FLOOR.

B.) UPON COMPLETION OF FABRICATION ROUND ALL CORNERS AND GRIND EDGES SMOOTH AND PAINT ALL INTERIOR AND EXTERIOR EXPOSED STEEL. PERFORM ALL PAINTING IN A WARM, DRY ENVIRONMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INCLUDING DRYING TIME TO RE–COAT.

C.) SANDBLAST EXTERIOR SURFACE TO SSPC–SP–10. PRIME WITH ONE COAT OF REINFORCED INORGANIC ZINC PRIMER, DEVOE CATHA–COAT 302, NO SUBSTITUTES, COLOR GREEN, TO 3 MILS DRY FILM THICKNESS. COVER WITH TWO COATS OF EPOXY, DEVOE BAR–RUST 236, NO SUBSTITUTES, TO 12 MILS DRY FILM THICKNESS. FIRST COAT COLOR GRAY, SECOND COAT COLOR WHITE.

D.) FINISH EXTERIOR WALLS AND SKIDS (ALL EXPOSED VERTICAL EXTERIOR SURFACES) WITH ONE COAT OF ALIPHATIC URETHANE ENAMEL, DEVOE DEVTHANE 389, NO SUBSTITUTES, COLOR WHITE, TO 3 MILS DFT.

E.) SANDBLAST INTERIOR SURFACE TO SSPC–SP–6. PRIME AND FINISH WITH TWO COATS OF EPOXY, SHERWIN WILLIAMS MACROPOXY 646, NO SUBSTITUTES, TO 8 MILS TOTAL DRY FILM THICKNESS. CEILING COLOR WHITE. WALL AND FLOOR COLOR STRUCTURAL GRAY 4031. NOTE THAT FIRST COAT ON WALLS AND FLOOR MAY BE WHITE.

☐ APPROVED
☑ APPROVED WITH CORRECTIONS NOTED
☐ REJECTED
☐ REVISE AND RESUBMIT
☐ SUBMIT SPECIFIED ITEM

Submittal review is only for ascertaining general conformance with the Contract Documents. Approval does not relieve the Contractor of responsibility for full compliance with the Contract Documents.

By: _____ Date: 12/17/19

Gray Stassel Engineering, Inc.
PO Box 111405
Anchorage, AK
P (907) 349-0100
F (907) 349-8001

NOTE: SEE MINOR CORRECTIONS ON SHEETS E4 & E5.

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |

WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344–1921
FAX:(907)344–8244

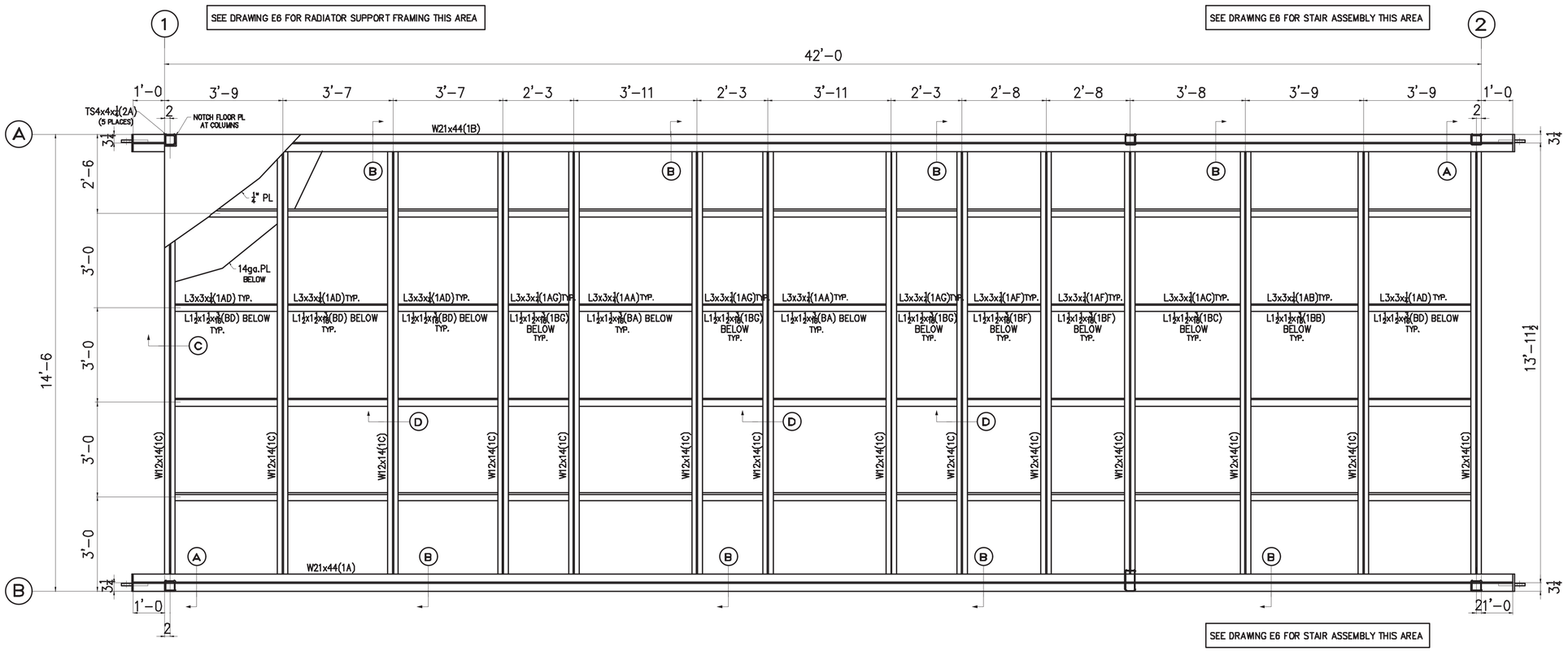
PROJECT
AKHIOK POWER SYSTEM UPGRADE

CUSTOMER
ALASKA ENERGY AUTHORITY

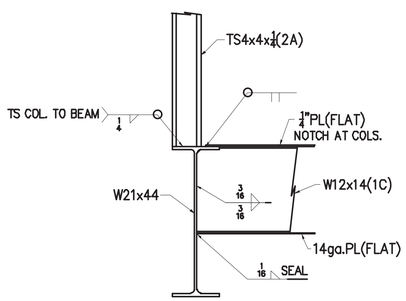
TITLE COVER SHEET

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | T1 |

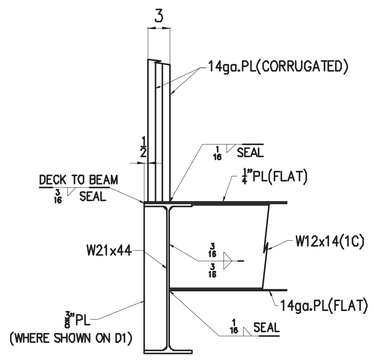
Structural Detailing Services of Alaska 907–336–2220 Fax:907–336–2231 dholland@gci.net



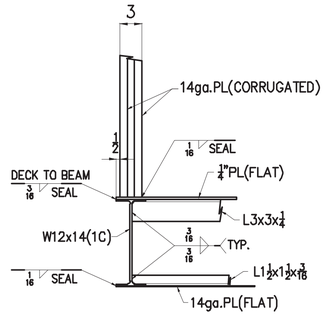

## BASE FRAMING PLAN



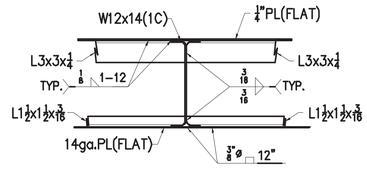

SECTION A




SECTION B




SECTION C




SECTION D

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |


WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-8244

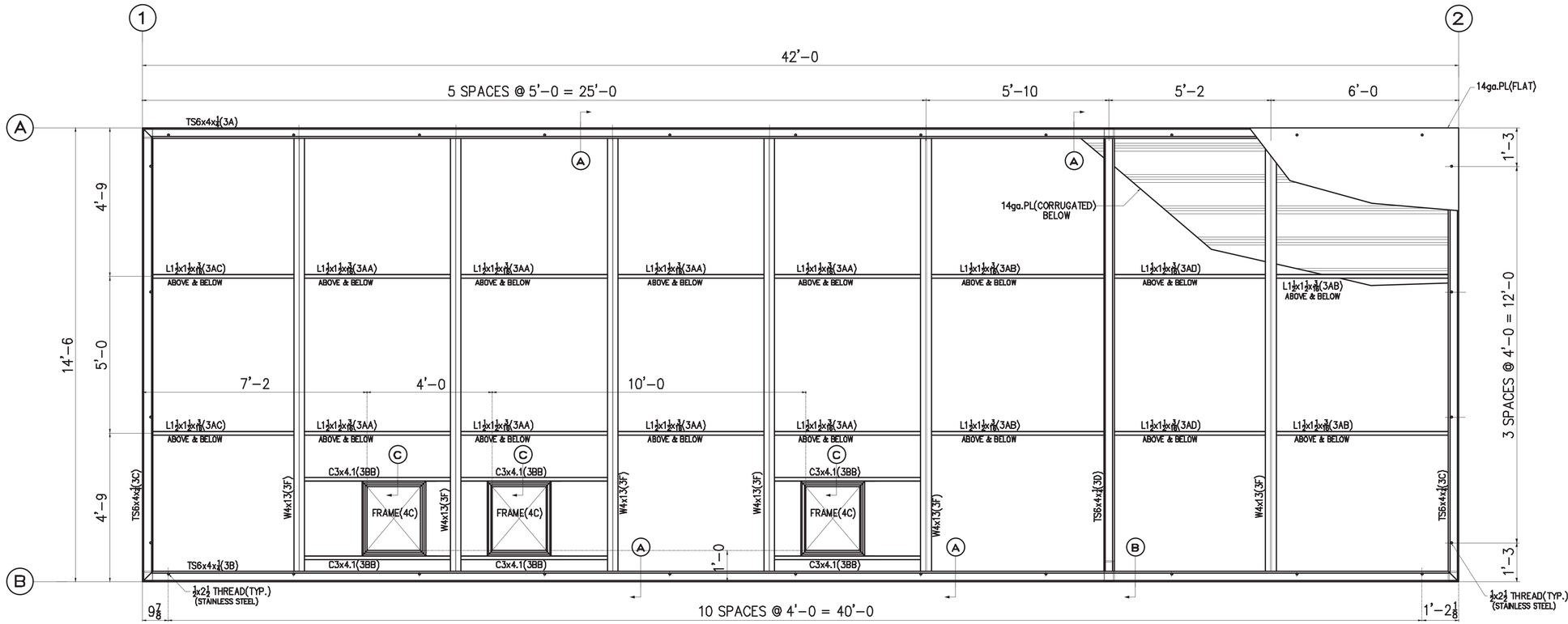

| | |
|---|---|
| CLEANING | |
| PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

