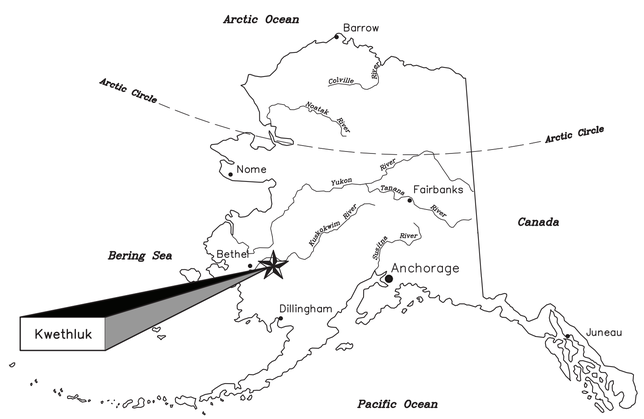
2025 M&I PROJECT DESIGN DRAWINGS – MECHANICAL	
M1.0	LEGEND & SCHEDULES
M3.3	MECHANICAL DEMOLITION PLAN
M3.4	MECHANICAL NEW WORK PLAN & DETAILS
M3.5	GEN#3 INSTALLATION ELEVATION & DETAILS
M3.6	GEN#3 ENGINE–GENERATOR ASSEMBLY & MODIFICATION DETAILS
M4.3	GEN#3 COOLANT PIPING MODIFICATIONS
M5.1	FUEL SYSTEM MODIFICATION PLAN & DETAILS
M6.1	NEW GEN#3 CHARGE AIR COOLING PLAN & DETAILS
M7.1	NEW GEN#3 EXHAUST & CRANK VENT PLAN & DETAILS

2025 M&I PROJECT DESIGN DRAWINGS – ELECTRICAL	
E1.0	LEGEND & SCHEDULES
E3.3	ELECTRICAL DEMOLITION PLAN
E3.4	ELECTRICAL NEW WORK PLAN
E3.5	GEN#3 INSTALLATION ELEVATION & DETAILS
E6.1	SWITCHGEAR MODIFICATION ONE–LINE DIAGRAM
E6.2	SWITCHGEAR SETING TABLE & SEQUENCE OF OPERATIONS SUMMARY
E6.3	RADIATOR VFD REPLACEMENT WIRING
E6.4	CHARGE AIR COOLER VFD REPLACEMENT WIRING
E6.5	GEN#3 ENGINE WIRING J–BOX LAYOUT & BILL OF MATERIALS
E6.6	GEN#3 ENGINE WIRING J–BOX WIRING DIAGRAM & SWITCHGEAR INTERCONNECT
E7.1	EXISTING FUEL SYSTEM CONTROL PANEL LOGIC MODIFICATIONS FOR FUEL POLISHING FUNCTION

REFERENCE 2011 ORIGINAL PLANT RECORD DRAWINGS – MECHANICAL	
M1.1	LEGEND & SCHEDULES
M1.2	OVERALL SITE PLAN & DETAILS
M1.3	EXCAVATION & GRADING PLANS
M1.4	ENLARGED SITE PLAN & DETAILS
M1.5	FUEL TANK & SITE WORK DETAILS
M2	MECHANICAL SPECIFICATIONS
M3.1	EQUIPMENT LAYOUT PLAN, SECTION, & DETAILS
M3.2	WALL ELEVATIONS & PIPING DETAILS
M4.1	COOLANT/HEAT RECOVERY PIPING PLAN, ISOMETRICS, & DETAILS
M4.2	SCHOOL HEAT RECOVERY PIPING PLANS, ISOMETRIC, & DETAILS
M5	DIESEL FUEL & USED OIL PIPING PLAN & DETAILS
M6	CHARGE AIR COOLING PLAN & DETAILS
M7	EXHAUST SYSTEM PLAN & DETAILS
M8.1	VENTILATION PLAN, SPECIFICATIONS, & DETAILS
M8.2	VENTILATION SYSTEM FABRICATION DETAILS

REFERENCE 2011 ORIGINAL PLANT RECORD DRAWINGS – ELECTRICAL	
E1	SITE PLAN & SCHEDULE OF DRAWINGS
E2	SPECIFICATIONS & EQUIPMENT SCHEDULE
E3.1	POWER & CONTROL PLANS & DETAILS
E3.2	WIREWAY PLAN, DATA/COMMUNICATION PLAN, & DETAILS
E4	LIGHTING/RECEPTACLE PLAN & DETAILS
E5	STATION SERVICE PLAN, PANEL, & DETAILS
E6	SWITCHGEAR DETAILS
E7	FUEL SYSTEM CONTROL PANEL 3–LINE DIAGRAM & OIL BLENDER LOGIC
E8	FUEL SYSTEM CONTROL PANEL VFD LOGIC
E9	FUEL SYSTEM CONTROL PANEL DAY TANK FILL LOGIC
E10	FUEL SYSTEM CONTROL PANEL LAYOUT & BILL OF MATERIALS

2023 SWITCHGEAR UPGRADE RECORD DRAWINGS REDLINED FOR 2025 CHANGES	
W–058508–01A	PHYSICAL LAYOUT
W–058508–01B	BASE & SECTIONAL VIEW
W–058508–02	SINGLE LINE DIAGRAM
W–058508–03	NAMEPLATE DETAILS
W–058508–04A	GENERATOR 1 AC SCHEMATIC
W–058508–04B	GENERATOR 2 AC SCHEMATIC
W–058508–04C	GENERATOR 3 AC SCHEMATIC
W–058508–05A	FEEDER BREAKER/MASTER AC SCHEMATIC
W–058508–05B	FEEDER BREAKER/MASTER AC SCHEMATIC
W–058508–05C	VFD AC SCHEMATIC
W–058508–06A	GENERATOR 1 DC CONTROL SCHEMATIC
W–058508–06B	GENERATOR 2 DC CONTROL SCHEMATIC
W–058508–06C	GENERATOR 3 DC CONTROL SCHEMATIC
W–058508–07A	GENERATOR 1 DC CONTROL SCHEMATIC
W–058508–07B	GENERATOR 2 DC CONTROL SCHEMATIC
W–058508–07C	GENERATOR 3 DC CONTROL SCHEMATIC
W–058508–08A	GENERATOR 1 DC CONTROL SCHEMATIC
W–058508–08B	GENERATOR 2 DC CONTROL SCHEMATIC
W–058508–08C	GENERATOR 3 DC CONTROL SCHEMATIC
W–058508–09	MASTER DC CONTROL SCHEMATIC
W–058508–10	MASTER DC CONTROL SCHEMATIC
W–058508–11	MASTER DC CONTROL SCHEMATIC
W–058508–12A	VFD CONTROL SCHEMATIC
W–058508–12B	VFD CONTROL SCHEMATIC
W–058508–13	FEEDER BREAKER DC CONTROL SCHEMATIC
W–058508–14	PLC COMMUNICATION SCHEMATIC
W–058508–15	COMMUNICATION NETWORK SCHEMATIC
W–058508–16	GEN CANBUS COMMUNICATION SCHEMATIC
W–058508–17	HEATER & LIGHTING CONTROL SCHEMATIC
W–058508–18	CONTROL SWITCH TARGET CHART
W–058508–19	INTERCONNECTION DIAGRAM
21116–KWT–BOM	BILL OF MATERIALS



KWETHLUK M&I 2025 IMPROVEMENTS PROJECT ISSUED FOR CONSTRUCTION MAY 2025

ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK M&I 2025 IMPROVEMENTS

TITLE: SCHEDULE OF DRAWINGS

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

DRAWN BY: BCG | SCALE: NO SCALE
DESIGNED BY: BCG | DATE: 5/29/25
FILE NAME: KWT 2025 M&I | SHEET: G1
PROJECT NUMBER:

SCHEDULE OF DRAWINGS:

WARNING SIGN SCHEDULE:

0.08" ALUMINUM, 3/16" HOLES IN ALL FOUR CORNERS. WHITE NON-REFLECTIVE VINYL BACKGROUND, 3M 3650-10, WITH 3M SERIES 225 HIGH PERFORMANCE VINYL LETTERS, COLOR AS INDICATED, ONE SIDE ONLY. 10"x14" UNLESS INDICATED OTHERWISE. WARNING LITES.

WARNING SIGNS - RED LETTERS ON WHITE BACKGROUND.

1. "DANGER - FLAMMABLE, NO SMOKING"
11. "DANGER HIGH VOLTAGE, AUTHORIZED PERSONNEL ONLY"
12. "CAUTION HEARING & EYE PROTECTION REQUIRED"
13. "FUEL OIL DAY TANK ALARM"
14. "IN CASE OF FUEL SPILL CALL DEC 1-800-478-9300"

INFORMATIONAL PLACARDS - BLACK LETTERS ON WHITE BACKGROUND.

16. "TO MANUALLY FILL DAY TANK IN CASE OF EMERGENCY:
    1) TURN OFF POWER TO THE DAY TANK CONTROL PANEL
    2) MANUALLY OPEN ACTUATOR VALVE AT 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"
18. "CHECK INTERMEDIATE TANK LEVEL DAILY, FILL WHEN BELOW 4'-0":
    1) GO TO TANK FARM & TURN ON CONTROL PANEL POWER
    2) VERIFY BULK TANK LEVELS & OPEN TANK VALVES
    3) GO TO INTERMEDIATE TANK & OPEN VALVE
    5) AT INTERMEDIATE TANK PRESS START BUTTON
    6) MONITOR TANK LEVELS CONTINUOUSLY (MAKE SURE BULK TANK AT TANK FARM DOES NOT RUN EMPTY DURING TRANSFER)
    7) WHEN INTERMEDIATE TANK LEVEL REACHES 6'-9" PRESS STOP BUTTON
    8) CLOSE & LOCK VALVE AT INTERMEDIATE TANK
    9) RETURN TO TANK FARM, CLOSE & LOCK VALVES, TURN CONTROL PANEL POWER OFF"

INSTALLATION - SECURE EACH SIGN TO WALL OR DOORS WITH STAINLESS STEEL SHEET METAL SCREWS.

NOTE: SEE FIRE SUPPRESSION PLANS AND SPECIFICATIONS FOR ADDITIONAL PLACARDS TO BE PROVIDED WITH FIRE SUPPRESSION SYSTEM. INSTALL ALL SIGNS AS INDICATED.

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 EQUAL.

GREEN (DIESEL FUEL)

21. "NORMALLY OPEN, CLOSE ONLY FOR EMERGENCIES & TEMPORARY MAINTENANCE OF DAY TANK & DEVICES"
22. "NORMALLY CLOSED, OPEN ONLY FOR HAND PRIMING DAY TANK"
23. "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF BLENDER"
24. "NORMALLY OPEN, CLOSE ONLY FOR TEMPORARY MAINTENANCE OF ENGINE"
25. "NORMALLY CLOSED, OPEN ONLY FOR TEMPORARY MAINTENANCE OF OIL COOLER"
26. "NORMALLY CLOSED, OPEN ONLY FOR FILLING INTERMEDIATE TANK"

BROWN (USED OIL)

41. "NORMALLY CLOSED, OPEN ONLY FOR ENGINE OIL CHANGE"
42. "FILTER #1, 10 MICRON HYDROSORB"
43. "FILTER #2, 10 MICRON HYDROSORB"
44. "FILTER #3, 2 MICRON PARTICULATE"

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, RADIATOR PRE-HEAT"

GRAY (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, HEATING RETURN TO HX"
65. "NORMALLY OPEN, HX TO BOILER"

TOMATO RED (WARNING)

71. "CAUTION: THIS UNIT STARTS AUTOMATICALLY, LOCK & TAG OUT PRIOR TO SERVICE"
72. "EXTERIOR SLAB HEAT, LEAVE SET AT 36° ALL YEAR"

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.

NOTE: 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.

COOLANT/HEAT RECOVERY EQUIPMENT SCHEDULE

CAC-1 CAC-2	GEN #1/#2 CHARGE AIR COOLER	AEA CUSTOM DESIGN CHARGE AIR COOLER, 1342 SCFM CHARGE AIR AT 396F IN AND 110F OUT AT 50F AMBIENT, 28" H2O MAX PRESSURE DROP, VERTICAL ALUMINUM CORE, EPOXY COATING, EXPANDED METAL GUARD, NO EXTERNAL DUCT CONNECTIONS, 3HP, 460V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO. L&M MESABI PART #115385, NO SUBSTITUTES.
CAC-3	GEN #3 CHARGE AIR COOLER	AEA CUSTOM DESIGN CHARGE AIR COOLER, 744 SCFM CHARGE AIR AT 427F IN AND 120F OUT AT 75F AMBIENT, 20" H2O MAX PRESSURE DROP, VERTICAL ALUMINUM CORE, EPOXY COATING, EXPANDED METAL GUARD, NO EXTERNAL DUCT CONNECTIONS, 3HP, 460V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO. L&M MESABI PART #116282, NO SUBSTITUTES.
R-1 R-2	GLYCOL RADIATOR	AEA CUSTOM DESIGN GLYCOL COOLER, 100 GPM 50% ETHYLENE GLYCOL AT 195F IN, 11,000 BTU/MINUTE CAPACITY AT 80F AMBIENT, 2 PSI MAX GLYCOL PRESSURE DROP, VERTICAL CORE WITH MECHANICAL JOINTS, EPOXY COATING, EXPANDED METAL GUARD, NO EXTERNAL DUCT CONNECTIONS, 5HP, 460V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO. L&M MESABI PART #116270. NO SUBSTITUTES.
TV-1	THERMOSTATIC VALVE	4" ANSI 125# FLAT FACED FLANGES, CAST IRON BODY, FACTORY SET NON-ADJUSTABLE FIELD REPLACEABLE THERMOSTATIC ELEMENTS - 185F NOMINAL TEMPERATURE, FPE #A4010-185, NO SUBSTITUTES.
HX-1	POWER PLANT HEAT EXCHANGER	316 SS PLATES, ALL BRAZED CONSTRUCTION, 2" NPT PORTS, 350 MBH MIN CAPACITY. AMERIDEX X-10B-100 OR EQUAL. PRIMARY: 55 GPM 195F EWT (50% ETHYLENE) 1.1 PSI MAX WPD, SECONDARY: 40 GPM 180F LWT (50% PROPYLENE) 0.7 PSI MAX WPD
HX-2	ELEM SCHOOL HEAT EXCHANGER	316 SS PLATES, ALL BRAZED CONSTRUCTION, 2" NPT PORTS, 250 MBH MIN CAPACITY. AMERIDEX X-10B-70 OR EQUAL. PRIMARY: 30 GPM 180F EWT (50% PROPYLENE) 1.2 PSI MAX WPD, SECONDARY: 30 GPM 170F LWT (50% PROPYLENE) 1.2 PSI MAX WPD
HX-3	HIGH SCHOOL HEAT EXCHANGER	316 SS PLATES, ALL BRAZED CONSTRUCTION, 2" NPT PORTS, 100 MBH MIN CAPACITY. AMERIDEX X-10B-50 OR EQUAL. PRIMARY: 10 GPM 180F EWT (50% PROPYLENE) 0.5 PSI MAX WPD, SECONDARY: 30 GPM 170F LWT (50% PROPYLENE) 2.0 PSI MAX WPD
ET-1	COOLANT EXP. TANK	24 GALLON CAPACITY STEEL TANK FABRICATED IN ACCORDANCE WITH AEA STANDARD POWER PLANT TANK FABRICATION DETAILS.
ET-2	HEAT RECOV. EXPANSION TANK	VERTICAL INSTALLATION BLADDER TYPE EXPANSION TANK, 132 GALLON TANK VOL, 46 GALLON ACCEPTANCE VOL, 100 PSIG WORKING PRES, 12 PSIG PRE-CHARGE. AMTROL AX-240 OR EQUAL.
P-HR1	HEAT RECOV. PRIMARY	55 GPM AT 9' TDH, 1/3HP, 115V, 1ø. GRUNDFOS UPS 50-40/4, SPEED 3, NO SUBSTITUTES, WITH 2" NPT COMPANION FLANGES, GASKETS, & BOLTS.
P-HR2	HEAT RECOV. SECONDARY	40 GPM AT 26' TDH, 3/4HP, 115V, 1ø. GRUNDFOS UPS 50-80/2, SPEED 3, NO SUBSTITUTES, WITH 2" NPT COMPANION FLANGES, GASKETS, & BOLTS.
P-HR3	CONTROL ROOM HEAT	4 GPM AT 15' TDH, 1/25HP, 115V, 1ø. GRUNDFOS UPS15-58F, SPEED 3, NO SUBSTITUTES, WITH 3/4" SOLDER COMPANION FLANGES, GASKETS, & BOLTS.
P-HR4	RADIATOR SLAB HEAT	4 GPM AT 15' TDH, 1/25HP, 115V, 1ø. GRUNDFOS UPS15-58F, SPEED 3, NO SUBSTITUTES, WITH 3/4" SOLDER COMPANION FLANGES, GASKETS, & BOLTS.
P-HR5 P-HR6	SCHOOL HEAT RECOVERY	30 GPM AT 10' TDH, 1/6HP, 115V, 1ø. GRUNDFOS UP 43-75F, NO SUBSTITUTES, WITH 1-1/2" SOLDER COMPANION FLANGES, GASKETS, & BOLTS.

FUEL/OIL EQUIPMENT SCHEDULE

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 C992M3E5QF50, NO SUBSTITUTES.
P-DF2 P-DF3 P-U01	PUMP DOWN, DIESEL CIRC, & USED OIL DRAIN PUMPS	ROTARY GEAR PUMP, 1/2" FPT INLET AND OUTLET, BRONZE CONSTRUCTION WITH STAINLESS STEEL 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 N994RH-J46, NO SUBSTITUTES.
P-U02	USED OIL INJECTION PUMP	ROTARY GEAR PUMP, 1/8" FPT INLET AND OUTLET, STAINLESS STEEL CONSTRUCTION, PEEK GEARS, PTFE SEALS, MAGNETICALLY COUPLED TO 1750 RPM TEFC THERMALLY PROTECTED, AUTO RESET MOTOR, 1/20 HP, 115 V, 1 PH, 60 HZ., 1.2 GPH @ 15 PSID. MICROPUMP GA-V21.J8FS.A PUMP WITH #82130 MOTOR, NO SUBSTITUTES.
HAND PUMP	GLYCOL & DIESEL	DOUBLE ACTION PISTON HAND PUMP, ALUM HOUSING, SS PISTON SHAFT & LINER, BUNA-N SEALS, ANTI-SIPHONING VALVE. GPI MODEL HP-100 NO SUBSTITUTES.
FOC-1	FUEL OIL COOLER	AEA CUSTOM DESIGN FUEL OIL COOLER, 4 GPM #1 DIESEL FUEL, 450 BTU/MINUTE CAPACITY WITH 120F MAXIMUM OUTLET TEMPERATURE AT 80F AMBIENT, 0.4 PSI MAX OIL PRESSURE DROP, HORIZONTAL CORE WITH WELDED JOINTS, STANDARD COATING FOR INTERIOR INSTALLATION, 18" BY 18" DUCT FLANGE OUTLET ON TOP, ALLOW FOR 0.50" EXTERNAL STATIC FOR DUCT, 1-1/2HP, 208V, 3 PH, MOTOR SUITABLE FOR VFD OPERATION AT 10:1 TURNDOWN RATIO. L&M MESABI PART #116224, NO SUBSTITUTES.

LEGEND

- GATE VALVE
- BALL VALVE
- CHECK VALVE
- HOSE END DRAIN VALVE
- GAUGE COCK
- AUTOMATIC AIR VENT
- THERMOMETER
- PRESSURE GAUGE
- TEMPERATURE SENSOR
- FLEXIBLE CONNECTOR
- FLANGED JOINT
- UNION
- ELBOW TURNED UP
- ELBOW TURNED DOWN
- PIPING CONNECTION (TEE)
- CHANGE OF PIPE SIZE
- DIRECTION OF FLOW

ABBREVIATIONS

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

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

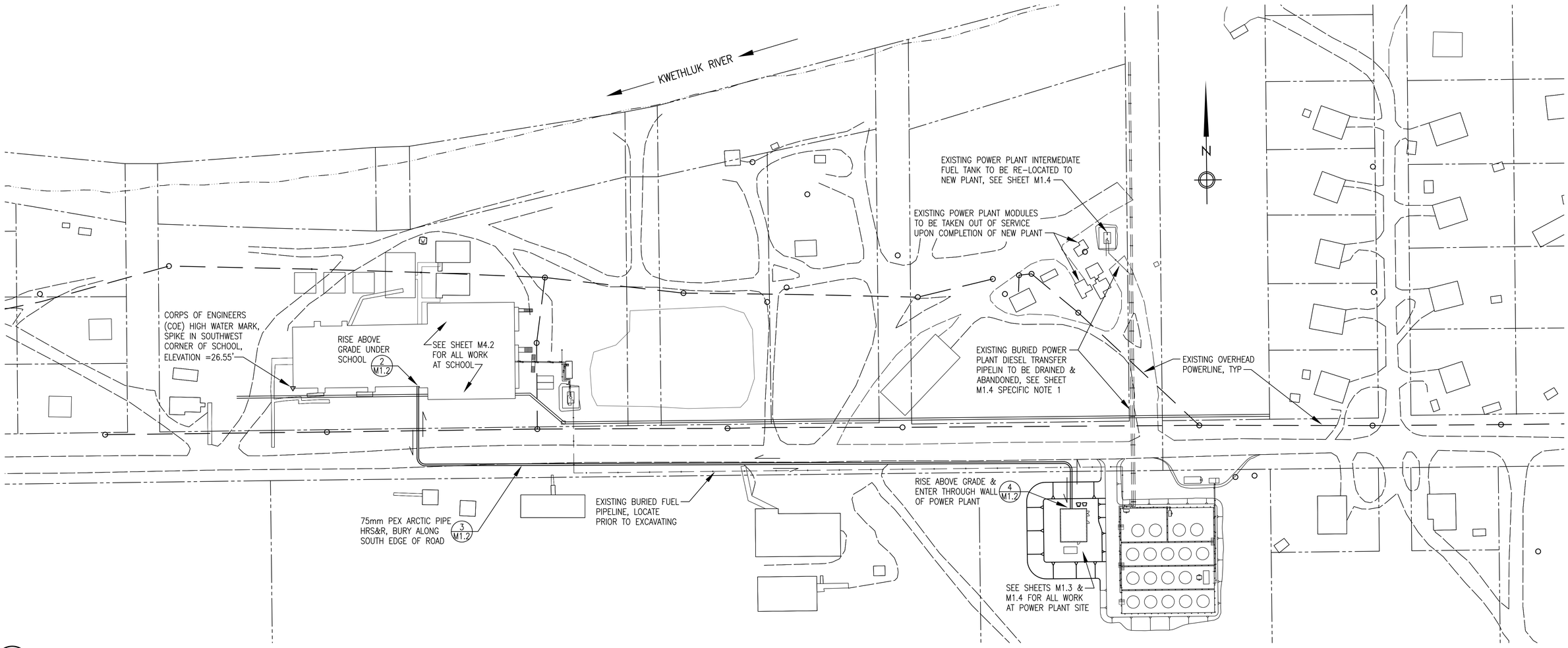
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

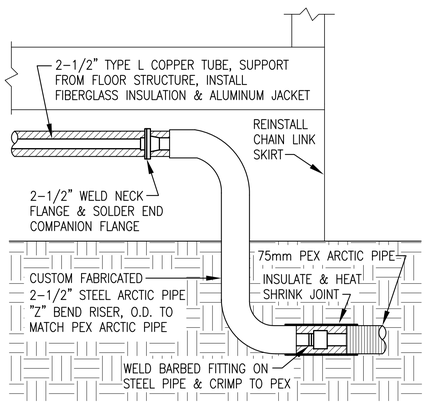
TITLE: LEGEND & SCHEDULES

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

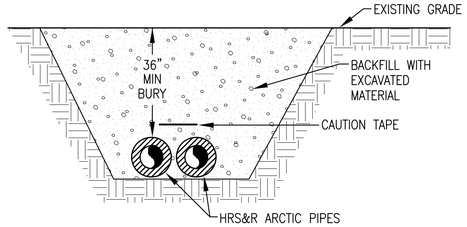
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M1	SHEET: M1.1 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



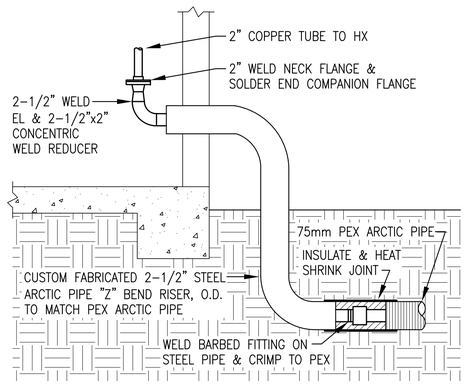
1 M1.2 OVERALL SITE PLAN
1"=60'



2 M1.2 ABOVE GRADE TRANSITION AT SCHOOL
NO SCALE



3 M1.2 TYPICAL BURIED ARCTIC PIPE INSTALLATION
NO SCALE



4 M1.2 ABOVE GRADE TRANSITION AT POWER PLANT
NO SCALE

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

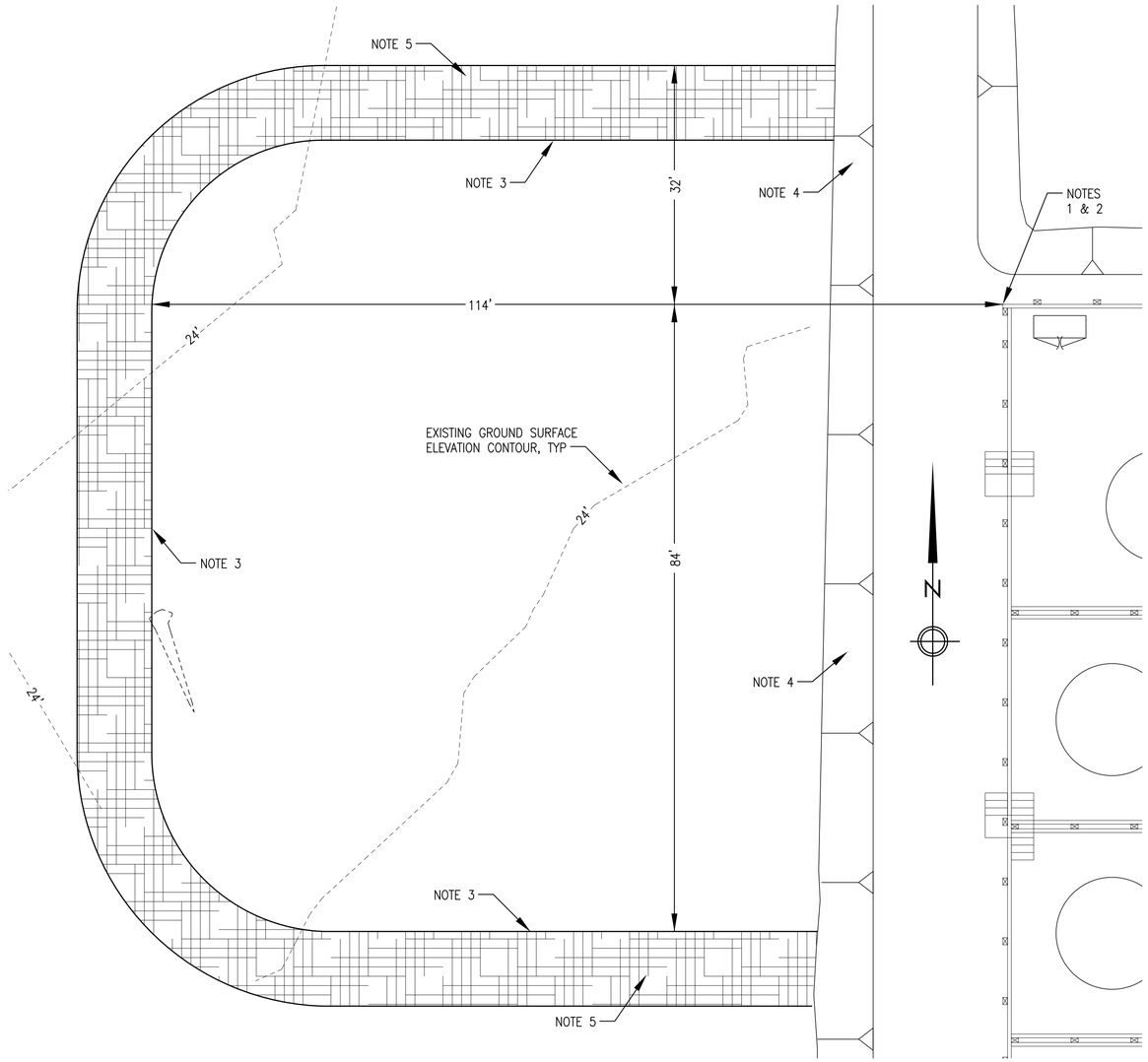
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

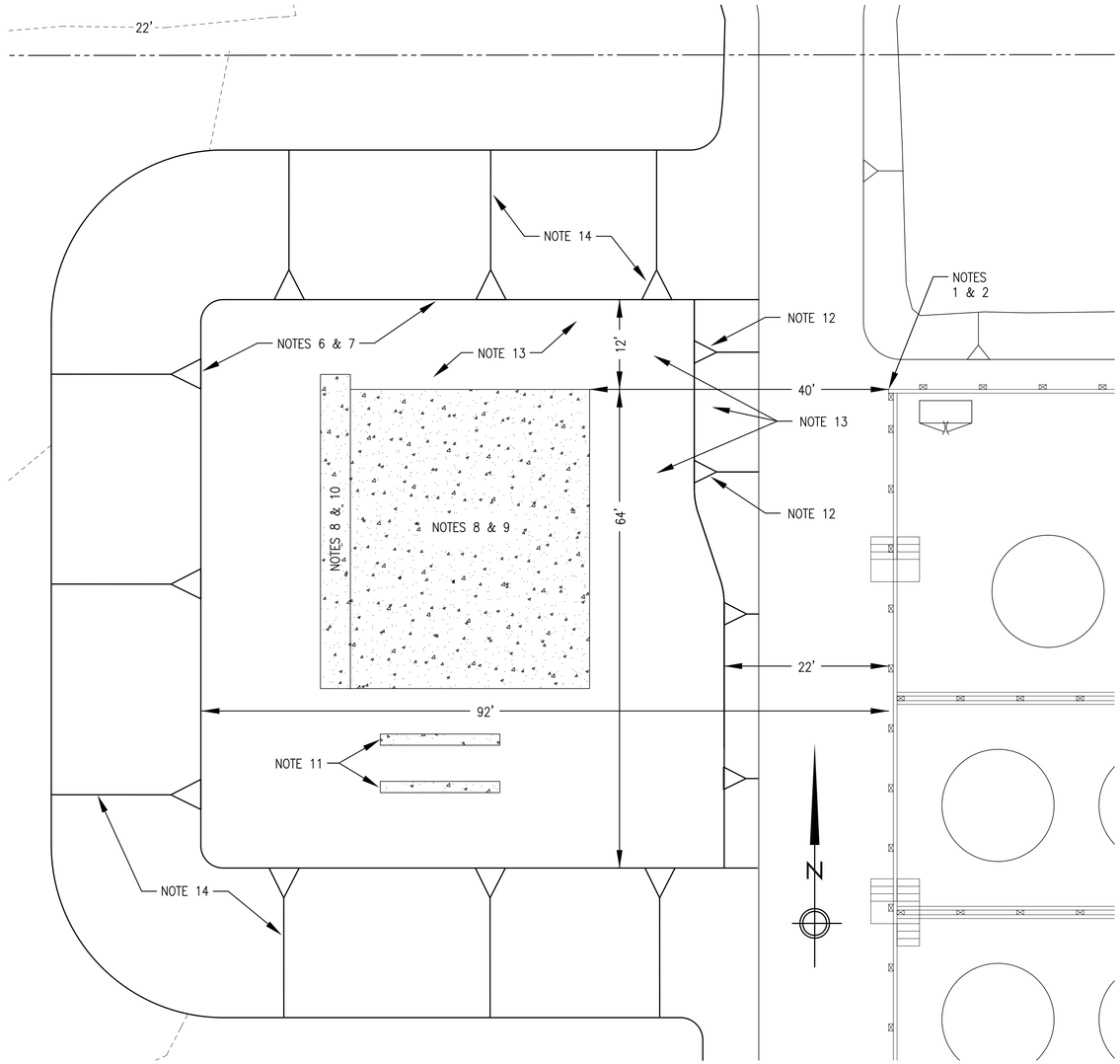
TITLE: OVERALL SITE PLAN & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

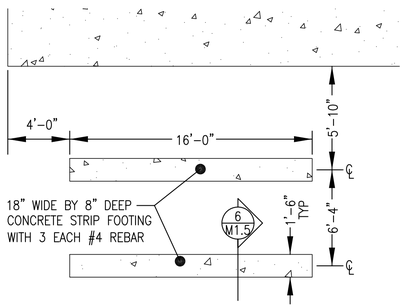
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M1	SHEET: M1.2 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 M1.3 EXCAVATION PLAN
1"=10'



2 M1.3 GRADING PLAN
1"=10'



3 M1.3 TANK FOOTING PLAN
1"=5'

EXCAVATION & GRADING NOTES:

1) BASIS OF HORIZONTAL LAYOUT EXTREME NORTHWEST CORNER OF EXISTING TIMBER DIKE STRUCTURE. LAY OUT ALL NEW WORK PARALLEL TO DIKE WALLS.

2) PROJECT BENCH MARK, MAGNETIC SPIKE SET IN TOP OF TIMBER DIKE WALL, ELEV=29.21'. COE RECOMMENDED BUILDING ELEVATION IS PRESENTLY 28.55' BUT LIKELY TO BE INCREASED IN THE FUTURE. FINISHED FLOOR OF NEW POWER PLANT =31.0'.

3) CLEAR AREA INDICATED OF ALL BRUSH. EXCAVATE AS REQUIRED TO REMOVE ALL VEGETATION AND ORGANIC SILT, APPROXIMATELY 1.5' BELOW EXISTING SURFACE. COMPACT BOTTOM OF EXCAVATION AND PLACE WOVEN GEOTEXTILE FABRIC ACROSS ENTIRE EXCAVATED AREA.

4) VERIFY THAT SIDESLOPE OF EXISTING ROAD IS PLACED ON GROUND THAT WAS CLEARED PRIOR TO FILL PLACEMENT. IF NOT EXCAVATE INTO ROAD AND SUB–EXCAVATE BASE TO MATCH NEW PAD AREA.

5) STOCKPILE EXCAVATED ORGANIC MATERIAL AROUND PERIMETER OF PAD.

6) CONSTRUCT PAD FROM SAND THAT IS FREE OF ORGANICS. PLACE FILL IN MAXIMUM 12" LIFTS AND COMPACT TO 95% DENSITY. PLACE INTERMEDIATE LAYER OF WOVEN GEOTEXTILE AT APPROXIMATELY ELEVATION 25'. CONSTRUCT PAD TO ELEVATION 31' AND PLACE 4' OF SURCHARGE OVER TOP TO ELEVATION 35'.

7) ALLOW PAD TO CONSOLIDATE FOR 30 DAYS MINIMUM. REMOVE SURCHARGE MATERIAL AND SPREAD OVER OUTSIDE SLOPES. CUT TOP OF PAD TO ELEV 30.5'.

8) OVER–EXCAVATE FOR FOOTINGS AND PLACE 6" MIN OF GRAVEL BELOW ALL CONCRETE. INSTALL UNDERFLOOR CONDUIT AS SHOWN ON SHEET E3.1 AND UNDERFLOOR PEX HEATING PIPING AS SHOWN ON SHEET M4.1. UPON COMPLETION OF ALL UNDERFLOOR PIPING INSTALLATION BACKFILL WITH GRAVEL. COMPACT ALL FINISHED SURFACES TO 95% MIN DENSITY PRIOR TO POURING CONCRETE.

9) 40'x32' CONCRETE SLAB FOR BUILDING, FINISHED ELEVATION 31.0'. SEE SHEET S2 FOR SLAB PLAN AND DETAILS.

10) 4'x33'–6" CONCRETE SLAB FOR RADIATORS, FINISHED ELEVATION 30.75'. SEE SHEET S2 FOR SLAB PLAN AND DETAILS.

11) STRIP FOOTING FOR FUEL TANK, SEE PLAN 3/M1.3, TYP(2) TOP ELEVATION 30.75'.

12) GRADE ACCESS AREA UNIFORMLY FROM TOP OF PAD DOWN TO EXISTING ROAD.

13) PLACE 6" GRAVEL FILL OVER TOP OF PAD AND DRIVE UP ACCESS.

14) GRADE SIDE SLOPES AT 2.5:1 AND PLACE VEGETATIVE MAT ALL AROUND FOR EROSION CONTROL.

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

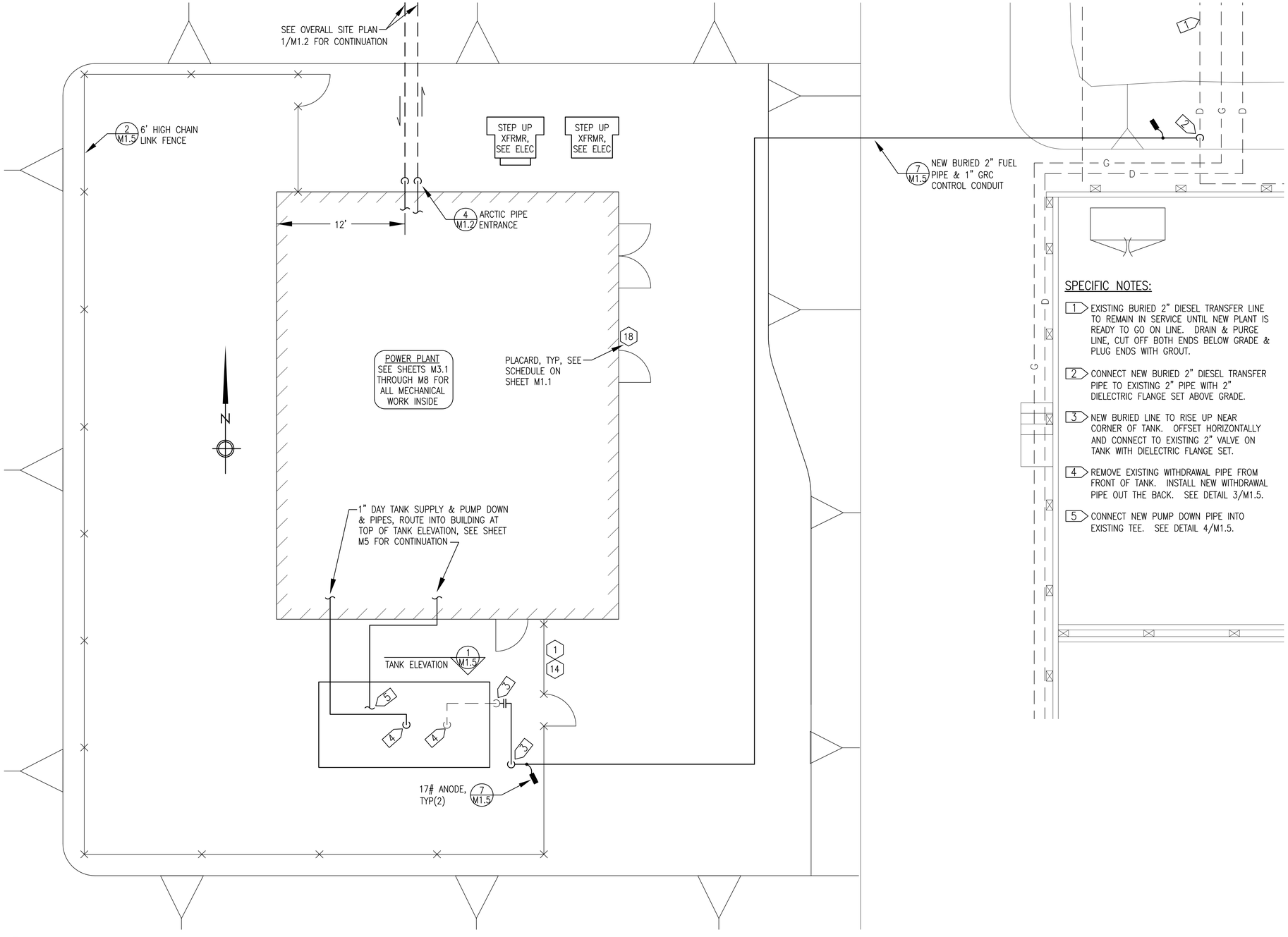
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: EXCAVATION & GRADING PLANS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511–1405 PHONE (907) 349–0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M1	SHEET: M1.3	OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07–04–9621		



1 M1.4 ENLARGED SITE PLAN
1"=5'

SPECIFIC NOTES:

1. EXISTING BURIED 2" DIESEL TRANSFER LINE TO REMAIN IN SERVICE UNTIL NEW PLANT IS READY TO GO ON LINE. DRAIN & PURGE LINE, CUT OFF BOTH ENDS BELOW GRADE & PLUG ENDS WITH GROUT.
2. CONNECT NEW BURIED 2" DIESEL TRANSFER PIPE TO EXISTING 2" PIPE WITH 2" DIELECTRIC FLANGE SET ABOVE GRADE.
3. NEW BURIED LINE TO RISE UP NEAR CORNER OF TANK. OFFSET HORIZONTALLY AND CONNECT TO EXISTING 2" VALVE ON TANK WITH DIELECTRIC FLANGE SET.
4. REMOVE EXISTING WITHDRAWAL PIPE FROM FRONT OF TANK. INSTALL NEW WITHDRAWAL PIPE OUT THE BACK. SEE DETAIL 3/M1.5.
5. CONNECT NEW PUMP DOWN PIPE INTO EXISTING TEE. SEE DETAIL 4/M1.5.