PROJECT
AKHIOK POWER SYSTEM UPGRADE
BASE FRAMING PLANS

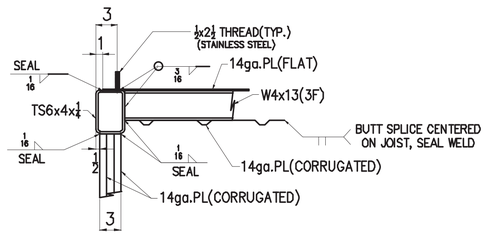
CUSTOMER
ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | E1 |

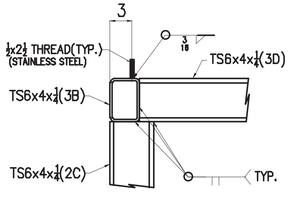

Structural Detailing Services of Alaska 907-336-2220 Fax: 907-336-2231 dhalland@gci.net



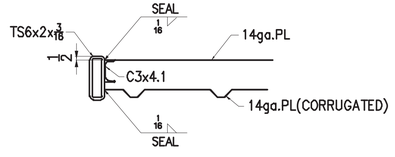

## CEILING FRAMING PLAN




***SECTION A***




***SECTION B***




***SECTION C***

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |


WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-8244

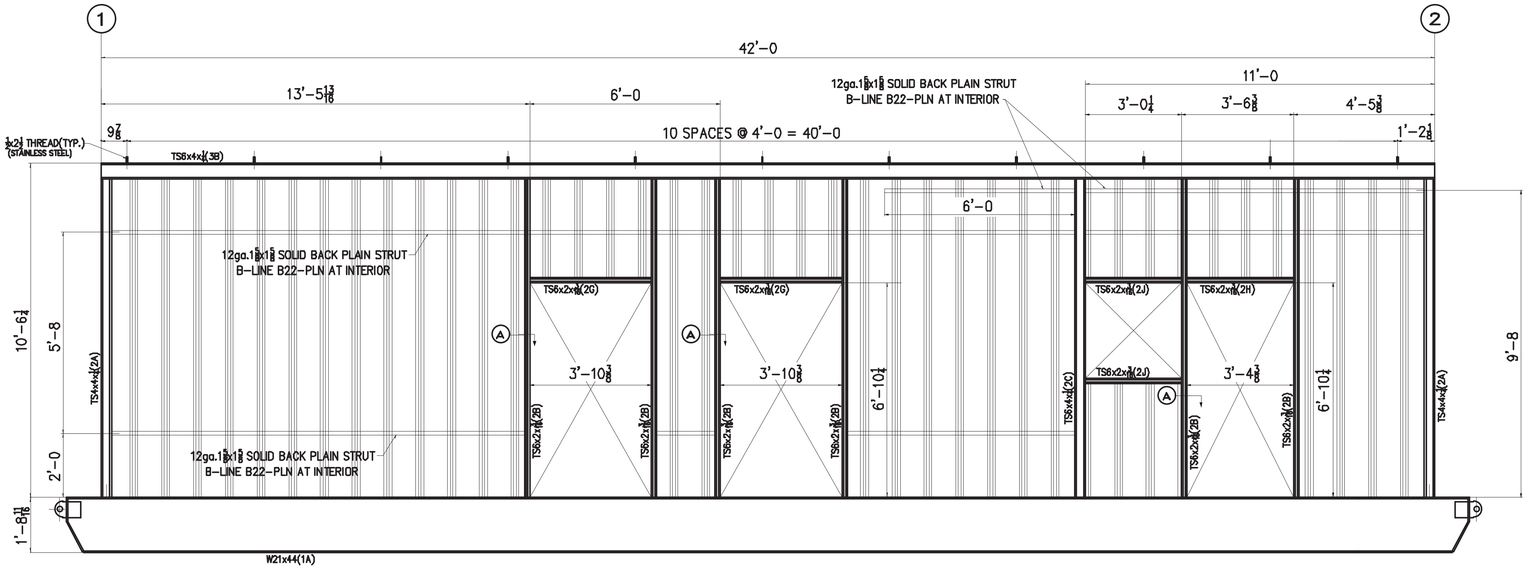

| | |
|---|---|
| CLEANING / PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

PROJECT: AKHIOK POWER SYSTEM UPGRADE
CEILING FRAMING PLAN

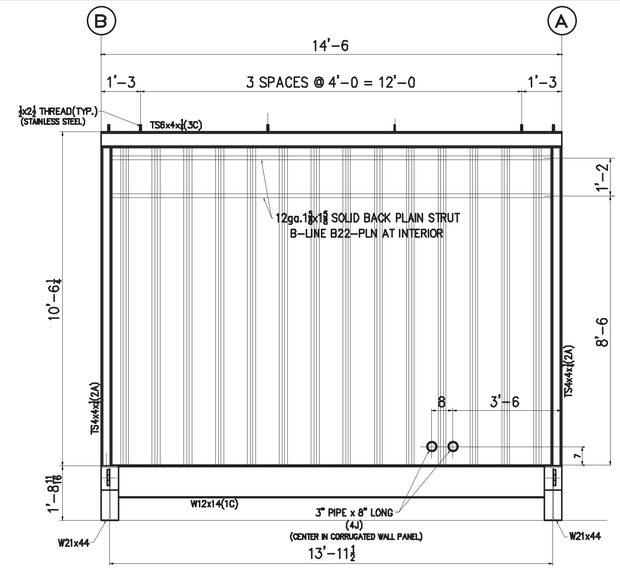
CUSTOMER: ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | E2 |

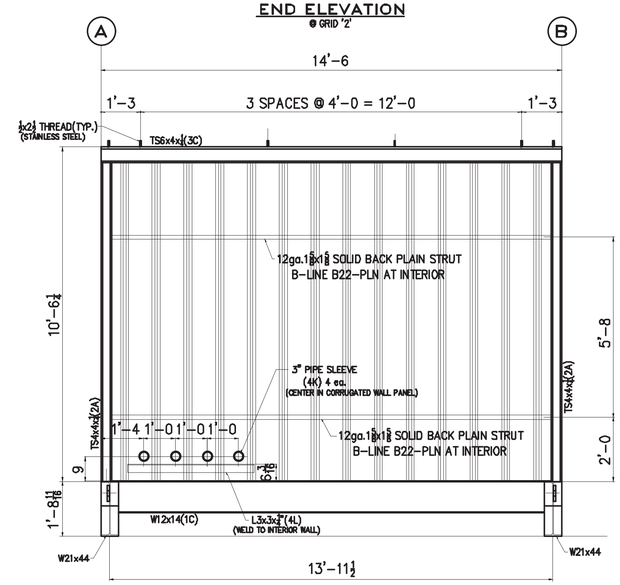

Structural Detailing Services of Alaska 907-336-2220 Fax:907-336-2231 dholland@gci.net



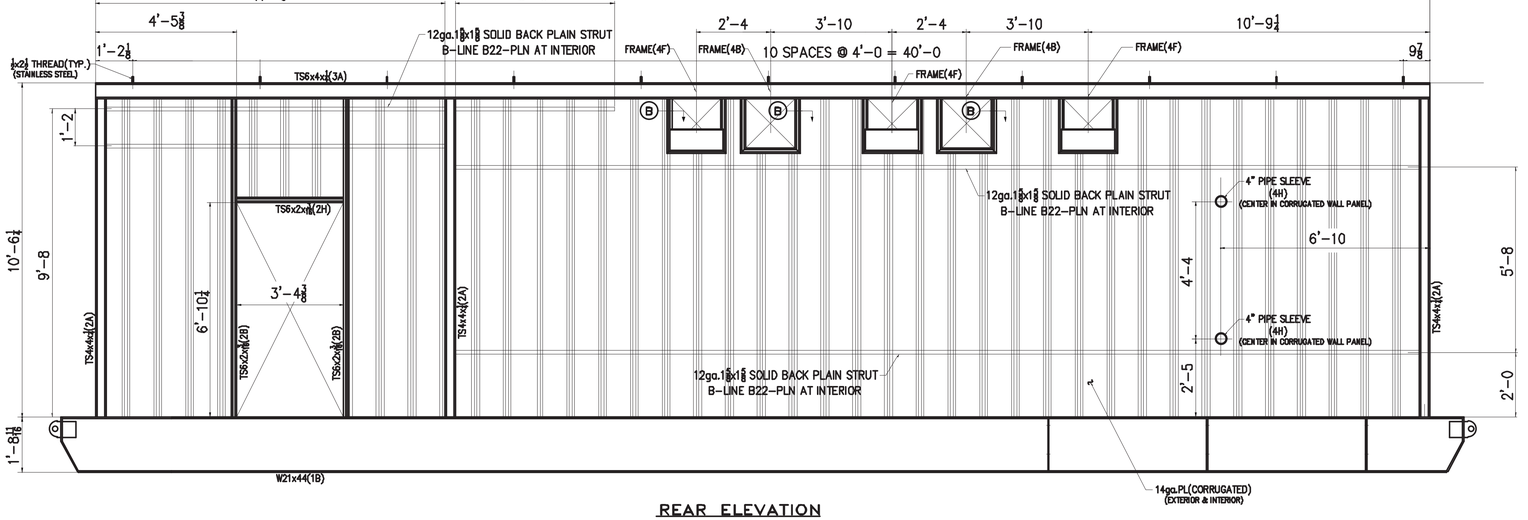

FRONT ELEVATION
@ GRID 'B'



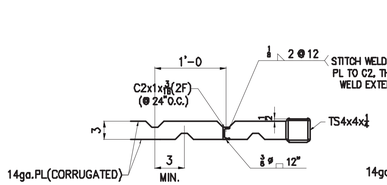

END ELEVATION
@ GRID '2'



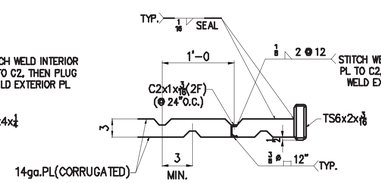

END ELEVATION
@ GRID '1'



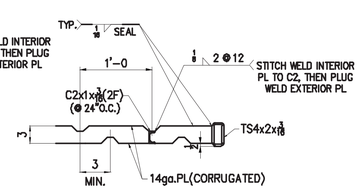

REAR ELEVATION




TYP. WALL SECTION




SECTION A

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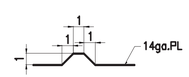


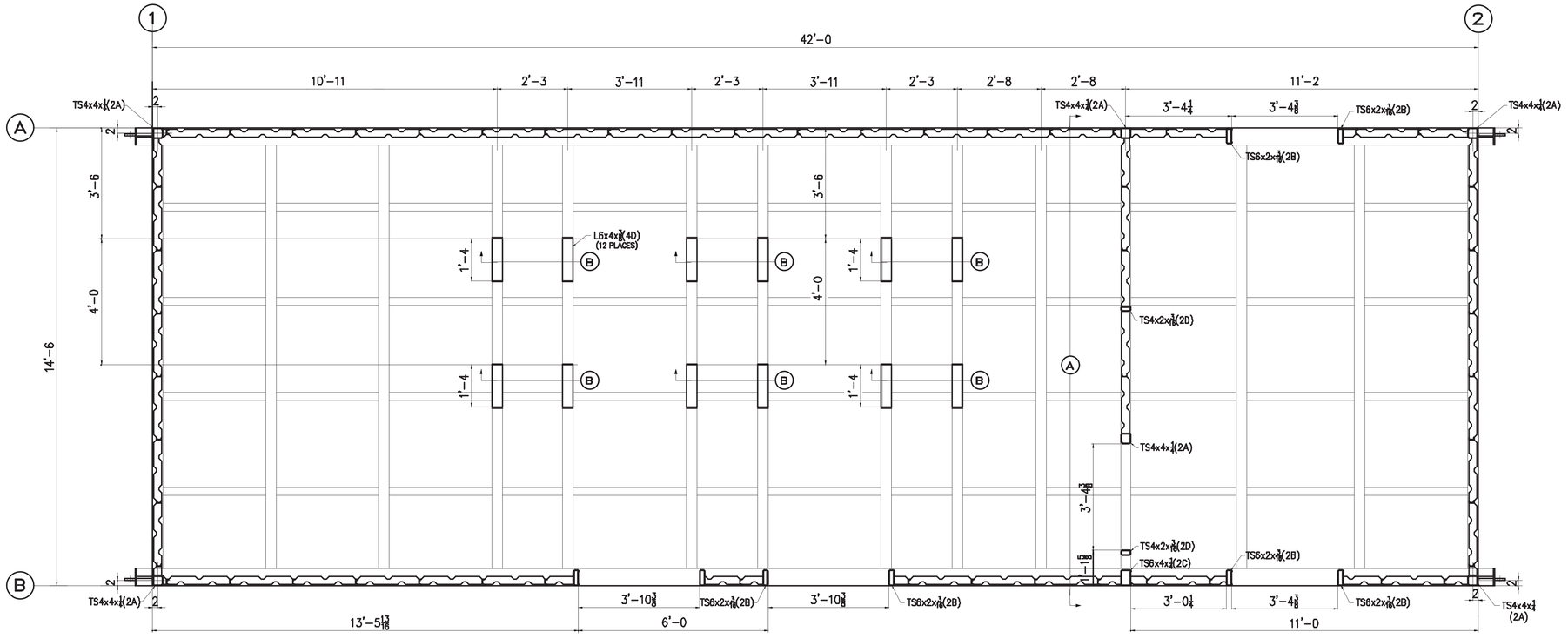

TYP. CORRUGATION

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |

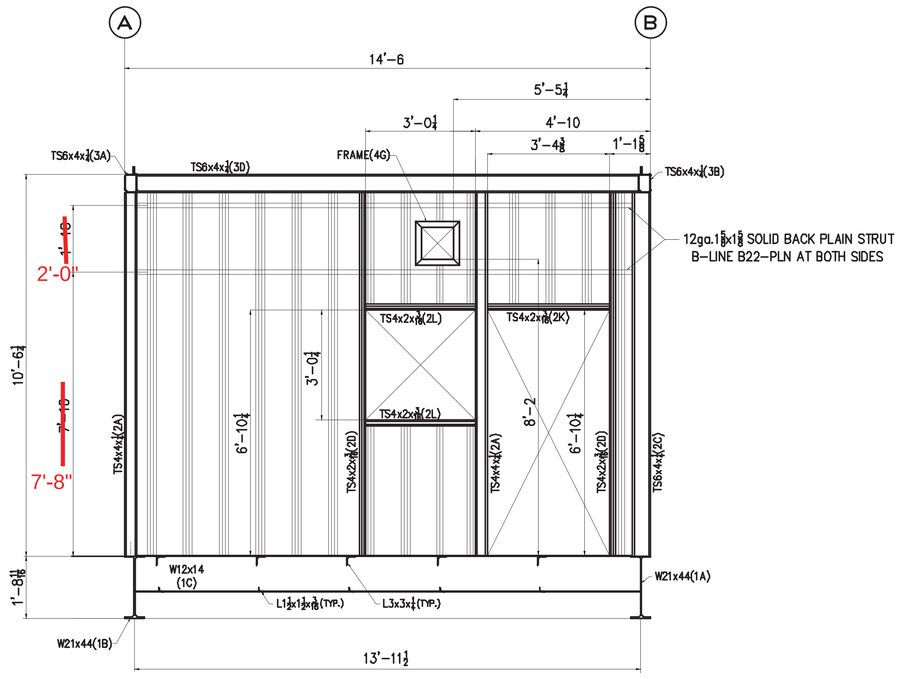

WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-8244


| | |
|---|---|
| CLEANING PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

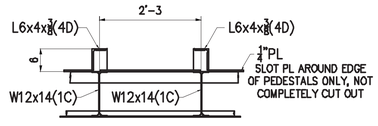
| | | | |
|---|---|---|---|
| PROJECT | | CUSTOMER | |
| AKHIOK POWER SYSTEM UPGRADE | | ALASKA ENERGY AUTHORITY | |
| EXTERIOR ELEVATIONS | DATE 12/9/19 | JOB No. | DWG. NO. E3 |



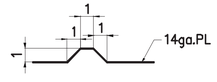

FLOOR PLAN



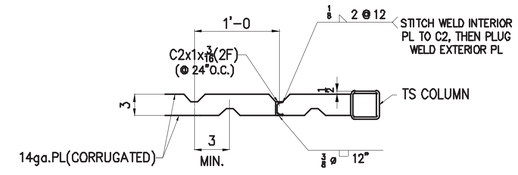

A INTERIOR WALL SECTION




B SECTION




TYP. CORRUGATION




EXTERIOR

TYP. WALL SECTION

SHOP NOTES:

1.) MAKE ALL JOINTS WITH CONTINUOUS GROOVE OR FILLET WELDS.
2.) SLOT FLOOR PLATE 3 SIDES THEN WELD PEDESTAL TO TOP OF BEAM AND SEAL WELD TO FLOOR PLATE ALL AROUND.

| REV. No. | DATE | BY | DESCRIPTION |
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WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-8244