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PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: ENLARGED SITE PLAN & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

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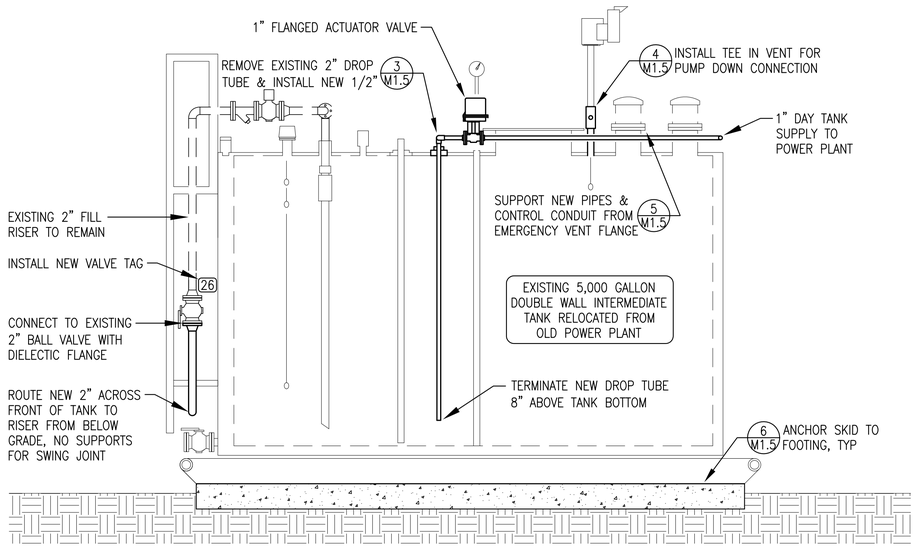
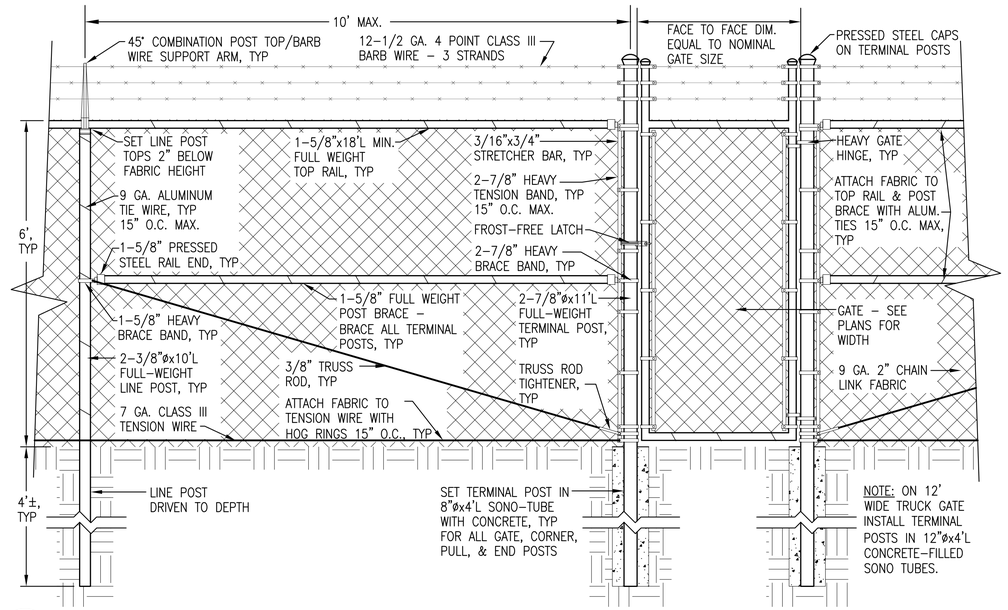
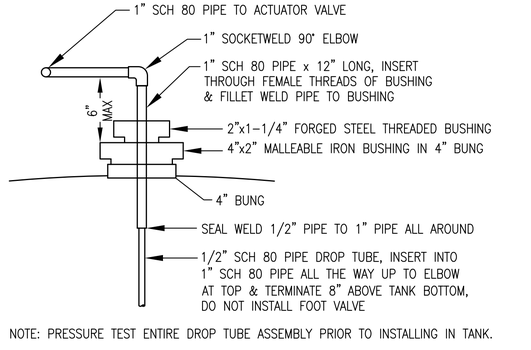


1 M1.5 SECTION THROUGH INTERMEDIATE FUEL TANK
1"=2'

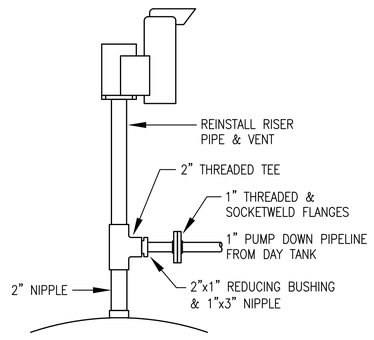


2 M1.5 TYPICAL FENCE INSTALLATION DETAIL
NO SCALE

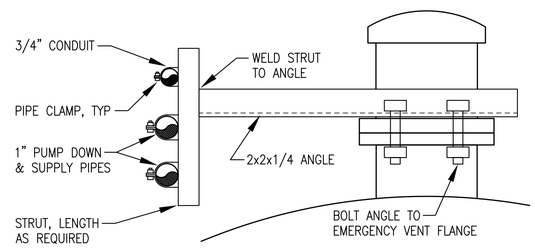


NOTE: PRESSURE TEST ENTIRE DROP TUBE ASSEMBLY PRIOR TO INSTALLING IN TANK.

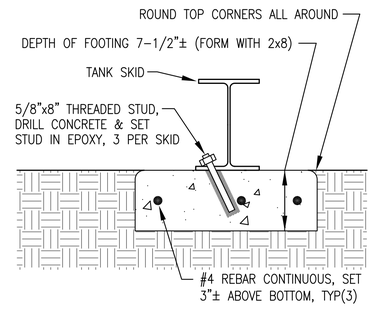
3 M1.5 DAY TANK SUPPLY DROP TUBE
NO SCALE



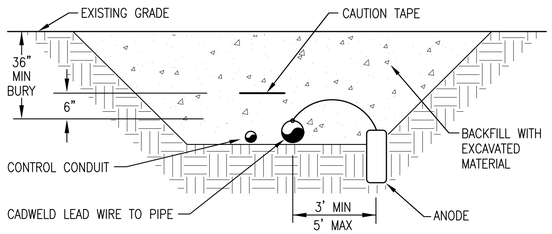
4 M1.5 PUMP DOWN CONNECTION
NO SCALE



5 M1.5 PIPING SUPPORT FROM EMERGENCY VENT
NO SCALE



6 M1.5 TANK FOOTING DETAIL
NO SCALE



7 M1.5 FUEL PIPELINE & ANODE INSTALLATION
NO SCALE

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Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: FUEL TANK & SITE WORK DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

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DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	

** GENERAL CONDITIONS **

PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST ADOPTED EDITIONS OF THE INTERNATIONAL FIRE CODE AND THE INTERNATIONAL BUILDING CODE INCLUDING STATE OF ALASKA AMENDMENTS. COMPLY WITH ALL APPLICABLE STATE AND FEDERAL REGULATIONS.

THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY SHOW ALL FEATURES OF THE REQUIRED WORK. PROVIDE ALL EQUIPMENT AND MATERIALS REQUIRED FOR A COMPLETE SYSTEM. VERIFY EXISTING FIELD CONDITIONS PRIOR TO STARTING CONSTRUCTION. IMMEDIATELY CONTACT THE ENGINEER FOR CLARIFICATION OF QUESTIONABLE ITEMS OR APPARENT CONFLICTS.

ALL EQUIPMENT AND MATERIALS SHOWN ARE NEW UNLESS SPECIFICALLY INDICATED AS EXISTING. WHERE ADDITIONAL OR REPLACEMENT ITEMS ARE REQUIRED, PROVIDE LIKE ITEMS BY THE SAME MANUFACTURER TO THE MAXIMUM EXTENT PRACTICAL. INSTALL ALL MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS, UNLESS INDICATED OTHERWISE.

PROTECT ALL MATERIALS AND EQUIPMENT DURING THE ENTIRE DURATION OF CONSTRUCTION WORK AGAINST CONTAMINATION OR DAMAGE. REPLACE OR REPAIR TO ORIGINAL MANUFACTURED CONDITION ANY ITEMS DAMAGED DURING CONSTRUCTION. IMMEDIATELY REPORT TO THE ENGINEER ANY ITEMS FOUND DAMAGED PRIOR TO COMMENCING CONSTRUCTION.

PERFORM WORK WITH SKILLED CRAFTSMEN SPECIALIZING IN SAID WORK. INSTALL ALL MATERIALS IN A NEAT, ORDERLY, AND SECURE FASHION, AS REQUIRED BY THESE SPECIFICATIONS AND COMMONLY RECOGNIZED STANDARDS OF GOOD WORKMANSHIP.

DO NOT CUT, DRILL, OR NOTCH STRUCTURAL MEMBERS UNLESS SPECIFICALLY APPROVED BY THE ENGINEER. MINIMIZE PENETRATIONS AND DISRUPTION OF BUILDING FEATURES. WHERE PREVIOUSLY COMPLETED BUILDING SURFACES OR OTHER FEATURES MUST BE CUT, PENETRATED, OR OTHERWISE ALTERED, SUCH WORK SHALL BE CAREFULLY LAID OUT AND PATCHED TO ORIGINAL CONDITION. SEAL ALL EXTERIOR FLOOR AND WALL PENETRATIONS AS INDICATED.

CONTACT THE ENGINEER ONE-WEEK PRIOR TO COMPLETION OF ALL WORK TO SCHEDULE A SUBSTANTIAL COMPLETION INSPECTION. THE ENGINEER WILL GENERATE A PUNCH LIST OF CORRECTIVE ACTION ITEMS DURING THE INSPECTION. WORK WILL NOT BE CONSIDERED COMPLETE UNTIL ALL CORRECTIVE ACTION ITEMS IN THE ENGINEERS PUNCH LIST HAVE BEEN SATISFACTORILY COMPLETED AND PHOTOGRAPHIC OR OTHER POSITIVE DOCUMENTATION HAS BEEN PROVIDED TO THE ENGINEER.

PROVIDE ONE SET OF DRAWINGS CLEARLY MARKED UP WITH ALL AS-BUILT INFORMATION TO THE ENGINEER WITHIN TWO WEEKS OF COMPLETION.

** SPECIAL CONDITIONS **

ENSURE THAT APPROPRIATE SAFETY MEASURES ARE IMPLEMENTED AND THAT ALL WORKERS ARE AWARE OF THE POTENTIAL HAZARDS FROM ELECTRICAL SHOCK, BURN, ROTATING FANS, PULLEYS, BELTS, HOT MANIFOLDS, NOISE, ETC. ASSOCIATED WITH WORKING NEAR POWER GENERATION AND CONTROL EQUIPMENT.

** SUPPORTS AND FASTENERS **

SUPPORT PIPING AND EQUIPMENT AS SHOWN ON PLANS USING SPECIFIED SUPPORTS AND FASTENERS. IF NOT DETAILED ON PLANS, SUPPORT FROM STRUCTURAL MEMBERS WITH PIPE HANGERS, CLAMPS, OR PIPE STRAPS SPECIFICALLY INTENDED FOR THE APPLICATION. DO NOT SUPPORT PIPING FROM CONNECTIONS TO EQUIPMENT. INDEPENDENTLY SUPPORT PUMPS AND EQUIPMENT.

STRUCTURAL STEEL – MISCELLANEOUS SHAPES AND PLATE ASTM A-36. RECTANGULAR TUBING ASTM A-500 GRADE B. STRUCTURAL PIPE ASTM A-53 OR ASTM A-106B. PAINT AS INDICATED.

STRUT – COLD FORMED MILD STEEL CHANNEL STRUT, HOT DIPPED GALVANIZED FINISH AND SLOTTED BACK UNLESS SPECIFICALLY INDICATED OTHERWISE. STANDARD STRUT – 12 GA, 1-5/8" x 1-5/8", B-LINE B22-SH-GALV OR EQUAL. DOUBLE STRUT – 12 GA, 1-5/8" x 3-1/4", B-LINE B22A-SH-GALV OR EQUAL. SHALLOW STRUT – 14 GA, 1-5/8" x 13/16", B-LINE B54-SH-GALV OR EQUAL.

FITTINGS AND ACCESSORIES – PROVIDE FITTINGS, BRACKETS, CHANNEL NUTS, AND ACCESSORIES DESIGNED SPECIFICALLY FOR USE WITH SPECIFIED CHANNEL STRUT. GALVANIZED OR ZINC-PLATED CARBON STEEL.

PIPE CLAMPS – TWO-PIECE PIPE CLAMP DESIGNED TO SUPPORT PIPE TIGHT TO STRUT. B-LINE B20## OR EQUAL. ZINC-PLATED CARBON STEEL.

PIPE STRAPS – CARBON STEEL TWO-HOLE PIPE STRAP. B-LINE B2400 OR EQUAL.

FASTENERS – ALL BOLTS, NUTS, AND WASHERS ZINC PLATED ZINC-PLATED EXCEPT WHERE SPECIFICALLY INDICATED AS STAINLESS STEEL.

CABLE TIES – TYPE 304 STAINLESS STEEL SELF-LOCKING TIES, 14" NOMINAL LENGTH, PANDUIT MLT4S-CP OR EQUAL.

** PAINTING **

PAINTING – PAINT ALL CARBON STEEL PIPE AND FABRICATIONS AND ALL COPPER PIPE THAT IS NOT INSULATED. AFTER COMPLETION OF FABRICATION, SANDBLAST OR WIRE BRUSH TO BARE METAL AND WIPE DOWN WITH SOLVENT. ETCH COPPER PIPE WITH ACID. PRIME WITH UNIVERSAL RED OXIDE PRIMER, DEVOE RUSTGUARD 4140 OR EQUAL, COLOR RED, TO 1.5 MILS DRY FILM THICKNESS. PAINT WITH TWO COATS OF ALKYD ENAMEL, DEVOE 4308 OR EQUAL, COLOR DC2534 MEDIUM GRAY EXCEPT WHERE INDICATED OTHERWISE.

TOUCH UP – FINISH ALL CUT ENDS AND DAMAGED SURFACES OF GALVANIZED AND ZINC PLATED SUPPORTS AND FASTENERS WITH SPRAY ON COLD GALVANIZING COMPOUND, ZRC OR EQUAL. TOUCH UP PAINT ON FABRICATED ITEMS TO MATCH ORIGINAL.

** INSULATION **

LOW TEMPERATURE INSULATION – INSULATE GLYCOL COOLANT PIPING MAINS AND CHARGE AIR COOLING SUPPLY TUBING WHERE INDICATED. INSTALL 1" PRE-FORMED RIGID FIBERGLASS PIPE INSULATION, JOHNS-MANVILLE MICRO-LOK OR EQUAL.

MEDIUM TEMPERATURE INSULATION – INSULATE EXHAUST PIPES WHERE INDICATED. INSTALL 1-1/2" PRE-FORMED RIGID MINERAL WOOL PIPE INSULATION, ROXUL TECHTON 1200 OR EQUAL.

JACKET – INSTALL ALUMINUM JACKET OVER ALL PIPE INSULATION. EXTERIOR GRADE CORRUGATED 0.016" THICK ALUMINUM JACKETING WITH PRE-FORMED ALUMINUM FITTING COVERS, PABCO OR EQUAL.

** DIESEL FUEL AND LUBE OIL PIPING, VALVES, AND SPECIALTIES **

OIL PIPING (DFR, DFS, UOR) – ASTM A106B SCHEDULE 80 SEAMLESS BLACK STEEL PIPE. BUTT WELD JOINTS FOR ALL PIPE 2" DIAMETER AND LARGER. SOCKET WELD OR THREADED JOINTS FOR ALL PIPING SMALLER THAN 2" DIAMETER WITH MINIMUM 3000# FORGED STEEL FITTINGS. PERFORM PIPE WELDING WITH EXPERIENCED WELDER WITH CURRENT API OR EQUIVALENT CERTIFICATION FOR PIPE WELDING IN ALL POSITIONS. PROVIDE SPIRAL WOUND METALLIC GASKETS AND COAT WITH ANTI SEIZE COMPOUND PRIOR TO ASSEMBLING FLANGED JOINTS. REAM THREADED PIPE ENDS AND THOROUGHLY COAT MALE PIPE ENDS WITH HERCULES GRIPP PIPE JOINT COMPOUND PRIOR TO ASSEMBLING. TEST ALL FUEL OIL PIPING JOINTS WITH MINIMUM 50 PSIG AIR, WITH EACH JOINT SOAKED WITH A FOAMING SOAPY WATER SOLUTION, AND VISUALLY INSPECT EACH JOINT FOR LEAKS.

SMALL HOSES – FUEL RATED HOSE, EATON WEATHERHEAD H569 OR EQUAL. SIZE AS INDICATED ON DRAWINGS. PROVIDE RE-USABLE PLATED STEEL JIC SWIVEL ENDS, STRAIGHT OR 90° AS REQUIRED, WITH NPT ADAPTERS.

FLANGED BALL VALVES – REDUCED PORT CARBON STEEL UNI-BODY, ANSI 150# RF FLANGED ENDS, STAINLESS STEEL BALL AND TRIM, LOCKABLE HANDLE, 150 PSIG MINIMUM WORKING PRESSURE. APOLLO 88A-245-24, NO SUBSTITUTES.

THREADED BALL VALVES – CARBON STEEL BODY, THREADED ENDS, STAINLESS STEEL BALL AND TRIM. PBV, APOLLO, OR EQUAL.

THREADED CHECK VALVES – BRONZE BODY, THREADED ENDS, SWING CHECK STYLE, 150 PSIG MINIMUM WORKING PRESSURE. MILWAUKEE 510-S OR HAMMOND EQUAL, DOMESTIC ONLY.

THREADED PRESSURE RELIEF VALVES – 3/8" SIZE – STEEL BODY, MPT INLET X FPT OUTLET, CLOSED CAP, SIZE AND PRESSURE SETTING AS INDICATED, HYDROSEAL LSA20/AO OR EQUAL. 1/4" SIZE – BRONZE BODY, FPT INLET AND OUTLET, PRESSURE SETTING AS INDICATED, KINGSTON 112C OR EQUAL.

FUSIBLE LINK VALVES – BRASS BODY, FPT ENDS, 165F FUSIBLE HEAD. FIROMATIC 200F FOR 1/2", FIROMATIC 400F FOR 1", OR EQUAL.

SOLENOID VALVES- 1/2" THREADED END BRASS BODY, 1/2" NPT CONDUIT CONNECTION, 120VAC, SS CORE, MOLDED EPOXY COIL ENCLOSURE, INTERNAL PILOT OPERATED, 150 PSI DIFFERENTIAL OPENING PRESSURE, LIQUID TIGHT AND FULL MODULATION AT 0 PSI DIFFERENTIAL.
NORMALLY CLOSED – ASCO CAT. NO. 8210G94, NO SUBSTITUTES.
NORMALLY OPEN – ASCO CAT. NO. 8210G34, NO SUBSTITUTES.

ELECTRIC ACTUATOR VALVES – 1" LOW TEMP BALL VALVE, 150# RF FLANGED ENDS, 151 IN-LB OPERATING TORQUE @ -50 DEG F. 150 PSIG MINIMUM WORKING PRESSURE. NUTRON MODEL T3-R10R01LZ-06, NO SUBSTITUTES. ELECTRIC ACTUATOR – NEMA 4 ENCLOSURE WITHOUT MANUAL OVERRIDE SHAFT EXTENSION. PTC SELF REGULATING HEATER, EXXON BEACON 325 SEVERE COLD LUBRICANT, 115 VAC, 350 IN-LBS TORQUE, 10 SECOND STROKE TIME, RATED TO -50 DEG F. RCS MODEL SXR-0897, NO SUBSTITUTES. ACTUATOR COUPLING BRACKET, SHAFT, AND FASTENERS – TYPE 304 STAINLESS STEEL. CONFIGURE COUPLING TO ALLOW WRENCH ACCESS FOR MANUAL OPERATION OF VALVE WITHOUT REMOVING ACTUATOR.

DAY TANK – RECTANGULAR HEAVY GAUGE WELDED STEEL TANK MANUFACTURED IN ACCORDANCE WITH UL STANDARD 142 AND AEA STANDARD POWER PLANT TANK FABRICATION DETAILS, NOMINAL 160 GALLON CAPACITY. FURNISH COMPLETE WITH ALL CONTROLS AND ACCESSORIES AS INDICATED.

USED OIL/DIESEL FUEL BLENDING SYSTEM – FIELD ASSEMBLED SYSTEM FOR BLENDING USED LUBRICATING OIL WITH DIESEL FUEL, CAPABLE OF AUTOMATIC OPERATION, 0.5% USED OIL INJECTION RATE, 30 PSIG OPERATING PRESSURE, TESTED TO 50 PSIG. PROVIDE COMPLETE WITH: 1) 20 GALLON USED OIL HOPPER; 2) PUMPS AS INDICATED IN SCHEDULE; 3) THREE STAGE FILTER BANK WITH CIM-TEK TITAN I ELEMENTS, 10 MICRON HYDROSORB ELEMENTS CIM-TEK E-1300HS-10 FIRST AND SECOND STAGE, 2 MICRON PARTICULATE ELEMENT CIM-TEK E-1300-2 FINAL STAGE; 4) 0-15 PSID DIFFERENTIAL PRESSURE GAUGES WITH ADJUSTABLE SPDT SWITCH FOR EACH FILTER, ASHCROFT 25-1132-A-25S-XV6-15, NO SUBSTITUTES; 5) NEMA 1 RATED CONTROL PANEL WITH ALARM AND SHUTDOWN FUNCTIONS; 6) ALL ASSOCIATED PIPING, VALVES, AND HOSES AS INDICATED. FABRICATE HOPPER AND FILTER BANK IN ACCORDANCE AEA STANDARD POWER PLANT TANK FABRICATION DETAILS.

THREADED STRAINERS – "Y" TYPE BRONZE BODY, SCREWED ENDS, GASKETED CAP, 20 MESH STAINLESS STEEL SCREEN, 200 PSIG WORKING PRESSURE, MUELLER #351M OR EQUAL.

DAY TANK FILTERS – ZINC TOP, 1" FPT CONNECTIONS, IMPACT RESISTANT "SEE-THRU" BOWL, 150 PSIG WORKING PRESSURE, GOLDEN ROD MODEL NO. 495 – NO SUBSTITUTES. USE STANDARD 10 MICRON FILTER ELEMENT, NO. 470-5. PROVIDE WITH FUEL FILTER WRENCH NO. 491.

FUEL FILTER – SINGLE ELEMENT FILTER, STEEL HOUSING, SCREW-ON T-HANDLE LID WITH RUBBER GASKET, 1" MPT INLET/OUTLET, 30 PSIG MAXIMUM WORKING PRESSURE, 3.2 PSIG MAXIMUM DIFFERENTIAL PRESSURE, 720 GPH FLOW CAPACITY, 40 MICRON WATER BLOCKING FILTER ELEMENT. RACOR MODEL 812, NO SUBSTITUTES. PROVIDE SIX EACH RK22610 ELEMENT KITS FOR EACH FILTER (EACH KIT INCLUDES ONE 40 MICRON AQUABLOC II FILTER, ONE COALESCER AND ONE GASKET).

DAY TANK METER – 1" ANSI 150# FLANGED INLET AND OUTLET. CONTOIL #9226, NO SUBSTITUTES. FURNISH COMPLETE WITH REED SWITCH PULSER.

DAY TANK GAUGE – MAGNETIC OPERATED SPIRAL GAUGE FOR #1 DIESEL FUEL, DIE-CAST ZINC HEAD, 1-1/2" MPT CONNECTION, ZINC-PLATED STEEL GUIDE ROD, BRASS CENTER SHAFT, EPOXY COATED CORK FLOAT, HERMETICALLY SEALED SIDE-VIEW DIAL, 25 PSIG MAXIMUM OPERATING PRESSURE, GUIDE ROD (OPERATING) LENGTH AS INDICATED ON DRAWINGS. ROCHESTER MODEL 8660 WITH SIDE-VIEW DIAL #5025S00570.

** HEAT RECOVERY ARCTIC PIPE **

PRE-INSULATED ARCTIC PIPE SYSTEM FOR NOT TO EXCEED 200F GLYCOL/WATER SERVICE AT 90 PSI IN DIRECT BURIAL INSTALLATION. PROVIDE PRESS-FIT COUPLINGS, ADAPTERS, AND SLEEVES; TOOLS, AND ALL OTHER COMPONENTS REQUIRED FOR A COMPLETE INSTALLATION. HEAT TRACE AND ALARM WIRES ARE NOT REQUIRED. PEX 02 BARRIER SINGLE CARRIER PIPE, DIAMETER AS INDICATED. FOAMED-IN-PLACE POLYURETHANE INSULATION (0.015 BTU/hr-ft-F) WITH POLYETHYLENE JACKET. TEES, ELBOWS, COUPLINGS AND SLEEVES TO BE HOT FORGED BRASS OR CAST BRONZE PRESS-FIT FITTINGS ONLY. THREADED OR BOLTED COMPRESSION FITTINGS WILL NOT BE ACCEPTED. WELD ADAPTERS TO BE CARBON OR STAINLESS STEEL, AS INDICATED. STRAIGHT AND TEE JOINT KITS TO INCLUDE POLYETHYLENE SHELLS AND SHRINK SLEEVES TO FORM A CONTINUOUS WATER-TIGHT JACKET. END CAPS TO BE HEAT SHRINK POLYETHYLENE. REHAU INSULPEX, PERMAPIPE PEXGARD, ROVANCO RHINOFLEX OR APPROVED EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

** GLYCOL PIPING, VALVES, AND SPECIALTIES **

GLYCOL PIPING (ECS, ECR, HRS, HRR) – PROVIDE COPPER PIPE AND FITTINGS. PROVIDE FLEXIBLE HOSE FOR CONNECTION TO ALL ENGINES. HYDROSTATICALLY TEST ALL PIPING AT 100 PSIG MINIMUM FOR ONE HOUR WITH NO NOTICEABLE WATER LEAKS OR PRESSURE DROP EXCEPT AS CAUSED BY TEMPERATURE CHANGE. ISOLATE ENGINES AND RADIATORS PRIOR TO PRESSURE TESTING. FLUSH PIPING WITH FRESH WATER PRIOR TO PLACING IN SERVICE.

COPPER PIPE – TYPE "L" HARD DRAWN COPPER TUBE WITH WROUGHT COPPER FITTINGS. ALL JOINTS SOLDERED WITH 95/5 TIN/ANTIMONY SOLDER OR SILVER SOLDER EXCEPT ON T-DRILL CONNECTIONS USE COPPER BRAZING ROD. REAM ALL CUT ENDS AND THOROUGHLY CLEAN PIPE ENDS AND FITTINGS PRIOR TO SOLDERING.

PROVIDE COPPER COMPANION FLANGES FOR TRANSITION TO STEEL PIPING OR FLANGED VALVES. INSTALL FULL FACED NITRILE RUBBER GASKETS, GARLOCK 9122 OR EQUAL.

ENGINE COOLANT HOSES – HIGH TEMPERATURE SILICONE HOSE, SIZE AS INDICATED ON DRAWINGS. INSTALL WITH STAINLESS STEEL T-BOLT CLAMPS.

PROVIDE 3/8" DIAMETER SILICONE HEATER HOSE WHERE INDICATED FOR INSTRUMENTATION AND BLEED LINES.

BALL VALVES – THREADED OR SOLDER END BRONZE BODY, CHROME PLATED BRONZE OR BRASS BALL, TFE OR VITON PACKING AND SEAT RING, MINIMUM 200 PSIG WOG RATING. DOMESTIC ONLY, HAMMOND OR MILWAUKEE, NO SUBSTITUTES. ON 2" AND SMALLER VALVES PROVIDE FULL PORT BALL. ON VALVES LARGER THAN 2" PROVIDE LARGE PORT BALL.

SWING CHECK VALVES – THREADED OR SOLDER END BRONZE BODY, SWING CHECK STYLE, MINIMUM 200 PSIG WOG RATING. DOMESTIC ONLY, HAMMOND OR MILWAUKEE, NO SUBSTITUTES.

DRAIN VALVES – BRONZE BODY, 3/4" FPT BY 3/4" MALE HOSE ENDS WITH CAP AND JACK CHAIN. WATTS B6000CC, OR EQUAL. INSTALL AT ALL DRAIN AND FILL CONNECTIONS AND WHERE INDICATED.

GAUGE COCK – BRASS BODY, MPT BY FPT ENDS, T-HANDLE. LEGEND VALVE ITEM 101-531 (1/4") OR ITEM 101-532 (3/8"), OR EQUAL. INSTALL ON ALL AIR VENTS, PRESSURE GAUGES, SMALL HOSE CONNECTIONS, AND WHERE INDICATED.

PRESSURE RELIEF VALVES – THREADED END BRONZE BODY, NON-FERROUS INTERNAL COMPONENTS, ASME LABELED, 3/4" NPT CONNECTIONS, 500 MBH MINIMUM CAPACITY, SETPOINT AS INDICATED. WATTS 174A OR EQUAL.

STRAINER – BRONZE BODY, SOLDER ENDS, SIZE AS INDICATED, GASKETED CAP, 20 MESH STAINLESS STEEL SCREEN. MUELLER STEAM #358S OR EQUAL.

AUTOMATIC AIR VENTS – BRASS BODY, SELF-CLOSING FLOAT OPERATED VALVE, SCREW ON CAP, 1/4" NPT CONNECTION. MAID-O-MIST AUTO AIR VENT NO. 75 OR EQUAL. PROVIDE WITH BALL VALVE ISOLATION.

LIQUID LEVEL SIGHT GAUGE – BOROSILICATE GLASS TUBE, ALUMINUM BODY, BUNA N SEALS, 1/2" MPT CONNECTIONS, 9" CENTERS. LUBE DEVICES G607-09-A-1-4 OR EQUAL.

EXPANSION TANK CAP – 2-1/2 PSIG PRESSURE, 1-1/2 OZ. VACUUM, 2" NPT CONNECTION. CIM-TEK 60001 OR EQUAL.

** INSTRUMENTATION **

PRESSURE GAUGES – 4" DIAL SIZE, STAINLESS STEEL CASE AND WETTED PARTS, 1/4" NPT BOTTOM CONNECTION, DRY CASE.
0-15 PSI RANGE WIKA #9745378 OR EQUAL.
0-60 PSI RANGE WIKA #9745394 OR EQUAL.

DIFFERENTIAL PRESSURE GAUGES – 2-1/2" DIAMETER DIAL, BRASS BODY, 1/4" FPT IN-LINE CONNECTION, SPDT SWITCH WITH TERMINAL STRIP, 0-15 PSID RANGE. MID WEST 142-BA-08-0(AA)-15, NO SUBSTITUTES. FACTORY SET SWITCH TO ACTIVATE AT 7 PSID

VACUUM GAUGES – 4" DIAL SIZE ZERO-CENTER PRESSURE/VACUUM GAUGE WITH TWO ADJUSTABLE SETPOINT SWITCHES WITH DPDT RELAYS, 1/8" NPT CONNECTION, -2" TO +2" WATER COLUMN RANGE. DWYER A3304, NO SUBSTITUTES.

FLOW METER, 150# ANSI FLANGED CONNECTION, SIZE AS INDICATED, PTFE LINER, HASTELLOY C ELECTRODES, RATED FOR 210F OPERATION.
SIEMENS SITRANS FM MAGFLO MAG 3100, NO SUBSTITUTES. FURNISH WITH TRANSMITTER FOR DIRECT AND REMOTE MOUNTING, 115/230 VAC, 50/60 HZ, AND NEMA 4X BODY. SIEMENS SITRANS F M MAGFLO MAG 5000, NO SUBSTITUTES, CODE NO. FDK:7ME6910, OPTION 1AA10-1AA0

THERMOMETERS – 3" DIAL SIZE BIMETAL TYPE, STAINLESS STEEL CASE AND STEM, 1% OF FULL SCALE ACCURACY, ADJUSTABLE ANGLE AND SWIVEL HEAD, 20F TO 240F RANGE, 2-1/2" STEM LENGTH. TEL-TRU AA-375R OR EQUAL. PROVIDE WITH 3/4"NPT BRASS THERMOWELL.

** SYSTEM STARTUP **

ENGINE COOLANT PIPING – AFTER PRESSURE TESTING AND FLUSHING, FILL SYSTEM WITH A SOLUTION OF EXTENDED LIFE ETHYLENE GLYCOL, SHELL ROTELLA ELC, NO SUBSTITUTES, PREMIXED TO A RATIO OF 50% ETHYLENE GLYCOL TO 50% WATER.

HEAT RECOVERY PIPING – AFTER PRESSURE TESTING AND FLUSHING, BLEED AIR RESERVOIR ON EXPANSION TANK AS REQUIRED TO MAINTAIN 10 PSIG RESIDUAL WITH SYSTEM EMPTY. FILL SYSTEM WITH A PRE-MIXED SOLUTION OF 50% PROPYLENE GLYCOL AND 50% WATER, DOWFROST, SAFE/T/THERM, OR EQUAL. FILL TO 20 PSIG MINIMUM WITH SYSTEM COLD. VENT AIR FROM ALL HIGH POINTS PRIOR TO STARTING CIRCULATING PUMP. CYCLE PUMP ON AND OFF AND VENT HIGH POINTS UNTIL ALL AIR HAS BEEN PURGED FROM PIPING. ADD ADDITIONAL PRE-MIXED GLYCOL SOLUTION AS REQUIRED TO BRING SYSTEM PRESSURE TO 30 PSIG MINIMUM AT EXPANSION TANK AT NORMAL OPERATING TEMPERATURE (180F).

FUEL OIL PIPING – AFTER PRESSURE TESTING PRIME ALL PIPING WITH HAND PRIMING PUMP, FILL FILTERS WITH DIESEL FUEL, AND BLEED OFF AIR PRIOR TO STARTING ELECTRIC PUMPS.

AS COOLING SYSTEM COMES UP TO NORMAL OPERATING TEMPERATURE VERIFY OPERATION OF THERMOSTATIC VALVE. SET VARIABLE FREQUENCY DRIVES TO SPECIFIED TEMPERATURES AND TEST LEAD AND BACKUP FUNCTION BY SHUTTING OFF LEAD RADIATOR. VERIFY OPERATING SETPOINTS BY READING THERMOMETERS IN PIPING MAINS.

VERIFY OPERATION OF ALL FUEL PUMP CONTROLS INCLUDING TIMER, LEVEL ALARMS, AND USED OIL BLENDER.

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

** SEQUENCE OF OPERATION **

COMBUSTION AIR INTAKE MOTORIZED DAMPER WILL BE OPEN ANY TIME PLANT OPERATES (STATION SERVICE POWER ON). GENERATOR ROOM COOLING AIR INTAKE DAMPER WILL OPEN ON A CALL FOR COOLING THROUGH A LINE VOLTAGE THERMOSTAT TO MAINTAIN SPACE TEMPERATURE, 80F, ADJUSTABLE. ALL DAMPER MOTORS WILL BE NORMALLY CLOSED SPRING RETURN AND WILL CLOSE ON LOSS OF POWER (FIRE ALARM) IN LESS THAN 30 SECONDS.

EXHAUST FANS EF-1 AND EF-2 WILL OPERATE ON A CALL FOR COOLING THROUGH A LINE VOLTAGE THERMOSTAT TO MAINTAIN GENERATING ROOM TEMPERATURE, 75F, ADJUSTABLE.

CRANK VENT FAN EF-3 WILL OPERATE CONTINUOUSLY. WHEN THE VACUUM AT THE FAN INTAKE FALLS BELOW 0.25" W.C. AN ALARM WILL BE INDICATED AT THE SWITCHGEAR.

CONTROL ROOM HEAT PUMP P-HR3 WILL OPERATE ON A CALL FOR HEATING THROUGH A LINE VOLTAGE THERMOSTAT TO MAINTAIN CONTROL ROOM TEMPERATURE, 70F, ADJUSTABLE.

RADIATOR SLAB HEAT PUMP P-HR4 WILL OPERATE ON A CALL FOR HEATING THROUGH A LINE VOLTAGE TEMPERATURE CONTROLLER TO MAINTAIN BELOW GRADE SOIL TEMPERATURE, 35F, ADJUSTABLE.

RADIATOR VARIABLE FREQUENCY DRIVES WILL MODULATE FAN SPEED TO MAINTAIN ENGINE COOLANT RETURN TEMPERATURE OPERATING SETPOINT. FANS WILL OPERATE AT A MINIMUM SPEED OF 10%, ADJUSTABLE. FANS WILL SHUT OFF WHEN ENGINE COOLANT RETURN TEMPERATURE IS BELOW THE MINIMUM SETPOINT. NORMAL OPERATING SETPOINT FOR R-1 = 175F AND FOR R-2 = 180F. MINIMUM SETPOINT 20F BELOW OPERATING SETPOINT.

CHARGE AIR COOLER FANS WILL OPERATE CONTINUOUSLY ANY TIME ASSOCIATED ENGINE RUNS AND STOP WHEN ENGINE STOPS. VARIABLE FREQUENCY DRIVES WILL OPERATE AT FULL SPEED FOR 30 SECONDS UPON STARTUP AND THEN WILL MODULATE FAN SPEED TO MAINTAIN ENGINE INTAKE MANIFOLD AIR TEMPERATURE OPERATING SETPOINT. MINIMUM FAN SPEED = 10%, ADJUSTABLE. SETPOINT = 90F, ADJUSTABLE.

HEAT RECOVERY PUMPS P-HR1 AND P-HR2 WILL OPERATE CONTINUOUSLY UNDER MANUAL CONTROL. WHEN THE FLOW RATE IN THE HEAT RECOVERY PIPING FALLS BELOW 10 GPM FOR A MINIMUM OF 15 MINUTES, A RED LAMP "HEAT RECOVERY LOSS OF FLOW" LOCATED IN THE SWITCHGEAR MASTER SECTION WILL ILLUMINATE.

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

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

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. FUEL OIL COOLER VARIABLE FREQUENCY DRIVE WILL MODULATE FAN SPEED TO MAINTAIN DIESEL FUEL RETURN TEMPERATURE AT 100F, ADJUSTABLE. WHEN DIESEL RETURN TEMPERATURE IS BELOW SETPOINT, FAN WILL OPERATE AT MINIMUM SPEED OF 10%, ADJUSTABLE. FAN WILL SHUT OFF WHEN DIESEL RETURN TEMPERATURE IS MORE THAN 10F, ADJUSTABLE, BELOW SETPOINT. THE COOLER DUCT DAMPER WILL OPEN ANY TIME THE FAN RUNS. SEE FUEL SYSTEM CONTROL DRAWINGS FOR DETAILED SEQUENCE.

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

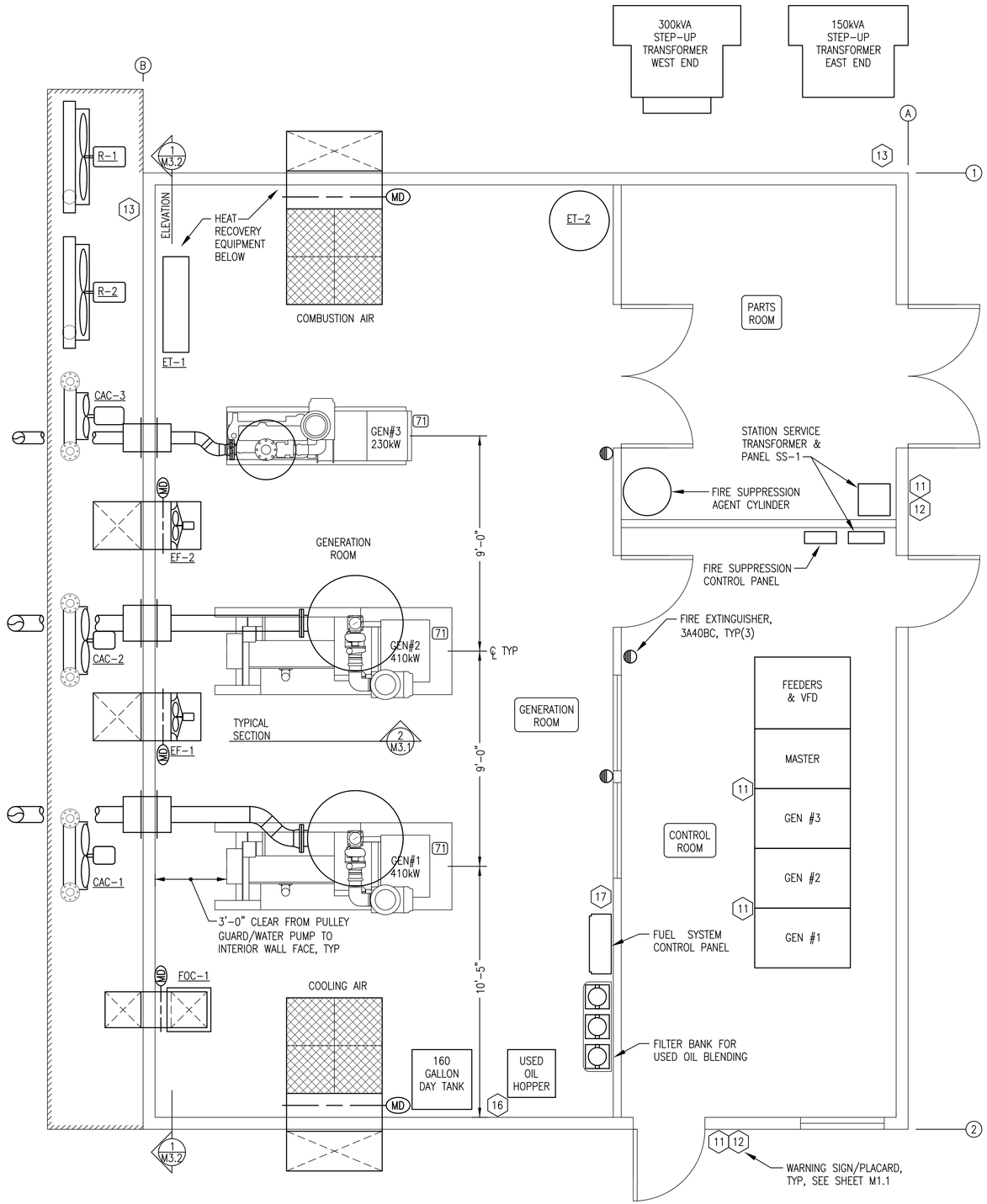
ALASKA ENERGY AUTHORITY

PROJECT:
KWETHLUK POWER SYSTEM UPGRADE

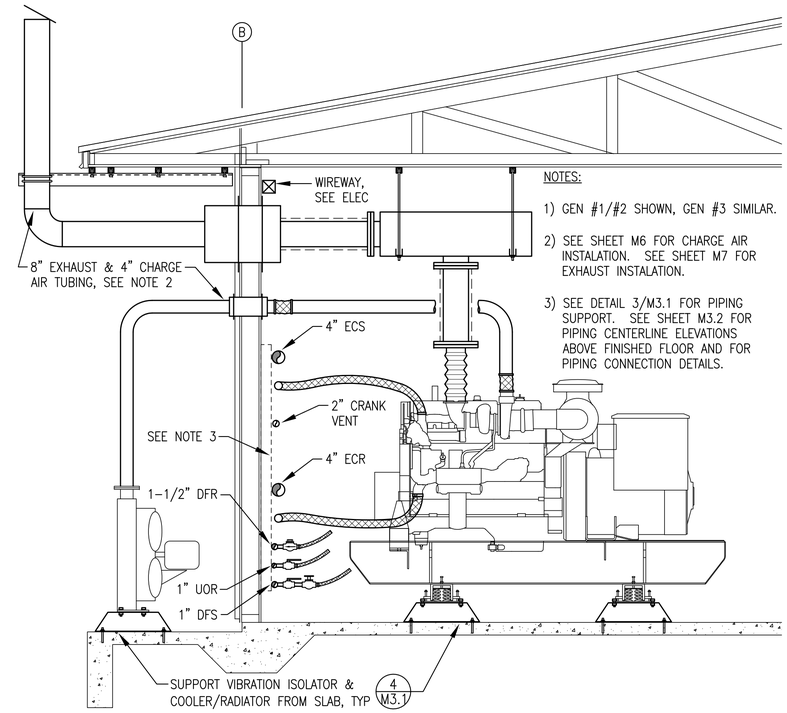
TITLE:
MECHANICAL SPECIFICATIONS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

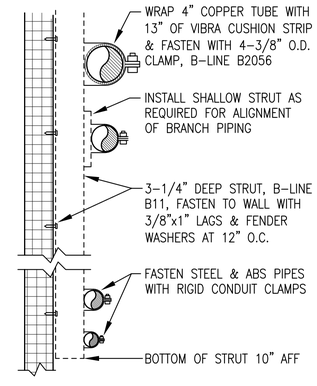
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M2 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



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

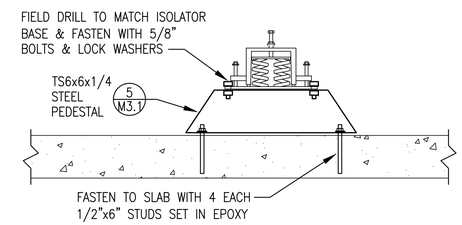


2 M3.1 SECTION THROUGH GENERATOR #2
1/2"=1'

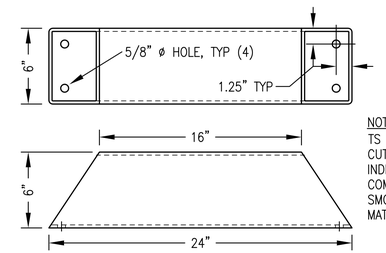


3 M3.1 PIPE SUPPORT
NO SCALE

NOTE: GENERATOR INSTALLATION SHOWN. RADIATOR SIMILAR EXCEPT FASTEN BASE WITH 1/2" BOLTS & ANCHOR TO SLAB WITH 2 EACH STUDS.



4 M3.1 SUPPORT PEDESTAL
NO SCALE



NOTE: FABRICATE FROM TS 6x6x1/4. SHOP CUT AND DRILL AS INDICATED. UPON COMPLETION GRIND SMOOTH & PAINT TO MATCH FLOOR.