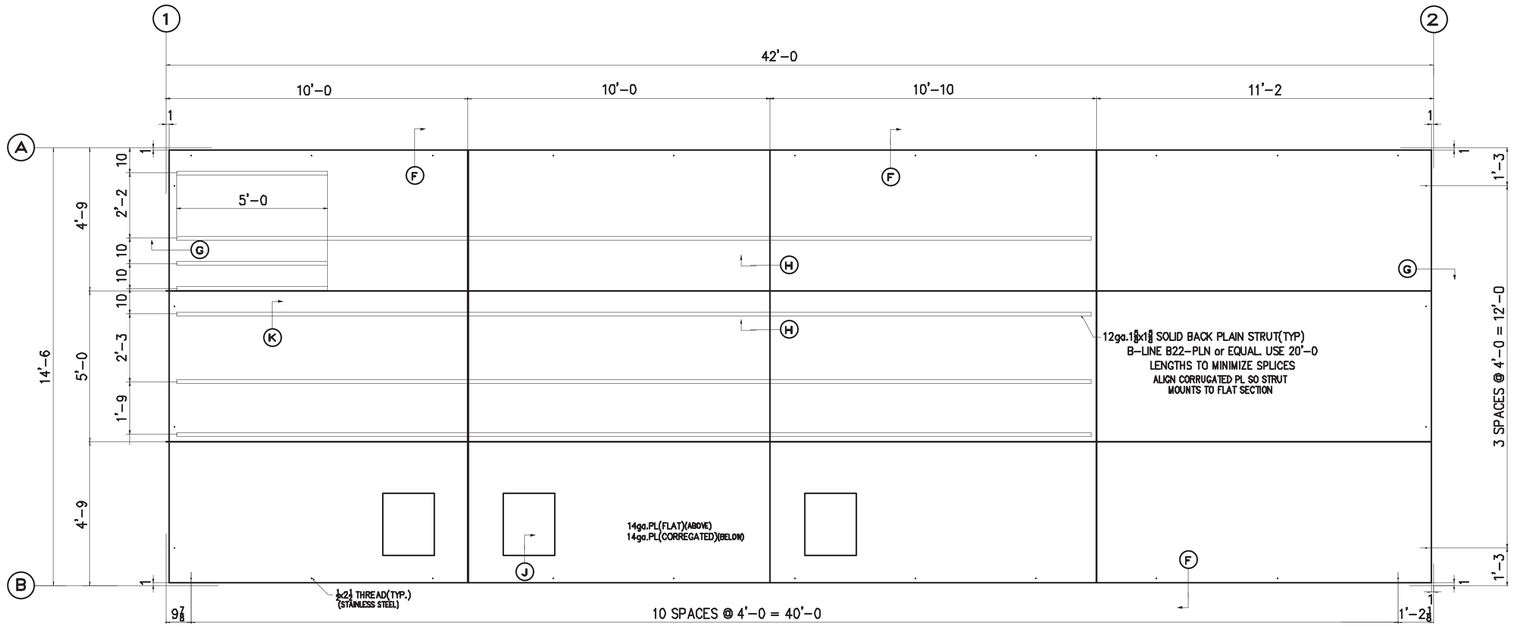

| | |
|---|---|
| CLEANING | |
| PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

PROJECT: AKHIOK POWER SYSTEM UPGRADE
FLOOR PLAN

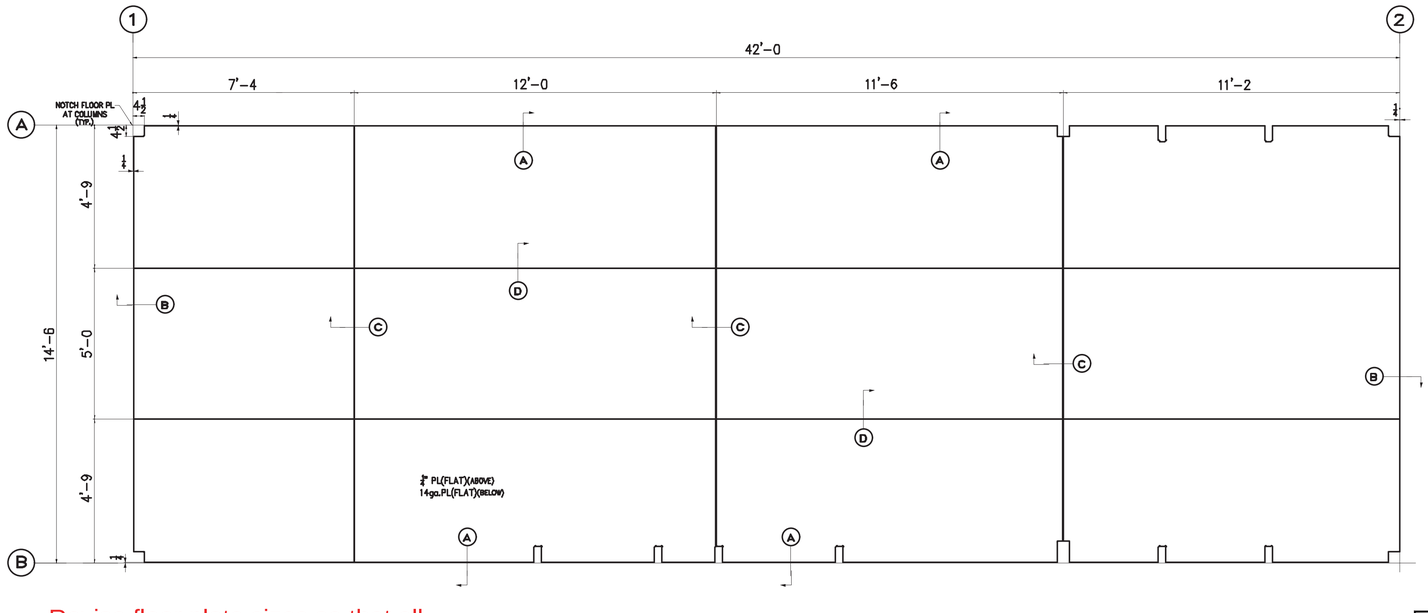
CUSTOMER: ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | E4 |


Structural Detailing Services of Alaska 907-336-2220 Fax: 907-336-2231 dhalland@gci.net

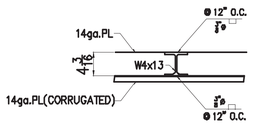



## CEILING PLATE LAYOUT

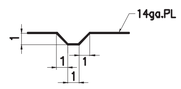



Revise floor plate sizes so that all joints are backed by joists or purlins.

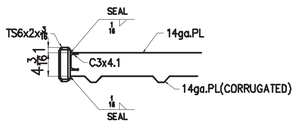
## FLOOR PLATE LAYOUT



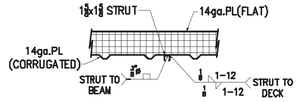

*TYP. CEILING SECTION*




*TYP. CORRUGATION*

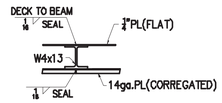



*SECTION J*




*SECTION K*

ALIGN CORRUGATED PL SO STRUT
MOUNTS TO FLAT SECTION

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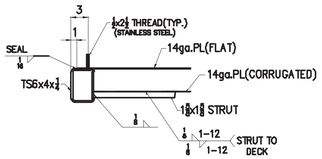
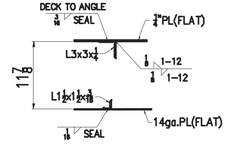
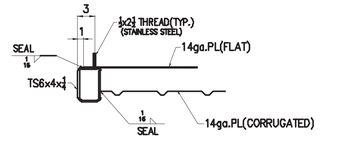



*SECTION G*




*SECTION D*

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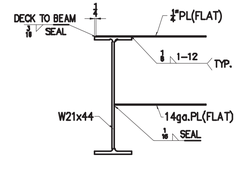
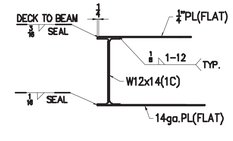
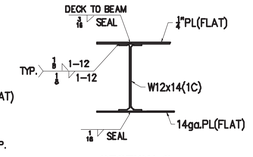



*SECTION A*




*SECTION B*




*SECTION C*

| REV. No. | DATE | BY | DESCRIPTION |
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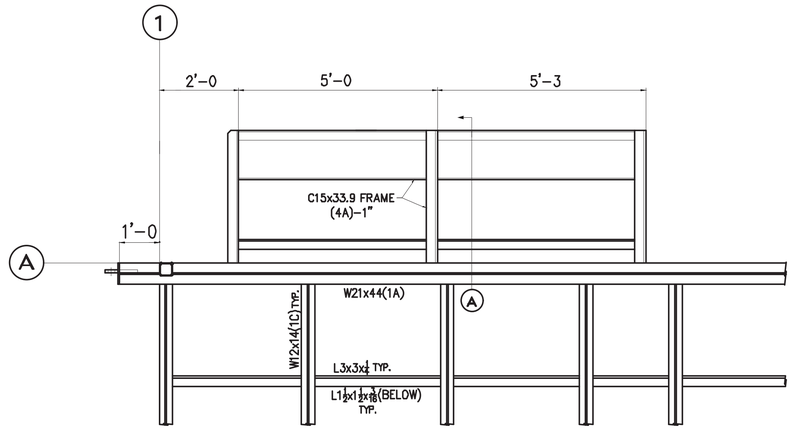
WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-5244


**SHOP NOTES:**
1.) FABRICATE FLOOR AND PAN DECK DECKS USING 5' AND 6' WIDE SHEETS WITH ALL JOINTS CENTERED ON PURLINS & JOISTS.
2.) FABRICATE CEILING ASSEMBLY (FLAT & CORREGATED) USING 5' AND 6' WIDE SHEETS WITH ALL JOINTS CENTERED ON JOISTS & PURLINS.

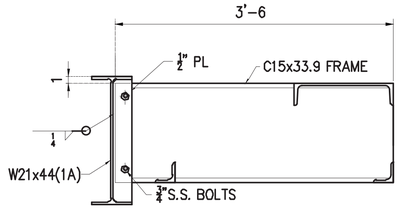
| | |
|---|---|
| CLEANING<br>PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

| PROJECT | CUSTOMER | | |
|---|---|---|---|
| AKHIOK POWER SYSTEM UPGRADE | ALASKA ENERGY AUTHORITY | | |
| DECK & CEILING PLATES | DATE<br>12/9/19 | JOB No. | DWG. NO.<br>E5 |

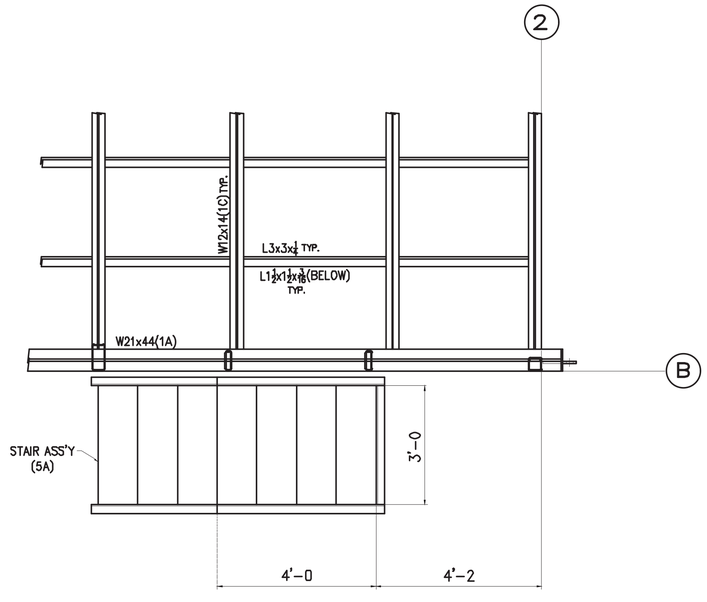

Structural Detailing Services of Alaska 907-336-2220 Fax:907-336-2231 dholland@gci.net



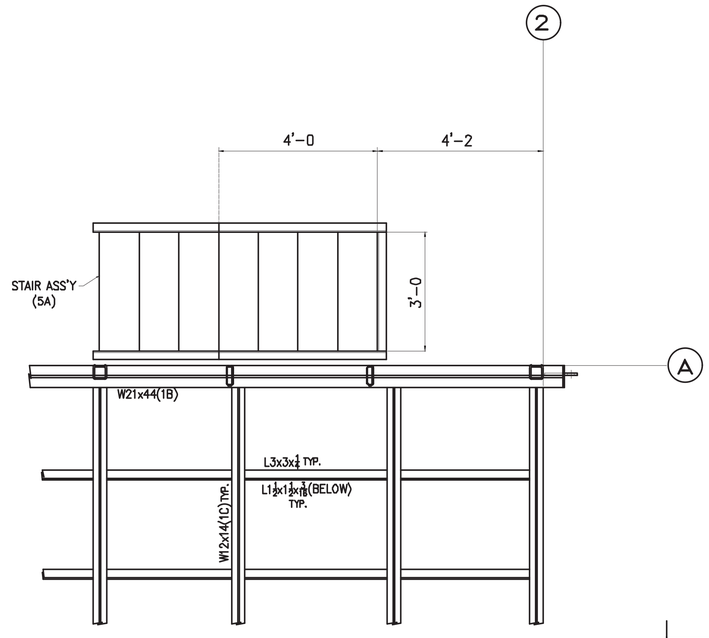

RADIATOR SUPPORTS FRAMING PLAN




SECTION A




STAIR/PLATFORM FRAMING PLAN




STAIR/PLATFORM FRAMING PLAN

| REV. No. | DATE | BY | DESCRIPTION |
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| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |


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10501 OLIVE LANE
ANCHORAGE, AK 99515
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FAX:(907)344-8244


| | |
|---|---|
| CLEANING | |
| PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

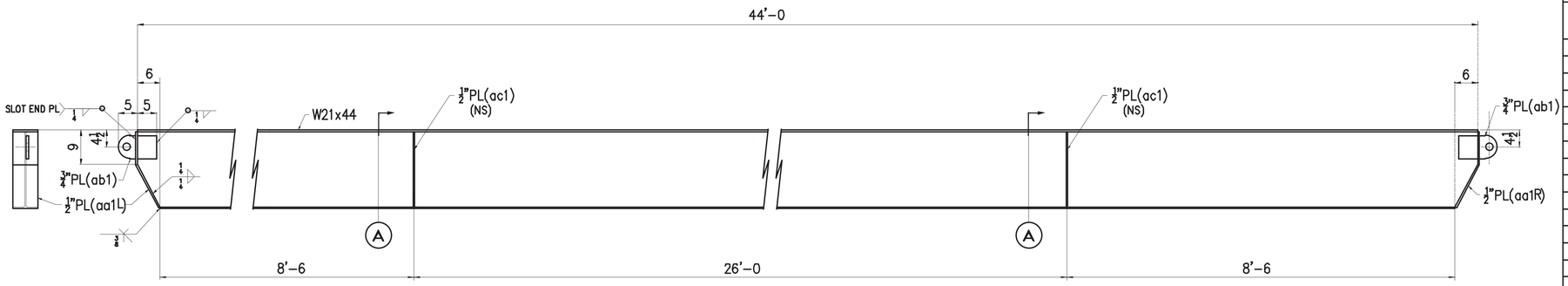
PROJECT
AKHIOK POWER SYSTEM UPGRADE

RADIATOR SUPPORTS & STAIR FRAMING PLANS

CUSTOMER
ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | E6 |


Structural Detailing Services of Alaska 907-336-2220 Fax:907-336-2231 dhalland@gci.net




***ONE ~ MAIN BEAM ~ 1A***

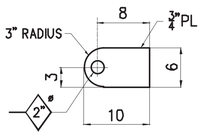
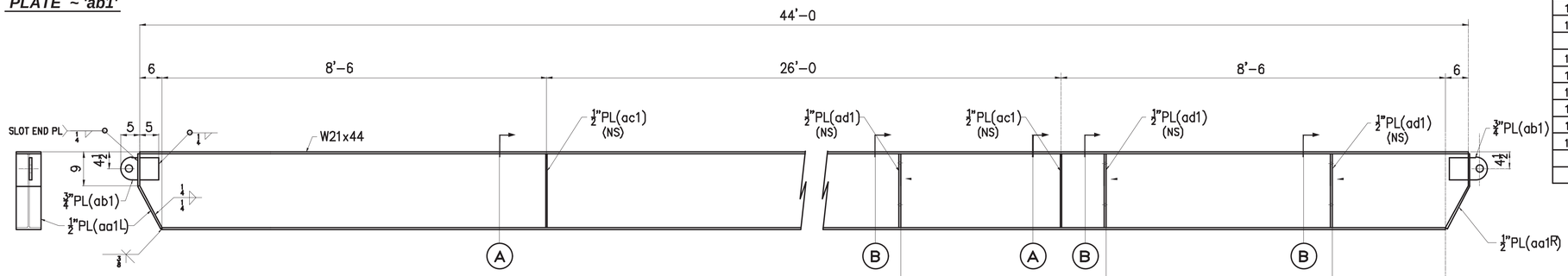
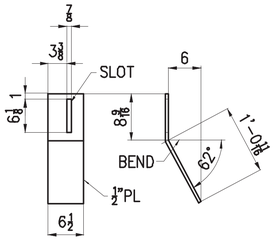


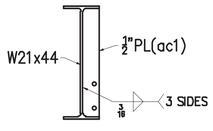

***PLATE ~ 'ab1'***



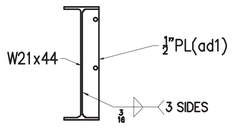

***ONE ~ MAIN BEAM ~ 1B***



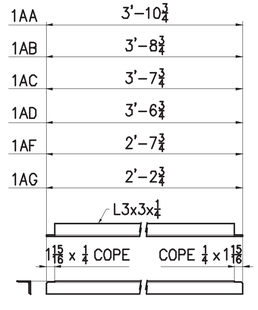

***BENT PL ~ 'aa1$^{L}$'*** (AS SHOWN)
***BENT PL ~ 'aa1$^{R}$'*** (OPP. HAND)



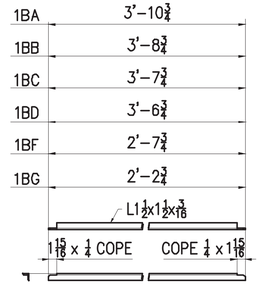

***SECTION A***



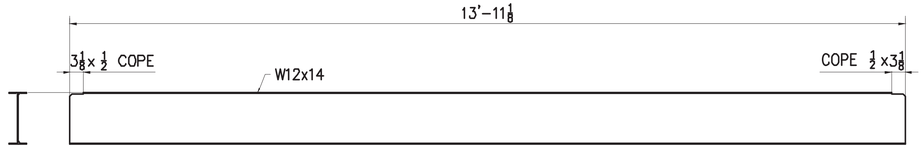

***SECTION B***




***8 ea. ~ ANGLES ~ 1AA***
***4 ea. ~ ANGLES ~ 1AB***
***4 ea. ~ ANGLES ~ 1AC***
***16 ea. ~ ANGLES ~ 1AD***
***8 ea. ~ ANGLES ~ 1AF***
***12 ea. ~ ANGLES ~ 1AG***




***8 ea. ~ ANGLES ~ 1BA***
***4 ea. ~ ANGLES ~ 1BB***
***4 ea. ~ ANGLES ~ 1BC***
***16 ea. ~ ANGLES ~ 1BD***
***8 ea. ~ ANGLES ~ 1BF***
***12 ea. ~ ANGLES ~ 1BG***