5 M3.1 GENERATOR/COOLER SUPPORT
NO SCALE

RECORD DRAWING

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DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

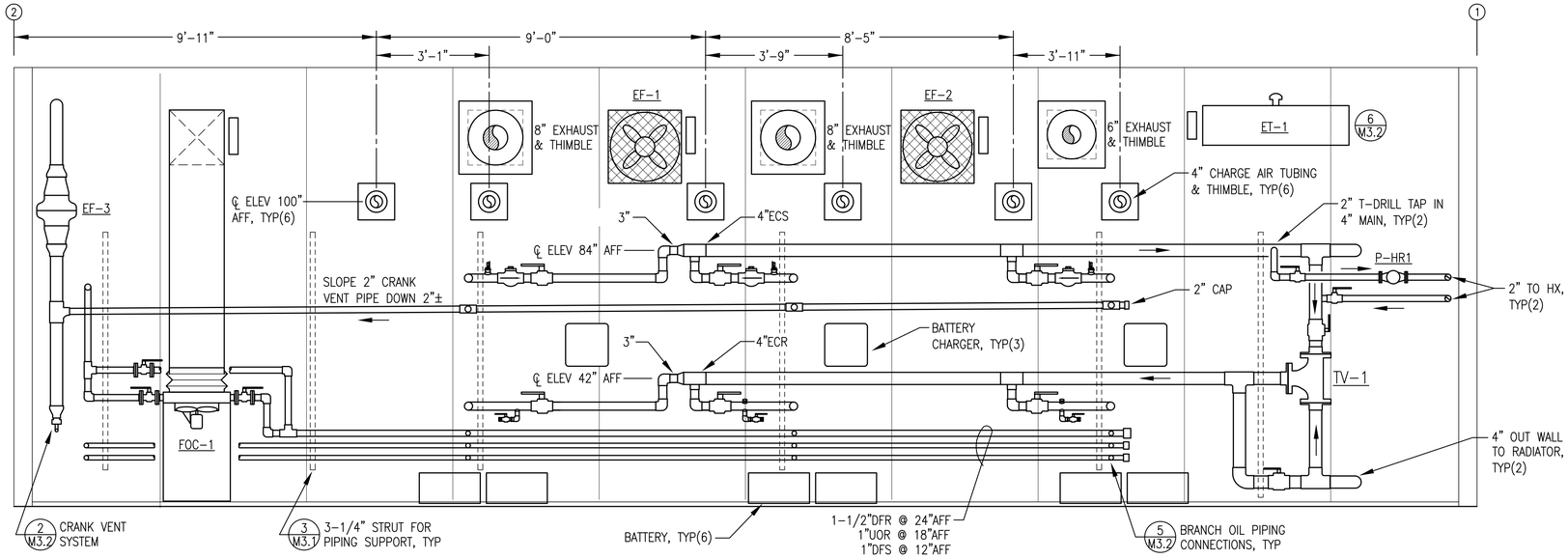
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: EQUIPMENT LAYOUT PLAN, SECTION, & DETAILS

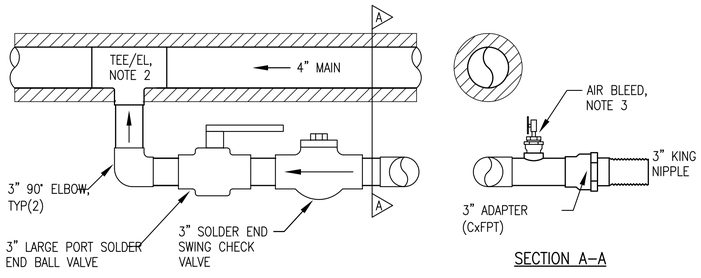
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M3.1	OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		



1 M3.2 BACK WALL ELEVATION

1/2"=1'



SECTION A-A

NOTES:

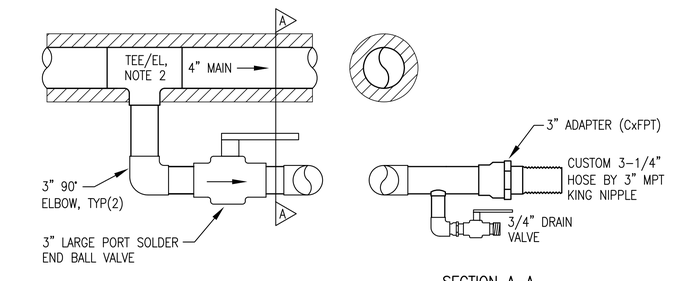
1) MAIN PIPING 4" WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.

2) GEN #2 SHOWN. GEN #1 SIMILAR EXCEPT ELBOWS INSTEAD OF TEE AS SHOWN ON ELEVATION. GEN #3 SIMILAR EXCEPT BRANCH PIPING 2-1/2".

3) 3/4" FITTING ADAPTER (FTGxFPT) IN 3/4" T-DRILL TAP WITH BUSHING, 1/4" GAUGE COCK, & THREADED PLUG.

3 M3.2 GENERATOR DISCHARGE CONNECTION

NO SCALE



SECTION A-A

NOTES:

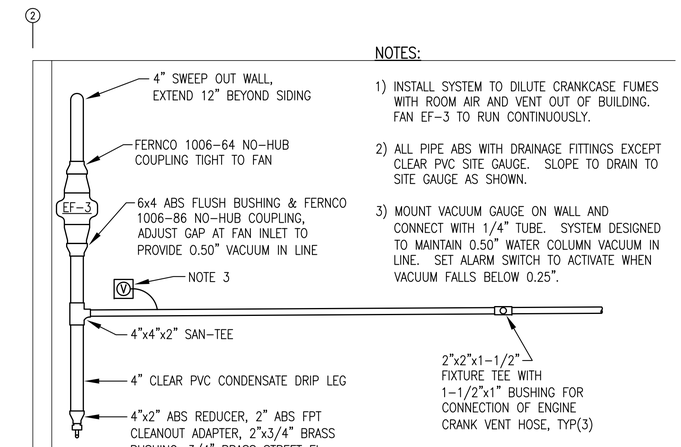
1) MAIN PIPING 4" OR 3" AS INDICATED WITH 1" INSULATION. ALL BRANCH PIPING NOT INSULATED.

2) GEN #2 (SHOWN) 4"x3"x3" TEE, GEN #3 4"x4"x2-1/2" TEE, GEN #1 OFFSET DOWN WITH 90° ELBOWS AS SHOWN ON ELEVATION.

3) GEN #1 & #2 BRANCH PIPING 3" AS SHOWN. GEN #3 BRANCH PIPING & VALVES 2-1/2".

4 M3.2 GENERATOR SUCTION CONNECTION

NO SCALE



NOTES:

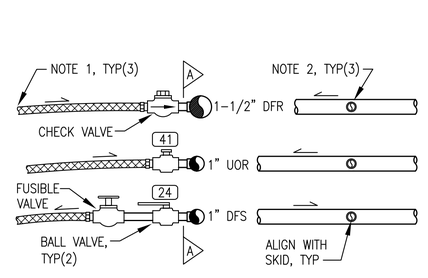
1) INSTALL SYSTEM TO DILUTE CRANKCASE FUMES WITH ROOM AIR AND VENT OUT OF BUILDING. FAN EF-3 TO RUN CONTINUOUSLY.

2) ALL PIPE ABS WITH DRAINAGE FITTINGS EXCEPT CLEAR PVC SITE GAUGE. SLOPE TO DRAIN TO SITE GAUGE AS SHOWN.

3) MOUNT VACUUM GAUGE ON WALL AND CONNECT WITH 1/4" TUBE. SYSTEM DESIGNED TO MAINTAIN 0.50" WATER COLUMN VACUUM IN LINE. SET ALARM SWITCH TO ACTIVATE WHEN VACUUM FALLS BELOW 0.25".

2 M3.2 CRANK VENT SYSTEM

1/2"=1'



SIDE ELEVATION

SECTION A-A

NOTES:

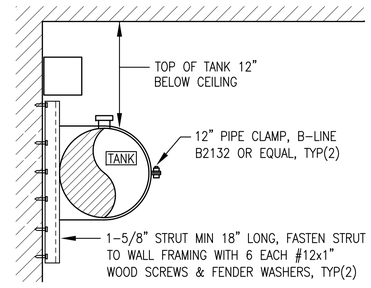
1) HOSES PROVIDED WITH ENGINE, SIZE VARIES PER ENGINE & PRODUCT. FIELD CUT TO LENGTH & INSTALL 1/2" MPT SWIVEL ENDS.

2) MAKE ALL CONNECTIONS TO MAINS WITH 1/2" THREAD-O-LET.

3) ALL VALVES 1/2" THREADED. ALL PIPE NIPPLES SCH 80.

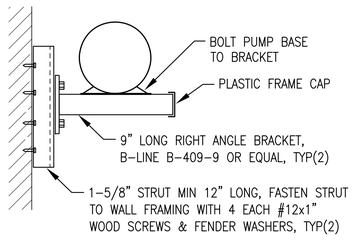
5 M3.2 ENGINE FUEL PIPING CONNECTION

NO SCALE



6 M3.2 EXPANSION TANK SUPPORT

NO SCALE



7 M3.2 PUMP P-DF2 SUPPORT

NO SCALE

RECORD DRAWING

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DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

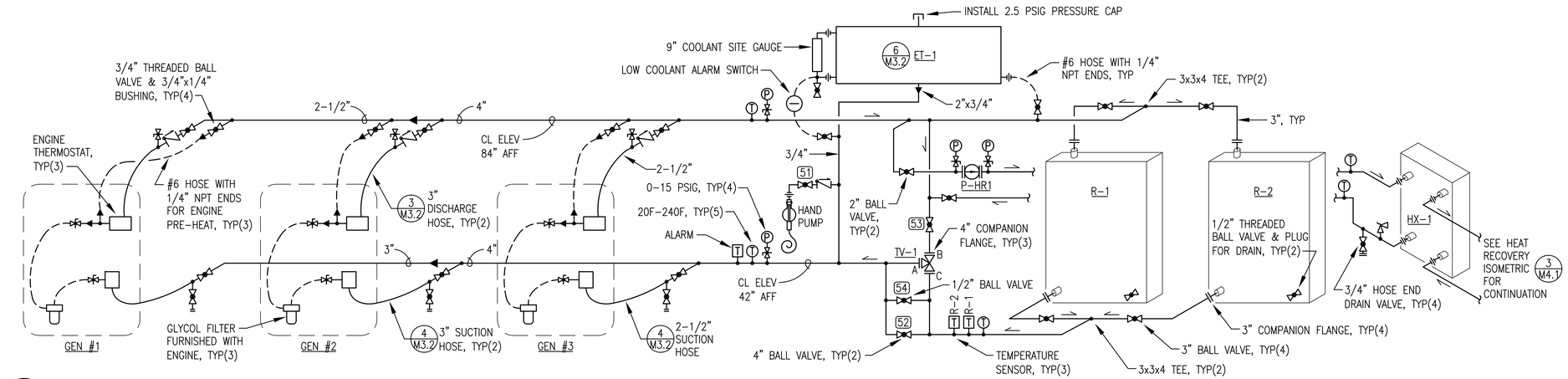
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: WALL ELEVATIONS & PIPING DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

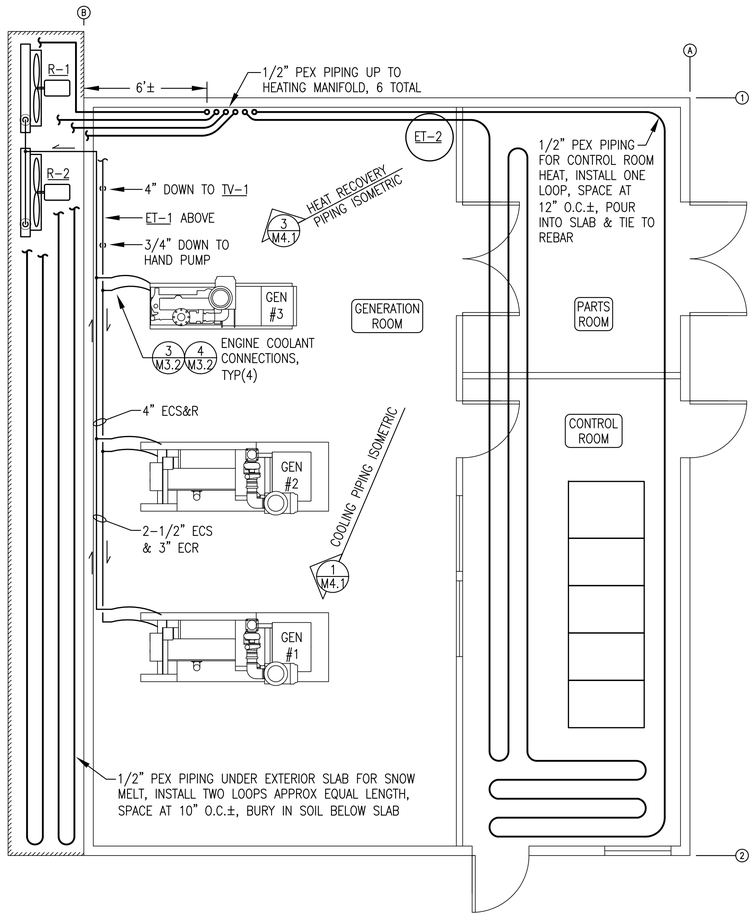
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M3.2	OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		



1 M4.1 COOLING SYSTEM PIPING ISOMETRIC
NO SCALE

NOTES:

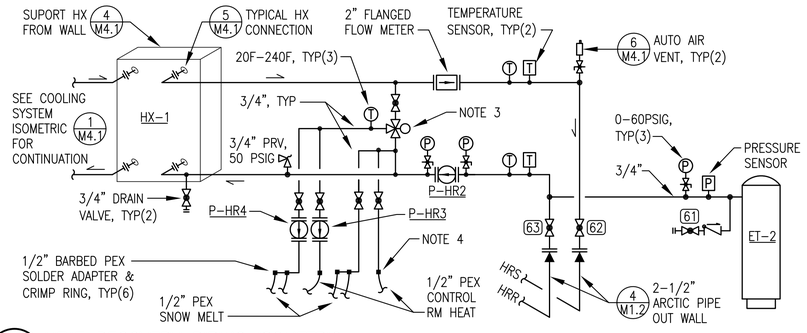
1) ALL COOLANT/HEAT RECOVERY PIPING TYPE "L" HARD DRAWN COPPER WITH SOLDER JOINTS.
2) ALL COOLANT PIPING 4"ø & ALL HEAT RECOVERY PIPING 2"ø UNLESS SPECFICALLY INDICATED OTHERWISE.
3) UNLESS SPECIFIED OTHERWISE MAKE ALL CONNECTIONS FOR INSTRUMENTATION, VENTS, & BLEED LINES WITH 3/4" T-DRILL TAP AND 3/4" FITTING ADAPTER (FTGxFPT). SEE DETAIL 4/M4.1 SIMILAR. INSTALL THREADED BRASS BUSHINGS AS REQUIRED.
4) ALL FLANGES ANSI 125# PATTERN BRONZE COMPANION WITH SOLDER ENDS.
5) UPON COMPLETION OF FABRICATION FLUSH INTERIOR OF PIPING TO REMOVE ALL DEBRIS & RESIDUE.
6) INSULATE COOLANT PIPING MAINS FROM GENERATOR VALVES TO THERMOSTATIC VALVE WITH 1" LOW TEMPERATURE INSULATION. ALL OTHER PIPING NOT INSULATED.



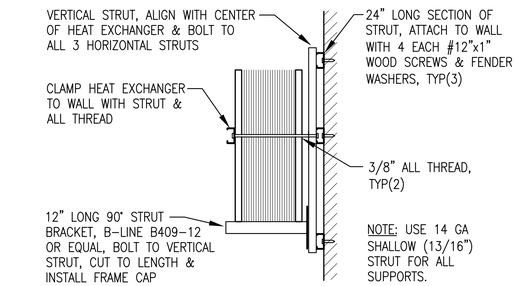
2 M4.1 COOLANT PIPING PLAN
3/8"=1'-0"

NOTES:

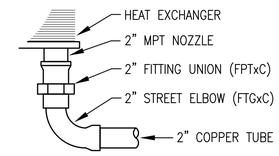
1) ALL HEAT RECOVERY PIPING TYPE "L" HARD DRAWN COPPER WITH SOLDER JOINTS, 2"ø UNLESS SPECFICALLY INDICATED OTHERWISE.
2) OPERATE ALL PUMPS ON SPEED 3.
3) 3/4" MIXING VALVE, 80-180F RANGE, SOLDER UNION CONNECTION. HONEYWELL AM101R-US-1.
4) INSTALL 1/2" PEX TUBING INSIDE 1" PVC SWEEP AT SLAB PENETRATION.



3 M4.1 HEAT RECOVERY PIPING ISOMETRIC
NO SCALE

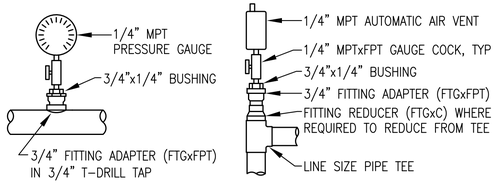


4 M4.1 HEAT EXCHANGER SUPPORT
NO SCALE



5 M4.1 TYPICAL HX CONNECTION
NO SCALE

NOTE: CLOSE GAUGE COCKS ON AIR VENTS AFTER BLEEDING SYSTEM OF AIR. LEAVE GAUGE COCKS OPEN ON PRESSURE GAUGES.



6 M4.1 TYPICAL AIR VENT & PRESSURE GAUGE
NO SCALE

RECORD DRAWING

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DATE: 1/10/11

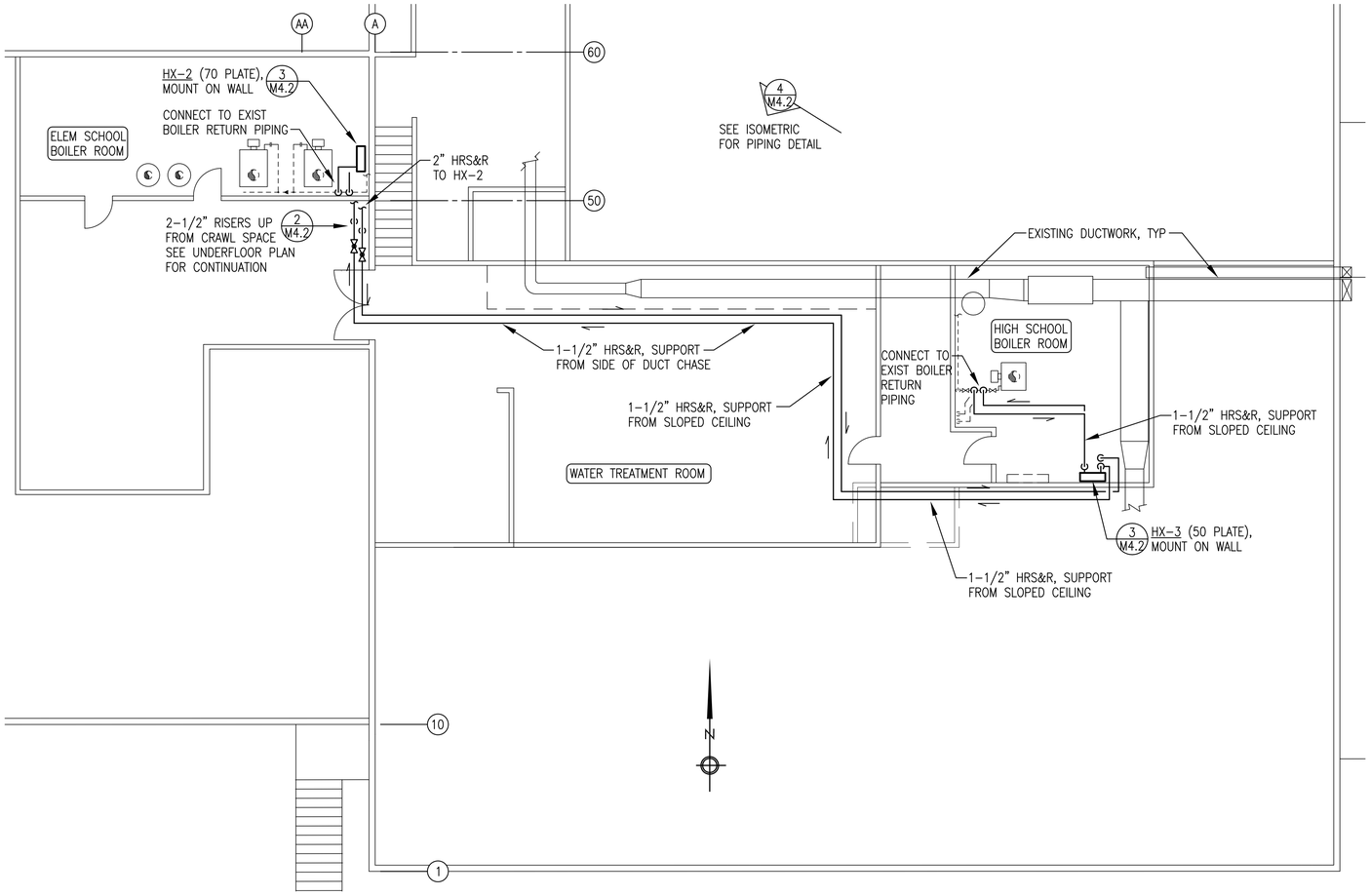
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

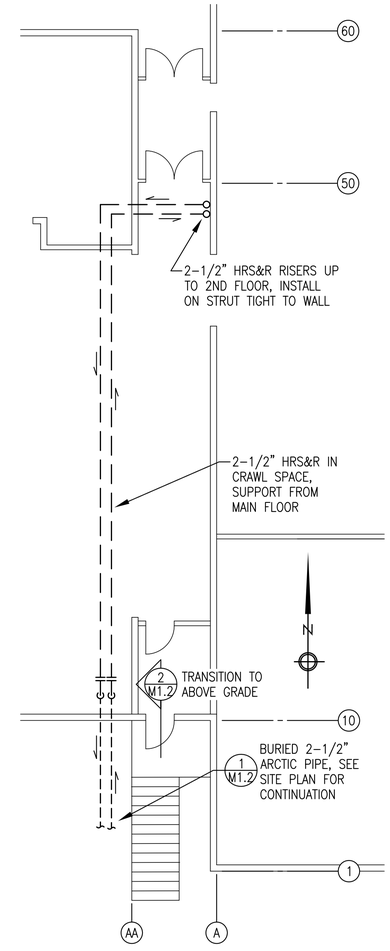
TITLE: POWER PLANT COOLANT/HEAT RECOVERY PIPING PLAN, ISOMETRICS, & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

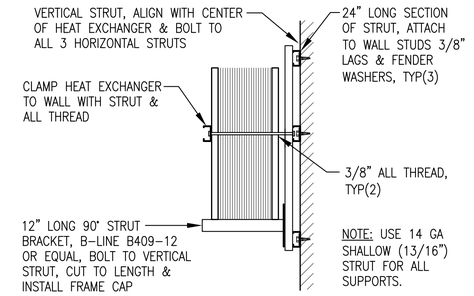
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET:	
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	M4.1	OF 8



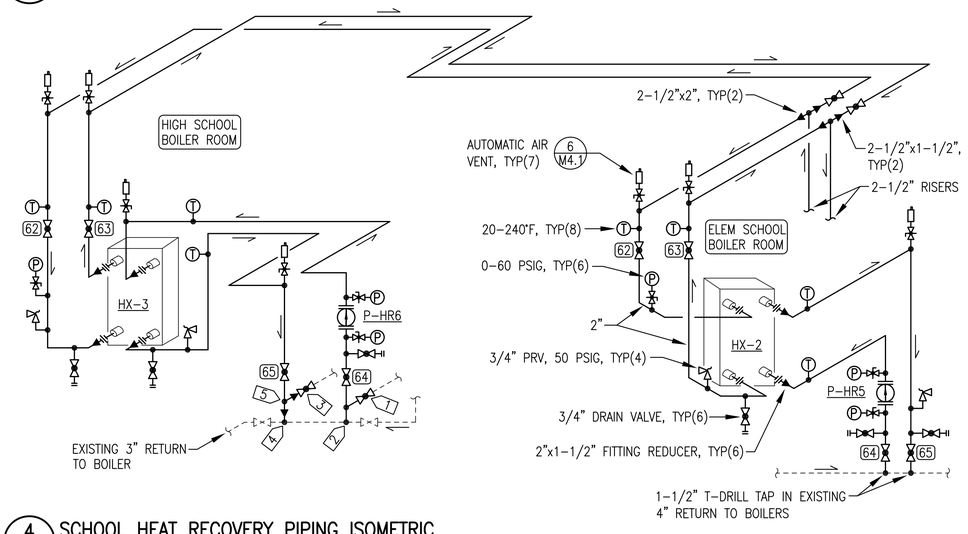
1 M4.2 SCHOOL HEAT RECOVERY SECOND FLOOR PIPING PLAN
1/8"=1'-0"



2 M4.2 SCHOOL UNDERFLOOR PIPING PLAN
1/8"=1'-0"



3 M4.2 HEAT EXCHANGER SUPPORT FROM WALL
NO SCALE



4 M4.2 SCHOOL HEAT RECOVERY PIPING ISOMETRIC
NO SCALE

GENERAL NOTES:

1) ALL PIPING SHOWN THIS ISOMETRIC 1-1/2"ø EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE.

2) UNLESS SPECIFIED OTHERWISE MAKE ALL CONNECTIONS FOR INSTRUMENTATION, VENTS, AND BLEED LINES WITH 3/4" T-DRILL TAP AND 3/4" FITTING ADAPTER (FTGxFPT). SEE DETAIL 4/M4.1 SIMILAR. INSTALL THREADED BRASS BUSHINGS AS REQUIRED.

3) ALL NEW PIPING & EQUIPMENT SHOWN IN DARK SOLID LINES. ALL EXISTING PIPING & EQUIPMENT SHOWN IN LIGHT DASHED LINES.

SPECIFIC NOTES:

1> INSTALL NEW SOLDER END BALL VALVE IN EXISTING 1-1/2" BRANCH PIPE, FIELD VERIFY SIZE.

2> REMOVE EXISTING 1-1/2" GATE VALVE & NIPPLE. INSTALL NEW COPPER MPT ADAPTER IN EXISTING 3"x3"x1-1/2" TEE, FIELD VERIFY SIZE.

3> INSTALL NEW SOLDER END BALL VALVE IN EXISTING 1" BRANCH PIPE, FIELD VERIFY SIZE.

4> REMOVE EXISTING 1" GATE VALVE & NIPPLE. INSTALL NEW COPPER MPT ADAPTER IN EXISTING 3"x3"x1" TEE, FIELD VERIFY SIZE.

5> 1-1/2"x1"x1" TEE.

RECORD DRAWING

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DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: SCHOOL HEAT RECOVERY
PIPING PLANS, ISOMETRICS, & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M4.2 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	

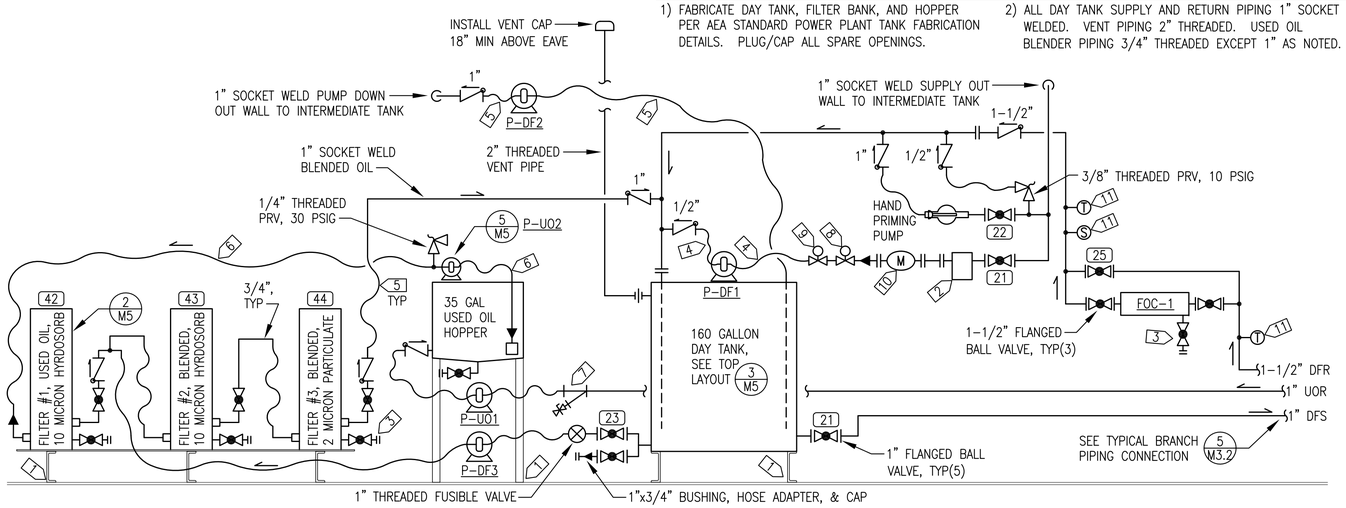
PIPING DIAGRAM GENERAL NOTES:

1) FABRICATE DAY TANK, FILTER BANK, AND HOPPER PER AEA STANDARD POWER PLANT TANK FABRICATION DETAILS. PLUG/CAP ALL SPARE OPENINGS.

2) ALL DAY TANK SUPPLY AND RETURN PIPING 1" SOCKET WELDED. VENT PIPING 2" THREADED. USED OIL BLENDER PIPING 3/4" THREADED EXCEPT 1" AS NOTED.

PIPING DIAGRAM SPECIFIC NOTES:

1. FASTEN TO FLOOR WITH 3/8" ANCHORS SET IN EPOXY.
2. 1" FILTER WITH CUSTOM 150# FLANGED ENDS, REMOVE DRAIN VALVE & INSTALL 1/8"MxF DRAIN COCK.
3. 3/4" THREADED BALL VALVE WITH HOSE ADAPTER & CAP, TYP(5), HOPPER, F=ILTER, & COOLER DRAINS.
4. #10 HOSE WITH 37° JIC FEMALE SWIVEL FITTINGS & 1/2" MPT FLARE CONNECTOR.
5. #12 HOSE WITH 37° JIC FEMALE SWIVEL FITTINGS & MPT FLARE CONNECTOR, 1/2", 3/4", OR 1" AS RQD TO MATCH PIPING OR PUMPS.
6. #6 HOSE WITH WITH 37° JIC FEMALE SWIVEL FITTINGS & MPT FLARE CONNECTOR, 1/8" & 1/4" AS RQD.
7. 1" THREADED STRAINER WITH GAUGE COCK BLOW DOWN.
8. 1/2" NO SOLENOID VALVE.
9. 1/2" NC SOLENOID VALVE.
10. METER EQUIPPED WITH 300# FLANGED ENDS, PROVIDE 1" ANSI 300# FLANGES, SOCKET WELD UPSTREAM & THREADED DOWNSTREAM.
11. TEMP SENSOR FOR FOC-1 VFD CONTROL & 20-240°F THERMOMETER, INSTALL THERMAL WELL IN 3/4" THREAD-O-LET.



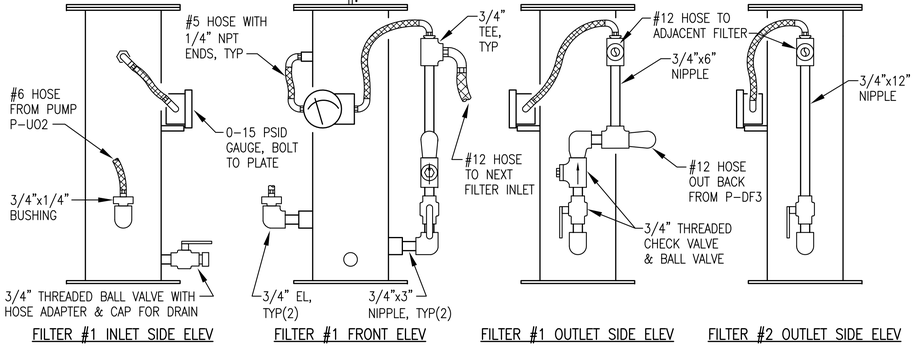
1 M5 DIESEL FUEL & USED OIL PIPING DIAGRAM

NO SCALE

NOTE: FILTER #2 & #3 INLET SIMILAR EXCEPT FOR #12 HOSE WITH 3/4" END (NO BUSHING) FROM ADJACENT FILTER.

NOTE: FILTER #2 & #3 FRONT ELEVATION SIMILAR EXCEPT NO CHECK VALVE ON DISCHARGE.

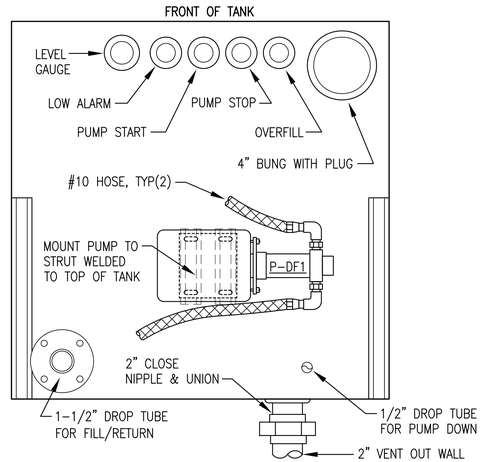
NOTE: FILTER #3 OUTLET ELEVATION SIMILAR TO FILTER #2 EXCEPT CHECK VALVE & #12 HOSE TO 1" BLENDED DISCHARGE PIPE.



FILTER #1 INLET SIDE ELEV | FILTER #1 FRONT ELEV | FILTER #1 OUTLET SIDE ELEV | FILTER #2 OUTLET SIDE ELEV

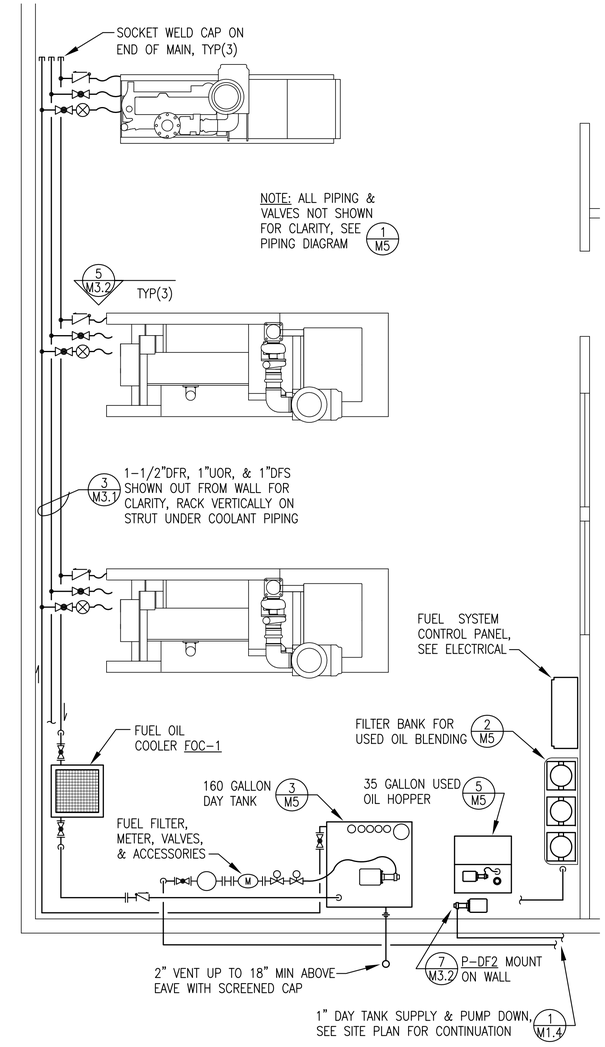
2 M5 FILTER PIPING ELEVATIONS

NO SCALE



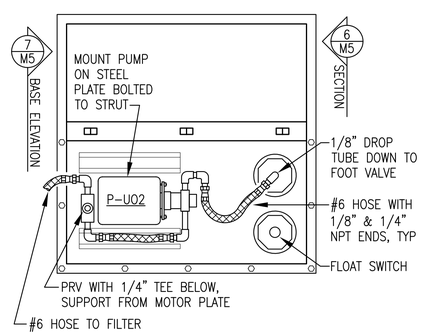
3 M5 TOP OF DAY TANK - PLAN VIEW

NO SCALE



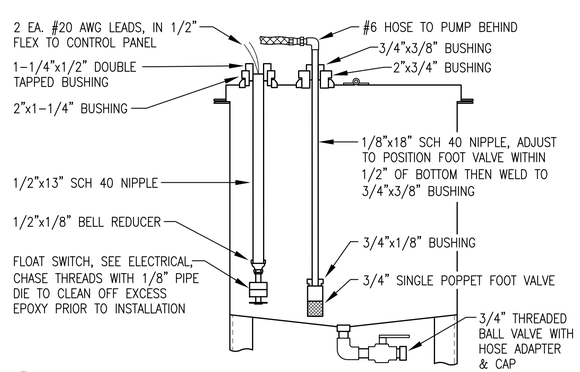
4 M5 DIESEL FUEL & USED OIL PIPING PLAN

3/8"=1'-0"



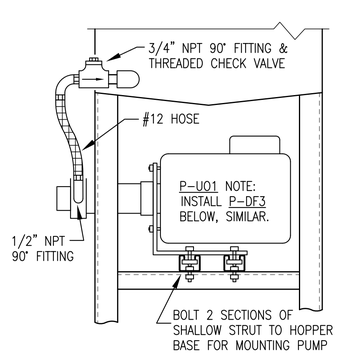
5 M5 TOP OF HOPPER - PLAN VIEW

NO SCALE



6 M5 SECTION THROUGH HOPPER

NO SCALE



7 M5 HOPPER BASE ELEVATION

NO SCALE

RECORD DRAWING

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State of Alaska
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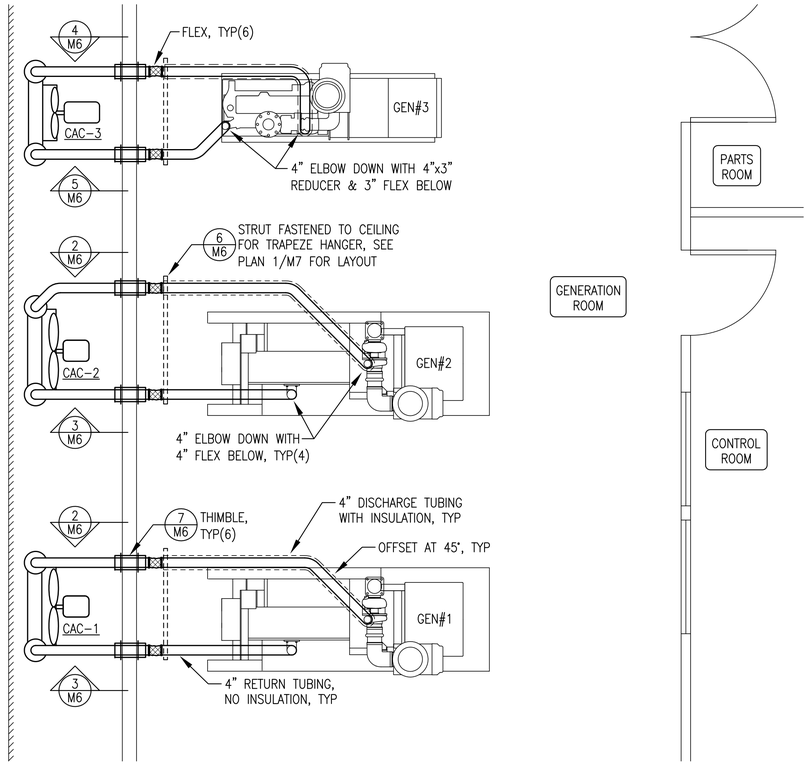
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

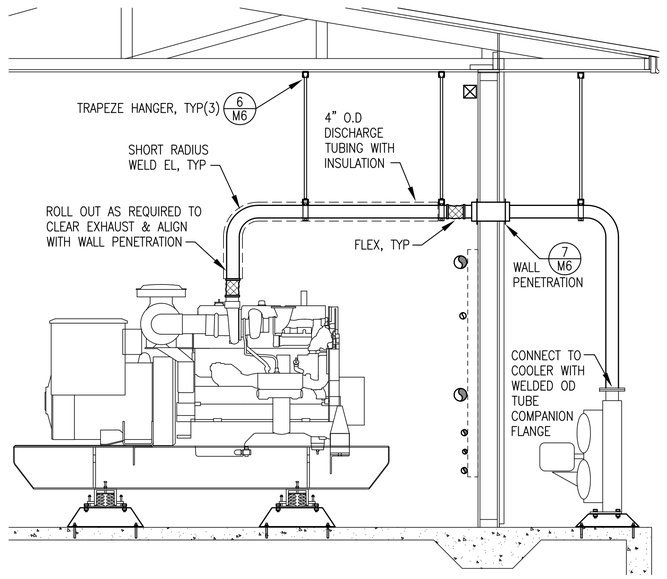
TITLE: DIESEL FUEL & USED OIL PIPING PLAN & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

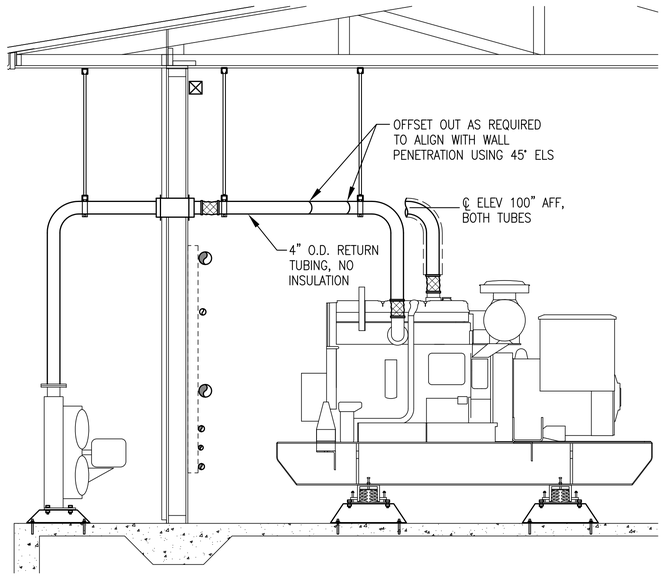
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M5	OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		



1/M6 CHARGE AIR COOLER PLAN
3/8"=1'



2/M6 GENERATOR #1 & #2 RIGHT SIDE ELEVATION
1/2"=1'



3/M6 GENERATOR #1 & #2 LEFT SIDE ELEVATION
1/2"=1'

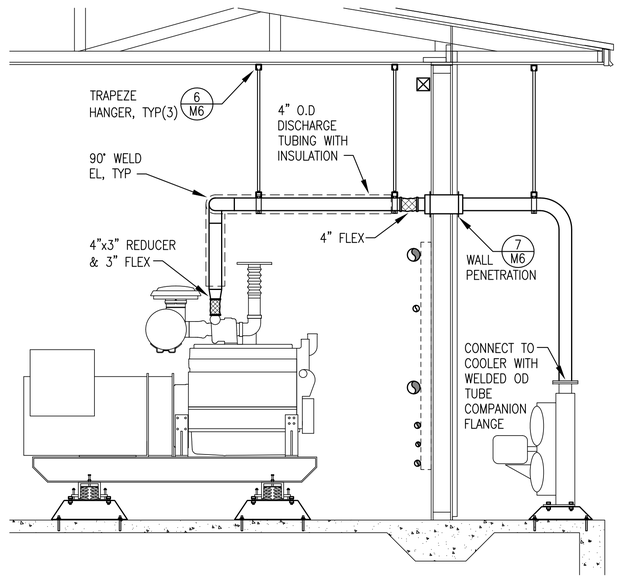
CHARGE AIR SYSTEM GENERAL NOTES:

1) ALL TUBING TO BE LIGHT WALL CARBON STEEL O.D. EXHAUST TUBING, G.T. EXHAUST OR EQUAL. ALL ELBOWS TO BE SHORT RADIUS FITTINGS TO MATCH TUBING. ALL JOINTS TO BE WELDED EXCEPT FOR FINAL CONNECTION TO ENGINES AND COOLERS.