***14 ea. ~ CROSS BEAMS ~ 1C***

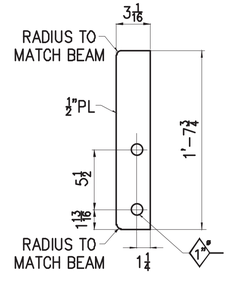



***PLATE ~ 'ac1'***

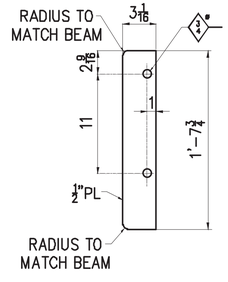



***PLATE ~ 'ad1'***

## BILL OF MATERIAL

| FIELD MARK | SHOP MARK | NO. PCS | SECTION | LENGTH | REMARKS | WT |
|---|---|---|---|---|---|---|
| 1A | | ONE | MAIN BEAM | | | |
| | 1A | ONE | W21 x 44 | 44'-0 | | |
| | aa1⅛ | 2 | PL ½ x 6½ BENT | 1'-9½ | 1 LEFT/1 RIGHT | |
| | ab1 | 2 | PL ¾ x 6 | 10 | RADIUS | |
| | ac1 | 2 | PL ½ x 3 1/16 | 1'-7¾ | STIFF. PL | |
| 1B | | ONE | MAIN BEAM | | | |
| | 1B | ONE | W21 x 44 | 44'-0 | | |
| | aa1⅛ | 2 | PL ½ x 6½ BENT | 1'-9½ | 1 LEFT/1 RIGHT | |
| | ab1 | 2 | PL ¾ x 6 | 10 | RADIUS | |
| | ac1 | 2 | PL ½ x 3 1/16 | 1'-7¾ | STIFF. PL | |
| | ad1 | 3 | PL ½ x 3 1/16 | 1'-7¾ | CONN. PL | |
| 1C | | 14 | CROSS BEAMS | | | |
| | 1C | 14 | W12 x 14 | 13'-11⅛ | COPE ENDS | |
| | | | ANGLES | | | |
| 1AA | | 8 | L3 x 3 x ¼ | 3'-10¾ | COPE ENDS | |
| 1AB | | 4 | L3 x 3 x ¼ | 3'-8¾ | do | |
| 1AC | | 4 | L3 x 3 x ¼ | 3'-7¾ | | |
| 1AD | | 16 | L3 x 3 x ¼ | 3'-6¾ | | |
| 1AF | | 8 | L3 x 3 x ¼ | 2'-7¾ | | |
| 1AG | | 12 | L3 x 3 x ¼ | 2'-2¾ | | |
| 1BA | | 8 | L1½ x 1½ x 3/16 | 3'-10¾ | COPE ENDS | |
| 1BB | | 4 | L1½ x 1½ x 3/16 | 3'-8¾ | do | |
| 1BC | | 4 | L1½ x 1½ x 3/16 | 3'-7¾ | | |
| 1BD | | 16 | L1½ x 1½ x 3/16 | 3'-6¾ | | |
| 1BF | | 8 | L1½ x 1½ x 3/16 | 2'-7¾ | | |
| 1BG | | 12 | L1½ x 1½ x 3/16 | 2'-2¾ | | |

SHOP NOTE:
DO NOT SHEAR STIFFENER PLATES.
CUT WITH WATER JET, TORCH, OR SAW.

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WELDS 3/16" FILLET U.N.O.

OPEN HOLES 13/16" U.N.O.

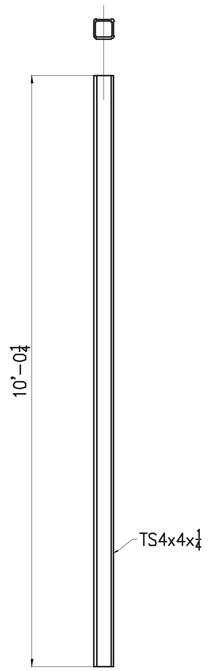
PROJECT
AKHIOK POWER SYSTEM UPGRADE

BASE BEAM DETAILS

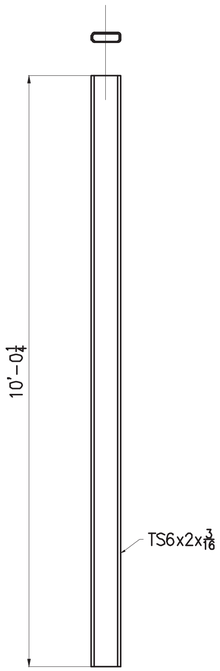
CUSTOMER
ALASKA ENERGY AUTHORITY

DATE 12/9/19 | JOB No. | DWG. NO. D1

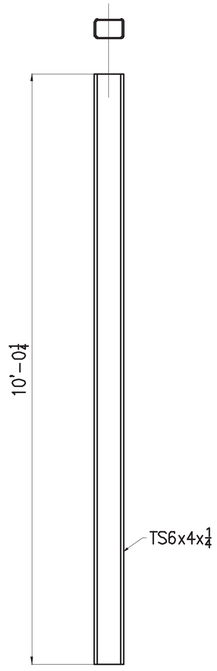

Structural Detailing Services of Alaska 907-336-2220 Fax:907-336-2231 dholland@gci.net



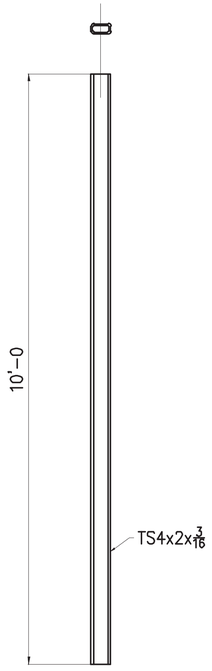

6 ea. ~ TS POSTS ~ 2A



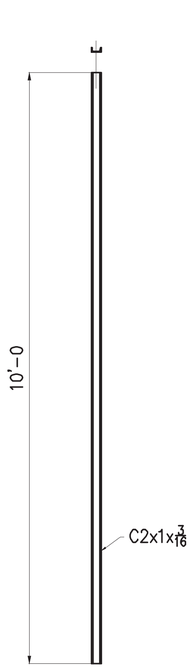

8 ea. ~ TS POSTS ~ 2B



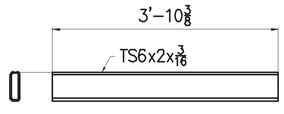

ONE ~ TS POST ~ 2C



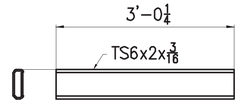

2 ea. ~ TS POSTS ~ 2D



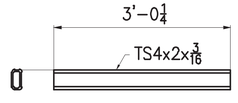

56 ea. ~ CHANNELS ~ 2F



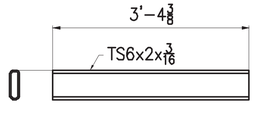

2 ea. ~ HEADER TUBE ~ 2G



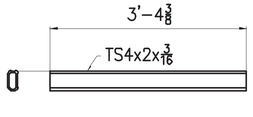

2 ea. ~ WINDOW TUBE ~ 2J




2 ea. ~ WINDOW TUBE ~ 2L




2 ea. ~ HEADER TUBE ~ 2H




ONE ~ HEADER TUBE ~ 2K

## BILL OF MATERIAL

| FIELD MARK | SHOP MARK | NO. PCS | SECTION | LENGTH | REMARKS | WT |
|---|---|---|---|---|---|---|
| 2A | | 6 | TS POSTS | | | |
| | 2A | 6 | TS4 x 4 x 1/4 | 10'-0 1/4 | | |
| 2B | | 8 | TS POSTS | | | |
| | 2B | 8 | TS6 x 2 x 3/16 | 10'-0 1/4 | | |
| 2C | | ONE | TS POST | | | |
| | 2C | ONE | TS6 x 4 x 1/4 | 10'-0 1/4 | | |
| 2D | | 2 | TS POSTS | | | |
| | 2D | 2 | TS4 x 2 x 3/16 | 10'-0 | | |
| 2F | | 56 | CHANNELS | | | |
| | 2F | 56 | C2 x 1 x 3/16 | 10'-0 | | |
| 2G | | 2 | TS HEADER | | | |
| | 2G | 2 | TS6 x 2 x 3/16 | 3'-10 3/8 | | |
| 2H | | 2 | TS HEADER | | | |
| | 2H | 2 | TS6 x 2 x 3/16 | 3'-4 3/8 | | |
| 2J | | 2 | WINDOW TUBE | | | |
| | 2J | 2 | TS6 x 2 x 3/16 | 3'-0 1/4 | | |
| 2K | | ONE | TS HEADER | | | |
| | 2K | ONE | TS4 x 2 x 3/16 | 3'-4 3/8 | | |
| 2L | | 2 | WINDOW TUBE | | | |
| | 2L | 2 | TS4 x 2 x 3/16 | 3'-0 1/4 | | |

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WELDS 3/16" FILLET U.N.O.

OPEN HOLES 13/16" U.N.O.

PROJECT
AKHIOK POWER SYSTEM UPGRADE

WALL FRAMING DETAILS

CUSTOMER
ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | D2 |

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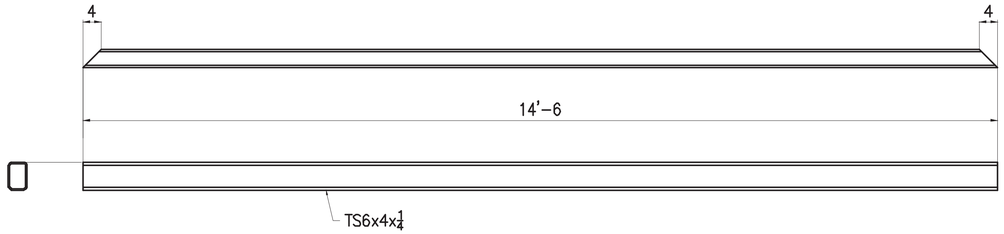
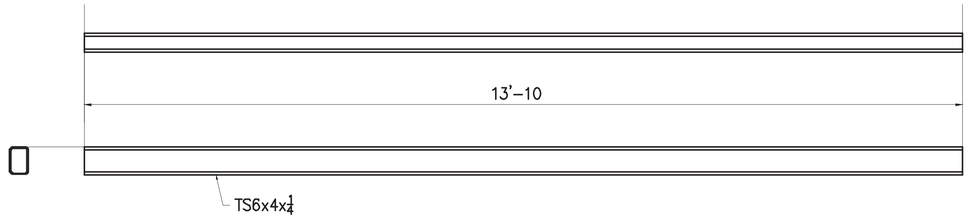
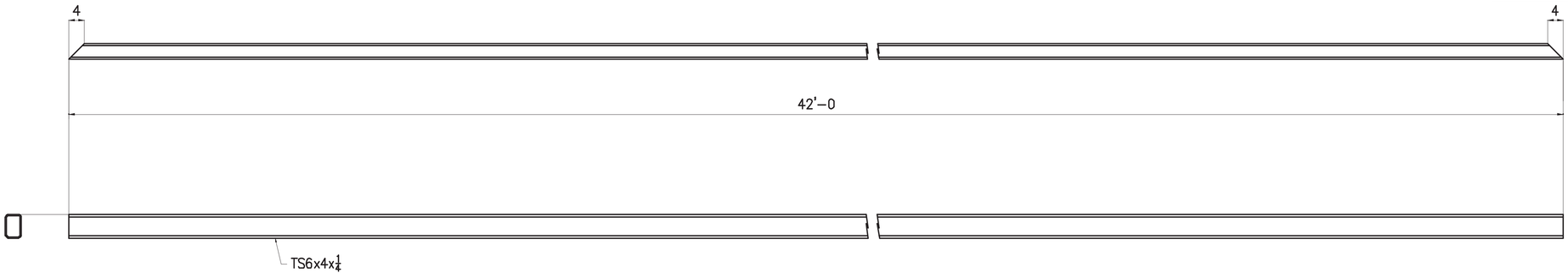