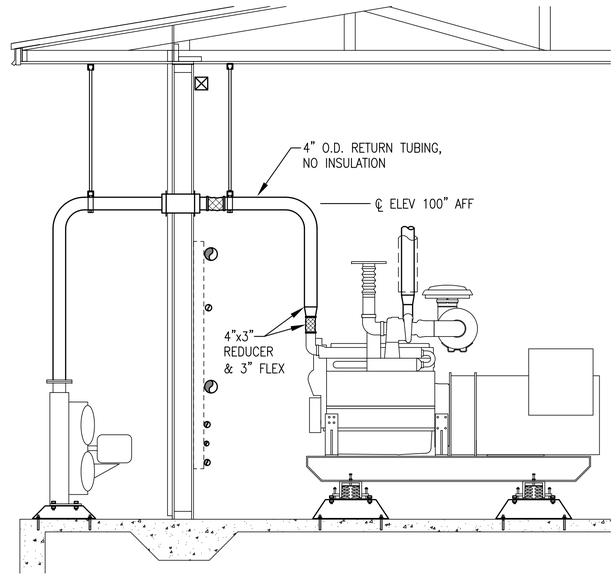
2) MAKE ENGINE CONNECTIONS WITH HIGH TEMPERATURE SILICONE FLEX HOSE (TURBO SLEEVE) WITH FULL CIRCLE LINED STAINLESS STEEL CLAMPS.

3) MAKE COOLER CONNECTIONS WITH O.D. TUBE BY ANSI 125# MACHINED LIGHT FLANGES, G.T. EXHAUST PART #43 OR EQUAL. INSTALL HIGH TEMPERATURE FULL FACE STAINLESS STEEL AND GRAPHITE GASKETS, GARLOCK 312555 OR EQUAL.

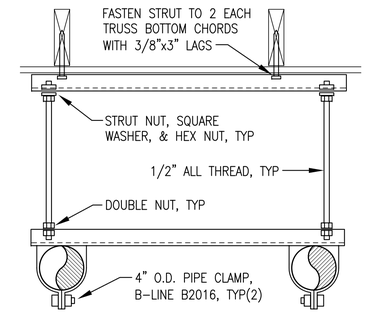
4) INSULATE INTERIOR CHARGE AIR DISCHARGE TUBING WITH 1" LOW TEMPERATURE INSULATION FROM FLEX AT ENGINE TO FLEX AT WALL PENETRATION AS SHOWN.



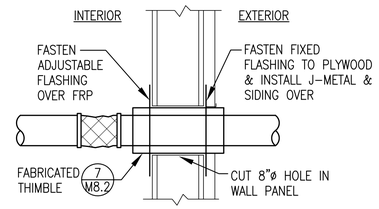
4/M6 GENERATOR #3 RIGHT SIDE ELEVATION
1/2"=1'



5/M6 GENERATOR #3 LEFT SIDE ELEVATION
1/2"=1'



6/M6 TUBING SUPPORT FROM CEILING
NO SCALE



7/M6 TUBING WALL PENETRATION
NO SCALE

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Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

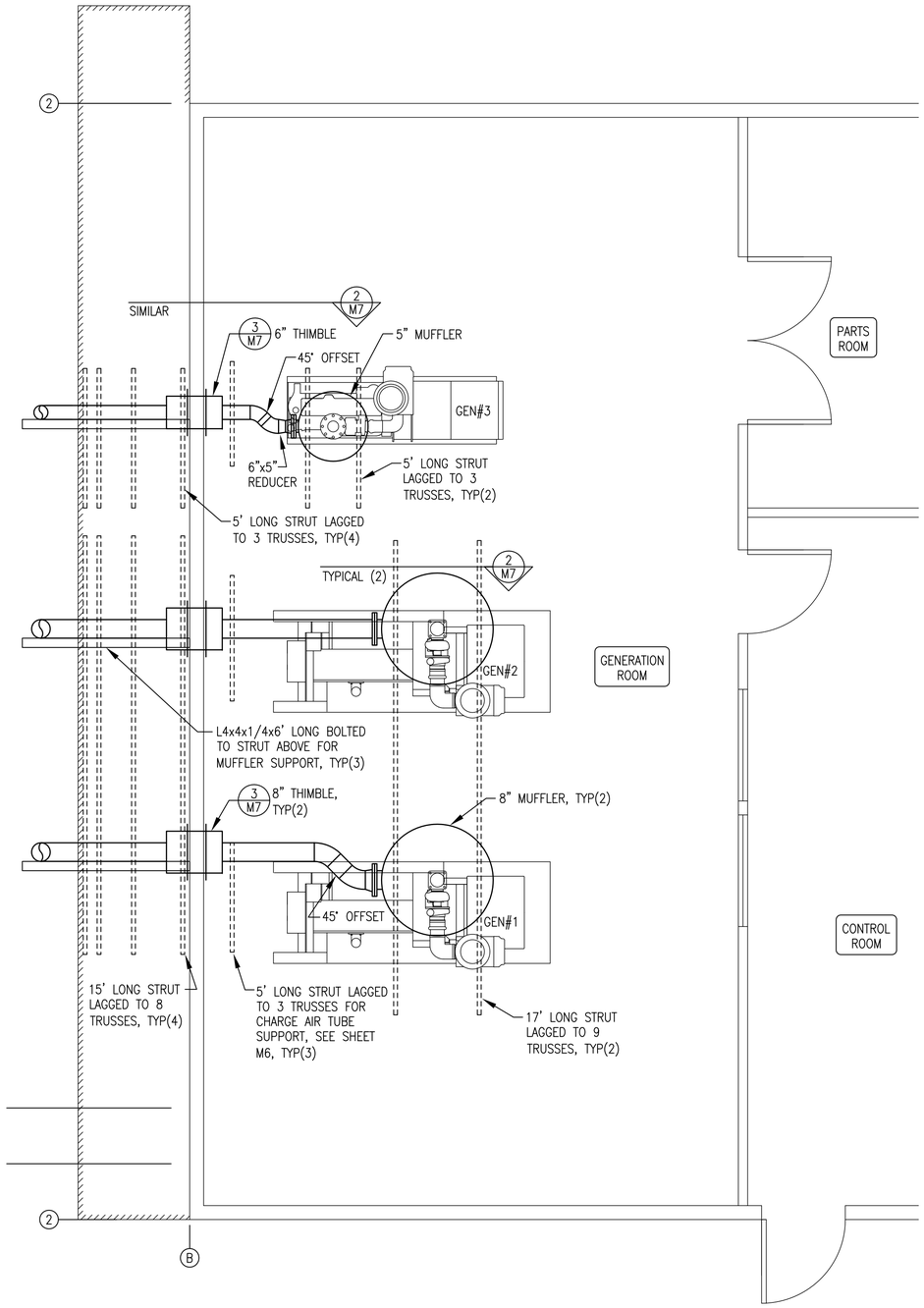
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: CHARGE AIR COOLING PLAN & DETAILS

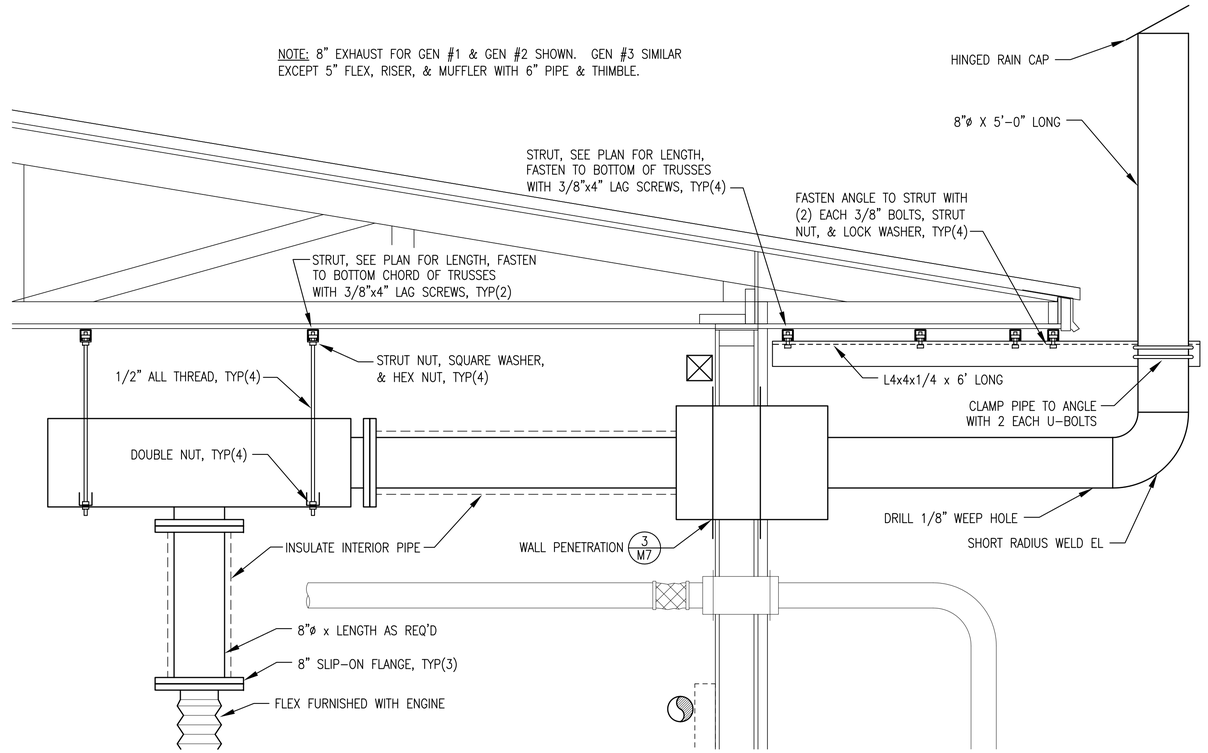
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M6 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 M7 EXHAUST SYSTEM PLAN
3/8"=1'

NOTE: 8" EXHAUST FOR GEN #1 & GEN #2 SHOWN. GEN #3 SIMILAR EXCEPT 5" FLEX, RISER, & MUFFLER WITH 6" PIPE & THIMBLE.



2 M7 MUFFLER & EXHAUST PIPE INSTALLATION
1"=1'

EXHAUST SYSTEM GENERAL NOTES:

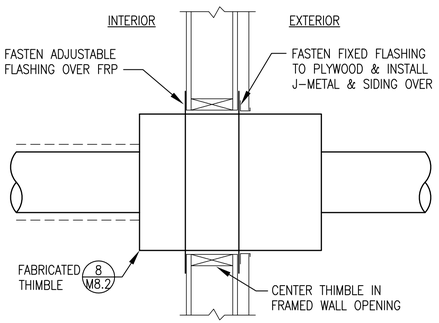
1) MUFFLERS AND FLEXES TO BE FURNISHED WITH GENERATORS. ALL OTHER EXHAUST SYSTEM COMPONENTS TO BE FURNISHED AND INSTALLED AS PART OF BUILDING MECHANICAL SYSTEM.

2) MUFFLERS TO BE CRITICAL GRADE WITH INTERNAL THERMAL INSULATION, EM PRODUCTS DCK2 OR EQUAL. THIMBLES TO BE STAINLESS STEEL, TRIPLE-WALL, INSULATED, VENTILATED, AND LISTED FOR ZERO CLEARANCE TO COMBUSTIBLES, HARCO WT-47 SERIES OR EQUAL.

3) ALL PIPE TO BE CARBON STEEL, LIGHTWALL (0.188" WALL THICKNESS), WITH WELDED JOINTS. ALL FLANGES TO BE ANSI 150# FLAT FACED, SLIP-ON EXCEPT WHERE INDICATED AS THREADED. INSTALL HIGH TEMPERATURE FULL FACE STAINLESS STEEL AND GRAPHITE GASKETS, GARLOCK 312555 OR EQUAL.

4) INSULATE INTERIOR EXHAUST PIPING WITH 1" MEDIUM TEMPERATURE INSULATION FROM FLEX TO MUFFLER AND FROM MUFFLER TO WALL PENETRATION AS SHOWN.

NOTE: SEAL BOTH FLASHINGS TO WALL SURFACES WITH SILICONE CAULK & FASTEN WITH 1/4"x1" WOOD SCREWS ALL AROUND.



3 M7 WALL THIMBLE INSTALLATION
NO SCALE

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Anchorage, Alaska 99503
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TITLE: EXHAUST SYSTEM PLAN & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M7	OF 8
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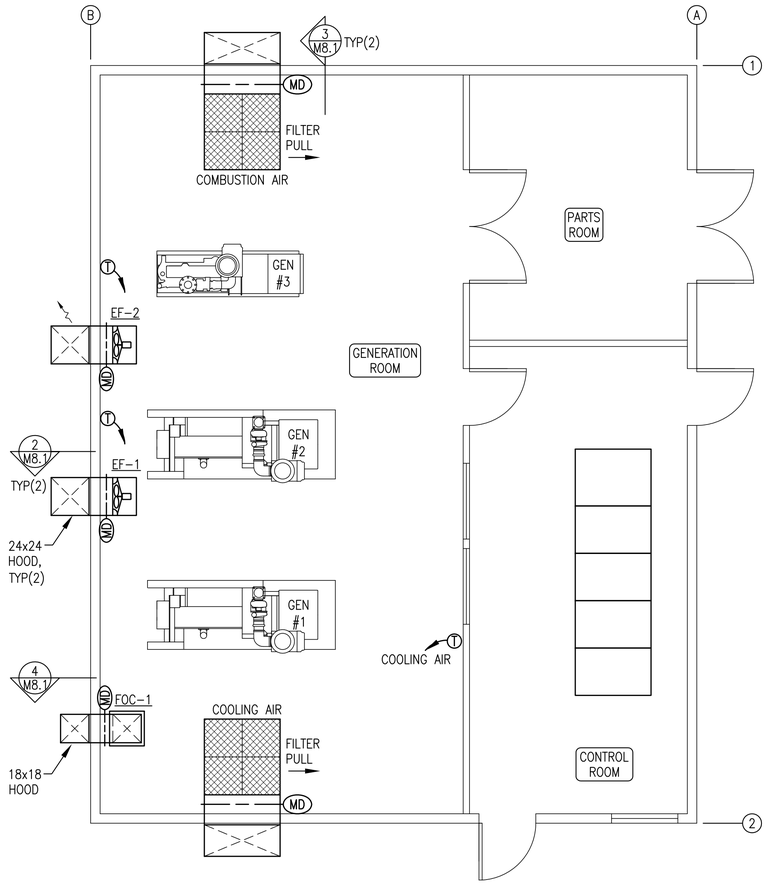
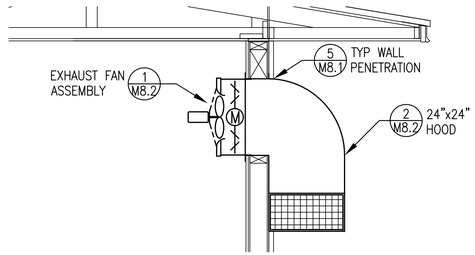
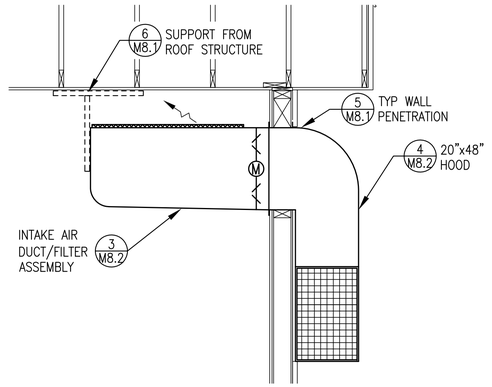


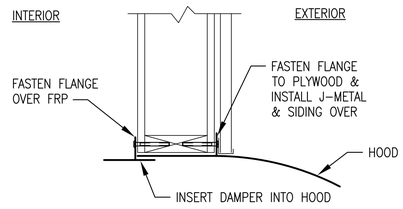
1 M8.1 VENTILATION PLAN
1/4"=1'



2 M8.1 TYPICAL EXHAUST FAN INSTALLATION
1/2"=1'

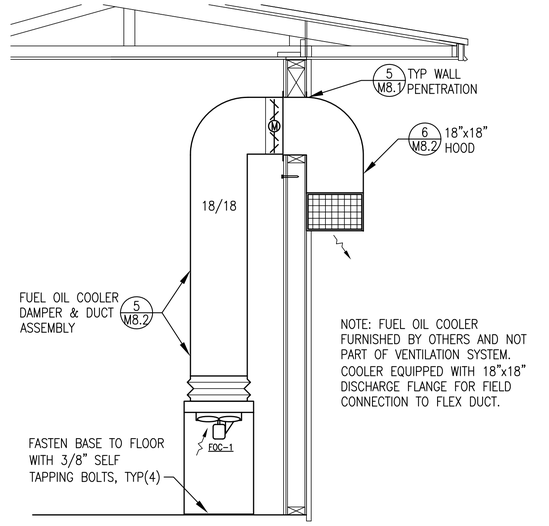


3 M8.1 TYPICAL INTAKE AIR INSTALLATION
1/2"=1'



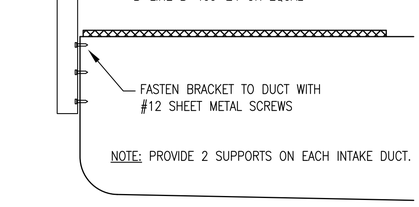
NOTE: SEAL BOTH FLANGES TO WALL SURFACES WITH SILICONE CAULK & FASTEN WITH 1/4"x3" WOOD SCREWS ALL AROUND.

5 M8,1 TYPICAL WALL PENETRATION
NO SCALE



NOTE: FUEL OIL COOLER FURNISHED BY OTHERS AND NOT PART OF VENTILATION SYSTEM. COOLER EQUIPPED WITH 18"x18" DISCHARGE FLANGE FOR FIELD CONNECTION TO FLEX DUCT.

4 M8.1 FUEL OIL COOLER INSTALLATION
1/2"=1'



6 M8,1 INTAKE DUCT SUPPORT
NO SCALE

VENTILATION EQUIPMENT SPECIFICATIONS

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

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

INTERIOR SHEET METAL FABRICATIONS – FABRICATE ALL DAMPER AND FAN ASSEMBLIES FROM MINIMUM 20 GAUGE GALVANIZED SHEET METAL USING STANDARD MECHANICAL JOINTS. SEAL ALL JOINTS AIR TIGHT.

EXTERIOR SHEET METAL FABRICATIONS – FABRICATE ALL HOODS AND INTAKE DUCTS FROM MINIMUM 0.090" THICK TYPE 5052 ALUMINUM USING CONTINUOUS SEAL WELDS FOR ALL JOINTS.

EXHAUST FANS EF-1 & 2 – DIRECT DRIVE 18"ø PROPELLER SIDEWALL EXHAUST FAN, 3,059 CFM AT 0.50" SP, 1,750 RPM. GREENHECK SE2-18-421-A5, NO SUBSTITUTES. PROVIDE WITH SPECIAL 3/4 HP, 208 V, 1 PH MOTOR.

EXHAUST FAN EF-3 – DIRECT DRIVE IN-LINE DUCT FAN, BACKWARD INCLINED CENTRIFUGAL WHEEL, EPOXY COATED STEEL HOUSING, 78 CFM AT 2.0" SP, 2,700 RPM, 115 V, 1 PH. CONTINENTAL FAN AXC200B OR EQUAL. FURNISH WITH VENTILATION EQUIPMENT. SEE DETAIL 2/M3.2 FOR INSTALLATION.

DAMPERS – OPPOSED BLADE LOW-LEAKAGE CONTROL DAMPER, GALVANIZED STEEL CONSTRUCTION, 304 STAINLESS STEEL BEARINGS AND JAMB SEALS, EPDM BLADE SEALS. GREENHECK VCD-23 NO SUBSTITUTES. SEE FABRICATION DETAILS FOR SIZES.

ACTUATORS – INSTALL 120V SPRING RETURN ACTUATOR, BELIMO, NO SUBSTITUTES. SEE FABRICATION DETAILS FOR MODEL NUMBER.

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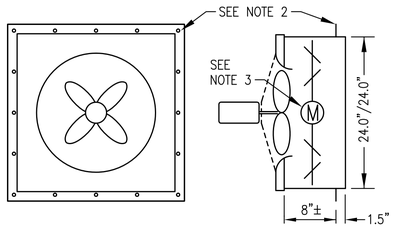
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: VENTILATION PLAN, SPECIFICATIONS, & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

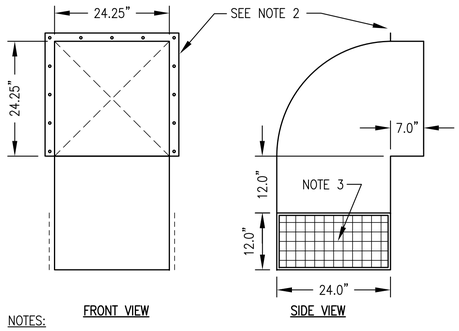
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET:		
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	M8.1	OF	8



NOTES:

1) FABRICATE TWO IDENTICAL ASSEMBLIES COMPLETE WITH FAN AND DAMPER MOUNTED AND SEALED TO DUCT.
2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 5/16" HOLES AT 6.5"± O.C.
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON THE SAME SIDE FOR ALL ASSEMBLIES. INSTALL BELIMO LF-120-US ACTUATOR, NO SUBSTITUTES. FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.

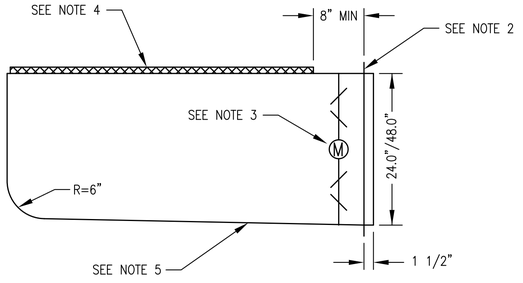
1 M8.2 TYPICAL FAN/DAMPER ASSEMBLY
1"=1'-0"



NOTES:

1) FABRICATE THREE IDENTICAL ASSEMBLIES.
2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 5/16" HOLES AT 6"± O.C.
3) 1"x1" ALUMINUM WIRE MESH OVER OPENING, TYP BOTH SIDES.

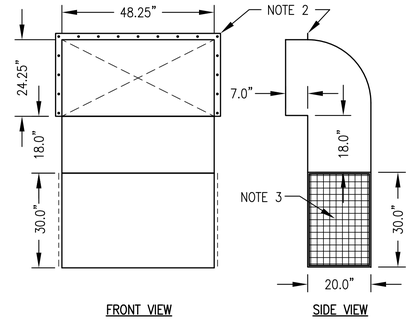
2 M8.2 24"x24" HOOD FABRICATION
3/4"=1'-0"



NOTES:

1) FABRICATE TWO IDENTICAL FILTER/DAMPER ASSEMBLIES.
2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 5/16" HOLES AT 6"± ON CENTER.
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON ONE SIDE AND FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME. INSTALL BELIMO AF-120-US ACTUATOR, NO SUBSTITUTES.
4) INSTALL FRAME FOR 4 EACH REMOVABLE 24"x24"x1" FURNACE FILTERS. FABRICATE FROM "C" CHANNEL THREE SIDES WITH LATCHING HINGED COVER ON FOURTH SIDE TO ALLOW FILTERS TO SLIDE OUT. SEE PLANS AND INSTALLATION DETAILS FOR DAMPER ACTUATOR AND FILTER PULL ORIENTATION.
5) SLOPE BOTTOM 1" MIN TO DRAIN TOWARD DAMPER AND SEAL JOINTS WATER TIGHT.

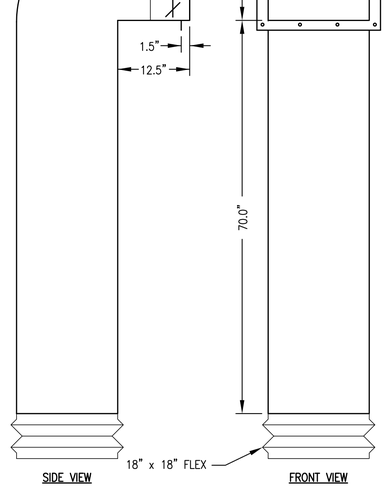
3 M8.2 INTAKE AIR DUCT/FILTER ASSEMBLY
1"=1'-0"



NOTES:

1) FABRICATE TWO IDENTICAL HOODS.
2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 5/16" HOLES AT 6"± O.C.
3) 1"x1" ALUMINUM WIRE MESH OVER OPENING, TYP BOTH SIDES.

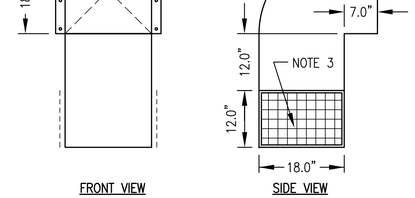
4 M8.2 20"x48" HOOD FABRICATION
1/2"=1'-0"



NOTES:

1) FABRICATE ONE 18"x18" OIL COOLER DAMPER ASSEMBLY.
2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 5/16" HOLES AT 6.5"± O.C.
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ONE SIDE. INSTALL BELIMO LF-120-US ACTUATOR, NO SUBSTITUTES. FABRICATE SHEET METAL STAND-OFF BRACKET TO SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.
4) PROVIDE 8" LONG 18/18 FABRIC FLEX DUCT WITH METAL EDGE BOTH ENDS. SHIP LOOSE FOR FIELD INSTALLATION BY OTHERS.

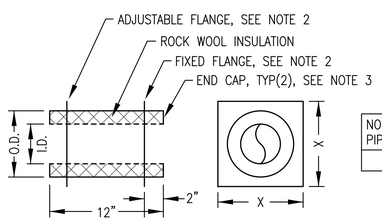
5 M8.2 FUEL OIL COOLER DAMPER ASSEMBLY
1"=1'-0"



NOTES:

1) FABRICATE ONE ASSEMBLY.
2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 5/16" HOLES AT 6"± O.C.
3) 1"x1" ALUMINUM WIRE MESH OVER OPENING, TYP BOTH SIDES.

6 M8.2 18"x18" HOOD FABRICATION
3/4"=1'-0"

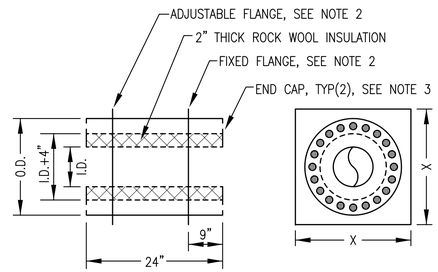


NOMINAL PIPE SIZE	I.D.	O.D.	X
4"	4.2"	7.0"	12.0"

NOTES:

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

7 M8.2 CHARGE AIR TUBING THIMBLE FABRICATION
NO SCALE



NOMINAL PIPE SIZE	I.D.	O.D.	X	VENT HOLE QUANTITY
6"	6.8"	16.3"	22.0"	16
8"	8.9"	17.3"	24.0"	20

NOTES:

1) FABRICATE ENTIRE ASSEMBLY FROM MINIMUM 16 GAUGE TYPE 304 STAINLESS STEEL WITH ALL JOINTS SEAL WELDED.
2) FABRICATE TWO IDENTICAL SQUARE FLANGES. SEAL WELD FIXED FLANGE TO OUTER SHELL. ADJUSTABLE FLANGE TO SHIP LOOSE FOR FIELD INSTALLATION.
3) SEAL WELD END CAPS TO INNER AND OUTER SHELLS. PROVIDE 1"ø VENT HOLES IN BOTH ENDS, QUANTITY AS INDICATED, EQUALLY SPACED. ON EXTERIOR (FIXED FLANGE) END INSTALL 1/8" STAINLESS STEEL BUG SCREEN.

8 M8.2 EXHAUST PIPE THIMBLE FABRICATION
NO SCALE

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

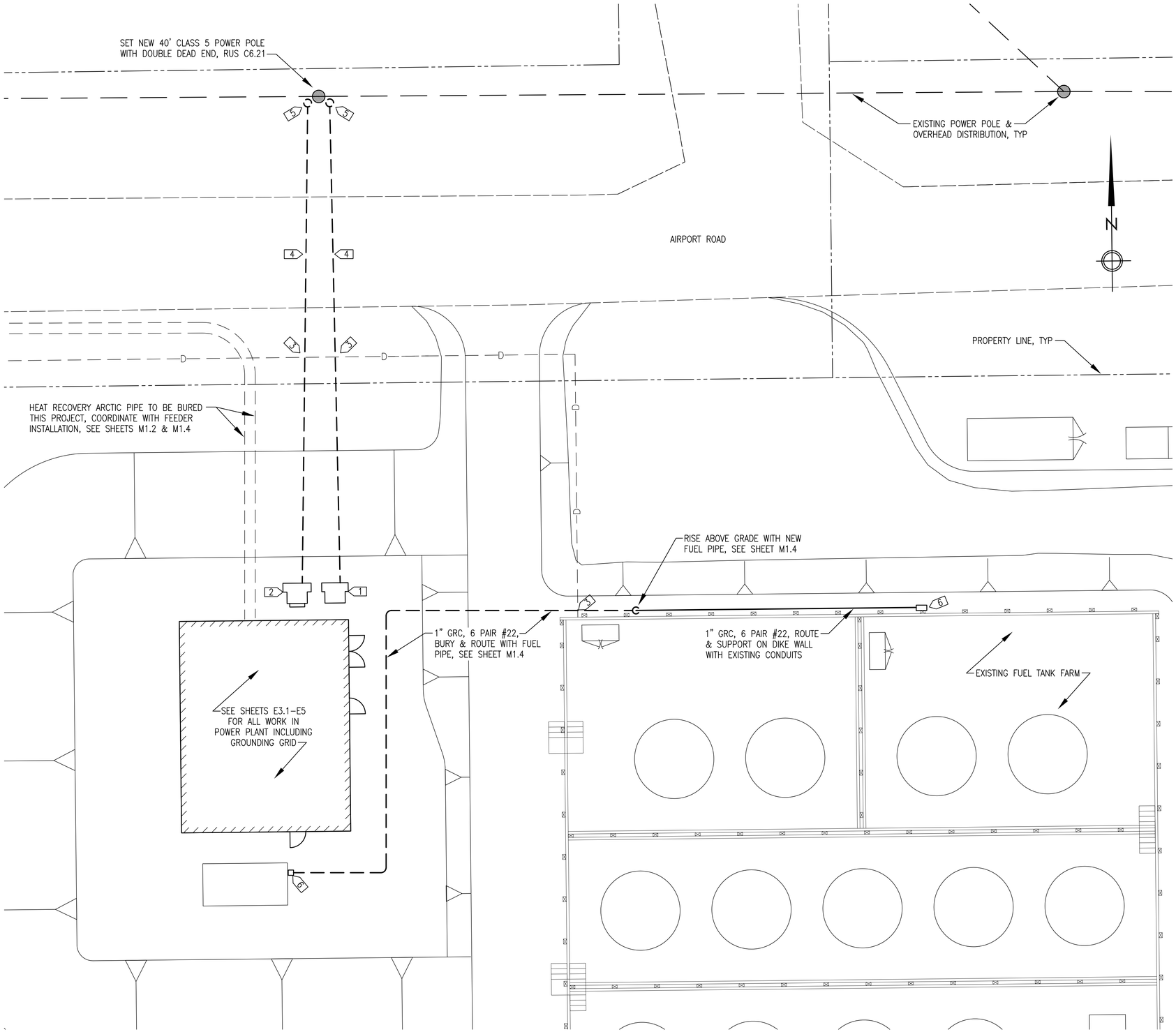
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: VENTILATION SYSTEM FABRICATION DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET M2-8	SHEET: M8.2 OF 8
DESIGNED BY: BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 E1 SITE PLAN
1"=10'

SCHEDULE OF DRAWINGS

SPECIFIC NOTES

1. EAST END FEEDER #1 PAD MOUNT 150 kVA STEP-UP TRANSFORMER, 277/480V WYE TO 7200/12470 WYE. INSTALL ON FIBERGLASS GROUND SLEEVE. PROVIDE TRANSFORMER GROUNDING IN ACCORDANCE WITH RUS CONSTRUCTION UNIT UM48-2. INSTALL RUS UM6-1 LOAD BREAK ELBOW ON EACH OF THE THREE INCOMING PRIMARY CONDUCTORS FOR CONNECTION TO THE TRANSFORMER INSERTS.
2. WEST END FEEDER #2 PAD MOUNT 300 kVA STEP-UP TRANSFORMER, 277/480V WYE TO 7200/12470 WYE. INSTALL ON FIBERGLASS GROUND SLEEVE. PROVIDE TRANSFORMER GROUNDING IN ACCORDANCE WITH RUS CONSTRUCTION UNIT UM48-2. INSTALL RUS UM6-1 LOAD BREAK ELBOW ON EACH OF THE THREE INCOMING PRIMARY CONDUCTORS FOR CONNECTION TO THE TRANSFORMER INSERTS.
3. EXISTING BURIED DIESEL FUEL PIPELINE, LOCATE PRIOR TO EXCAVATING.
4. BURIED 4" PVC, 3#1/0 JCN, FULL CONCENTRIC NEUTRAL, 15kV, 133% EPR INSULATION.
5. TRANSITION TO GRC BELOW GRADE WITH GRC SWEEP. INSTALL 4" GRC RISER UP POLE WITH 3' OF LIQUID TIGHT FLEX JUST ABOVE GRADE.
6. EXISTING INTERMEDIATE FUEL STORAGE TANK TO BE RE-LOCATED FROM OLD POWER PLANT TO NEW, SEE SHEETS M1.2 & M1.4. DOCUMENTATION ON EXISTING CONTROL SYSTEM IS NOT AVAILABLE. PRIOR TO DISCONNECTING WIRING AT OLD POWER PLANT VERIFY CONTROL CONNECTIONS. UPON RE-INSTALLATION AT NEW PLANT RUN CONDUIT FROM FRONT OF TANK TO EXISTING CONTROL PANEL AT TANK FARM AS SHOWN. RE-CONNECT CONTROL CIRCUITS. TEST AND VERIFY ALL FUNCTIONS INCLUDING ALARMS.

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: SITE PLAN & SCHEDULE OF DRAWINGS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET E1	SHEET: E1 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	

** GENERAL CONDITIONS **

PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE INCLUDING STATE OF ALASKA AMENDMENTS.

THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY SHOW ALL FEATURES OF THE REQUIRED WORK. PROVIDE ALL EQUIPMENT AND MATERIALS REQUIRED FOR A COMPLETE SYSTEM. VERIFY EXISTING FIELD CONDITIONS PRIOR TO STARTING CONSTRUCTION. IMMEDIATELY CONTACT THE ENGINEER FOR CLARIFICATION OF QUESTIONABLE ITEMS OR APPARENT CONFLICTS.

ALL EQUIPMENT AND MATERIALS SHOWN ARE NEW UNLESS SPECIFICALLY INDICATED AS EXISTING. WHERE ADDITIONAL OR REPLACEMENT ITEMS ARE REQUIRED, PROVIDE LIKE ITEMS BY THE SAME MANUFACTURER TO THE MAXIMUM EXTENT PRACTICAL. INSTALL ALL MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS, UNLESS INDICATED OTHERWISE.

PROTECT ALL MATERIALS AND EQUIPMENT DURING THE ENTIRE DURATION OF CONSTRUCTION WORK AGAINST CONTAMINATION OR DAMAGE. REPLACE OR REPAIR TO ORIGINAL MANUFACTURED CONDITION ANY ITEMS DAMAGED DURING CONSTRUCTION. IMMEDIATELY REPORT TO THE ENGINEER ANY ITEMS FOUND DAMAGED PRIOR TO COMMENCING CONSTRUCTION.

PERFORM WORK WITH SKILLED CRAFTSMEN SPECIALIZING IN SAID WORK. INSTALL ALL MATERIALS IN A NEAT, ORDERLY, AND SECURE FASHION, AS REQUIRED BY THESE SPECIFICATIONS AND COMMONLY RECOGNIZED STANDARDS OF GOOD WORKMANSHIP.

DO NOT CUT, DRILL, OR NOTCH STRUCTURAL MEMBERS UNLESS SPECIFICALLY APPROVED BY THE ENGINEER. MINIMIZE PENETRATIONS AND DISRUPTION OF BUILDING FEATURES. WHERE PREVIOUSLY COMPLETED BUILDING SURFACES OR OTHER FEATURES MUST BE CUT, PENETRATED, OR OTHERWISE ALTERED, SUCH WORK SHALL BE CAREFULLY LAID OUT AND PERFORMED, AND PATCHED TO ORIGINAL CONDITION. SEAL ALL EXTERIOR FLOOR AND WALL PENETRATIONS AS INDICATED.

CONTACT THE ENGINEER ONE-WEEK PRIOR TO COMPLETION OF ALL WORK TO SCHEDULE A SUBSTANTIAL COMPLETION INSPECTION. THE ENGINEER WILL GENERATE A PUNCH LIST OF CORRECTIVE ACTION ITEMS DURING THE INSPECTION. WORK WILL NOT BE CONSIDERED COMPLETE UNTIL ALL CORRECTIVE ACTION ITEMS IN THE ENGINEERS PUNCH LIST HAVE BEEN SATISFACTORILY COMPLETED AND PHOTOGRAPHIC OR OTHER POSITIVE DOCUMENTATION HAS BEEN PROVIDED TO THE ENGINEER.

PROVIDE ONE SET OF DRAWINGS CLEARLY MARKED UP WITH ALL AS-BUILT INFORMATION TO THE ENGINEER WITHIN TWO WEEKS OF COMPLETION.

** SPECIAL CONDITIONS **

ENSURE THAT APPROPRIATE SAFETY MEASURES ARE IMPLEMENTED AND THAT ALL WORKERS ARE AWARE OF THE POTENTIAL HAZARDS FROM ELECTRICAL SHOCK, BURN, ROTATING FANS, PULLEYS, BELTS, HOT MANIFOLDS, NOISE, ETC. ASSOCIATED WITH WORKING NEAR POWER GENERATION AND CONTROL EQUIPMENT.

CHANGE OVER FROM OLD SYSTEMS TO NEW SYSTEMS WILL REQUIRE SHUT DOWN OF THE POWER GENERATION SYSTEM. PLAN OUT AND COORDINATE WORK TO MINIMIZE DISRUPTION OF LOCAL POWER SERVICE. SCHEDULE OUTAGES IN ADVANCE WITH THE VILLAGE OFFICE.

** DEVICES AND EQUIPMENT **

DEVICES - LISTED FOR INTENDED SERVICE. MANUFACTURER/MODEL IN THE EQUIPMENT SCHEDULE IS PROVIDED TO INDICATE REQUIRED FEATURES. SUBSTITUTIONS OF EQUIVALENT ITEMS WILL BE ACCEPTED UNLESS ITEM SPECIFICALLY INDICATED NO SUBSTITUTES. INSTALL ALL DEVICES SUCH THAT MINIMUM REQUIRED ACCESS CLEARANCE IS MAINTAINED.

CONTROL PANELS - PROVIDE SHOP FABRICATED CONTROL PANELS AS REQUIRED. WHERE SPECIFICALLY INDICATED ON PANEL DRAWINGS PROVIDE LOGIC, LAYOUT, AND DEVICES AS INDICATED. ALL PANELS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH AN APPROPRIATE THIRD PARTY INDEPENDENT STANDARD. BENCH TEST TO BE PERFORMED AT THE MANUFACTURING FACILITY PRIOR TO SHIPMENT.

NAMEPLATES - LAMACOID TYPE BLACK WITH WHITE CORE, BEVELED EDGES. PROVIDE NAMEPLATES FOR EACH DEVICE, DISCONNECT SWITCH, AND CONTROL PANELS/DEVICES. SPECIFICALLY, LABEL ALL BATTERY CHARGERS FOR THE ASSOCIATED GENERATING UNIT. ATTACH NAMEPLATES WITH EPOXY ADHESIVE OR SELF-TAPPING SCREWS.

SUPPORT - INDEPENDENTLY SUPPORT EACH DEVICE FROM BUILDING STRUCTURAL MEMBERS WITH CHANNEL STRUT OR FABRICATED BRACKETS UTILIZING APPROPRIATE FASTENERS. ALL FASTENERS SHALL BE GALVANIZED OR ZINC PLATED EXCEPT WHERE SPECIFICALLY INDICATED ON EXTERIOR INSTALLATIONS USE TYPE 304 STAINLESS STEEL.

** RACEWAYS **

INTERIOR - ALL INTERIOR LOCATIONS SHALL BE ELECTRICAL METALLIC TUBING (EMT) EXCEPT WHERE SPECIFICALLY INDICATED AS WIREWAY. WIREWAY SHALL BE NEMA 1 WITH HINGED COVER AND MANUFACTURER PROVIDED CONNECTORS AND FITTINGS.

EXTERIOR - ALL EXTERIOR ABOVE GRADE LOCATIONS SHALL BE GALVANIZED RIGID CONDUIT (GRC). PROVIDE LIQUID TIGHT OIL RESISTANT FLEXIBLE CONDUIT WHERE INDICATED AND AS REQUIRED TO ACCOMMODATE MOVEMENT.

UNDERGROUND - ALL UNDERGROUND LOCATIONS SHALL BE SCH 40 PVC.

TERMINATION - FINAL CONNECTIONS TO DEVICES MAY BE WITH LIQUID TIGHT OIL RESISTANT FLEXIBLE CONDUIT. CONDUITS TERMINATING IN EXTERIOR ENCLOSURES SHALL UTILIZE A WEATHERPROOF CONDUIT HUB. CONDUITS TERMINATING IN INDOOR ENCLOSURES SHALL UTILIZE LOCKNUTS INSIDE AND OUT WITH A METALLIC CONDUIT BUSHING, HUB, OR BOX CONNECTOR INSIDE THE ENCLOSURE.

SUPPORT - SUPPORT CONDUIT FROM BUILDING STRUCTURAL MEMBERS WITH CHANNEL STRUT AND PIPE CLAMPS OR PIPE HANGERS. DO NOT SUPPORT FROM CONNECTIONS TO EQUIPMENT. DO NOT USE PERFORATED STRAPS FOR SUPPORT.

** CONDUCTORS **

GENERATOR LEADS, FEEDERS (480V), AND BATTERY CABLES - TYPE VW-1, UL LISTED HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE. 600V, 150°C THERMOSET EPDM INSULATION WITH TIN COATED COPPER CONDUCTOR. COBRA WIRE AND CABLE, BELDEN, OR EQUAL. ON GENERATOR LEADS AND COMMUNITY DISTRIBUTION FEEDER 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 THHN INSULATION, 600V AND 75C RATED.

CONDUCTORS INSTALLED IN EXTERIOR LOCATIONS (OTHER THAN FEEDERS) - CLASS B CONCENTRIC STRANDED, SOFT DRAWN COPPER. TYPE XHHW INSULATION, 600V AND 75C RATED.

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

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.

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. EQUIPMENT GROUNDING CONDUCTORS FOR THE GENERATOR LEADS SHALL BE TYPE VW-1 AS SPECIFIED FOR GENERATOR LEADS. CONDUCTORS NOT INDICATED SHALL BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

GENERATOR CONTROL CONDUCTORS - TYPE VW-1, UL LISTED HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE, 600V, 150°C THERMOSET EPDM INSULATION WITH TIN COATED COPPER CONDUCTOR EXCEPT FOR SPECIALTY CABLE WHERE INDICATED. COBRA WIRE AND CABLE, BELDEN, OR EQUAL. CONTROL CONDUCTORS ROUTED BETWEEN THE TERMINAL BLOCK LOCATED IN THE GENERATOR TERMINAL HOUSING AND THE TERMINAL BLOCKS LOCATED IN THE GENERATOR CONTROL SECTION OF THE SWITCHGEAR SHALL BE COLOR CODED EXACTLY AS INDICATED ON THE DRAWINGS AND PACKAGED INTO A SINGLE CONTROL CABLE BUNDLE INCLUDING SHIELDED AND SPECIALTY CONDUCTORS AS SPECIFIED BELOW.

SHIELDED CONDUCTORS - STRANDED TINNED COPPER CONDUCTORS, 600V POLYETHYLENE INSULATION, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH A STRANDED TINNED COPPER DRAIN WIRE, AND PVC OUTER JACKET. SINGLE PAIR TWISTED #18 AWG, BELDEN #1120A OR EQUAL. SINGLE TRIAD TWISTED #18 AWG, BELDEN #1121A OR EQUAL. FOUR PAIR TWISTED #18 AWG, BELDEN #1049A OR EQUAL. TWO PAIR CANBUS CABLE #22 AWG AND #24 AWG TWISTED PAIRS, BELDEN 3084A OR EQUAL.

ETHERNET CABLE - CATEGORY 5E UNBONDED-PAIR CABLE, FOUR PAIR TWISTED, 24 GAUGE COPPER CONDUCTORS, 300V FEP INSULATION, BELDEN 1585LC OR EQUAL.

** ENGINE GENERATORS **

PROVIDE CATERPILLAR (GEN #1 AND #2) AND JOHN DEERE (GEN #3) ENGINE/GENERATOR SETS OF PRIME CAPACITY INDICATED, NO SUBSTITUTES. THE ENGINE-GENERATOR SETS SHALL BE MOUNTED ON WELDED STRUCTURAL STEEL BASE COMPLETE WITH VIBRATION ISOLATORS. MATERIALS AND EQUIPMENT SHALL BE NEW AND OF CURRENT DESIGN, DELIVERED TO THE SITE COMPLETELY WIRED, TESTED AND READY FOR INSTALLATION. PROVIDE COMPLETE WITH GOVERNOR, 12VDC OR 24VDC STARTING SYSTEM, INSTRUMENT PANEL, CONTROLS, SAFETY SHUT DOWNS, EXHAUST SYSTEM, DRIP PAN, AND ALL OTHER ACCESSORIES AS INDICATED AND REQUIRED. SEE THE ENGINE GENERATOR PURCHASE SPECIFICATIONS FOR ADDITIONAL DETAIL.

** PARALLELING SWITCHGEAR **

PROVIDE A FREESTANDING NEMA 1 ENCLOSURE WITH HINGED FRONT-OPENING DOORS. THE PANEL SHALL BE CONFIGURED AS INDICATED IN THE DRAWINGS. PANEL SHALL BE RATED 3,000 AMPERE COPPER, 3-PHASE, 4-WIRE WITH NEUTRAL AND GROUND BUSES. COMPLETE WITH PROVISIONS FOR THREE GENERATORS, MASTER CONTROL/STATION SERVICE, AND FEEDER SECTION WITH VARIABLE FREQUENCY DRIVES (VFD) FOR RADIATORS AND CHARGE AIR COOLERS AS INDICATED. EQUIPMENT ARRANGEMENT AND SIZES SHALL CONFORM TO THE ONE-LINE DIAGRAM. PANEL SHALL BE PAINTED ANSI 61 GRAY.

IN UPPER SECTION OF EACH GENERATOR SECTION PROVIDE A GENSET CONTROL PACKAGE (GCP) WITH THE FOLLOWING FEATURES: (A) AUTOMATIC PARALLELING AND SYNCHRONIZATION; (B) ENGINE SPEED CONTROL; (C) LOAD SHARE; (D) SAFETY SHUT DOWNS; (E) PROTECTIVE RELAYING; (F) POWER MONITOR WITH VOLTS, AMPS FREQUENCY, KW, PF, AND TOTAL KWH. ALSO PROVIDE MANUAL BREAKER OPEN/CLOSE CONTROL.

PROVIDE THE FOLLOWING PROTECTION FOR EACH GENERATING UNIT - (A) OVERCRANK; (B) OVERSPEED; (C) OVER/UNDER VOLTAGE; (D) OVER/UNDER FREQUENCY; (E) REVERSE POWER; (F) OVERCURRENT; (G) HIGH JACKET WATER TEMPERATURE; (H) LOW LUBE OIL PRESSURE; (I) LOW LUBE OIL LEVEL; (J) PLUGGED AIR FILTER. PROVIDE ANNUNCIATION PANEL WITH LED LAMPS FOR INDICATION OF ENGINE STATUS AND ALL ALARM CONDITIONS.

** PARALLELING SWITCHGEAR (CONTINUED) **

IN LOWER SECTION OF EACH GENERATOR SECTION PROVIDE A MOTOR OPERATED CIRCUIT BREAKER FOR NORMAL ON/OFF LINE CONTROL.

PROVIDE THE FOLLOWING FEATURES IN THE MASTER CONTROL SECTION TO SERVE ALL GENERATING UNITS - (A) PROGRAMMABLE LOGIC CONTROLLER (PLC) FOR AUTOMATIC LOAD CONTROL AND SENSING; (B) OPERATOR INTERFACE UNIT FOR OPERATOR CHANGES TO THE LOAD CONTROL SET POINTS IN THE PLC; (C) MICROPROCESSOR BASED KILOWATT-HOUR METERS FOR THE BUS, STATION SERVICE, AND FEEDERS; (D) ANNUNCIATION PANEL WITH LED LAMPS FOR INDICATION OF SYSTEM STATUS AND ALL ALARM CONDITIONS.

PROVIDE A FEEDER SECTION COMPLETE WITH - (A) MOTOR OPERATED CIRCUIT BREAKERS FOR THE COMMUNITY; (B) RADIATOR VARIABLE FREQUENCY DRIVES. ALL CIRCUIT BREAKER SIZES AND TRIP SETTINGS SHALL BE AS INDICATED ON THE ONE-LINE DIAGRAM.

OPERATION - THE PARALLELING SWITCHGEAR SHALL ALLOW THE OPERATOR TO SELECT EITHER MANUAL OPERATION OF ANY OR ALL OF THE GENERATING UNITS OR COMPLETE UNATTENDED AUTOMATIC OPERATION. THE CONTROL SYSTEM SHALL ALLOW THE SELECTION OF ALL OF THE GENERATING UNITS TO OPERATE IN MANUAL OR AUTOMATIC MODE OR A PORTION OF THE GENERATING UNITS TO OPERATE IN MANUAL MODE AND THE REMAINDER IN AUTOMATIC MODE. THE OPERATOR SHALL PLACE THE UNIT IN MANUAL OR AUTOMATIC MODE USING THE GCP.

AUTOMATIC - WHEN THE UNIT IS IN THE AUTOMATIC MODE, THE PROGRAMMABLE LOGIC CONTROLLER (PLC) SHALL SENSE THE DEMAND ON THE SYSTEM AND SHALL AUTOMATICALLY SELECT THE MOST APPROPRIATE ENGINE/GENERATOR UNIT OR COMBINATION OF UNITS TO MEET THE DEMAND. THE PLC SHALL COMMAND THE GCP TO AUTOMATICALLY START THE ENGINE/GENERATOR UNITS, BRING THEM TO THE PROPER SPEED, SYNCHRONIZE THE UNITS, AND CLOSE THE GENERATOR TO THE BUS. WHEN THE PLC REMOVES AN ENGINE/GENERATOR FROM THE SERVICE, THE GCP SHALL REMOVE THE UNIT FROM THE BUS AND ALLOW THE ENGINE TO OPERATE FOR A COOLDOWN PERIOD BEFORE STOPPING THE ENGINE.

MANUAL - IN THE MANUAL MODE, THE OPERATOR SHALL BE ABLE TO START THE ENGINE/GENERATOR USING THE GCP. THE GCP WILL START THE ENGINE/GENERATOR, BRING THE ENGINE UP TO SPEED, AND SYNCHRONIZE THE GENERATOR TO THE BUS. THIS SHALL BE ACCOMPLISHED INDEPENDENTLY FROM THE PLC.

EMERGENCY SHUTDOWN - UPON RECEIPT OF A CONTACT CLOSURE FROM THE FIRE SUPPRESSION SYSTEM, THE LOW COOLANT LEVEL SWITCH, OR THE EMERGENCY STOP PUSHBUTTON ALL OPERATING ENGINES SHALL BE IMMEDIATELY SHUT DOWN WITHOUT GOING THROUGH A SHUTDOWN PROCEDURE. THE SYSTEM SHALL REMAIN IN A LOCKOUT CONDITION UNTIL ALL ALARMS ARE CLEARED.

LOW FUEL LEVEL ALARM - A NORMALLY CLOSED CONTACT ON THE DAY TANK CONTROL PANEL SHALL OPEN ON A LOW FUEL LEVEL. THE LOW FUEL LEVEL INDICATION SHALL START A TIME DELAY RELAY, 2 HOURS, ADJUSTABLE, AND ILLUMINATE A RED LAMP "LOW FUEL LEVEL". IF THE FUEL LEVEL HAS NOT BEEN CORRECTED BY THE END OF THE TIMED INTERVAL THE ENGINES SHALL BE SHUT DOWN AND THE ALARM LAMP SHALL REMAIN ILLUMINATED. A MANUAL RESET BUTTON ON THE FRONT OF THE SWITCHGEAR SHALL BE PROVIDED TO RESET THE TIMER RELAY FOR ANOTHER INTERVAL AND PLACE THE ENGINES BACK IN SERVICE (IF TIMED OUT). THE RESET FUNCTION SHALL WORK ANY TIME DURING OR AFTER EXPIRATION OF THE TIMED INTERVAL.

SEE THE AUTOMATIC PARALLELING SWITCHGEAR PURCHASE SPECIFICATIONS FOR ADDITIONAL DETAIL.

** TESTING AND STARTUP**

EACH ENGINE/GENERATOR UNIT SHALL BE LOAD TESTED AT THE FACTORY FOR A MINIMUM OF 8 HOURS.

THE PARALLELING SWITCHGEAR SHALL BE FACTORY TESTED TO VERIFY ALL CONTROL AND ALARM FEATURES.

THE ENTIRE GENERATION PACKAGE SHALL BE FIELD TESTED WITH A LOAD BANK PRIOR TO PLACING IN SERVICE. FIELD TESTING SHALL INCLUDE ALL FEATURES OF BOTH AUTOMATIC AND MANUAL MODES PLUS ALL ALARM AND SHUTDOWN FUNCTIONS. LOCAL PLANT OPERATORS SHALL PARTICIPATE IN ALL TESTING.

ALL STATION SERVICE EQUIPMENT SHALL BE TESTED TO VERIFY PROPER OPERATION. ALL CONTROL AND ALARM FUNCTIONS SHALL BE VERIFIED.

UPON SUCCESSFUL COMPLETION OF TESTING, THE PLANT SHALL BE PLACED IN SERVICE. A MINIMUM OF ONE WEEK OF SYSTEM PERFORMANCE MONITORING AND LOCAL OPERATOR TRAINING SHALL BE PROVIDED UPON SYSTEM STARTUP PRIOR TO LEAVING THE PROJECT SITE.

ELECTRICAL EQUIPMENT SCHEDULE

ITEM NO.	DESCRIPTION	MANUFACTURER
1	MULTI-TONE ALARM WITH STROBE, 115V, NEMA 3R, WEATHER RESISTANT SURFACE MOUNT BELL BOX	WHEELOCK MT4-115-WH-VNS
2	DAY TANK 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
3	LINE VOLTAGE HEATING/COOLING THERMOSTAT, 120V, 9.8 FLA, SPDT, 44F TO 86F RANGE.	HONEYWELL T651A3018
4	NOT USED	
5	EMERGENCY FIXTURE, WALL MOUNT, 20 GA STEEL ENCLOSURE, LEAD-CALCIUM BATTERY, 120V INPUT, 12VDC, 150W, DUAL 12W HALOGEN LAMPS	PATHWAY 12D150-2L-H12 NO SUBSTITUTES
6	EMERGENCY FIXTURE WITH EXIT SIGN, WALL MOUNT, 20 GA STEEL ENCLOSURE, LEAD-CALCIUM BATTERY, 120V INPUT, DUAL 6V LAMPS, OPTION M1 STYLE MOUNT WITH LIGHT BEHIND SIGN	PATHWAY LEP12X1CR-M1 NO SUBSTITUTES
7	SURFACE MOUNTED/SUSPENDED FLOURESCENT FIXTURE, SOLID TOP, WIDE DISTRIBUTION, 48" LONG, 3 TUBE F32WT8 LAMP, INSTANT START MULTI VOLTAGE ENERGY SAVING BALLAST	LITHONIA MS8-ST-3-32-WD MVOLT
8	150W HIGH PRESSURE SODIUM WALL MOUNT FIXTURE, MULTI-TAP BALLAST. PROVIDE WITH 120V PHOTO CELL CONTROL AND TWO LAMPS (ONE SPARE).	LITHONIA TWH150STB
9	0-5 MINUTE TIMER SWITCH, 120V, 20A, 1HP RATED, INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER.	INTERMATIC FF5M
10	SINGLE POLE SNAP SWITCH, 120V, 20A, METAL, 1-1/2HP RATED, INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER, IVORY.	HUBBELL 1221-I
11	SINGLE POLE SNAP SWITCH WITH RED PILOT LIGHT, 120V, 20A, 1-1/2HP RATED, INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER	HUBBELL 1221-PL
12	DOUBLE POLE SNAP SWITCH WITH RED PILOT LIGHT, 240V, 30A, 2HP RATED, INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER	HUBBELL 3032-PL
13	STATION SERVICE TRANSFORMER - ENERGY STAR COMPLIANT, ENCLOSURE TYPE 1, 15kVA, HV 480 DELTA, LV 208Y/120	EGS ELECTRICAL GROUP CAT. NO. ET2H15S
14	STATION SERVICE PANELBOARD, 3-PHASE MAIN BREAKER WITH COPPER BUS, 4 WIRE, 120/208V, 150A, 42 CIRCUITS, BOLT-IN BREAKERS, SURFACE MOUNT, NEMA 1	SIEMENS
15	SURFACE MOUNT 125V NEMA 5-20R RECEPTACLE. INSTALL IN 4"x4" PRESSED STEEL BOX WITH METAL COVER.	HUBBELL 5362I
16	125V NEMA 5-20R RECEPTACLE. MOUNT IN CAST FDA BOX WITH WEATHERPROOF COVER.	HUBBELL 5362I WITH CROUSE HINDS WLRD-1 COVER
17	12/24-VOLT 20-AMP SOLID STATE AUTO-EQUALIZING BATTERY CHARGER FOR 120 VOLT AC INPUT POWER WITH OPTIONAL HIGH/LOW VOLTAGE, AC POWER FAILURE & REMOTE SUMMARY ALARM RELAYS	CHARLES INDUSTRIES 93-INCHGR20-A
18	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
19	PRESSURE TRANSMITTER, 0-60 PSIG RANGE, 4-20mA OUTPUT, 1/4" NPT PIPING CONNECTION, HIRSCHMANN ELECTRICAL CONNECTION	NOSHOK 100-60-1-1-2-7
20	NON-FUSED LOCKABLE SAFETY SWITCH, NEMA 3R ENCLOSURE, 3PST, 600V, 30A, MIN 5HP RATED	SQUARE D HU361RB
21	EXHAUST FAN CONTACTOR, IEC STYLE, 12A, 120V COIL, NEMA 1 ENCLOSURE	ALLEN BRADLEY 100C12D10 & 198EBA966
22	EXTERIOR SLAB HEAT TEMPERATURE CONTROLLER, NEMA 1, SPDT, -30°F TO 212°F, 16A/120V	JOHNSON A419ABC-1C

RECORD DRAWING

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DATE: 1/10/11

State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503

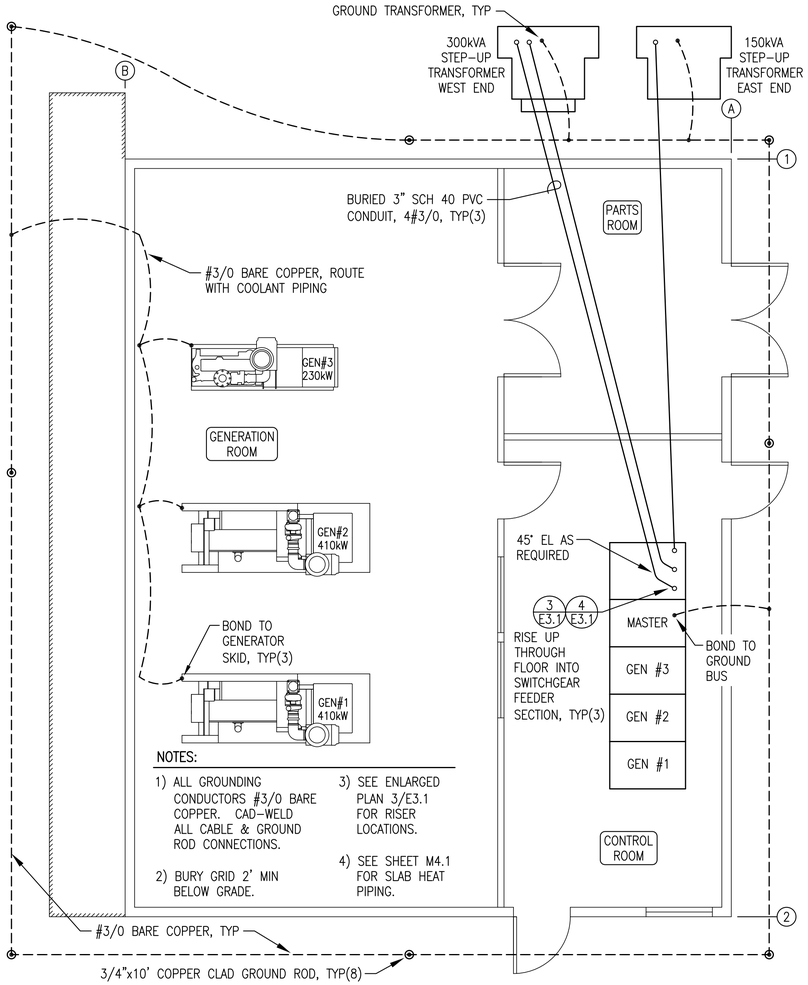
ALASKA ENERGY AUTHORITY

PROJECT:
KWETHLUK POWER SYSTEM UPGRADE

TITLE:
SPECIFICATIONS & EQUIPMENT SCHEDULE

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

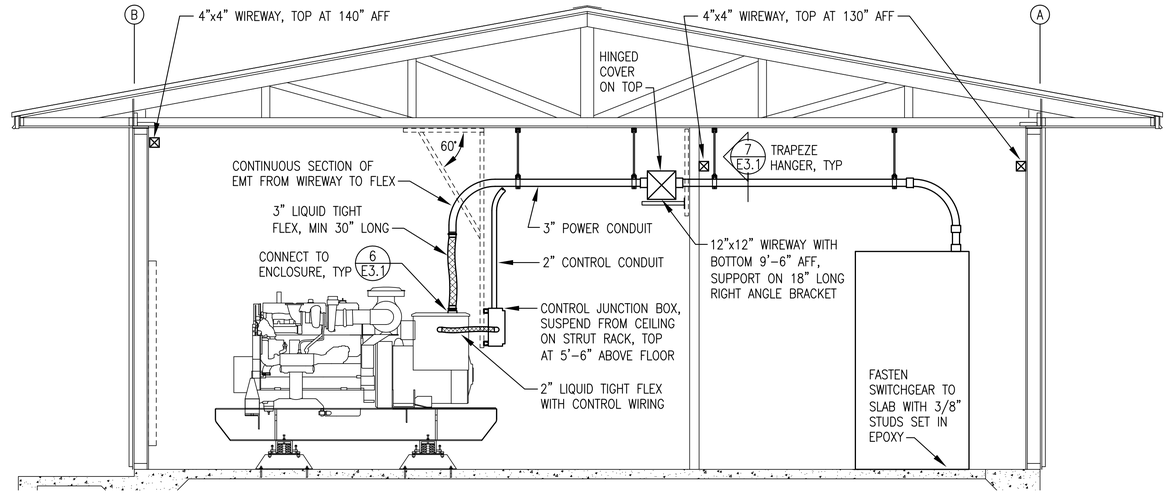
DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET: E2	OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		



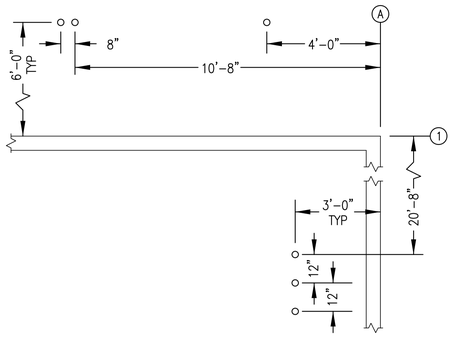
NOTES:

1) ALL GROUNDING CONDUCTORS #3/0 BARE COPPER. CAD-WELD ALL CABLE & GROUND ROD CONNECTIONS.
2) BURY GRID 2' MIN BELOW GRADE.
3) SEE ENLARGED PLAN 3/E3.1 FOR RISER LOCATIONS.
4) SEE SHEET M4.1 FOR SLAB HEAT PIPING.

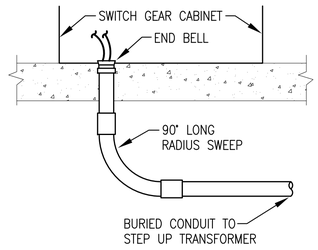
1 E3.1 GROUNDING GRID & UNDERFLOOR FEEDER PLAN
1/4"=1'



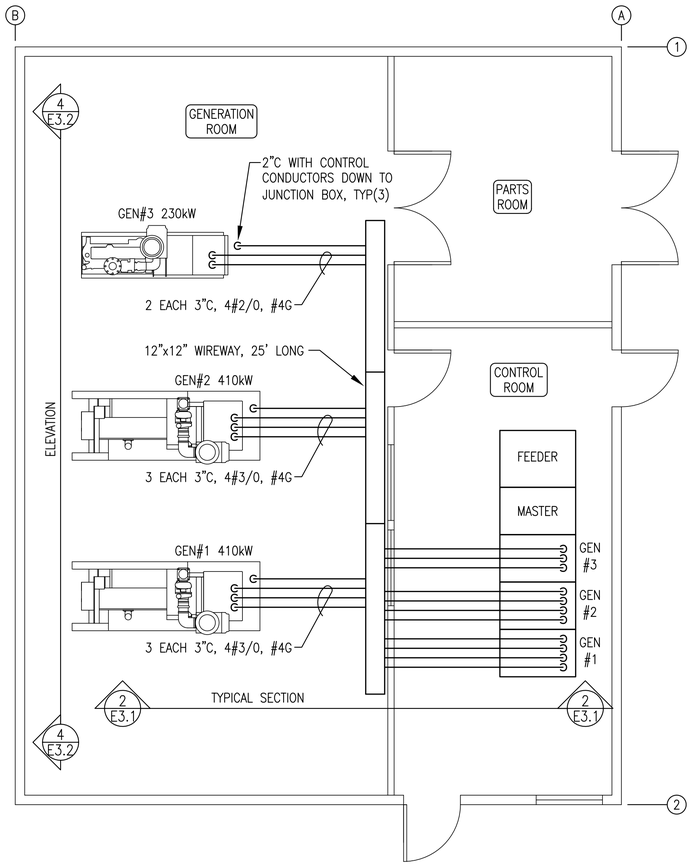
2 E3.1 TYPICAL SECTION
3/8"=1'



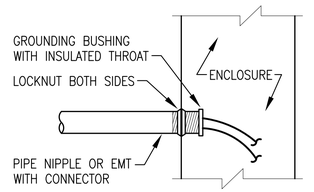
3 E3.1 ENLARGED RISER LOCATION PLAN
3/8"=1'



4 E3.1 SWITCHGEAR BOTTOM ENTRANCE
NO SCALE



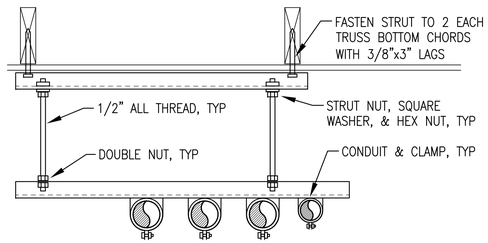
5 E3.1 GENERATOR POWER & CONTROL PLAN
1/4"=1'



NOTES:

1) THIS DETAIL APPLIES TO ALL CONNECTIONS TO GENERATOR ENCLOSURES, SWITCHGEAR, AND PANELS.
2) ON GENERATOR ENCLOSURES MAKE ALL CONNECTIONS AS TIGHT AS POSSIBLE & RE-TIGHTEN AFTER INITIAL RUN IN.

6 E3.1 CONNECTION TO ENCLOSURE
NO SCALE



7 E3.1 TRAPEZE HANGER
NO SCALE

RECORD DRAWING

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DATE: 1/10/11

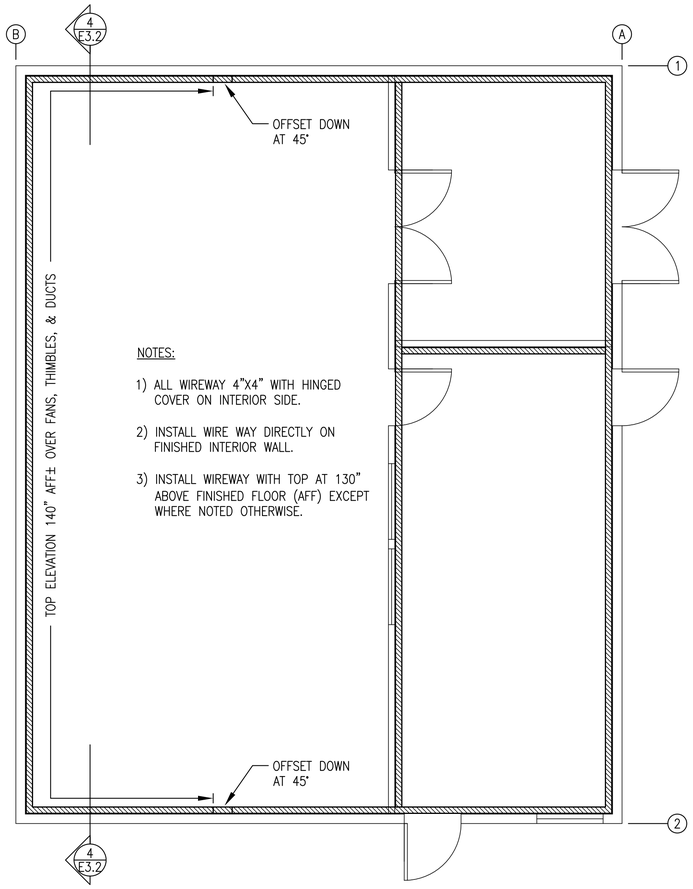
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

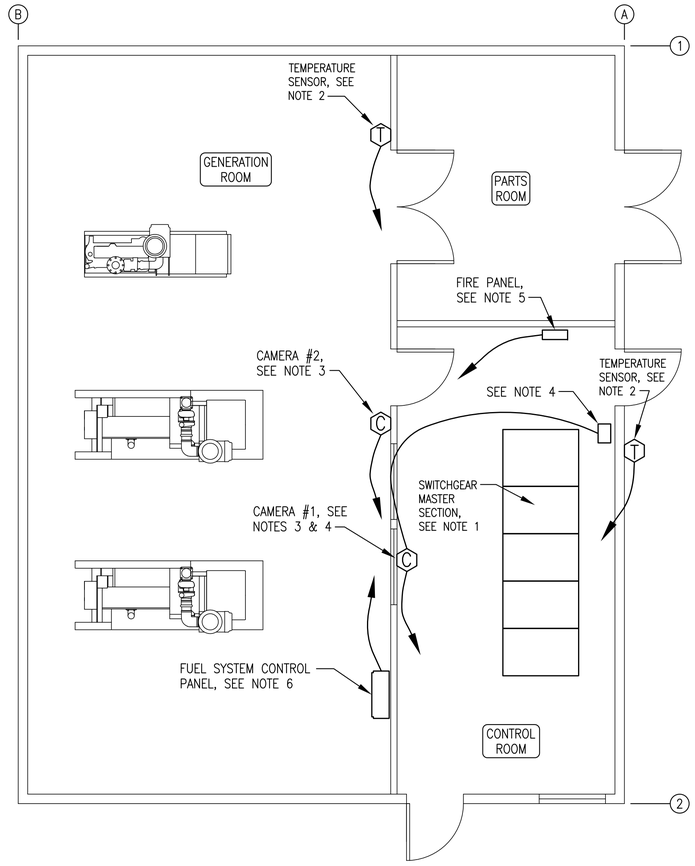
TITLE: POWER & CONTROL PLANS & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET: E3.1 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 E3.2 STATION SERVICE WIREWAY PLAN
1/4"=1'



NOTES:

1) PROVIDE TELEPHONE AND HIGH SPEED INTERNET SERVICE CONNECTIONS THIS AREA.
2) RTD TEMPERATUIRE SENSOR, ROUTE #18 SHIELDED TRIAD TO SWITCHGEAR MASTER SECTION.
3) ROUTE 2#14 (12VDC) POWER TO CAMERA FROM POWER SUPPLY AT SWITCHGEAR UPS. ROUTE ETHERNET CABLE FROM CAMERA TO SERVER IN SWITCHGEAR.
4) INSTALL CONTACTOR WITH TIMER RELAY FOR REMOTE LIGHTING CONTROL. OPERATE FROM DRY CONTACT ON CAMERA #1. SET TIMER TO TURN LIGHTS ON FOR 5 MINUTES EACH TIME CAMERA IS OPERATED. SEE SCHEMATIC 3/E3.2.
5) ROUTE 4-WIRE TELEPHONE CABLE FROM FIRE SUPPRESSION CONTROL PANEL TO DESKTOP COMPUTER.
6) ROUTE CATEGORY 5E ETHERNET CABLE FROM FUEL SYSTEM CONTROL PANEL TO SWITCHGEAR MASTER SECTION.

2 E3.2 DATA/COMMUNICATION PLAN
1/4"=1'

NOTES:

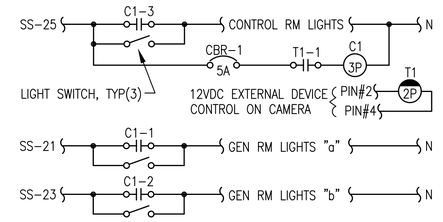
1) INSTALL CONTACTOR, TIMER RELAY, AND CIRCUIT BREAKER IN 8"x8"x8" NEMA 1 JUNCTION BOX ON WALL ABOVE LIGHT SWITCHES.
2) ALL LIGHTING CIRCUIT WIRING MIN #12 AWG. ALL 5A CONTROL CIRCUIT WIRING MIN #16AWG.
3) SET TIMER FOR 5 MINUTES, SINGLE SHOT MODE.

BILL OF MATERIALS:

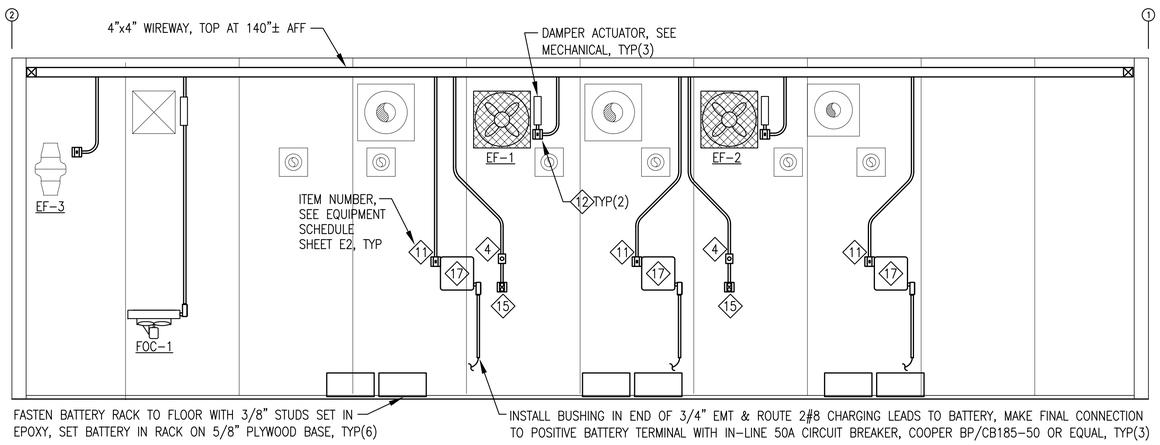
CB1: 5A, 1P, RAIL MOUNT CIRCUIT BREAKER. ALLEN BRADLEY 1489-A1-050.

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.



3 E3.2 LIGHTING REMOTE CONTROL SCHEMATIC
NO SCALE



4 E3.2 BACK WALL ELEVATION
3/8"=1'

RECORD DRAWING

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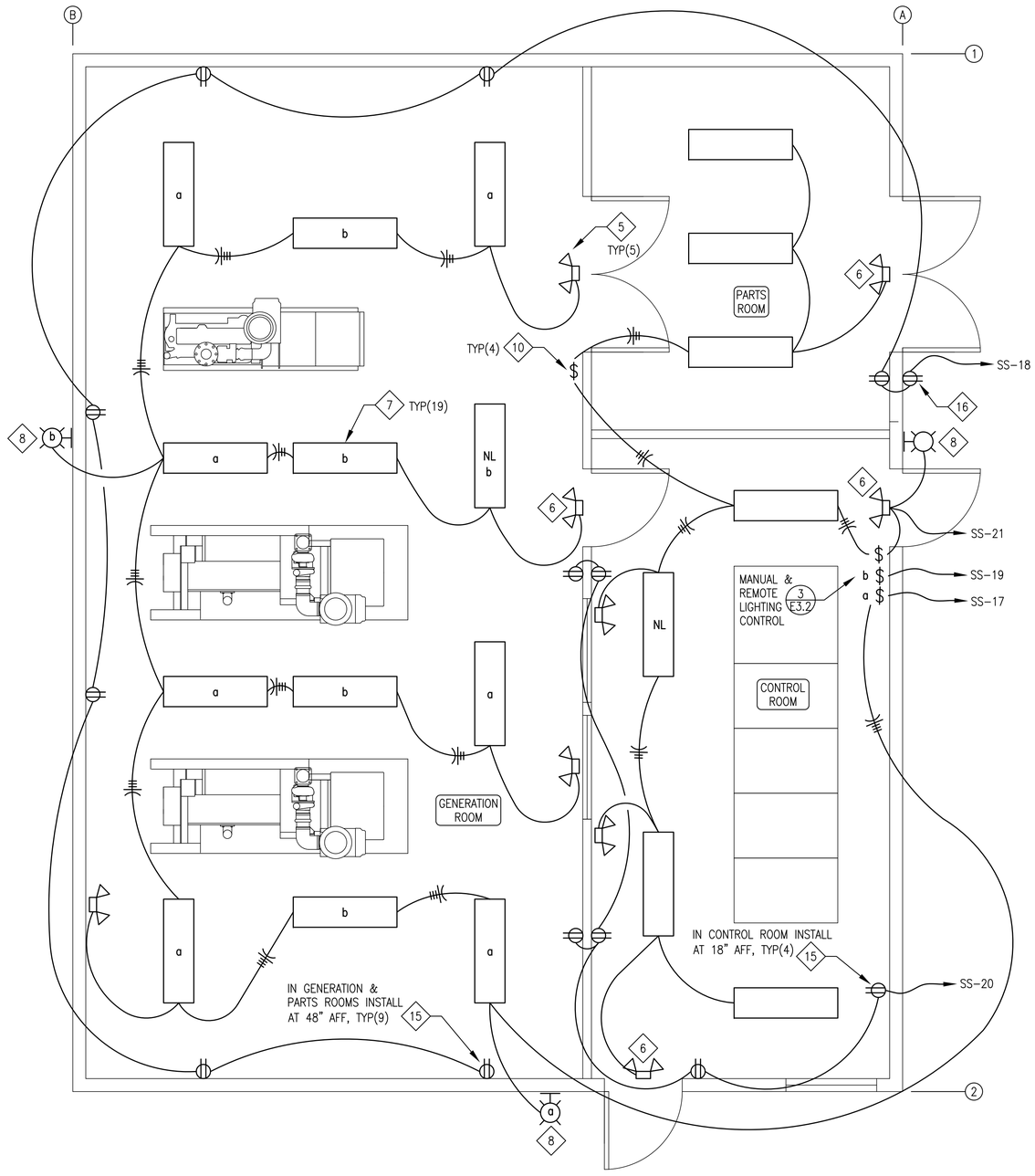
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: WIREWAY PLAN, DATA/COMMUNICATION PLAN, & DETAILS

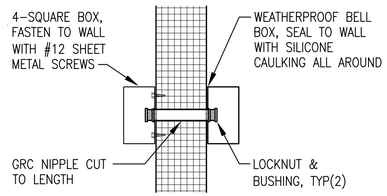
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET: E3.2 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 / E4 LIGHTING/RECEPTACLE PLAN
3/8"=1'

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
$	SNAP SWITCH/ SMALL MOTOR DISCONNECT
T$	TIMER SWITCH
	GROUND



2 / E4 EXTERIOR WALL PENETRATION
NO SCALE

RECORD DRAWING

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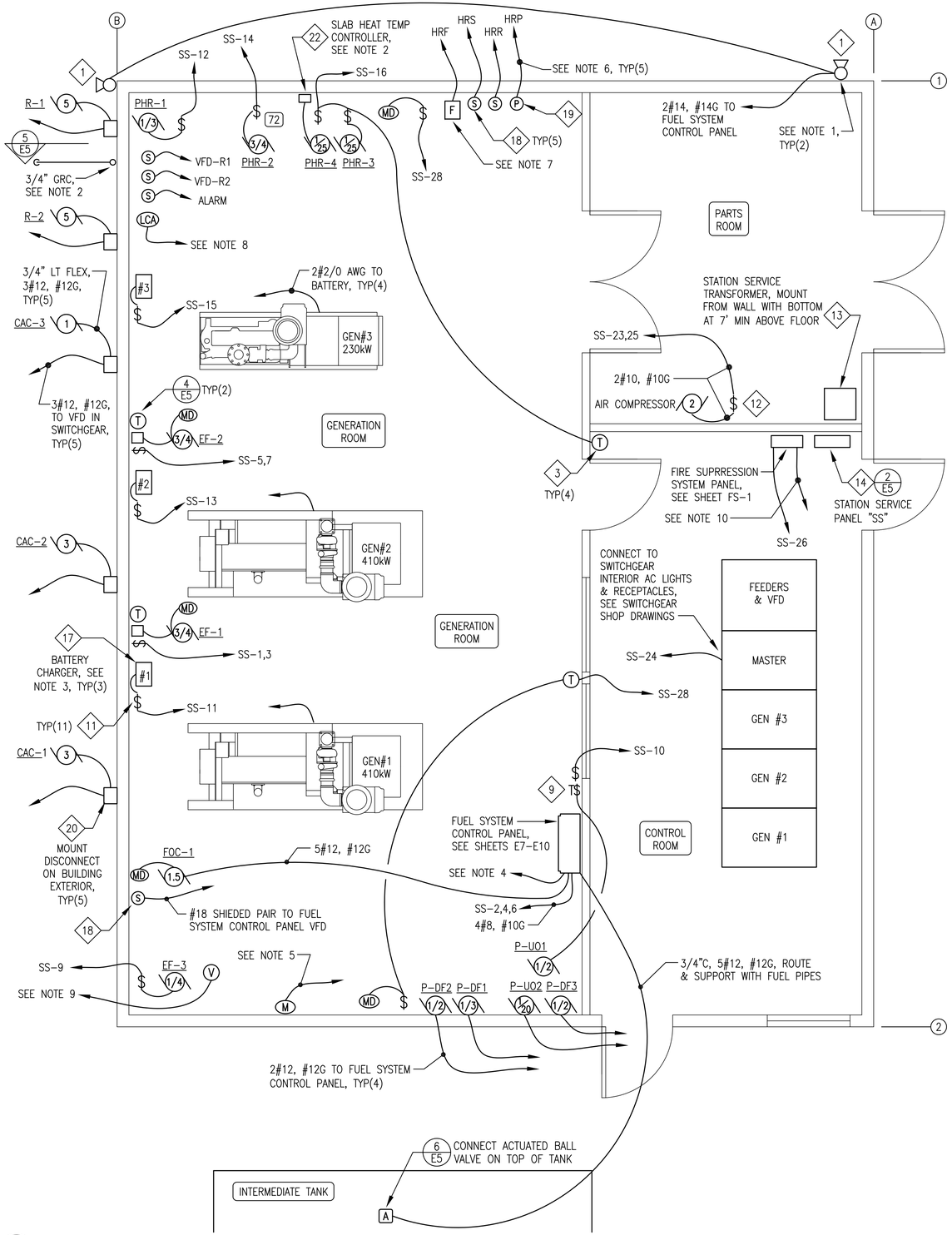
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: LIGHTING/RECEPTACLE PLAN & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET: E4 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 E5 STATION SERVICE PLAN
3/8"=1'

STATION SERVICE NOTES

1) INSTALL PLACARD, SEE SHEET M1.1.

2) INSTALL TEMPERATURE SENSOR AT EDGE OF RADIATOR SLAB, SEE 5/E5. MOUNT CONTROLLER ON WALL NEAR P-HR4 & PROVIDE POWER FROM P-HR4 DISCONNECT. INSTALL TAG, SEE M1.1.

3) MOUNT BATTERY CHARGER TO WALL & INSTALL BATTERY ON FLOOR BELOW, SEE ELEVATION 2/E4. ROUTE 2#14 FROM CHARGER ALARM CONTACTS TO ASSOCIATED SWITCHGEAR GENERATOR SECTION, SEE TERMINAL STRIP DRAWING 2/E6.

4) ROUTE 2#14 FROM FUEL PANEL TO LOW FUEL ALARM IN SWITCHGEAR MASTER SECTION.

5) ROUTE 2 EACH #18 SHIELDED PAIR FROM DAY TANK METER TO SWITCHGEAR MASTER SECTION, ONE FOR 24VDC REGISTER POWER & ONE FOR PULSER.

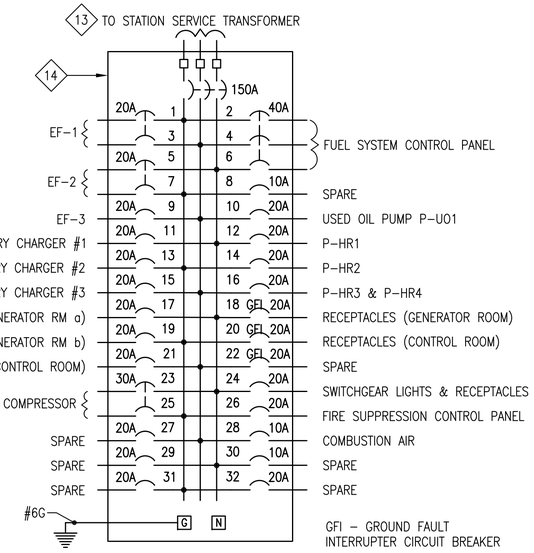
6) INSTALL TEMP & PRESS TRANSMITTERS WHERE SHOWN ON COOLING & HEAT RECOVERY PIPING ISOMETRICS. ROUTE #18 SHIELDED PAIR FROM EACH SENSOR TO SWITCHGEAR. TERMINATE RADIATOR COOLANT SENSORS AT ASSOCIATED VFD PANEL. TERMINATE HEAT RECOVERY SENSORS AT MASTER SECTION.

7) INSTALL FLOW METER FOR HEAT RECOVERY MONITORING WHERE SHOWN ON HEAT RECOVERY PIPING ISOMETRIC. PROVIDE POWER FROM P-HR2 DISCONNECT. ROUTE #18 SHIELDED PAIR TO SWITCHGEAR MASTER SECTION.

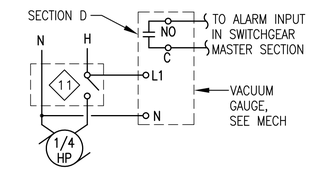
8) LOW COOLANT LEVEL ALARM SWITCH FURNISHED WITH GENERATORS & INSTALLED AT EXPANSION TANK, SEE MECHANICAL. ROUTE 2#14 TO SWITCHGEAR MASTER SECTION.