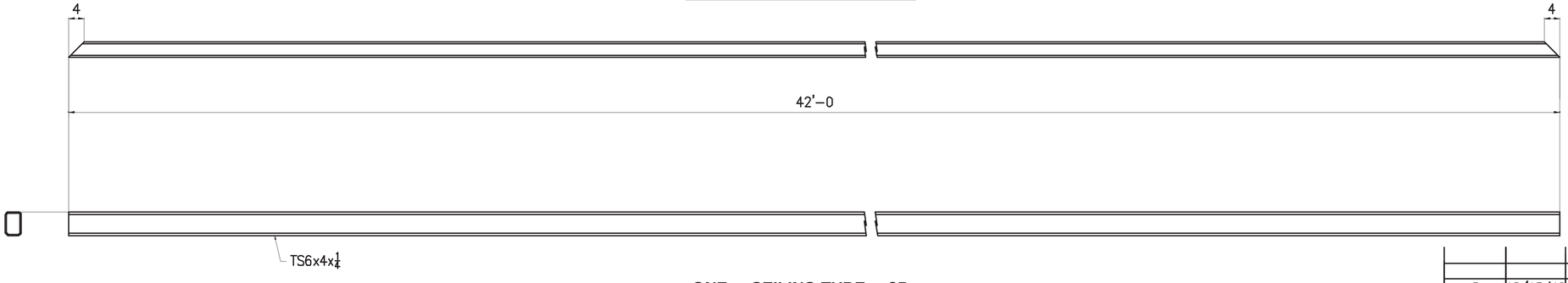

***2 ea. ~ CEILING TUBE ~ 3C***



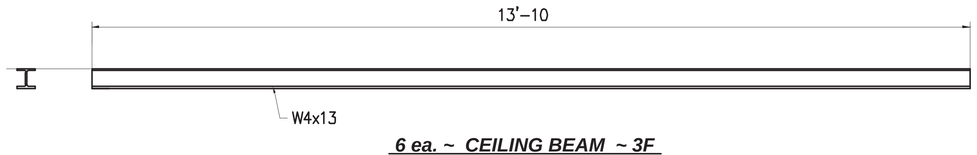

***ONE ~ CEILING TUBE ~ 3D***



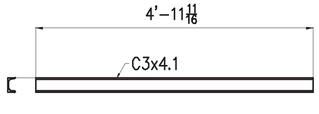

***ONE ~ CEILING TUBE ~ 3A***




***ONE ~ CEILING TUBE ~ 3B***



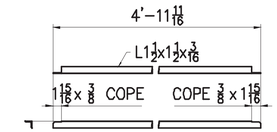

***6 ea. ~ CEILING BEAM ~ 3F***



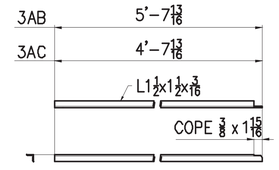

***6 ea. ~ CHANNELS ~ 3BB***

## BILL OF MATERIAL

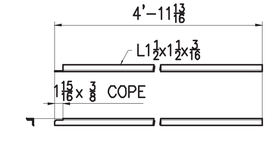
| FIELD MARK | SHOP MARK | NO. PCS | SECTION | LENGTH | REMARKS | WT |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3A | | ONE | CEILING TUBE | | | |
| | 3A | ONE | TS6 x 4 x 1/4 | 42'–0 | MC2E | |
| | | | | | | |
| | | | | | | |
| 3B | | ONE | CEILING TUBE | | | |
| | 3B | ONE | TS6 x 4 x 1/4 | 42'–0 | MC2E | |
| | | | | | | |
| | | | | | | |
| 3C | | 2 | CEILING TUBE | | | |
| | 3C | 2 | TS6 x 4 x 1/4 | 14'–6 | MC2E | |
| | | | | | | |
| 3D | | ONE | CEILING TUBE | | | |
| | 3D | ONE | TS6 x 4 x 1/4 | 13'–10 | | |
| | | | | | | |
| 3F | | 6 | CEILING BEAM | | | |
| | 3F | 6 | W4 x 13 | 13'–10 | | |
| | | | | | | |
| | | | SUPPORT ANGLES | | | |
| | 3AA | 14 | L1 1/2 x 1 1/2 x 3/16 | 4'–11 11/16 | COPE 2 ENDS | |
| | 3AB | 8 | L1 1/2 x 1 1/2 x 3/16 | 5'–7 13/16 | COPE 1 END | |
| | 3AC | 4 | L1 1/2 x 1 1/2 x 3/16 | 4'–7 13/16 | COPE 1 END | |
| | 3AD | 4 | L1 1/2 x 1 1/2 x 3/16 | 4'–11 13/16 | COPE 1 END | |
| | | | | | | |
| | | | SUPPORT CHANNEL | | | |
| | 3BB | 6 | C3 x 4.1 | 4'–11 11/16 | | |




***14 ea. ~ ANGLES ~ 3AA***




***8 ea. ~ ANGLES ~ 3AB***
***4 ea. ~ ANGLES ~ 3AC***




***4 ea. ~ ANGLES ~ 3AD***

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CLEANING
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WELDS 3/16" FILLET U.N.O.

OPEN HOLES 13/16" U.N.O.

PROJECT
AKHIOK POWER SYSTEM UPGRADE

CEILING TUBE DETAILS

CUSTOMER
ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | D3 |


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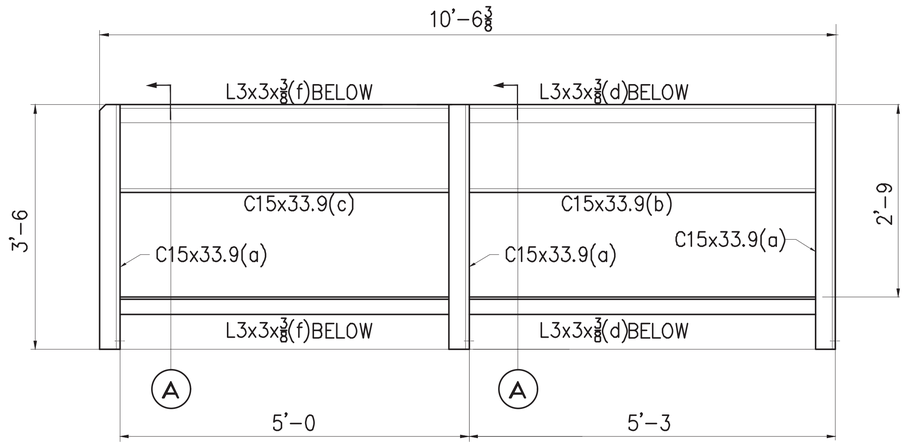
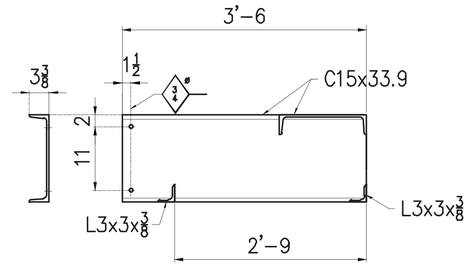
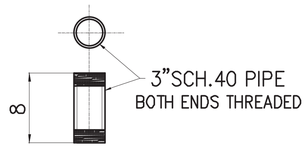