9) ROUTE 2#14 FROM ALARM CONTACT ON CRANK VENT SYSTEM VACUUM GAUGE TO SWITCHGEAR MASTER SECTION, SEE 3/E5.

10) ROUTE 2#14 TO SWITCHGEAR MASTER SECTION FOR FIRE ALARM SHUT DOWN.

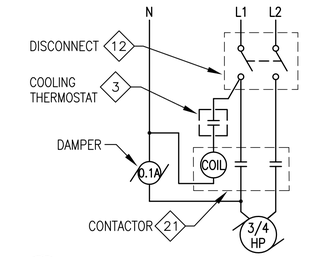


2 E5 STATION SERVICE PANEL "SS"
NO SCALE

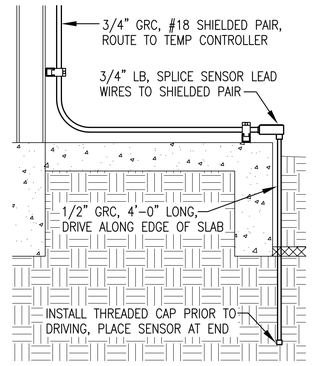


3 E5 EF-3 WIRING DIAGRAM
NO SCALE

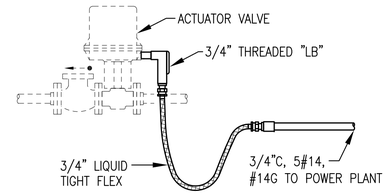
NOTE: FAN MOTORS FURNISHED WITH INTEGRAL THERMAL PROTECTION.



4 E5 EF-1/2 WIRING DIAGRAM
NO SCALE



5 E5 SLAB HEAT TEMP SENSOR
NO SCALE



NOTE: SEE LOGIC DIAGRAM SHEET E9 FOR ACTUATOR CONNECTIONS.

6 E5 ACTUATOR VALVE CONNECTION
NO SCALE

RECORD DRAWING

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Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: STATION SERVICE PLAN, PANEL, & DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

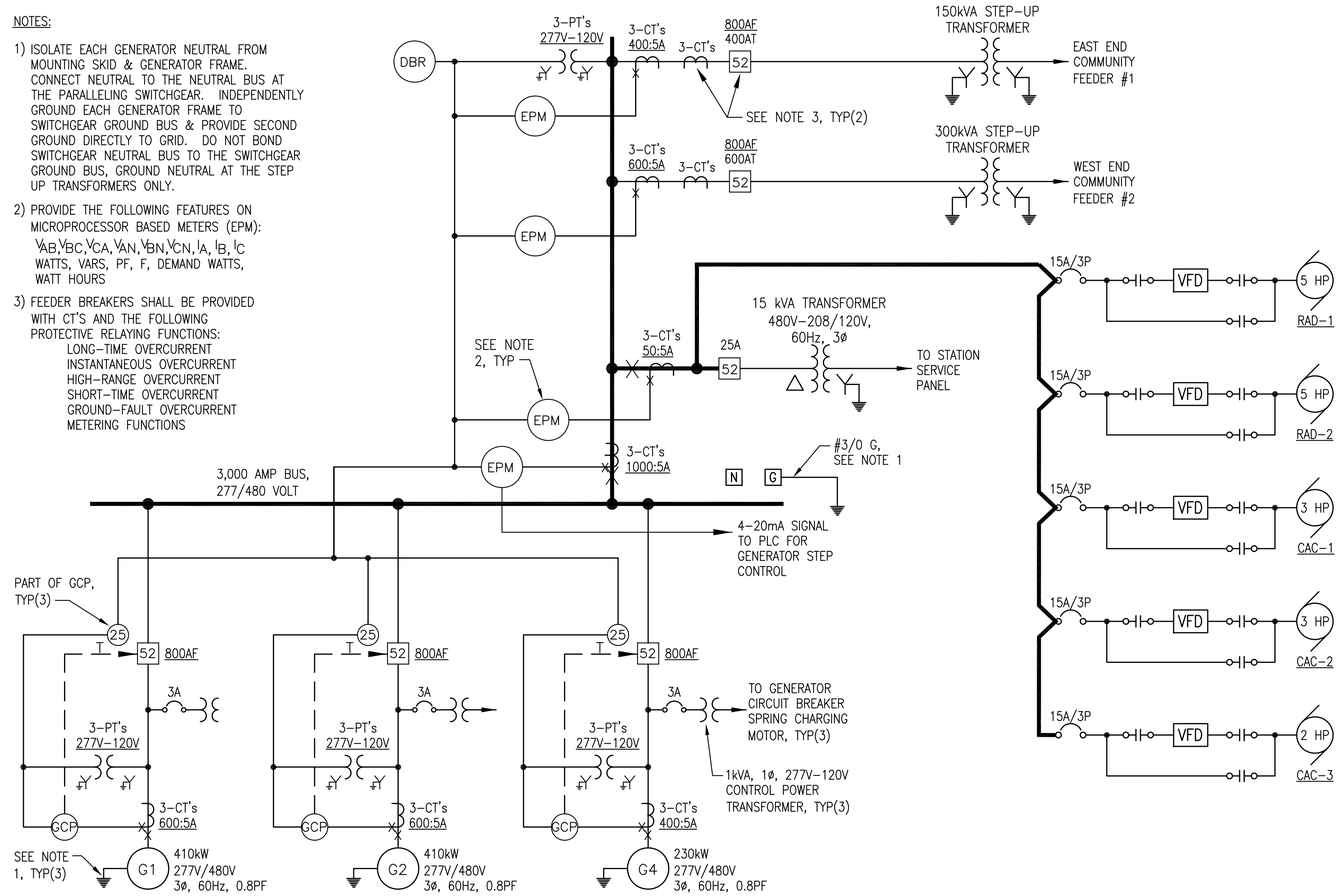
DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET: E5	OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		

NOTES:

1) 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 GRID. DO NOT BOND SWITCHGEAR NEUTRAL BUS TO THE SWITCHGEAR GROUND BUS, GROUND NEUTRAL AT THE STEP UP TRANSFORMERS ONLY.

2) PROVIDE THE FOLLOWING FEATURES ON MICROPROCESSOR BASED METERS (EPM):
$V_{AB}, V_{BC}, V_{CA}, V_{AN}, V_{BN}, V_{CN}, I_A, I_B, I_C$
WATTS, VARS, PF, F, DEMAND WATTS, WATT HOURS

3) FEEDER BREAKERS SHALL BE PROVIDED WITH CT'S AND THE FOLLOWING PROTECTIVE RELAYING FUNCTIONS:
LONG-TIME OVERCURRENT
INSTANTANEOUS OVERCURRENT
HIGH-RANGE OVERCURRENT
SHORT-TIME OVERCURRENT
GROUND-FAULT OVERCURRENT
METERING FUNCTIONS



1 E6 SWITCHGEAR ONE-LINE DIAGRAM
NO SCALE

GEN#1 & GEN#2 (CATERPILLAR 3456)

1	R	(+) ENGINE BATTERY
2	BK	(–) (#8 AWG & 50A TERMINAL BLOCKS)
3		
4		RATED SPEED (PWM)
5		RATED SPEED (–) — ECU CONTROL
6	Y–W	ECM RUN (012), 12 VDC (#14 AWG)
7	O–R	STARTER RELAY, 12 VDC (#14 AWG)
8		SPARE
9		SPARE
10		OIL LEVEL SWITCH
11		
12		MAGNETIC PICKUP
13		
14		
15		OIL PRESSURE SENSOR
16		
17		JACKET WATER TEMPERATURE SENSOR
18		
19		SEE NOTE #3, TYP
20		EXHAUST TEMPERATURE
21		100 OHM 2-WIRE RTD
22		SPARE
23		SPARE
24		#18 AWG SHIELDED/TWISTED PAIR, TYP
25	A	VOLTAGE REGULATOR
26	B	AUXILIARY BIAS INPUT
27		INTAKE AIR TEMPERATURE SENSOR,
28		4-20mA
29		AIR FILTER VACUUM
30		SENSOR, 4-20mA
31		
32		CAT DATA LINK
33		
34		SPARE TERMINALS FOR FUTURE ADDITIONAL
35		ECU COMMUNICATION WIRING
36		
BC-1		#14 AWG TO BATTERY CHARGER ALARM, INSTALL
BC-2		AT SWITCHGEAR ONLY (NOT ON GENERATOR)

GEN#3 (JOHN DEERE 6090)

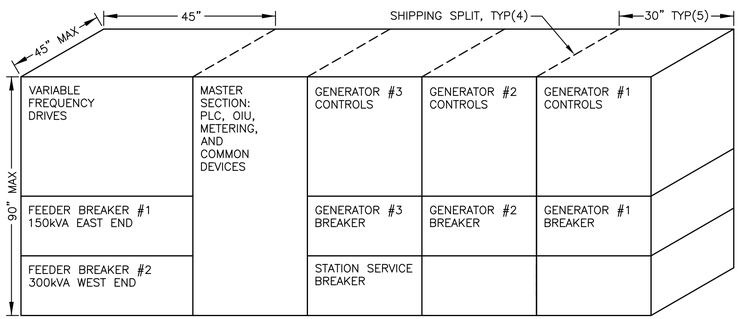
1	R	(+) ENGINE BATTERY
2	BK	(–) (#8 AWG & 50A TERMINAL BLOCKS)
3		
4		414/914 SENSOR RETURN (–)
5		915 SENSING (0.25-4.75 VDC) — ECU CONTROL
6	Y–WH	ECM RUN (012), 12 VDC (#14 AWG)
7	O–R	STARTER RELAY, 12 VDC (#14 AWG)
8		SPARE
9		SPARE
10		OIL LEVEL SWITCH
11		
12		SPARE
13		SPARE
14		
15		SPARE
16		SPARE
17		SPARE
18		SPARE
19		SEE NOTE #3, TYP
20		EXHAUST TEMPERATURE
21		100 OHM 2-WIRE RTD
22		SPARE
23		SPARE
24		#18 AWG SHIELDED/TWISTED PAIR, TYP
25	A	VOLTAGE REGULATOR
26	B	AUXILIARY BIAS INPUT
27		INTAKE AIR TEMPERATURE SENSOR,
28		4-20mA
29		AIR FILTER VACUUM
30		SENSOR, 4-20mA
31		
32	BLU	J1939 CANBUS FROM ECU
33	WH	(#22 & #24 AWG SHIELDED PAIRS)
34	BLK	
35		SPARE TERMINALS FOR FUTURE ADDITIONAL
36		ECU COMMUNICATION WIRING
BC-1		#14 AWG TO BATTERY CHARGER ALARM, INSTALL
BC-2		AT SWITCHGEAR ONLY (NOT ON GENERATOR)

NOTES:
1) PROVIDE IDENTICAL TERMINAL STRIPS IN EACH GENERATOR & EACH CORRESPONDING SECTION OF SWITCHGEAR (EXCEPT BATTERY CHARGER AS NOTED). LAY OUT & NUMBER TERMINALS EXACTLY AS SHOWN. USE WIRE GAUGES & COLOR CODE INDICATED FOR FIELD INTERCONNECTION.

2) PROVIDE TYPE "K" THERMOCOUPLE TERMINAL BLOCKS & EXTENSION WIRE.

3) IN ADDITION TO TERMINAL BLOCKS SHOWN PROVIDE 2 EACH 30A GROUNDING LUGS IN GENERATOR ENCLOSURE BONDED TO GENERATOR FRAME. TERMINATE DRAIN WIRES FOR ALL SHIELDS AT GENERATOR END ONLY.

2 E6 TYPICAL GENERATOR CONNECTION DETAILS
NO SCALE



3 E6 SWITCHGEAR ENCLOSURE LAYOUT
NO SCALE

SWITCHGEAR SYMBOL LEGEND

- (G) DIESEL GENERATOR
- (52) 80AT 250AF CIRCUIT BREAKER AT=AMP TRIP RATING AF=AMP FRAME RATING
- 250A CONTACTOR WITH AMPERE RATING
- CURRENT TRANSFORMER M.R. – INDICATES MULTIRATIO TAP – INDICATES ACTUAL SETTING CT'S RATING FACTOR RF=2.0
- POTENTIAL TRANSFORMER
- (25) SYNC CHECK RELAY
- (DBR) DEAD BUS RELAY
- (GCP) GENSET CONTROL PACKAGE WOODWARD GCP-31
- (EPM) MICROPROCESSOR BASED METERING UNIT
- DELTA CONNECTION
- WYE CONNECTION

RECORD DRAWING

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DATE: 1/10/11

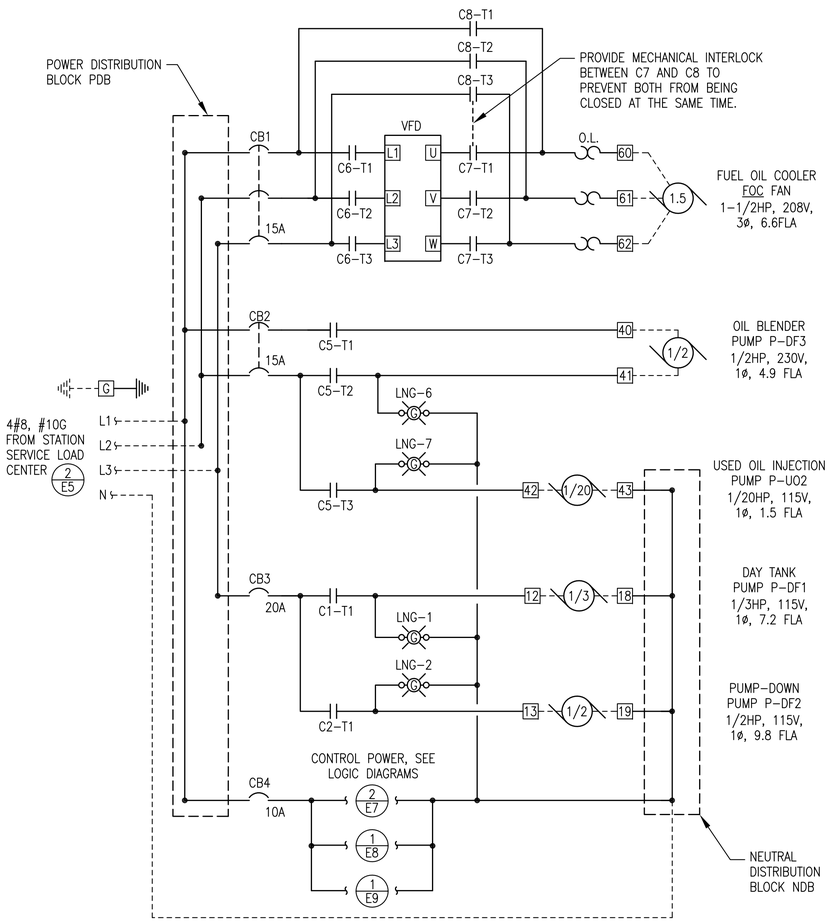
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: SWITCHGEAR DETAILS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

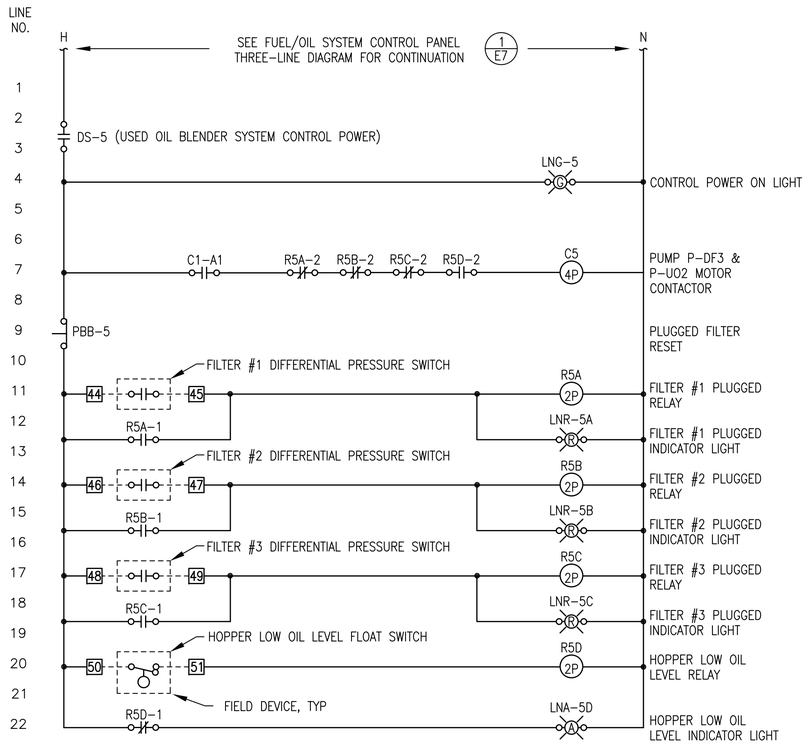
DRAWN BY: JTD/BCG	SCALE: AS NOTED	FILE NAME: KWET E2-6	SHEET:		
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	E6	OF	10



NOTE: ALL 1/2HP AND UNDER MOTORS EQUIPPED WITH INTEGRAL THERMAL PROTECTION.

1/E7 FUEL SYSTEM CONTROL PANEL THREE-LINE DIAGRAM

NO SCALE



2/E7 USED OIL BLENDER SYSTEM LOGIC DIAGRAM

NO SCALE

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 FILLS BOTH THE DIESEL CIRCULATING PUMP, P-DF3, 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 OR THE CONTROL POWER MUST BE TURNED OFF AND BACK ON 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.

PANEL		FIELD
C5-T1	40	L1 TO PUMP PDF-3
C5-T2	41	L2 TO PUMP PDF-3
C5-T3	42	PUMP P-UO2 POWER
N	43	PUMP P-UO2 NEUTRAL
	44	FILTER #1 SWITCH L1
	45	FILTER #1 SWITCH L2
	46	FILTER #2 SWITCH L1
	47	FILTER #2 SWITCH L2
	48	FILTER #3 SWITCH L1
	49	FILTER #3 SWITCH L2
	50	OIL LEVEL SWITCH L1
	51	OIL LEVEL SWITCH L2
	52	SPARE
	53	SPARE

NOTE: INSTALL TERMINAL STRIP VERTICALLY AS SHOWN. LOCATE TERMINAL STRIP TO THE RIGHT OF PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO THE TOP, BOTTOM OR RIGHT SIDE (FACING) OF PANEL. SEE SUBPANEL LAYOUT 2/E10.

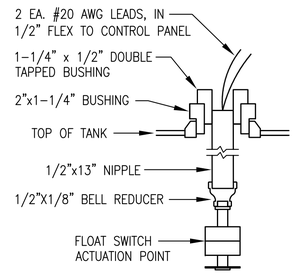
3/E7 USED OIL BLENDER TERMINAL STRIP TB-2

NO SCALE

LEGEND

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
PANEL WIRING	PB-# NORMALLY CLOSED MOMENTARY PUSH BUTTON
FIELD WIRING	

SW-#	NORMALLY OPEN FLOAT SWITCH
SW-#	NORMALLY CLOSED FLOAT SWITCH
SV#	SOLENOID VALVE
ASL-#	ALARM & STROBE LIGHT



NOTES:

1) THIS DETAIL IS FOR FIELD INSTALLATION ONLY AND IS NOT PART OF THE PANEL BID.
2) SEE SHEET M5 FOR ADDITIONAL PIPING DETAIL.
3) 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/E7 USED OIL HOPPER FLOAT SWITCH INSTALLATION

NO SCALE

RECORD DRAWING

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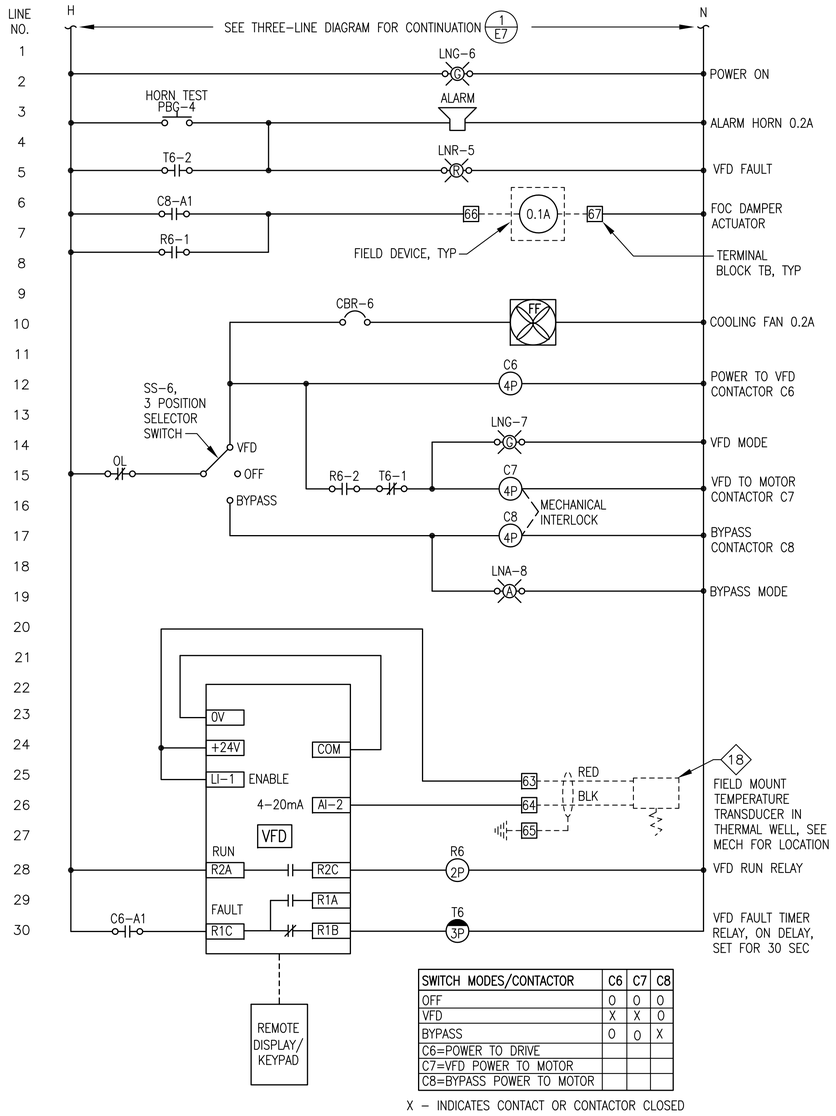
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: FUEL SYSTEM CONTROL PANEL 3-LINE DIAGRAM & OIL BLENDER LOGIC

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET E7-10	SHEET: E7	OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621		



SWITCH MODES/CONTACTOR	C6	C7	C8
OFF	0	0	0
VFD	X	X	0
BYPASS	0	0	X
C6=POWER TO DRIVE			
C7=VFD POWER TO MOTOR			
C8=BYPASS POWER TO MOTOR			

X – INDICATES CONTACT OR CONTACTOR CLOSED

1/E8 FUEL OIL COOLER VFD LOGIC DIAGRAM
NO SCALE

FUEL OIL COOLER VFD SEQUENCE OF OPERATION:

1) WHEN THE CIRCUIT BREAKER IN STATION SERVICE PANEL "SS" AND THE INTERNAL BREAKER CB1 ARE CLOSED POWER IS PROVIDED TO ALL CONTROL DEVICES AND THE "POWER ON" LIGHT IS ON.

2) WHEN THE 3-POSITION SELECTOR SWITCH IS IN THE "OFF" POSITION, THE FAN WILL NOT OPERATE.

3) WHEN THE 3-POSITION SELECTOR SWITCH IS IN THE "BYPASS" MODE, THE FAN WILL OPERATE AT FULL SPEED AND THE "BYPASS MODE" LIGHT WILL BE ON. THE VFD WILL NOT BE IN SERVICE.

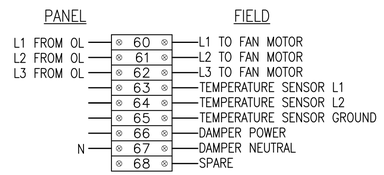
4) WHEN THE 3-POSITION SELECTOR SWITCH IS IN THE "VFD" POSITION, THE FAN WILL OPERATE UNDER CONTROL OF THE VFD AND THE "VFD MODE" LIGHT WILL BE ON. THE REMOTE TEMPERATURE SENSOR WILL SENSE FUEL RETURN TEMPERATURE AND SEND A 4-20MA SIGNAL TO THE VFD WHERE 20°F EQUALS 4 MA AND 240°F EQUALS 20 MA. USING ITS INTERNAL PROPORTIONAL CONTROL, THE VFD WILL MODULATE THE FAN SPEED AS REQUIRED TO MAINTAIN FUEL TEMPERATURE AT THE OPERATING SETPOINT. ONCE THE FAN SPEED REACHES A MINIMUM SPEED OF 10% (FIELD ADJUSTABLE), THE VFD WILL MAINTAIN THAT SPEED AS LONG AS THE FUEL TEMPERATURE IS ABOVE THE MINIMUM SETPOINT. AS THE COOLANT TEMPERATURE RISES, THE VFD WILL INCREASE THE SPEED OF THE FAN MOTOR UP TO 100%.

5) WHEN THE FUEL TEMPERATURE IS BELOW THE MINIMUM SETPOINT, THE MOTOR WILL STOP. THE MOTOR WILL REMAIN OFF UNTIL THE TEMPERATURE REACHES THE OPERATING SETPOINT. THE MOTOR WILL START AT MINIMUM SPEED AND RAMP UP TO THE REQUIRED SPEED.

6) THE FOC DAMPER WILL BE OPEN ANY TIME THE FOC FAN RUNS (BOTH VFD AND BYPASS MODES).

7) THE SPEED OF THE FAN MOTOR WILL BE DISPLAYED ON THE REMOTE DISPLAY/KEYPAD MOUNTED ON THE FRONT DOOR OF THE PANEL.

8) IN THE EVENT OF A FAILURE OF THE VFD, AFTER 30 SECONDS THE ALARM HORN WILL SOUND, THE RED "VFD FAULT" LAMP WILL ILLUMINATE, AND THE VFD WILL BE LOCKED OUT. THE FOC FAN CAN BE MANUALLY OPERATED IN BYPASS MODE.



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2/E8 VFD TERMINAL STRIP TB-1
NO SCALE

LEGEND

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

RECORD DRAWING

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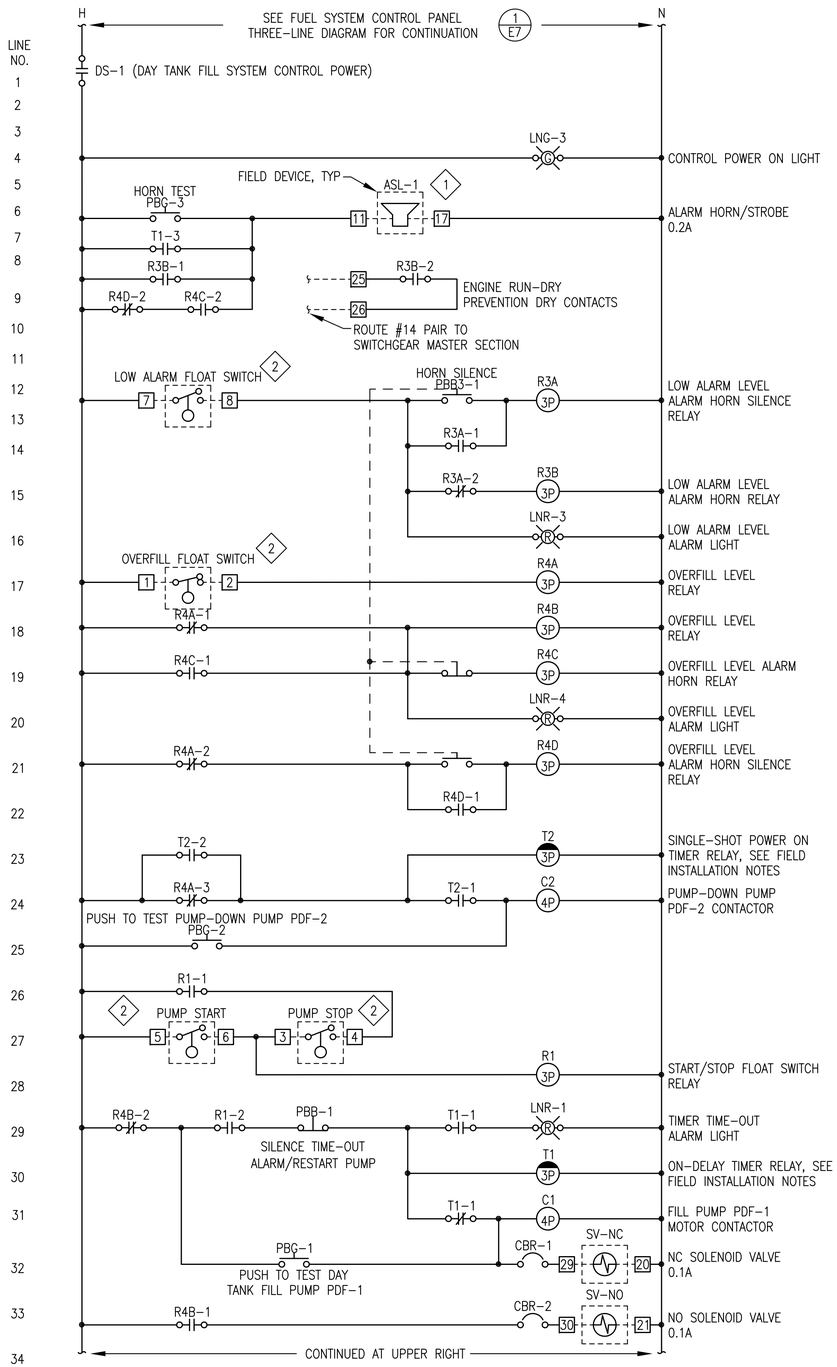
PROJECT: KWETHLUK POWER SYSTEM UPGRADE

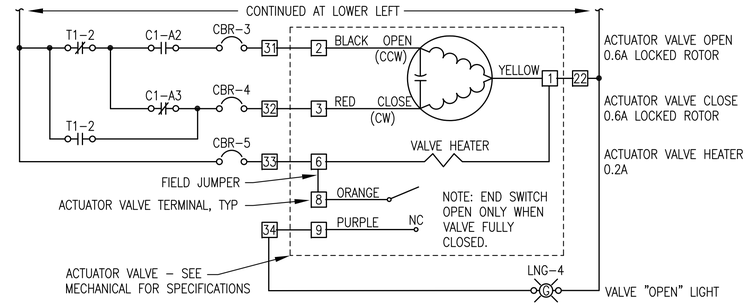
TITLE: FUEL SYSTEM CONTROL PANEL VFD LOGIC

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET E7-10	SHEET: E8 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



1 E9 DAY TANK AUTOMATIC FILL SYSTEM LOGIC DIAGRAM
NO SCALE



1 E9 DAY TANK AUTOMATIC FILL SYSTEM LOGIC DIAGRAM (CONTINUED)
NO SCALE

	PANEL		FIELD
FLOAT SWITCH POWER	⊗ 1 ⊗		OVERFILL FLOAT SWITCH L1
	⊗ 2 ⊗		OVERFILL FLOAT SWITCH L2
	⊗ 3 ⊗		PUMP STOP FLOAT SWITCH L1
	⊗ 4 ⊗		PUMP STOP FLOAT SWITCH L2
	⊗ 5 ⊗		PUMP START FLOAT SWITCH L1
	⊗ 6 ⊗		PUMP START FLOAT SWITCH L2
	⊗ 7 ⊗		LOW ALARM FLOAT SWITCH L1
	⊗ 8 ⊗		LOW ALARM FLOAT SWITCH L2
	⊗ 9 ⊗		SPARE
	⊗ 10 ⊗		CONTROL PANEL POWER FROM CB-4 (NO FIELD WIRING)
	⊗ 11 ⊗		ALARM/STROBE POWER
	⊗ 12 ⊗		FILL PUMP PDF-1 MOTOR POWER
	⊗ 13 ⊗		PUMP-DOWN PUMP PDF-2 MOTOR POWER
	⊗ 14 ⊗		SPARE
	⊗ 15 ⊗		SPARE
N	⊗ 16 ⊗		CONTROL PANEL NEUTRAL FROM NDB (NO FIELD WIRING)
	⊗ 17 ⊗		ALARM/STROBE NEUTRAL
	⊗ 18 ⊗		FILL PUMP PDF-1 MOTOR NEUTRAL
	⊗ 19 ⊗		PUMP-DOWN PUMP PDF-2 MOTOR NEUTRAL
	⊗ 20 ⊗		DAY TANK NC SOLENOID VALVE NEUTRAL
	⊗ 21 ⊗		DAY TANK NO SOLENOID VALVE NEUTRAL
	⊗ 22 ⊗		INTERMEDIATE TANK ACTUATOR VALVE NEUTRAL
	⊗ 23 ⊗		SPARE NEUTRAL
	⊗ 24 ⊗		SPARE NEUTRAL
	⊗ 25 ⊗		ENGINE RUN-DRY PREVENTION L1 TO SWITCHGEAR
	⊗ 26 ⊗		ENGINE RUN-DRY PREVENTION L2 TO SWITCHGEAR
	⊗ 27 ⊗		SPARE
	⊗ 28 ⊗		SPARE
CBR-1	⊗ 29 ⊗		NC SOLENOID VALVE POWER
CBR-2	⊗ 30 ⊗		NO SOLENOID VALVE POWER
CBR-3	⊗ 31 ⊗		INTERMEDIATE TANK REMOTE ACTUATOR VALVE OPEN SIGNAL
CBR-4	⊗ 32 ⊗		INTERMEDIATE TANK REMOTE ACTUATOR VALVE CLOSE SIGNAL
CBR-5	⊗ 33 ⊗		INTERMEDIATE TANK REMOTE ACTUATOR VALVE HEATER/END SWITCH POWER
	⊗ 34 ⊗		INTERMEDIATE TANK REMOTE ACTUATOR VALVE OPEN INDICATOR LIGHT SIGNAL
	⊗ 35 ⊗		SPARE

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2 E9 DAY TANK TERMINAL STRIP TB-3
NO SCALE

SEQUENCE OF OPERATIONS:

1. WHEN THE FUEL SYSTEM PANEL CIRCUIT BREAKER IN STATION SERVICE PANEL "SS", INTERNAL PANEL BREAKER CB2 AND THE DAY TANK CONTROL POWER SELECTOR 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, TIMER T1 IS STARTED, THE N.C. DAY TANK SOLENOID VALVE OPENS, THE REMOTE ACTUATOR VALVE OPENS & THE VALVE "OPEN" LIGHT TURNS ON, DAY TANK FILL PUMP P-DF1 IS ENERGIZED, THE PUMP P-DF1 "ON" LIGHT TURNS ON, AND THE USED OIL BLENDER RUN CIRCUIT DRY CONTACTS ARE CLOSED. 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 TIMER T1 TIMES-OUT, TIMER T1 IS RESET, THE N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE REMOTE ACTUATOR VALVE "OPEN" LIGHT TURNS OFF, DAY TANK FILL PUMP P-DF1 IS DE-ENERGIZED, THE PUMP P-DF1 "ON" LIGHT TURNS OFF, AND THE USED OIL BLENDER RUN CIRCUIT DRY CONTACTS ARE OPENED.

4. TIMER OPERATION – IF TIMER T1 TIMES OUT; THE N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE REMOTE ACTUATOR VALVE "OPEN" LIGHT TURNS OFF, DAY TANK FILL PUMP P-DF1 DE-ENERGIZES, THE PUMP P-DF1 "ON" LIGHT TURNS OFF, THE USED OIL BLENDER RUN CIRCUIT DRY CONTACTS ARE OPENED, THE "TIME-OUT" ALARM LIGHT TURNS ON, AND THE 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 T1 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 N.C. DAY TANK SOLENOID VALVE AND REMOTE ACTUATOR VALVE CLOSE, THE VALVE "OPEN" LIGHT TURNS OFF, DAY TANK FILL PUMP P-DF1 DE-ENERGIZES, THE PUMP P-DF1 "ON" LIGHT TURNS OFF, THE USED OIL BLENDER RUN CIRCUIT DRY CONTACTS ARE OPENED, TIMER T2 IS STARTED, PUMP-DOWN PUMP P-DF2 ENERGIZES FOR A TIMED INTERVAL, THE PUMP P-DF2 "ON" LIGHT TURNS ON, THE "OVERFILL LEVEL" ALARM LIGHT TURNS ON, AND THE ALARM HORN SOUNDS. WHILE THE FUEL LEVEL REMAINS ABOVE THE "OVERFILL" FLOAT LEVEL, PRESSING THE LEVEL ALARM HORN "SILENCE/RESET" BUTTON SILENCES THE ALARM HORN WHILE LEAVING THE "OVERFILL LEVEL" ALARM LIGHT ON. AFTER THE OVERFILL FAULT HAS BEEN CORRECTED (THE FUEL LEVEL FALLS BELOW THE "OVERFILL" FLOAT SWITCH), PRESSING THE LEVEL ALARM HORN "SILENCE/RESET" BUTTON TURNS OFF THE "OVERFILL LEVEL" ALARM LIGHT, OPENS THE N.O. DAY TANK SOLENOID VALVE, AND TURNS OFF THE ALARM HORN (IF NOT PREVIOUSLY SILENCED). THE LEVEL ALARM HORN "SILENCE/RESET" BUTTON MUST BE PRESSED AFTER THE OVERFILL FAULT HAS BEEN CORRECTED FOR THE NORMAL FILL OPERATION TO REPEAT WHEN THE FUEL LEVEL REACHES THE "PUMP START" FLOAT SWITCH. (SEE FIELD INSTALLATION NOTES FOR TIMER T2 SETTING).

6. LOW FUEL LEVEL – IF THE FUEL LEVEL FALLS BELOW THE "LOW ALARM" FLOAT SWITCH, THE "LOW FUEL LEVEL" ALARM LIGHT TURNS ON AND THE ALARM HORN SOUNDS. THE LEVEL ALARM HORN "SILENCE/RESET" BUTTON SILENCES THE ALARM HORN WHILE LEAVING THE "LOW FUEL LEVEL" ALARM LIGHT ON. PRESSING THE "TIME-OUT ALARM SILENCE / PUMP RESTART" BUTTON RESETS THE TIMER AND STARTS THE NORMAL FILL OPERATION. WHEN THE FUEL LEVEL RISES ABOVE THE "LOW ALARM" FLOAT SWITCH THE "LOW FUEL LEVEL" ALARM LIGHT TURNS OFF AND THE ALARM HORN TURNS OFF (IF NOT PREVIOUSLY SILENCED).

7. PUMP TEST – MOMENTARY CONTACT BUTTONS ARE PROVIDED TO TEST THE PUMPS. PRESSING THE DAY TANK FILL PUMP P-DF1 "PUSH TO TEST" BUTTON STARTS TIMER T1, MOMENTARILY OPENS THE N.C. DAY TANK SOLENOID VALVE AND ACTUATED BALL VALVE, ENERGIZES DAY TANK FILL PUMP P-DF1, TURNS ON THE PUMP P-DF1 "ON" LIGHT, AND CLOSES THE USED OIL BLENDER RUN CIRCUIT CONTACTS. PUMP P-DF1 IS LOCKED OUT IF THE TANK IS AT THE OVERFILL LEVEL. PRESSING THE PUMP DOWN PUMP P-DF2 "PUSH TO TEST" BUTTON ENERGIZES PUMP DOWN PUMP P-DF2 AND TURNS ON THE PUMP P-DF2 "ON" LIGHT.

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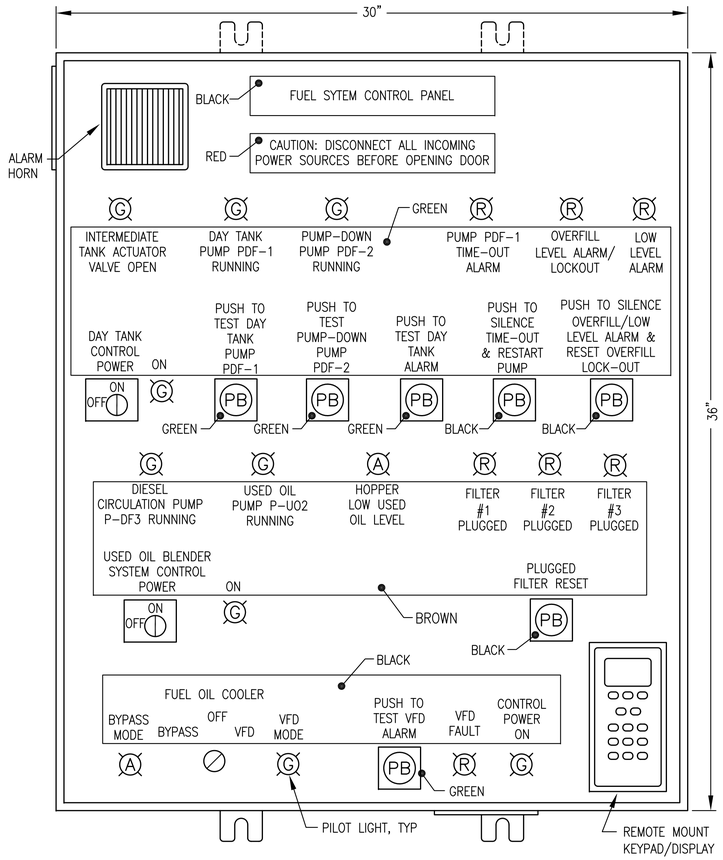
PROJECT: KWETHLUK POWER SYSTEM UPGRADE

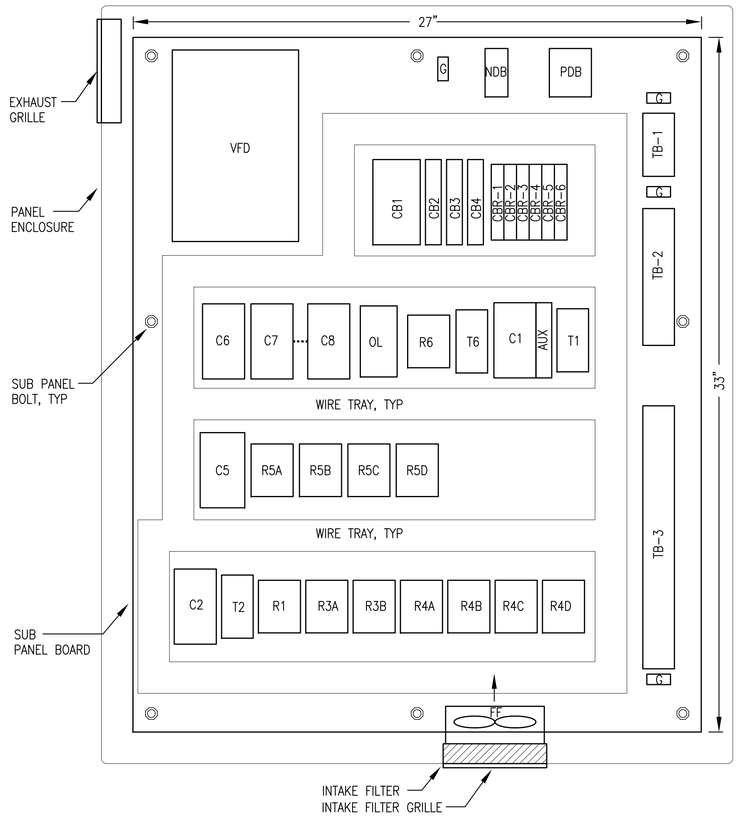
TITLE: FUEL SYSTEM CONTROL PANEL
DAY TANK FILL LOGIC

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET E7-10	SHEET: E9 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07-04-9621	



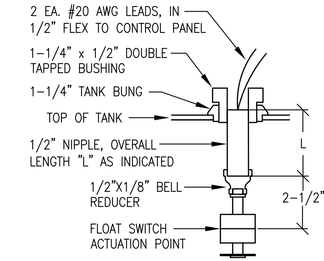
1 E10 FRONT PANEL LAYOUT
NO SCALE



2 E10 SUB PANEL LAYOUT
NO SCALE

BILL OF MATERIALS (NOTE: PROVIDE MATERIALS AS SPECIFIED – NO SUBSTITUTIONS ALLOWED)

TAG	QTY	MANUFACTURER	MODEL	DESCRIPTION
AL	1	INGRAM	AH115A8G	PANEL FACE MOUNTED ALARM HORN, GRAY
AUX	1	ALLEN–BRADLEY	100–SA11	AUXILIARY CONTACT FOR CONTACTOR, 2 POLE, NO, NC
C	6	ALLEN–BRADLEY	100–C23D10	5HP, 208V, 23A, 3ø, MOTOR CONTACTOR W/ 1 N.O. AUX CONTACT
	1	ALLEN–BRADLEY	100–MCA00	CONTACTOR MECHANICAL INTERLOCK
CB1	1	ALLEN–BRADLEY	1489–A3–150	15A, 3P, RAIL MOUNT CIRCUIT BREAKER
CB2	1	ALLEN–BRADLEY	1489–A2–150	15A, 2P, RAIL MOUNT CIRCUIT BREAKER
CB3	1	ALLEN–BRADLEY	1489–A1–200	20A, 1P, RAIL MOUNT CIRCUIT BREAKER
CB4	1	ALLEN–BRADLEY	1489–A1–100	10A, 1P, RAIL MOUNT CIRCUIT BREAKER
CBR	6	ALLEN–BRADLEY	1492–GH010	RAIL–MOUNT CIRCUIT BREAKER, 1A
DS	2	ALLEN–BRADLEY	194L–E201753	DISCONNECT, 2 POSITION, 2 N.O., 20A, FACE MOUNT
	2	ALLEN–BRADLEY	194L–HC4E1751	KNOB ACTUATOR FOR LOAD SWITCH, ON/OFF, LOCKABLE
FF	1	HAMMOND	PF2000	FILTER FAN (INTAKE AIR) WITH FILTER AND GRILLE
	1	HAMMOND	PFA2000	EXHAUST AIR FILTER GRILLE
G	8	BLACKBURN	ADR2	SCREW TERMINAL GROUND LUG FOR UP TO #2AWG
LNA	2	ALLEN–BRADLEY	800T–QH10A	AMBER LED PILOT LIGHT, 120V, NEMA 4, 13
LNG	9	ALLEN–BRADLEY	800T–QH10G	GREEN LED PILOT LIGHT, 120V, NEMA 4, 13
LNR	7	ALLEN–BRADLEY	800T–QH10R	RED LED PILOT LIGHT, 120V, NEMA 4, 13
NDB	1	MARATHON	1411400	DISTRIBUTION BLOCK
OL	1	ALLEN BRADLEY	193–TAC10	208V, 3ø OVERLOAD, ADJUSTABLE 6A–10A RANGE
	1	ALLEN BRADLEY	193–TAPM	OVERLOAD BASE
PBB	2	ALLEN–BRADLEY	800–HAR2D2	MOMENTARY PUSH BUTTON, 1 NC, NEMA 4X, BLACK
PBB3	1	ALLEN–BRADLEY	800–HAR2	MOMENTARY PUSH BUTTON, NEMA 4X, BLACK
	2	ALLEN–BRADLEY	800–TXD1	NO CONTACT BLOCK
	1	ALLEN–BRADLEY	800–TXD2	NC CONTACT BLOCK
PBG	4	ALLEN–BRADLEY	800–HAR1D1	MOMENTARY PUSH BUTTON, 1 NO, NEMA 4X, GREEN
PDB	1	ALLEN–BRADLEY	1492–PDM3141	DISTRIBUTION BLOCK, 3P, 1LINE–4LOAD
R	5	ALLEN–BRADLEY	700–HA32A1	DPDT RELAY
	5	ALLEN–BRADLEY	700–HN100	8 PIN SOCKET BASE
R	7	ALLEN–BRADLEY	700–HA33A1	3PDT RELAY
	7	ALLEN–BRADLEY	700–HN101	11 PIN SOCKET BASE
SS	1	ALLEN–BRADLEY	800T–J2A	3 POSITION MAINTAINED CONTACT SELECTOR SWITCH
T	3	ALLEN–BRADLEY	700–HA33A1	3PDT RELAY
	3	ALLEN–BRADLEY	700–HN205	11 PIN RELAY SOCKET BASE FOR TIMER
	3	ALLEN–BRADLEY	700–HT3	SERIES B TIMING MODULE
TB	58	ALLEN–BRADLEY	1492–CAM1L	35A, 600V, LARGE–HEAD SCREW TERMINALS
VFD	1	SQUARE D	ATV61HU15M3	2 HP, 208V, 3ø VARIABLE FREQUENCY DRIVE
	1	SQUARE D	VW3A1102	MOUNTING KIT FOR REMOTE KEYPAD
	1	SQUARE D		2 METER LONG CABLE FOR REMOTE KEYPAD
	1	SQUARE D	VW3A3310	ETHERNET COMMUNICATIONS CARD



NIPPLE LENGTH "L"

OVERFILL L=2"

PUMP STOP L=4"

PUMP START L=18"

LOW ALARM L=20"

NOTES:

1) THIS DETAIL IS FOR FIELD INSTALLATION ONLY AND IS NOT PART OF THE PANEL BID.

2) SEE SHEET M5 FOR ADDITIONAL PIPING DETAIL.

3) 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.

3 E10 DAY TANK FLOAT SWITCH INSTALLATION
NO SCALE

SHOP FABRICATION NOTES:

1. PROVIDE COMPLETE UL LISTED PANEL ASSEMBLY WITH ALL DEVICES INDICATED IN LOGIC DIAGRAMS SHEETS E7, E8 AND E9 EXCEPT FOR FIELD DEVICES. FIELD DEVICES ARE INDICATED BY LIGHT DASHED LINES. FIELD WIRING AND FIELD INSTALLED DEVICES PROVIDED BY OTHERS ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT PART OF THE PANEL BID.
2. INSTALL IN A 30"x36"x12" NEMA 12 ENCLOSURE, MIN 14 GAUGE STEEL CONSTRUCTION WITH WITH 4 EACH INTEGRAL MOUNTING LUGS AT BACK, A MIN 14 GAUGE INTERIOR BACK PANEL, AND HINGED LOCKABLE DOOR. PAINT ENCLOSURE ANSI 61 GRAY AND PAINT BACK PANEL WHITE.
3. TAG EACH END OF ALL JUMPERS WITH DEVICE OR TERMINATION DESIGNATOR OF LANDING OF OPPOSITE END OF JUMPER (REVERSE ADDRESS).
4. 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.
5. PROVIDE BEVELED EDGE WHITE CORE NAMEPLATES, FACE COLOR AS INDICATED. SECURE TO PANEL FACE WITH A MINIMUM OF TWO MOUNTING SCREWS.
6. BENCH TEST COMPLETED UNIT. PROVIDE A SIGNED AND DATED BENCH TEST REPORT VERIFYING ALL FUNCTIONS. RED–LINE DESIGN DRAWINGS AS REQUIRED TO INDICATE AS–BUILT CONSTRUCTION AND RETURN TO ENGINEER.

FIELD INSTALLATION NOTES:

1. PERFORM ALL FIELD WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS ON SHEET E2. FIELD WIRING TO MOTORS MIN #12 AWG. FIELD WIRING TO DAMPER ACTUATORS AND ALL CONTROL DEVICES (FLOAT SWITCHES, SOLENOID VALVES, ETC.) MIN #14 AWG. FIELD WIRING TO TEMPERATURE SENSOR MIN #18AWG SHIELDED/TWISTED PAIR. LABEL BOTH ENDS OF ALL CONDUCTORS WITH VFD PANEL TERMINAL BLOCK TERMINATION NUMBERS.
2. VERIFY THAT ALL DAY TANK FLOAT SWITCHES ARE ORIENTED FOR N.C. (OPEN ON RISE) OPERATION PRIOR TO INSTALLATION. ALL DAY TANK FLOATS SHOWN ON LOGIC DIAGRAM WITH TANK AT FULL (PUMP STOP) LEVEL.
3. FILL ALL PUMP CAVITIES WITH LUBE OIL PRIOR TO INITIAL OPERATION. VERIFY PROPER ROTATION OF ALL PUMPS. PRIME ALL PIPING WITH HAND PUMP AND FILL ALL FILTER BODIES PRIOR TO OPERATING SYSTEM.
4. FIELD TEST DAY TANK FILL OPERATION TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. MANIPULATE FLOAT SWITCHES BY REACHING IN THROUGH ADJACENT 4" BUNG. TEMPORARILY SET TIMING RELAYS TO 10 SECONDS TO VERIFY TIME–OUT AND RESET FUNCTIONS.
5. SET DAY TANK FILL PUMP PDF–1 TIMING RELAY T1 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".
6. SET PUMP–DOWN PUMP P–DF2 TIMING RELAY T2 TIME DELAY TO 6 MINUTES (36 GALS. REQUIRED TO DROP LEVEL INTO NORMAL OPERATING RANGE @ APPROX. 6 GPM).
7. SET VFD FAULT TIMER RELAY T5 TO 30 SECONDS.
8. ADJUST VFD OVERLOAD TO 115% OF ACTUAL FAN MOTOR NAMEPLATE FLA RATING. WITH FAN RUNNING IN BYPASS MODE CHECK CURRENT IN ALL THREE PHASES AND VERIFY THAT MOTOR IS OPERATING WITHIN NAMEPLATE RATING.
9. VERIFY THAT VFD IS IN STANDARD (MATERIAL HANDLING) MODE. SET MINIMUM SPEED TO 6HZ (10%). SET TEMPERATURE TO SETPOINTS INDICATED IN MECHANICAL SPECIFICATIONS SEQUENCE OF OPERATION. FIELD TEST SYSTEM TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. VERIFY TEMPERATURE SETPOINTS WITH PIPING THERMOMETERS.

RECORD DRAWING

THESE DRAWINGS HAVE BEEN PREPARED FROM OBSERVATIONS OF THE UNDERSIGNED AND INFORMATION PROVIDED BY OTHERS. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.

DATE: 1/10/11

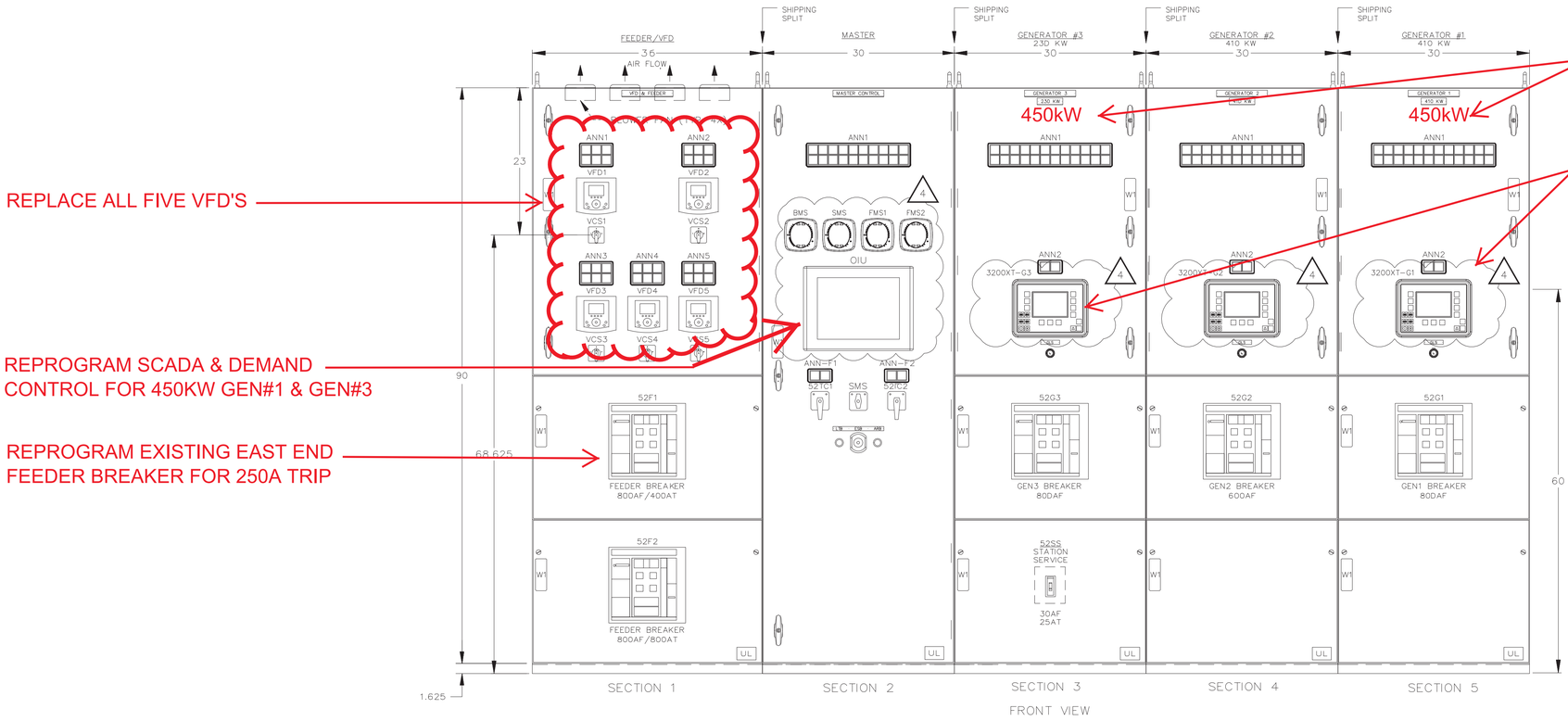
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: KWETHLUK POWER SYSTEM UPGRADE

TITLE: FUEL SYSTEM CONTROL PANEL LAYOUT & BILL OF MATERIALS

ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511–1405 PHONE (907) 349–0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: KWET E7–10	SHEET: E10 OF 10
DESIGNED BY: CWV/BCG	DATE: 10/08/09	PROJECT NUMBER: 07–04–9621	



REPLACE ALL FIVE VFD'S

REPROGRAM SCADA & DEMAND CONTROL FOR 450KW GEN#1 & GEN#3

REPROGRAM EXISTING EAST END FEEDER BREAKER FOR 250A TRIP

NEW ENGRAVED PLATE 450kW CAPACITY TAG FOR GEN#1 & GEN#3

REPROGRAM GEN#1 & GEN#3 EZGEN FOR NEW CT RATIO, 800A BREAKER TRIP, & 450KW GENSET RATING

NOTES:
1) SWITCHGEAR MODIFICATION WORK TO BE PERFORMED THIS PROJECT INDICATED BY REDMARKS ON THIS PAGE AND FOLLOWING.
2) PERFORM ALL SWITCHGEAR MODIFICATION WORK UNDER BASE BID EXCEPT AS SPECIFICALLY INDICATED ADDITIVE ALTERNATE ON M&I 2025 DESIGN SHEETS E3.3, E3.4, & E6.1.

DEVICE LEGEND

ANN	ALARM/STATUS ANNUNCIATOR
ARB	ALARM RESET BUTTON
DMS	DIGITAL METER – SHARK 250
ESB	EMERGENCY STOP BUTTON
EZG	GENERATOR CONTROLER – EASYGEN–3200XT
GLS	GENERATOR LOCKOUT SWITCH
OIU	OPERATOR INTERFACE UNIT
LTB	LAMP TEST BUTTON
SMS	MASTER CONTROL SWITCH (AUTO–MANUAL)
VCS	VFD CONTROL SWITCH
52xx	CIRCUIT BREAKER
52TC	CIRCUIT BREAKER TRIP / CLOSE SWITCH

NOTES

1	WIRE MARKERS: HEATSHRINK TYPE c/w INDELIBLE INK MARKINGS
2	WIRE TYPE: ALL CONNECTIONS TO BUS AND BREAKERS TO BE #14AWG SIS. WIRING THAT IS TO BE PROVIDED AS PART OF OR IS AN INTEGRAL PART OF SUPERVISORY CONTROL EQUIPMENT SHALL BE #18–14AWG SIS. CT WIRING TO BE #12AWG SIS MIN.
3	WIRING COLOR CODED: NO WIRE NUMBERS TO MATCH TERMINAL NUM6ERS UNLESS NOTED
4	LOAD BUS TO BE 1000A 3PH 4W SILVER PLATED COPPER BRACED AT 30KA.
5	ENCLOSURE TYPE NEMA 1 BUILT TO UL891.
6	PAINT ASA #61 GREY EXTERIOR, WHITE MOUNTING PAN
7	ENCLOSURE SUPPLIED IN FIVE PIECES
8	FULL LENGTH COPPER GROUND BUS 0.25" X 2.0" C/W (8) #6–250MCM GROUND LUGS
9	POWER CABLES: GEN & LOAD BOTTOM. REAR ACCESS ONLY REQUIRED.
10	LAMICOIDS BLACK C/W WHITE LETTERS, MECHANICALLY ATTACHED
11	CABLE LUG SIZES: GEN 1: (2) 4/0–500MCM Cu/AL PER PHASE GEN 2 & 3: (2) 4/0–500MCM Cu/AL PER PHASE FEEDER 1 & 2: PROVISION FOR 3 x 2 HOLE 4/0 CRIMP LUGS SS: (1) #14–3/0 Cu/AL PER PHASE
12	SEPARATE 12/24VDC FROM 120VAC TERMINAL BLOCKS
13	PROVIDE A REMOVABLE LINK TO THE GROUND BUS IN MASTER SECTION
14	1/8" THK GLASS BARRIER IS PROVIDED TO COVER PROTRUDING BOLTS THROUGH THE LOW VOLTAGE BACK PAN
15	BREAKERS AND CONTACTOR IN LOWER SECTION ARE SEPARATED FROM BUS BY GLASTIC BARRIER

DRAWING LEGEND

1A	PHYSICAL LAYOUT
1B	BASE & SECTIONAL VIEW
2	SINGLE LINE DIAGRAM
3	NAMEPLATE DETAILS
4A	GENERATOR 1 AC SCHEMATIC
4B	GENERATOR 2 AC SCHEMATIC
4C	GENERATOR 3 AC SCHEMATIC
5A	FEEDER BREAKER/MASTER AC SCHEMATIC
5B	FEEDER BREAKER/MASTER AC SCHEMATIC
5C	VFD AC SCHEMATIC
6A	GENERATOR 1 DC CONTROL SCHEMATIC
8B	GENERATOR 2 DC CONTROL SCHEMATIC
6C	GENERATOR 3 DC CONTROL SCHEMATIC
7A	GENERATOR 1 DC CONTROL SCHEMATIC
7B	GENERATOR 2 DC CONTROL SCHEMATIC
7C	GENERATOR 3 DC CONTROL SCHEMATIC
8A	GENERATOR 1 DC CONTROL SCHEMATIC
8B	GENERATOR 2 DC CONTROL SCHEMATIC
8C	GENERATOR 3 DC CONTROL SCHEMATIC

DRAWING LEGEND

9	MASTER DC CONTROL SCHEMATIC
10	MASTER DC CONTROL SCHEMATIC
11	MASTER OC CONTROL SCHEMATIC
12A	VFD CONTROL SCHEMATIC
12B	VFD CONTROL SCHEMATIC
13	FEEDER BREAKER D CONTROL SCHEMATIC
14	PLC COMMUNICATION DIAGRAM
15	COMMUNICATION NETWORK DIAGRAM
16	MONITORING & SYSTEM COMMUNICATION DIAGRAM
17	HEATER & LIGHTING CONTROL SCHEMATIC
18	CONTROL SWITCH TARGET DIAGRAM
19	INTERCONNECTION DIAGRAM

EZG READOUT

* INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING LIST OF METERING, STATUS, AND ALARMS.

METERING LEGEND
1. VOLTS: AØ, BØ, CØ L–N, L–L
2. AMPS: AØ, BØ, CØ
3. KW
4. PF
5. KWH

ALARM LEGEND
1. LOW OIL PRESSURE ALARM
2. LOW OIL PRESSURE SHUTDOWN
3. HIGH WATER TEMPERATURE ALARM
4. HIGH WATER TEMPERATURE SHUTDOWN
5. OVERCRANK
6. OVERSPEED
7. LOW OIL LEVEL

ANALOG INPUT LEGEND
1. OIL PRESSURE (PSI)
2. WATER TEMP (F)

MISC. LEGEND
1. ENGINE HOURS
2. ENGINE START COUNTER
3. MAINTENANCE CALL

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DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		4	AS–BUILT – M&I 21116	JRV	JRP	03–31–23
		3	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03–13–23
		2A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02–15–23
		2	AS BUILT	LR	RR	09–08–06
		1	CUSTOMER APPROVAL MOD'S	RR	RR	09–06–15

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RURAL ENERGY GROUP
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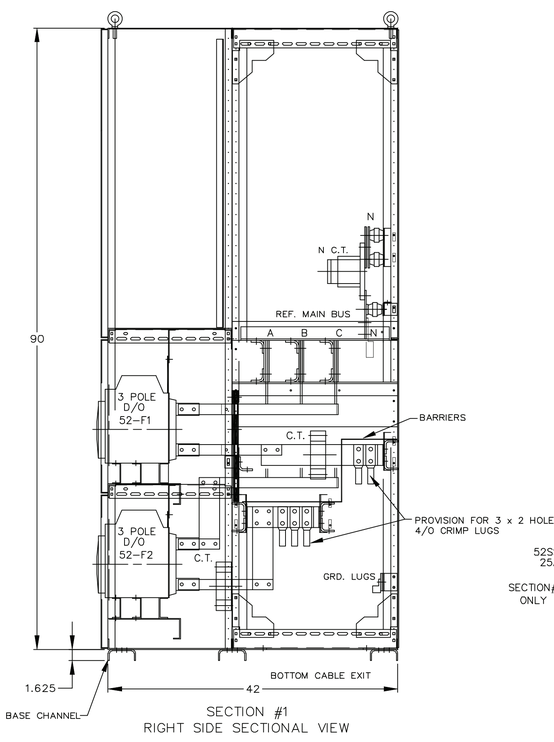
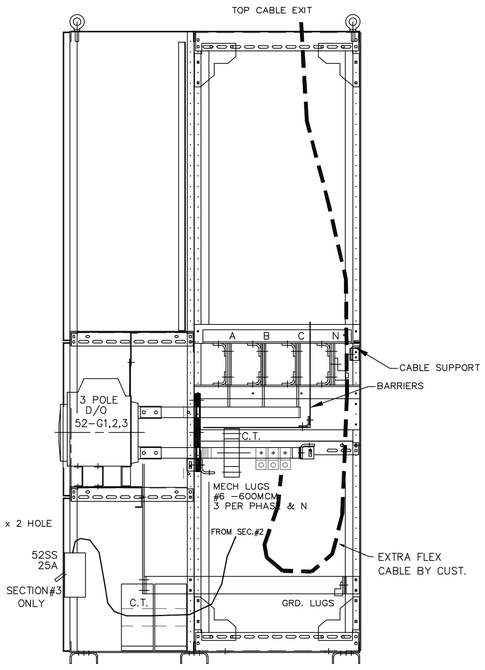
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
PHYSICAL LAYOUT
KWETHLUK SITE

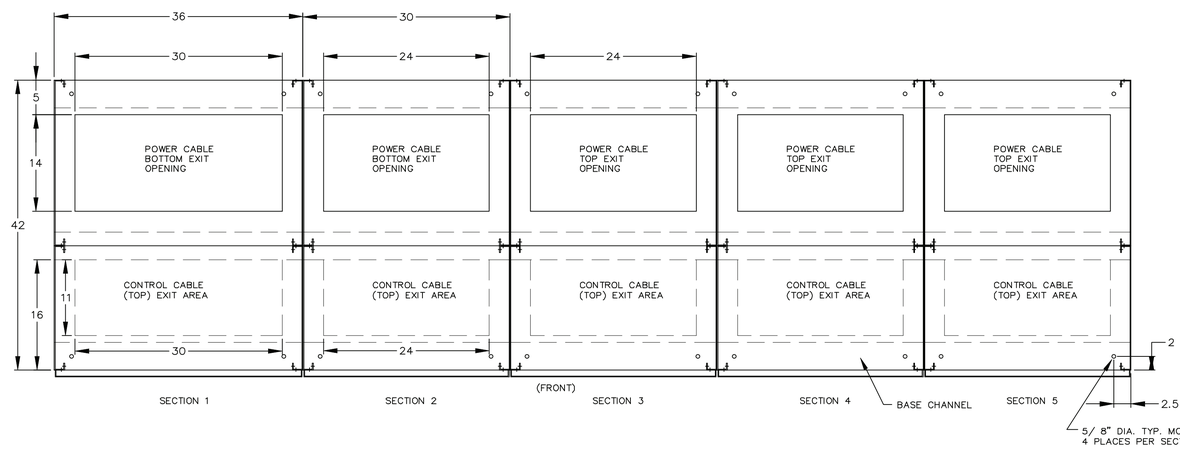
CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02–15–23
REV	4
DRAWING/FILE No.	W–058508–01A
SHEET	1A



SECTION #1
RIGHT SIDE SECTIONAL VIEW



SECTIONS #3,4,5
RIGHT SIDE SECTIONAL VIEW



BASE DETAIL

AS BUILT

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THOMSON TECHNOLOGY
POWER & CONTROL
A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
BASE & SECTIONAL VIEW
KWETHLUK SITE

CUSTOMER: ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.	WORK ORDER No.
C-035807	W-058508

DRAWN BY	AUTH BY	DATE	REV
AZ	RR	09-03-25	1

DRAWING/FILE No.: W-058508-01B
SHEET: 1B

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MAIN BUS 3000 A, 277/480V, 3ø, 4W, 35 KAIC

B-CT(3) ~~2000:5~~ 800:5

BPT BUS POTENTIAL TRANSFORMER 277:120V (3)

SMS SHARK 250 EPM — SS-CT(3) 50:5

FMS1 SHARK 250 EPM — TF-CT(3) 400:5

FMS2 SHARK 250 EPM — TF-CT(3) ~~400:5~~ 800:5

BMS SHARK 250 EPM

REPROGRAM GEN#1 & GEN#3 EZGEN FOR NEW CT RATIO, 800A BREAKER TRIP, & 450KW GENSET RATING

3 EA. NEW 800:5A CT'S, TYP 4 LOCATIONS

800:5

CT ~~400:5A~~ (3)

3200XT-G3 EZG TYPICAL FOR GEN 1 & GEN 2.

CT 600:5A (3)

CT ~~800:5A~~ (3)

DEAD BUS RELAY — TO PLC — DBR

TO GEN 1 & 2 EZG CONTROL

COMMUNICATION LINES TO OTHER EZG CONTROLS

REPROGRAM TO 250A TRIP FOR EXISTING CONDUCTOR PROTECTION

PT POTENTIAL TRANSFORMER 480:120V (1) — TO BREAKER CONTROL

PT POTENTIAL TRANSFORMER 480:120V (1) — TO BREAKER CONTROL

REPLACE ALL FIVE VFD'S

52VFD5 CHARGE AIR COOLER No. 3 VFD BREAKER 15A

52VFD4 CHARGE AIR COOLER No.2 VFD BREAKER 15A

52VFD3 CHARGE AIR COOLER No.1 VFD BREAKER 15A

52VFD2 RADIATOR 2 VFD BREAKER 15A

52VFD1 RADIATOR 1 VFD BREAKER 15A

TRIP UNIT — 52SS STATION SERVICE MAIN BREAKER 25A

LSIG TRIP UNIT — 52F1 FEEDER BREAKER 800AF/~~400~~AT 250AT

LSIG TRIP UNIT — 52F2 FEEDER BREAKER 800AF/800AT

CLOSE/OPEN — 52G3 GENERATOR 3 BREAKER 800AF 800AT

GCP-31 CLOSE/OPEN — 52G2 GENERATOR 2 BREAKER 800AF

GCP-31 CLOSE/OPEN — 52G1 GENERATOR 1 BREAKER 800AF

NEW FEEDER CONDUCTORS SEE SHEET E3.4

NEW 500KVA TRANSFORMER

BACKUP POWER SUPPLY 24VDC 20A — 24V DC ~ 120

PT POTENTIAL TRANSFORMER 277:120V (3)

PT POTENTIAL TRANSFORMER 480:120V (1) — TO BREAKER CONTROL

PT POTENTIAL TRANSFORMER 277:120V (3)

PT POTENTIAL TRANSFORMER 480:120V (1) — TO BREAKER CONTROL

PT POTENTIAL TRANSFORMER 277:120V (3)

PT POTENTIAL TRANSFORMER 480:120V (1) — TO BREAKER CONTROL

VFD VFD VFD VFD VFD

2HP CHARGE AIR COOLER No.3

3HP CHARGE AIR COOLER No.2

3HP CHARGE AIR COOLER No.1

5HP RADIATOR 2

5HP RADIATOR 1

15KVA STATION SERVICE TRANSFORMER 480V-208/120V, 60Hz, 3ø — STATION SERVICE PANEL

150KVA STEP-UP TRANSFORMER — EAST END COMMUNITY FEEDER

~~700KW~~ STEP-UP TRANSFORMER — WEST END COMMUNITY FEEDER

120V, 1DA TERMINALS

NEW POWER CONDUCTORS SEE SHEET E3.4

450kW GENERATOR 3 ~~575KW~~ 0.8 PF, 277/480 V 3ø, 4W, 60 HZ, ~~910~~ F.L.A. 677 F.L.A

GENERATOR 2 410KW, 08 PF, 277/480 V 3ø, 4W, 60 HZ, 616 F.L.A.

450kW GENERATOR 1 ~~575KW~~ 0.8 PF, 277/480 V 3ø, 4W, 60 HZ, ~~910~~ F.L.A. 677 F.L.A

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1	AS BUILT	LR	RR	09-08-08

DRAWING No. | REFERENCE DRAWINGS

ALASKA ENERGY AUTHORITY
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GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
SINGLE LINE DIAGRAM
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
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AUTH BY	JRP
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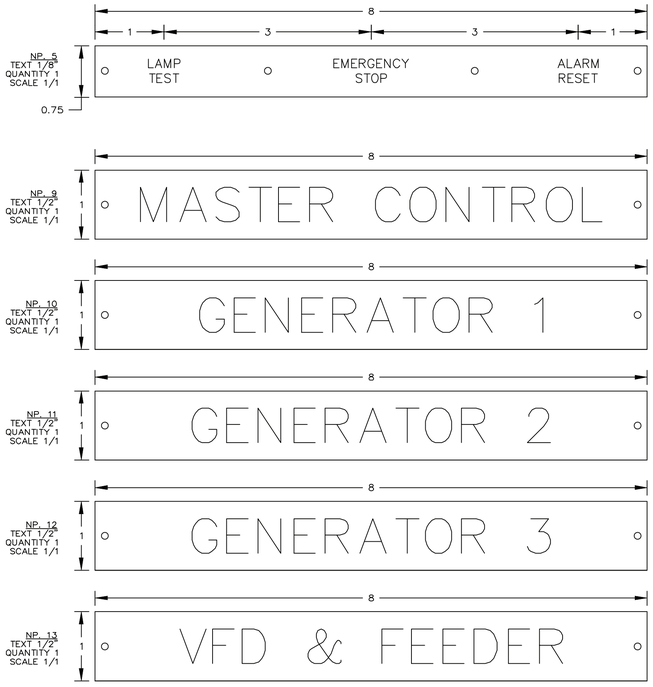
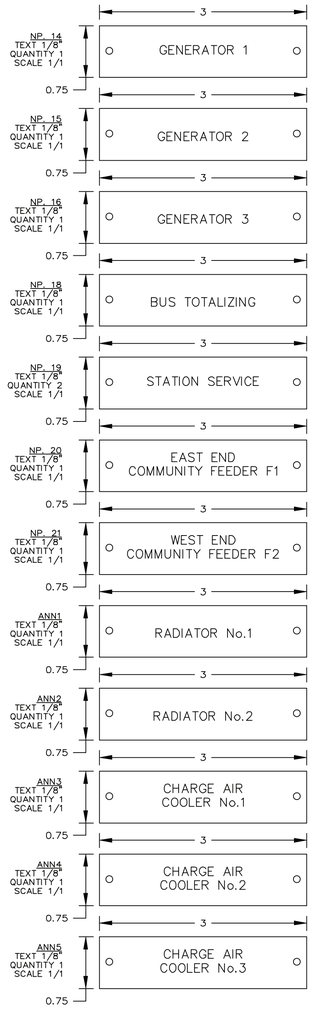
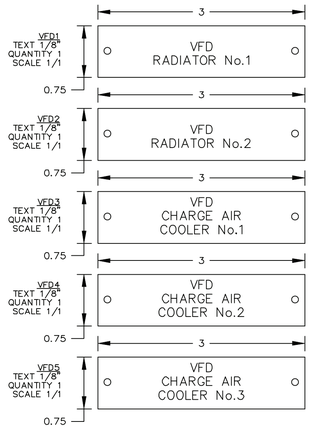
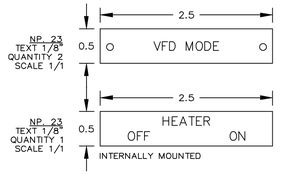
DRAWING/FILE No.	W-058508-02
SHEET	2









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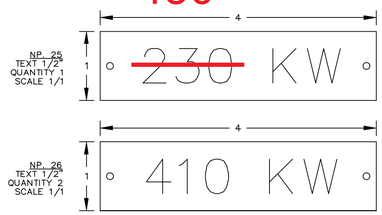
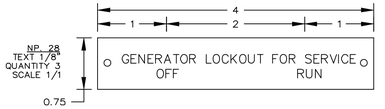


2 EACH



NOTES:
1. ALL NAMEPLATES SHALL BE BLACK FACE WITH WHITE LETTERS EXCEPT AS NOTED.
2. ALL NAMEPLATES SHALL HAVE PRESSURE SENSITIVE ADHESIVE ON BACK
3. ALL NAMEPLATES MECHANICALLY ATTACHED

AS BUILT

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
2	AS BUILT	LR	RR	09-08-06
1	CUSTOMER APPROVAL MOD'S	RR	RR	09-06-10

THOMSON TECHNOLOGY®
POWER & CONTROL
A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
NAMEPLATE DETAILS
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.	WORK ORDER No.		
C-035807	W-058508		
DRAWN BY	AUTH BY	DATE	REV
MS	RR	09-03-25	2
DRAWING/FILE No.		SHEET	
W-058508-03		3	

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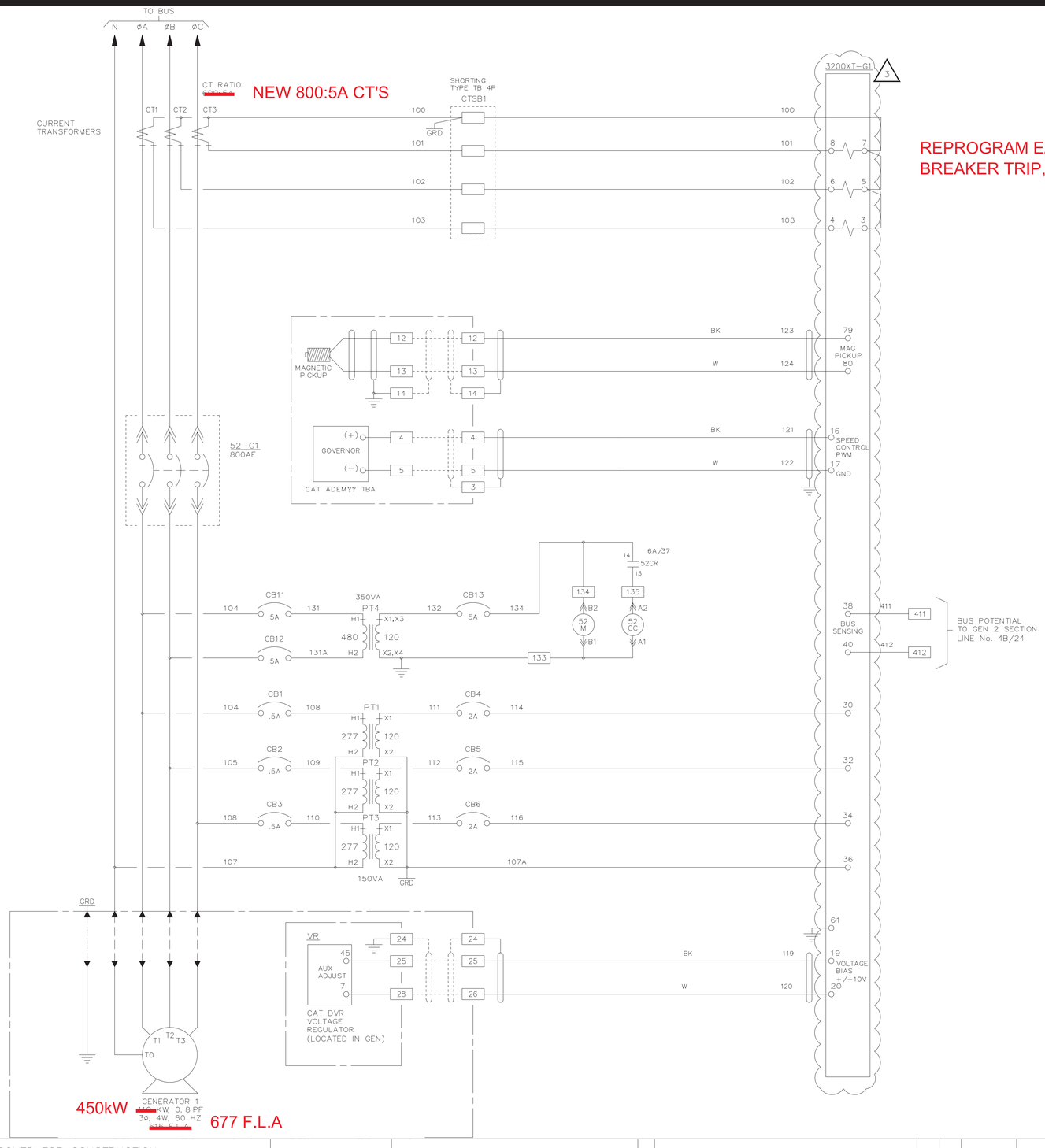

SECTION #5

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

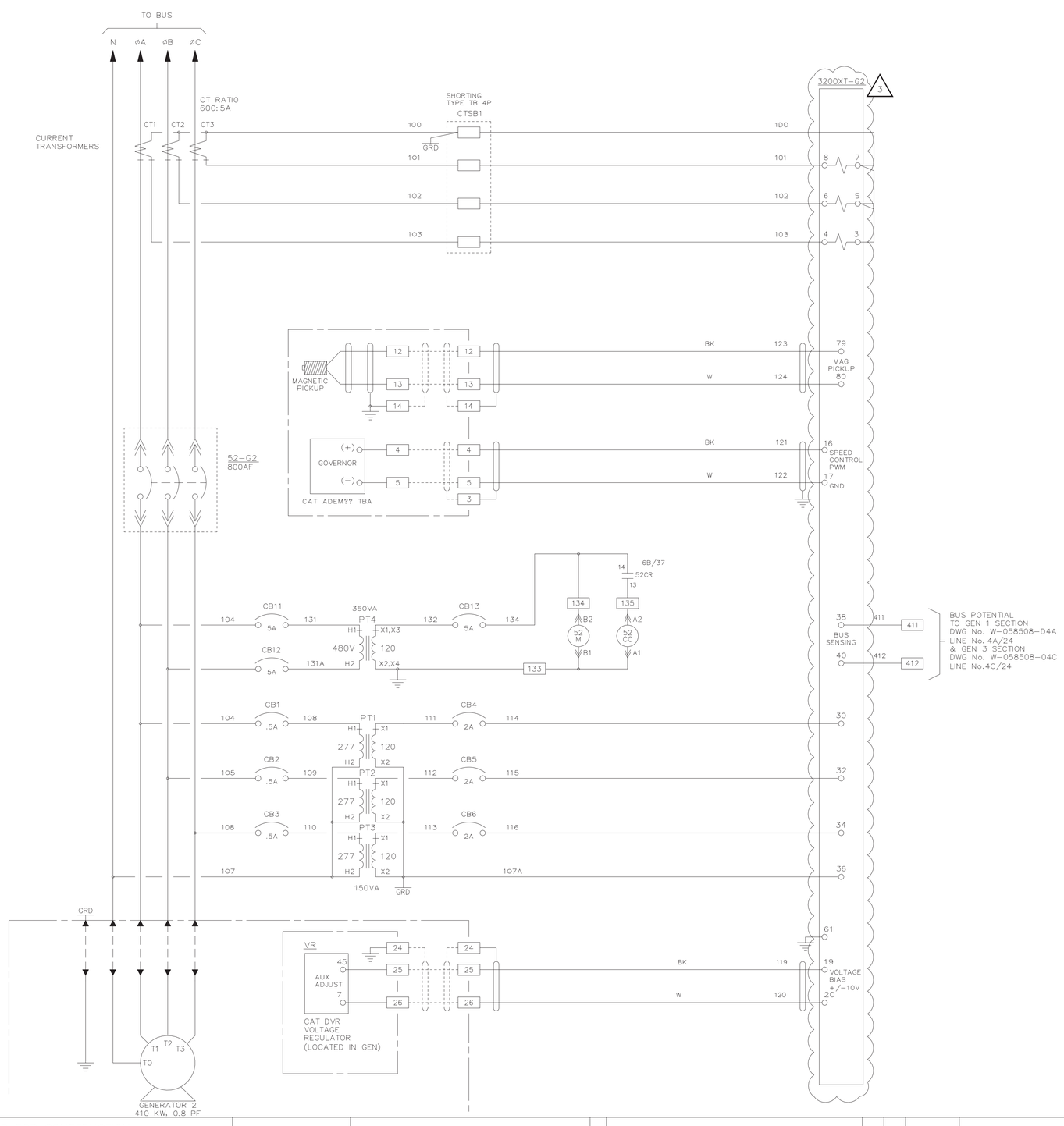
DRAWING No. | REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
3	AS-BUILT – M&I 21116	JRV	JRP	03-31-23
2	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03-13-23
1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 1 AC SCHEMATIC
LEVELOCK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH. BY	JRP
DATE	02-15-23
REV	3
DRAWING/FILE No.	W-058508-04A
SHEET	4A