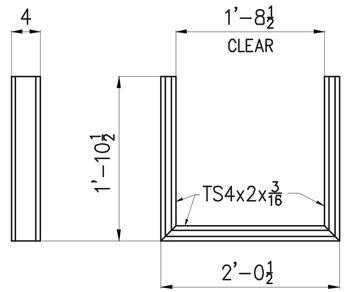

## ONE ~ RADIATOR SUPPORT FRAME ~ 4A



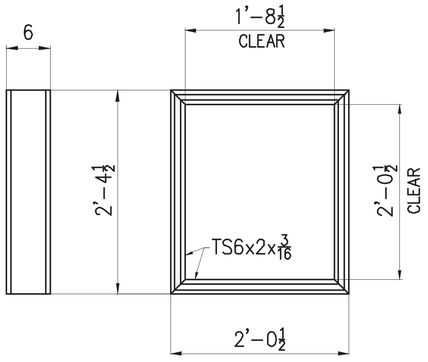

## SECTION A



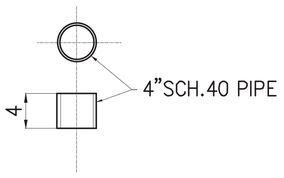

## 2 ea. ~ PIPE NIPPLES ~ 4J



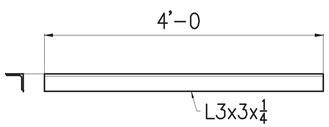

## 2 ea. ~ WALL FRAMES ~ 4B



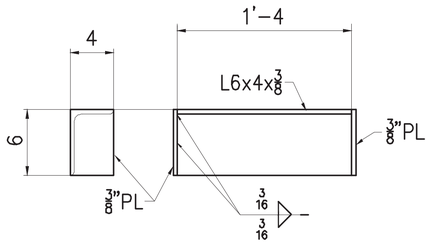

## 3 ea. ~ CEILING FRAMES ~ 4C



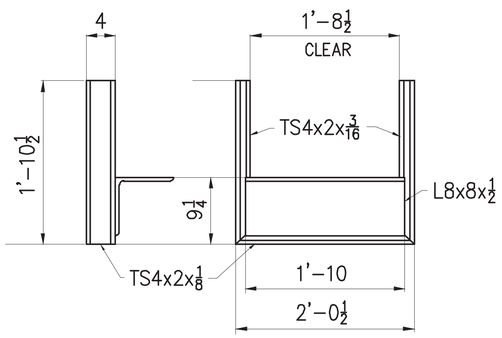

## 2 ea. ~ PIPE SLEEVES ~ 4H



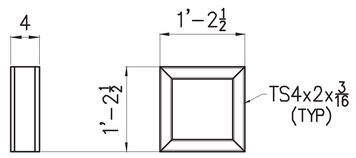

## ONE ~ SUPPORT ANGLE ~ 4L



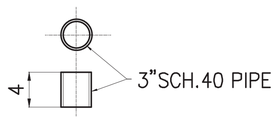

## 12 ea. ~ ANGLE MOUNTS ~ 4D




## 3 ea. ~ WALL FRAMES ~ 4F




## ONE ~ WALL FRAME ~ 4G




## 4 ea. ~ PIPE SLEEVES ~ 4K

## BILL OF MATERIAL

| FIELD MARK | SHOP MARK | NO. PCS | SECTION | LENGTH | REMARKS | WT |
|---|---|---|---|---|---|---|
| 4A | | ONE | RADIATOR SUPPORT | | | |
| | a | 3 | C15 x 33.9 | 3'-6 | | |
| | b | ONE | C15 x 33.9 | 5'-2 3/8 | COPE 1 END | |
| | c | ONE | C15 x 33.9 | 4'-11 5/8 | COPE 1 END | |
| | d | 2 | L3 x 3 x 3/8 | 5'-2 3/8 | COPE 1 END | |
| | f | 2 | L3 x 3 x 3/8 | 4'-11 5/8 | COPE 1 END | |
| 4B | | 2 | WALL FRAMES | | | |
| | | 4 | TS4 x 2 x 3/16 | 1'-10 1/2 | MC1E | |
| | | 2 | TS4 x 2 x 3/16 | 2'-0 1/2 | MC2E | |
| 4C | | 3 | CEILING FRAMES | | | |
| | | 6 | TS6 x 2 x 3/16 | 2'-0 1/2 | MC2E | |
| | | 6 | TS6 x 2 x 3/16 | 2'-4 1/2 | MC2E | |
| 4D | | 12 | ANGLE MOUNTS | | | |
| | | 12 | L6 x 4 x 3/8 | 1'-4 | | |
| | | 24 | PL 3/8" x 4 | 6 | | |
| 4F | | 3 | WALL FRAMES | | | |
| | | 6 | TS4 x 2 x 3/16 | 1'-10 1/2 | MC1E | |
| | | 3 | TS4 x 2 x 3/16 | 2'-0 1/2 | MC2E | |
| | | 3 | L8 x 8 x 1/2 | 1'-10 | | |
| 4G | | ONE | WALL FRAME | | | |
| | | 4 | TS4 x 2 x 3/16 | 1'-2 1/2 | MC2E | |
| 4H | | 2 | PIPE SLEEVE | | | |
| | | 2 | 4" SCH.40 PIPE | 4 | | |
| 4J | | 2 | PIPE NIPPLE | | | |
| | | 2 | 3" SCH.40 PIPE | 8 | THREADED BOTH ENDS | |
| 4K | | 4 | PIPE SLEEVE | | | |
| | | 4 | 3" SCH.40 PIPE | 4 | | |
| 4L | | ONE | SUPPORT ANGLE | | | |
| | | ONE | L3 x 3 x 1/4 | 4'-0 | | |

SHOP NOTES:

1.) FABRICATE RADIATOR FRAME WITH MITERED CORNERS AND FULL PENETRATION GROOVE WELDS.
2.) GRIND OUT INSIDE OF MITERED CORNERS OF WALL & CEILING FRAMES TO PROVIDE FULL CLEAR OPENING.

| | |
|---|---|
| CLEANING PAINT | BLAST & PAINT PER SPECS. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |


WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344-1921
FAX:(907)344-8244

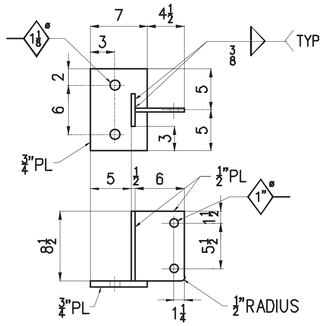

PROJECT: AKHIOK POWER SYSTEM UPGRADE

CUSTOMER: ALASKA ENERGY AUTHORITY

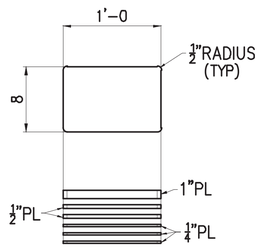
MISCELLANEOUS DETAILS

DATE: 12/9/19 | JOB No. | DWG. NO. D4


Structural Detailing Services of Alaska 907-336-2220 Fax:907-336-2231 dholland@gci.net



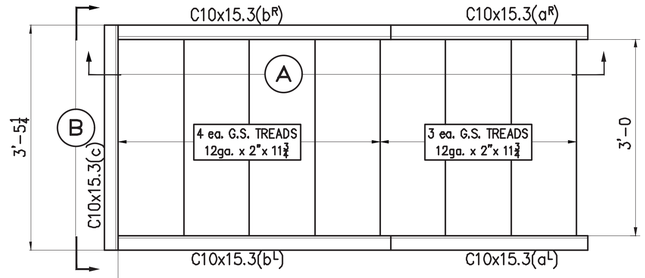

*4 ea. ~ FOUNDATION ANCHORS ~ 5B*



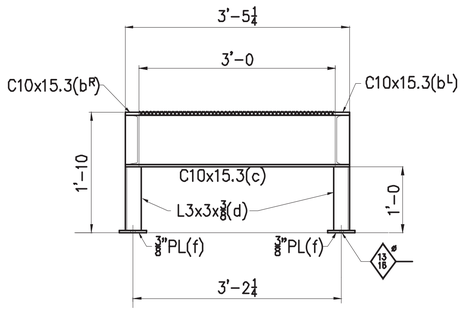

*4 ea. ~ SHIM PACKS ~ 5C*

## BILL OF MATERIAL

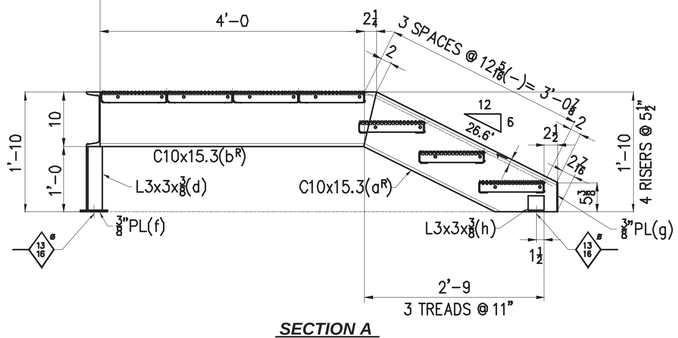
| FIELD MARK | SHOP MARK | NO. PCS | SECTION | LENGTH | REMARKS | WT |
|---|---|---|---|---|---|---|
| | | | | | | |
| 5A | | 2 | STAIR ASSEMBLY | | | |
| | $a^R_L$ | 4 | C10 x 15.3 | 3'–3⅜ | 2 LEFT/2 RIGHT | |
| | $b^R_L$ | 4 | C10 x 15.3 | 4'–2¼ | 2 LEFT/2 RIGHT | |
| | c | 2 | C10 x 15.3 | 3'–5¼ | | |
| | d | 4 | L3 x 3 x ⅜ | 11⅞ | | |
| | f | 4 | PL ⅜" x 5 | 5 | | |
| | g | 4 | PL ¼" x 2⅝ | 5⅜ | | |
| | h | 4 | L3 x 3 x ⅜ | 3 | | |
| | | | | | | |
| | | | GRIP STRUT | | GALVANIZED | |
| | | 14 | 2"x12ga.x11¾ | 3'–0 | TREAD | |
| | | | | | | |
| 5B | | 4 | ANCHOR PL ASS'Y | | | |
| | | 4 | PL ⅜" x 7 | 10 | | |
| | | 4 | PL ½" x 4 | 8½ | | |
| | | 4 | PL ½" x 6 | 8½ | | |
| | | | | | | |
| 5C | | 4 | SHIM PACKS | | | |
| | | 4 | PL 1" x 8 | 1'–0 | RADIUS CORNERS | |
| | | 8 | PL ½" x 8 | 1'–0 | RADIUS CORNERS | |
| | | 12 | PL ¼" x 8 | 1'–0 | RADIUS CORNERS | |
| | | | | | | |
| | | | | | | |
| | | | | | | |




*2 ea. ~ STAIR ASSEMBLIES ~ 5A*




*SECTION B*




*SECTION A*

| REV. No. | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 12/13/19 | DWH | ISSUED FOR APPROVAL |


WEONA CORPORATION
10501 OLIVE LANE
ANCHORAGE, AK 99515
PHONE:(907)344–1921
FAX:(907)344–8244


| | |
|---|---|
| CLEANING PAINT | HOT DIP GALVANIZE AFTER FAB. |
| WELDS | 3/16" FILLET U.N.O. |
| OPEN HOLES | 13/16" U.N.O. |

PROJECT
AKHIOK POWER SYSTEM UPGRADE
STAIR ASSEMBLY DETAILS

CUSTOMER
ALASKA ENERGY AUTHORITY

| DATE | JOB No. | DWG. NO. |
|---|---|---|
| 12/9/19 | | D5 |


Structural Detailing Services of Alaska 907–336–2220 Fax:907–336–2231 dholland@gci.net