SECTION #4

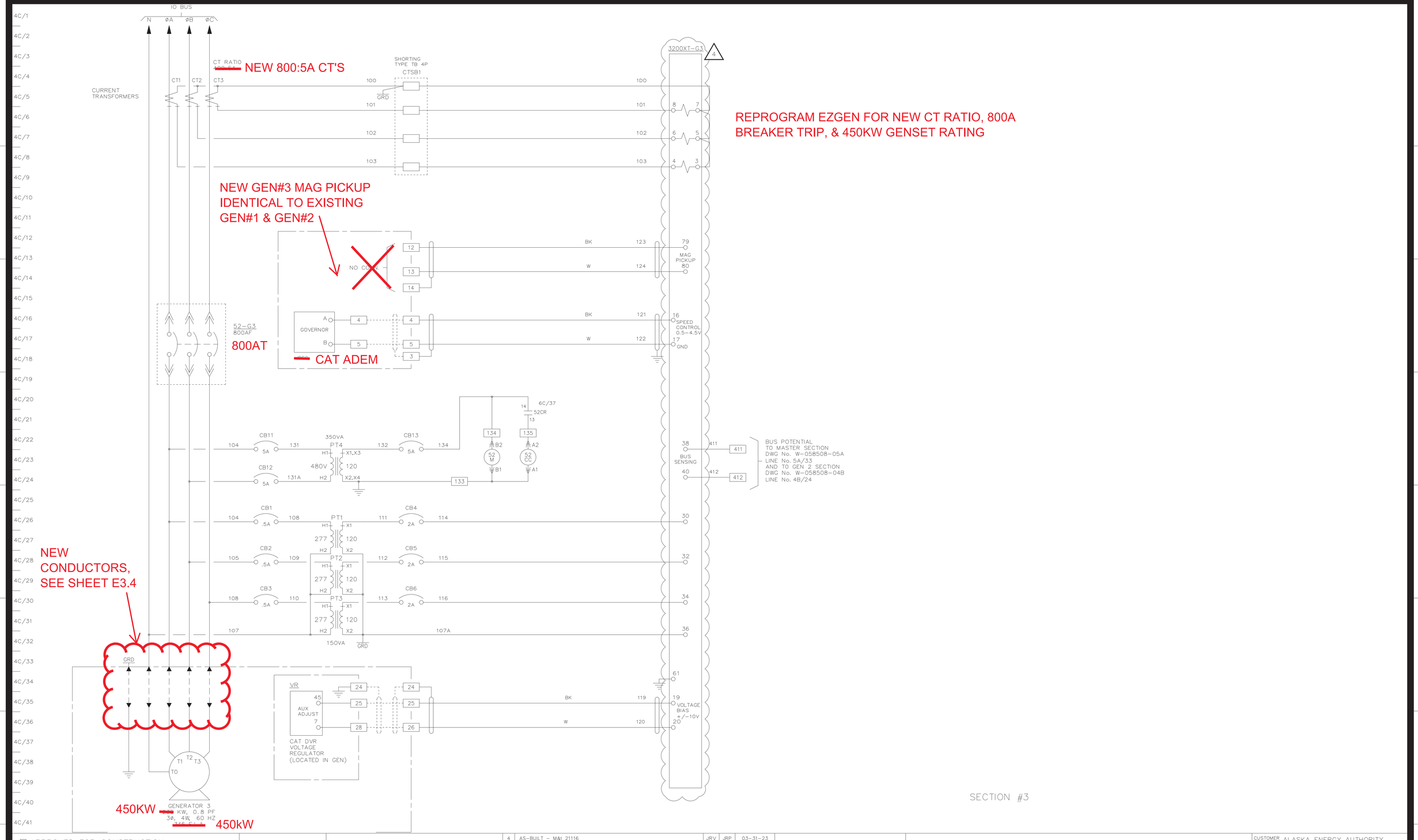
☐ APPROVED FOR CONSTRUCTION
☐ MASTER COPY ☐ REFERENCE COPY ____ OF ____
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT – M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 2 AC SCHEMATIC
KWETHLUK SITE

CUSTOMER: ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.: 21116
DRAWN BY: JRV | AUTH BY: JRP | DATE: 02-15-23 | REV: 3
DRAWING/FILE No.: W-058508-04B | SHEET: 4B



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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		4	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		3	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		2A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		2	AS BUILT	LR	RR	09-08-06
		1	CUSTOMER APPROVAL MOD'S.	RR	RR	09-08-10

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 3 AC SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02-15-23
REV	4
DRAWING/FILE No.	W-058508-04C
SHEET	4C

B-CT(3) NEW 800:5A CT'S

SWITCHGEAR BUS FROM GEN SECTION

N, øA, øB, øC

REPROGRAM FOR NEW CT RATIO

SHARK 250 ELECTRONIC POWER METER BMS

Ia, Ib, Ic — LO / HI

GND

Va Vb Vc Vr

SHORTING TYPE TB 4P B-CTSB1

407 407
408 408
409 409
406 406
GRD

CT1, CT2, CT3

D-CB4 411 2A 401 — PT1 X1 H1 120 277 X2 H2 — 486 .5A D-CB1 491

D-CB5 412 2A 402 — PT2 — 4B7 .5A D-CB2 492

D-CB6 413 2A 403 — PT3 — 4B8 .5A D-CB3 493

495 — 494

2.4:1 150VA

DEAD BUS RELAY DBR A B (9/68) (13/21) (13/12) (120VAC)

SYNC POTENTIAL TO GENERATOR 3 DWG W-058508-04C LINE 4C/24

411
412

NCT EXTERNAL NEUTRAL CT

INT. JUMPER

GND T4 T3 T2 T1 VN H1 VC H2

2.2µF

BK R

T4 T2 T1

52F2 800AF/ 800AT 6.0 LSIG TRIP UNIT

GRD

NEW CONDUCTORS, SEE SHEET E3.4

G R øA øB øC

TO WEST END COMMUNITY FEEDER

SECTION 1

CT7 CT8 CT9

CT RATIO 800:5A NEW 800:5A CT'S

SHARK 250 ELECTRONIC POWER METER FMS2

SHORTING TYPE TB 4P F2-CTSB

707 707
708 708
709 709
706 706
GRD

Ia, Ib, Ic — HI / LO

GND

Va Vb Vc Vr

REPROGRAM FOR NEW CT RATIO

F2-6CR (10/36) 4 7

703 52TC 17 702 D-CB8 5A 701 PT4 X1,X3 120 480 X2,X4 H1 H4 700 D-CB7 5A 491 4B2

A2 16 CLOSE 52F2 CC A1 — BREAKER CLOSE COIL

62 52F2 M B1 704 — BREAKER CHARGING MOTOR

411
412
413
495

BUS VOLTAGE TO FMS1 & SMS METERS DWG No. W-058508-05B LINE 5B/29

SECTION #2

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

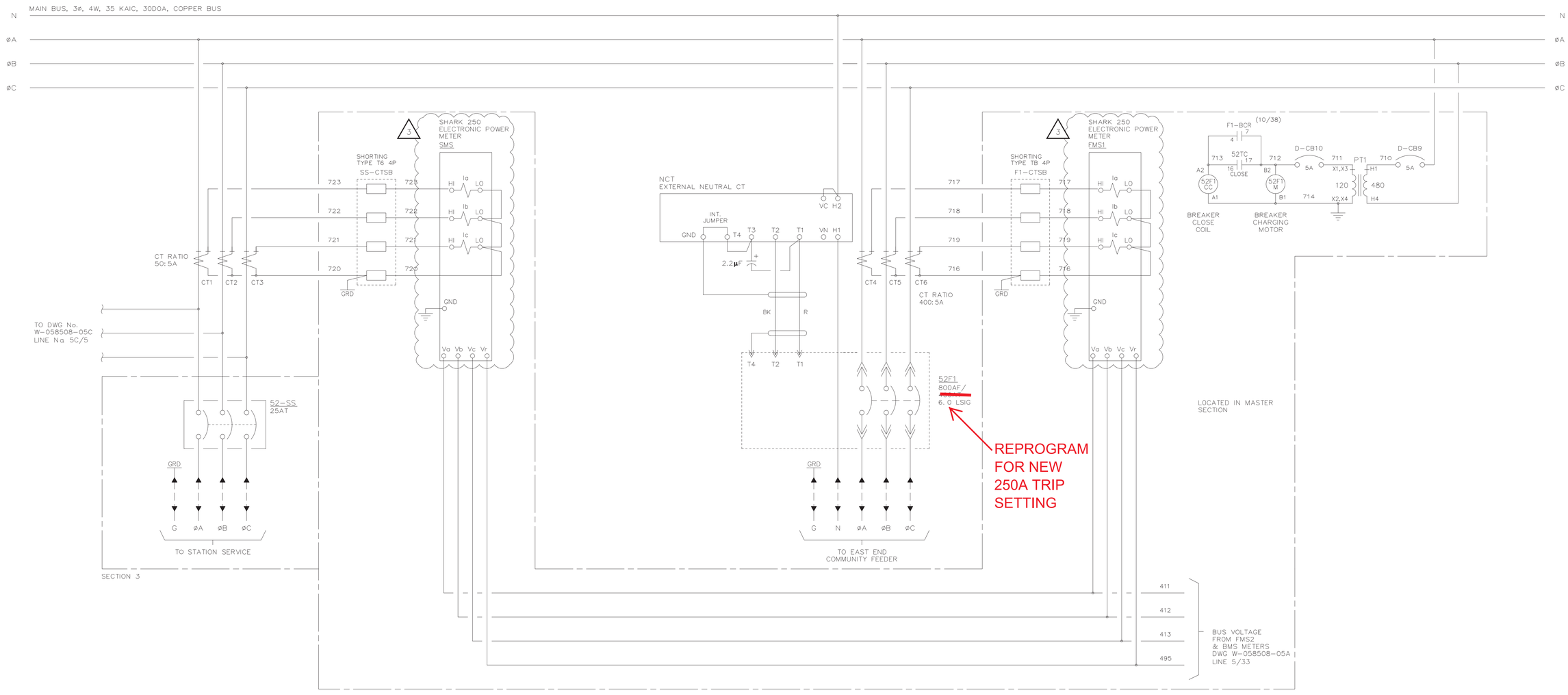
No.	REVISIONS	BY	AUTH	DATE
3	AS-BUILT – M&I 21116	JRV	JRP	03-31-23
2	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03-13-23
1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
1	CUSTOMER APPROVAL MOD'S	LR	RR	09-06-17

DRAWING No. | REFERENCE DRAWINGS

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
FEEDER BREAKER/MASTER AC SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02-15-23
REV	3
DRAWING/FILE No.	W-058508-05A
SHEET	5A



SECTION #1

☐ APPROVED FOR CONSTRUCTION
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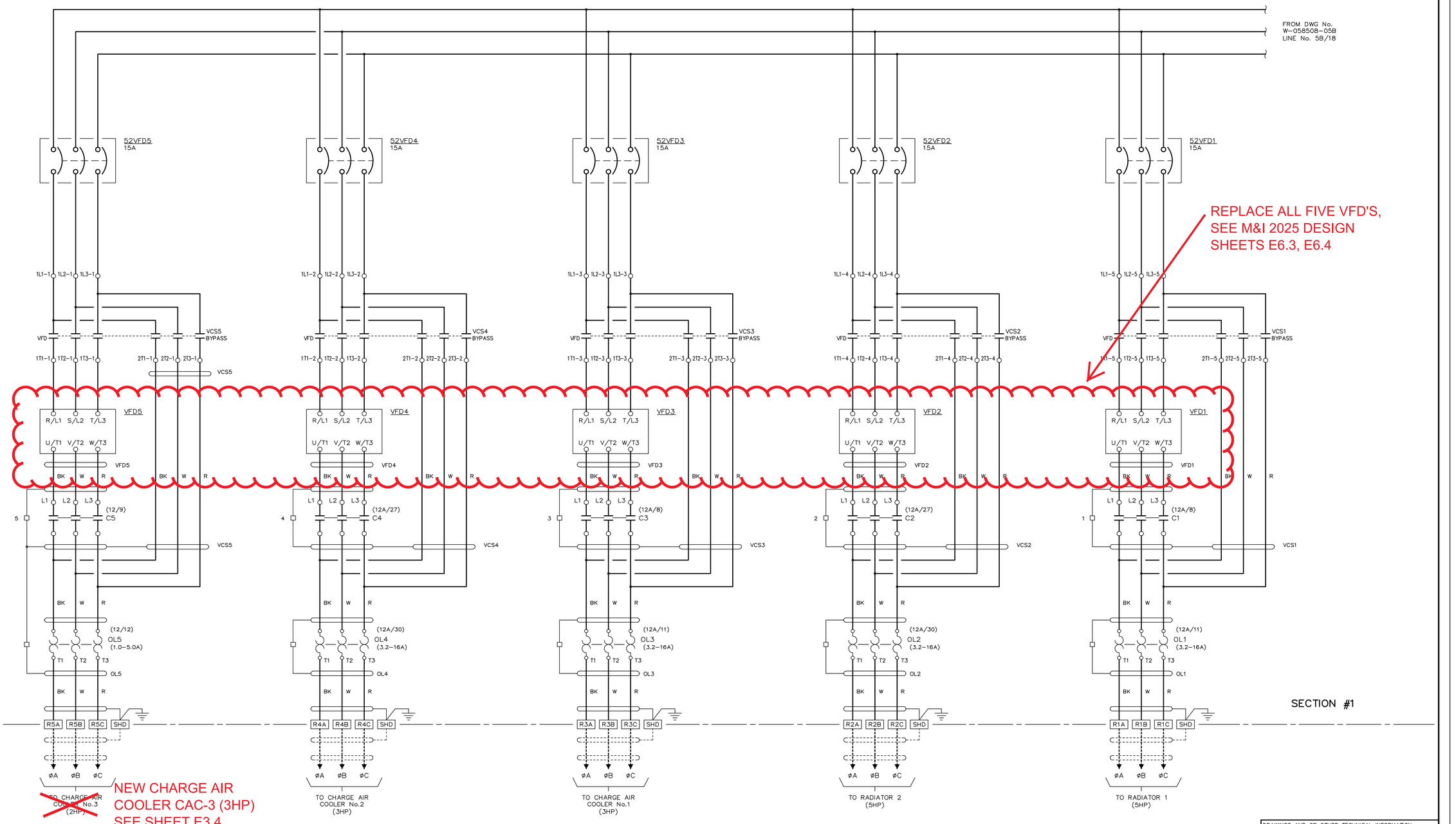
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	CUSTOMER APPROVAL MOD'S	RR	RR	09-06-16

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
FEEDER BREAKER/VFD AC SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No. 21116			
DRAWN BY JRV	AUTH BY JRP	DATE 02-15-23	REV 3
DRAWING/FILE No. W-058508-05B		SHEET 5B	



5C/1 5C/2 5C/3 5C/4 5C/5 5C/6 5C/7 5C/8 5C/9 5C/10 5C/11 5C/12 5C/13 5C/14 5C/15 5C/16 5C/17 5C/18 5C/19 5C/20 5C/21 5C/22 5C/23 5C/24 5C/25 5C/26 5C/27 5C/28 5C/29 5C/30 5C/31 5C/32 5C/33 5C/34 5C/35 5C/36 5C/37 5C/38 5C/39 5C/40 5C/41

AS BUILT

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
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DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT	LR	RR	09-08-06

THOMSON TECHNOLOGY® POWER & CONTROL A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 3300
VFD AC SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-035807	WORK ORDER No.	W-058508
DRAWN BY	MS	AUTH BY	RR
DATE	09-03-35	REV	1
DRAWING/FILE No.	W-058508-05C	SHEET	5C

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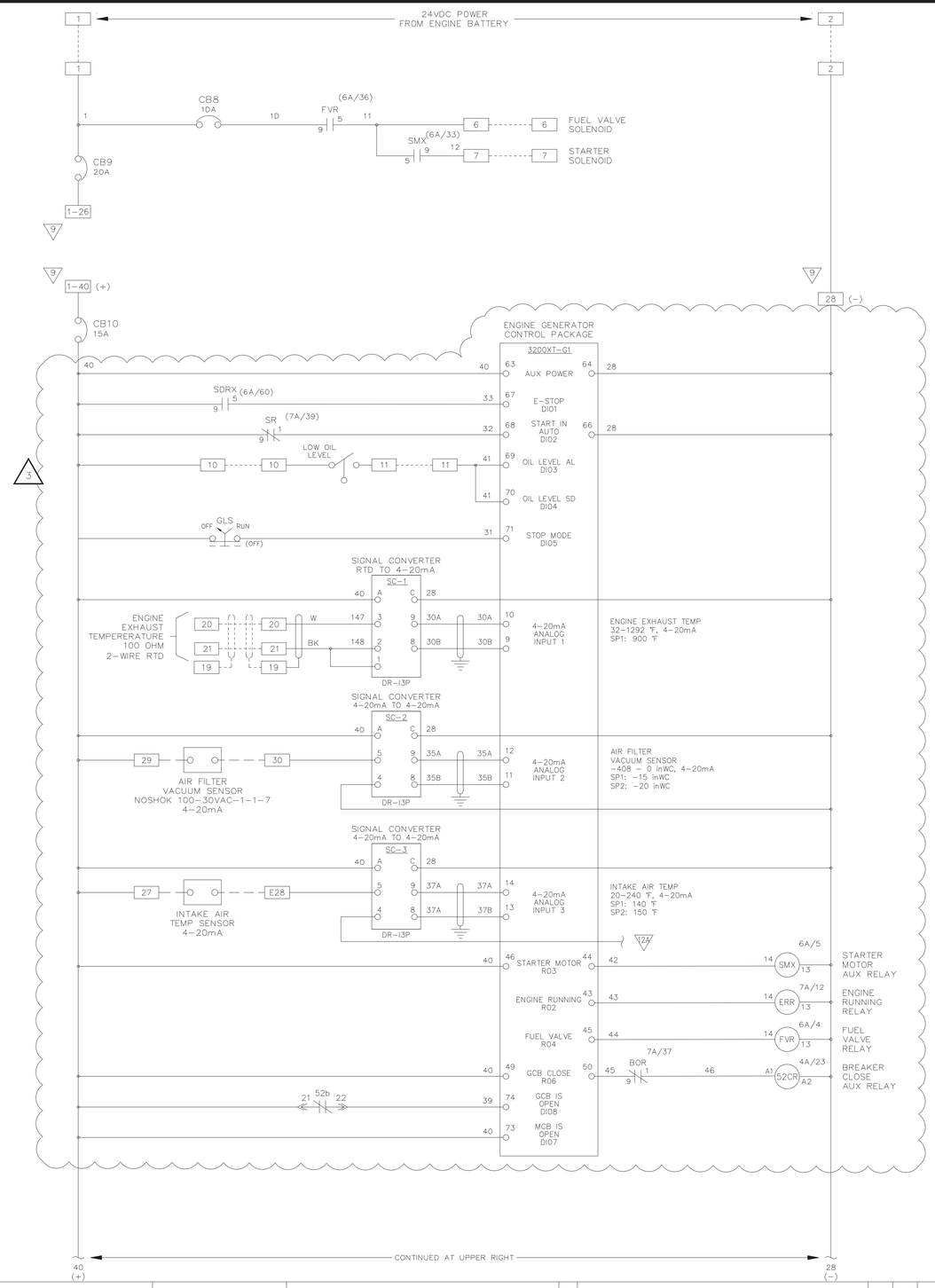

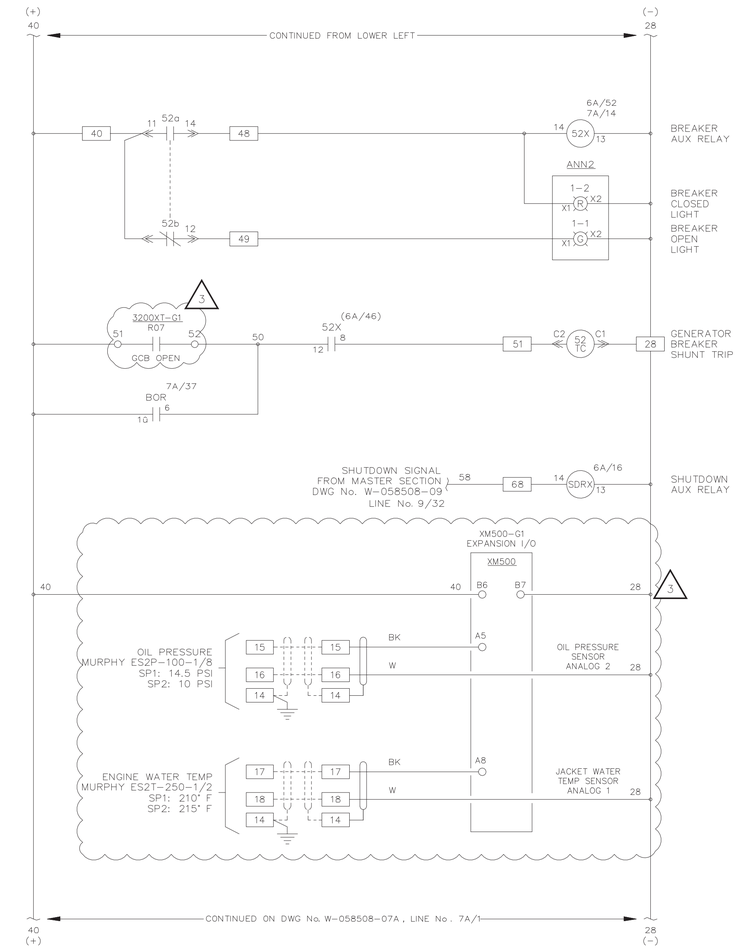

SECTION #5

3	AS-BUILT – M&I 21116	JRV	JRP	03-31-23
2	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03-13-23
1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
1	AS BUILT	LR	RR	09-08-06
No.	REVISIONS	BY	AUTH	DATE

DRAWING No. | REFERENCE DRAWINGS

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☐ MULTIPLE UNIT WORK ORDER
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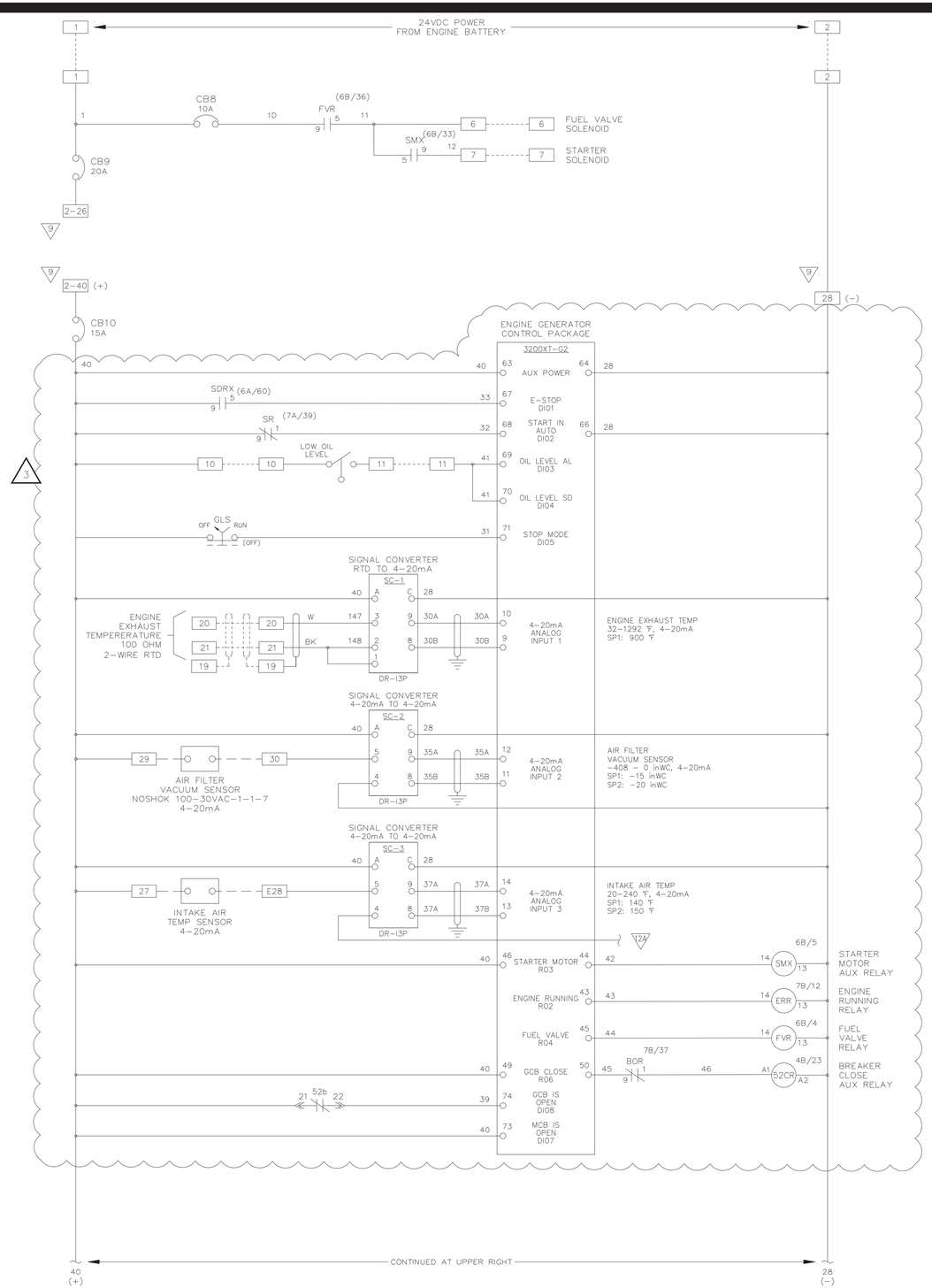
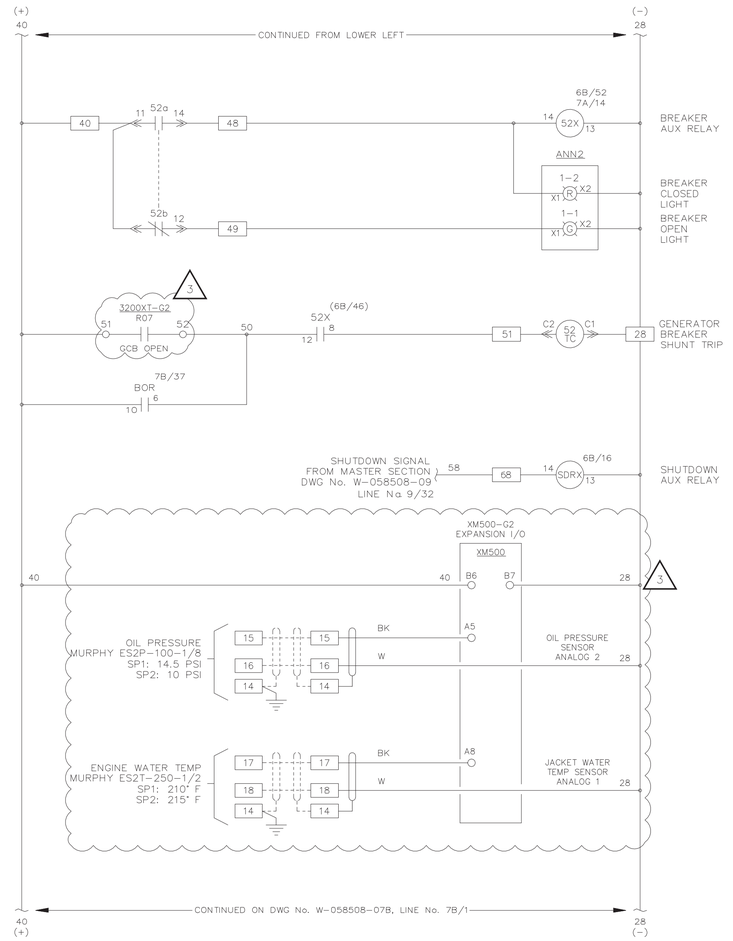
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 1 – DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02-15-23
REV	3
DRAWING/FILE No.	W-058508-06A
SHEET	6A





SECTION #4

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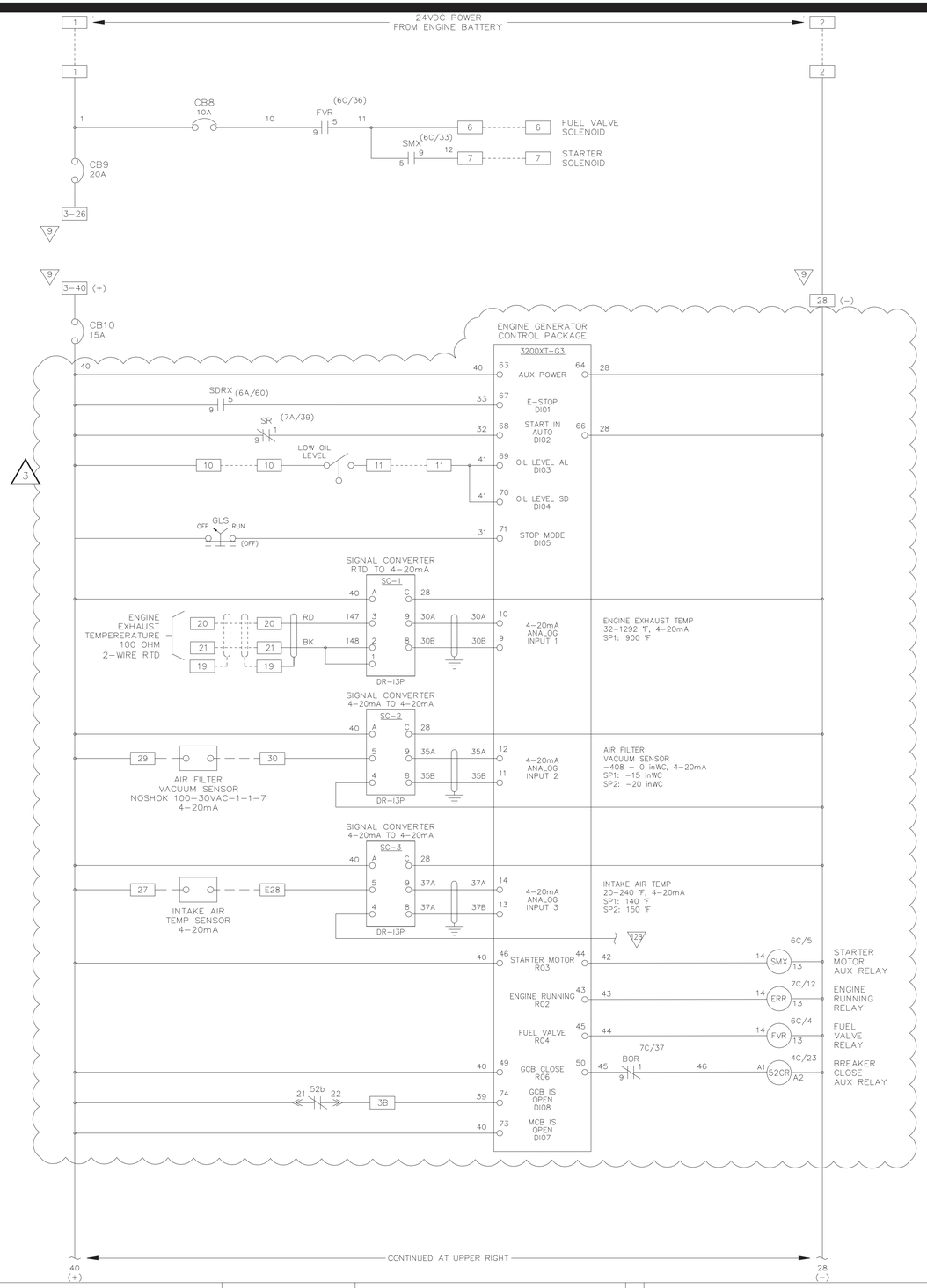
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

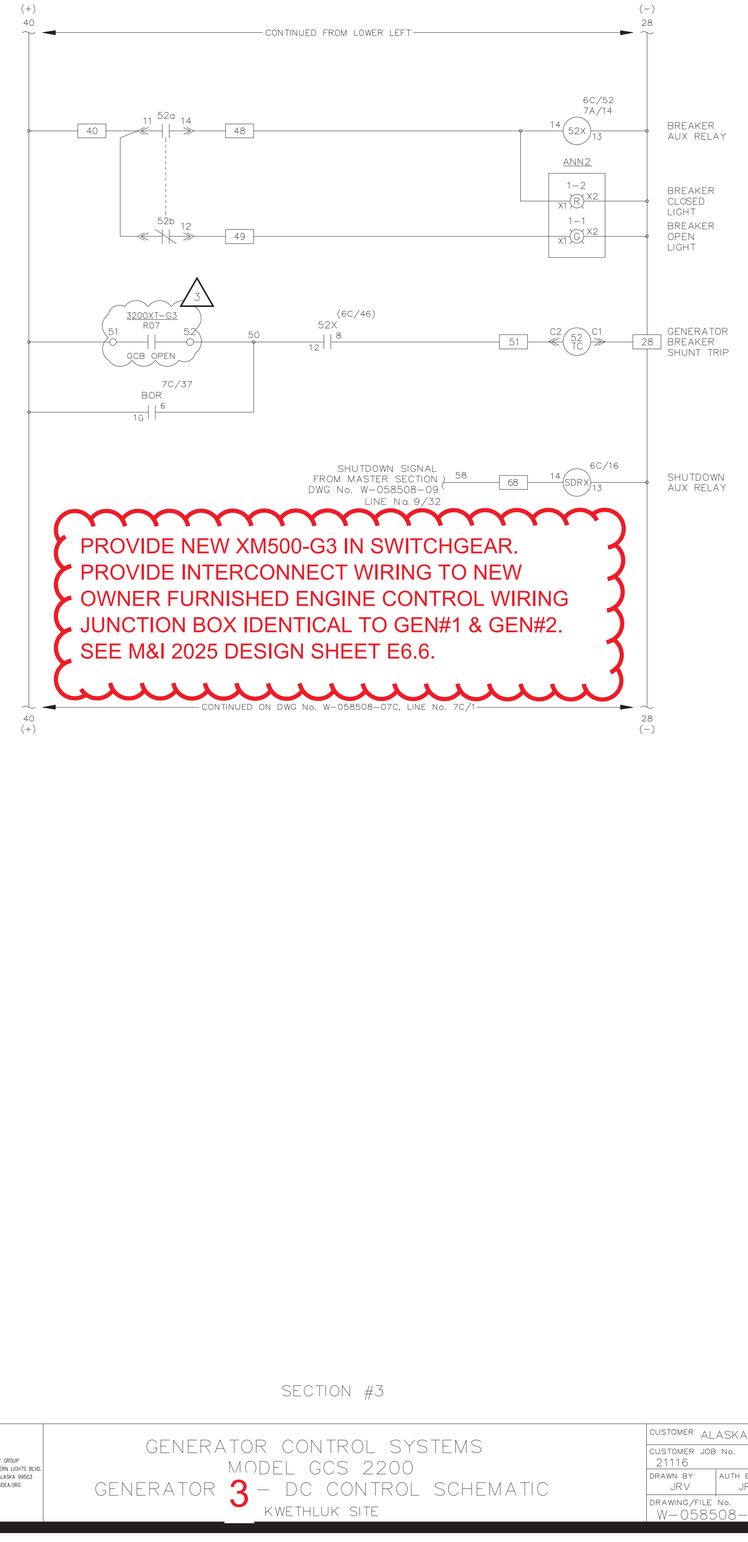
DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 2 - DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY
CUSTOMER JOB No. 21116
DRAWN BY JRV | AUTH BY JRP | DATE 02-15-23 | REV 3
DRAWING/FILE No. W-058508-06B | SHEET 6B





SECTION #3

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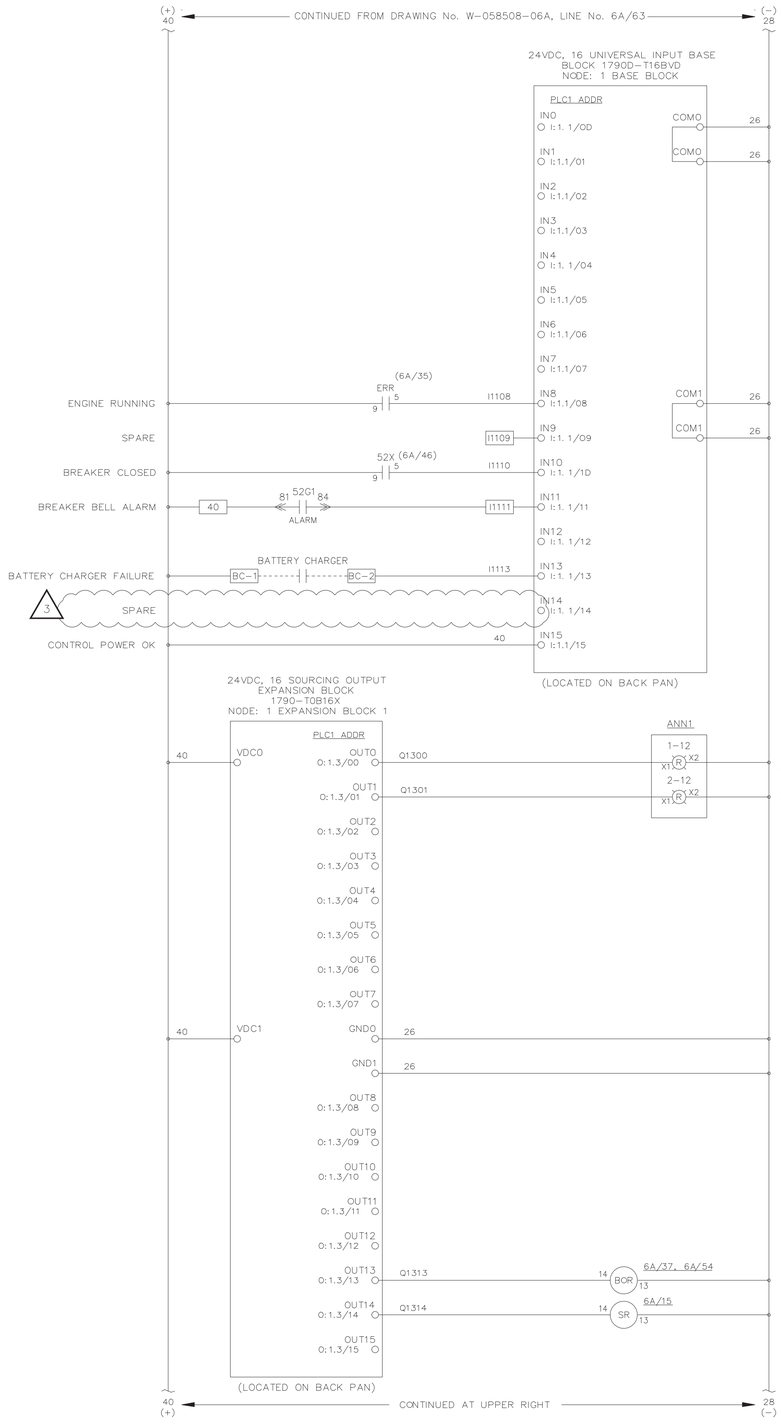
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY:_____ DATE:_____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 3 - DC CONTROL SCHEMATIC
KWETHLUK SITE

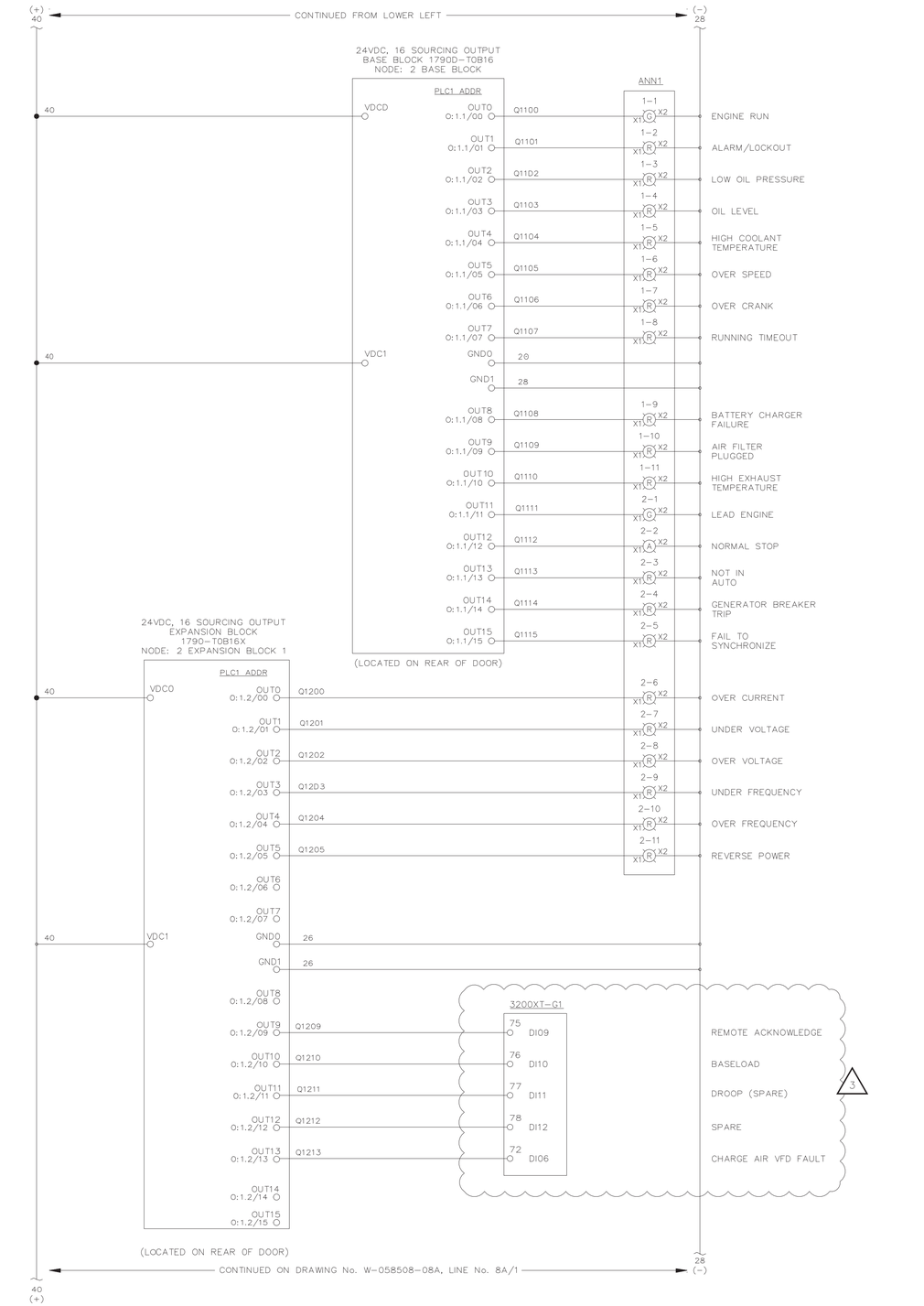
CUSTOMER ALASKA ENERGY AUTHORITY
CUSTOMER JOB No. 21116
DRAWN BY JRV | AUTH BY JRP | DATE 02-15-23 | REV 3
DRAWING/FILE No. W-058508-06C | SHEET 6C



ANNUNCIATOR LAYOUT (TYPICAL)

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12

LOCATION	COLOUR	DESCRIPTION
1-1	G	ENGINE RUN
1-2	R	ALARM/LOCKOUT
1-3	R	LOW OIL PRESSURE
1-4	R	OIL LEVEL
1-5	R	HIGH COOLANT TEMPERATURE
1-6	R	OVER SPEED
1-7	R	OVER CRANK
1-8	R	RUNNING TIMEOUT
1-9	R	BATTERY CHARGER FAILURE
1-10	R	AIR FILTER PLUGGED
1-11	R	HIGH EXHAUST TEMPERATURE
1-12	R	HIGH CHARGE AIR TEMP
2-1	G	LEAD ENGINE
2-2	A	NORMAL STOP
2-3	R	NOT IN AUTO
2-4	R	GENERATOR BREAKER TRIP
2-5	R	FAIL TO SYNCHRONIZE
2-6	R	OVER CURRENT
2-7	R	UNDER VOLTAGE
2-8	R	OVER VOLTAGE
2-9	R	UNDER FREQUENCY
2-10	R	OVER FREQUENCY
2-11	R	REVERSE POWER
2-12	R	CHARGE AIR VFD FAILURE



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☐ MASTER COPY ☐ REFERENCE COPY ____ OF ____
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 1 - DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	AUTH BY	DATE	REV
JRV	JRP	02-15-23	3
DRAWING/FILE No.	W-058508-07A	SHEET	7A

CONTINUED FROM DRAWING No. W-058508-06B, LINE No. 6B/63

24VDC, 16 UNIVERSAL INPUT BASE
BLOCK 1790D-T16BV0
NODE: 3 BASE BLOCK

PLC1 ADDR

IN0 I:1.1/00 — COM0 — 28
IN1 I:1.1/01 — COM0 — 28
IN2 I:1.1/02
IN3 I:1.1/03
IN4 I:1.1/04
IN5 I:1.1/05
IN6 I:1.1/06
IN7 I:1.1/07
IN8 I:1.1/08 — COM1 — 28
IN9 I:1.1/09 — COM1 — 28
IN10 I:1.1/10
IN11 I:1.1/11
IN12 I:1.1/12
IN13 I:1.1/13
IN14 I:1.1/14
IN15 I:1.1/15 — 40

ENGINE RUNNING — (6B/35) ERR 9 | 5 — I1108 — IN8
I11D9 — IN9
BREAKER CLOSED — 52X (6B/46) 9 | 5 — I1110 — IN10
BREAKER BELL ALARM — 40 — 81 52G2 84 ALARM — I1111 — IN11
BATTERY CHARGER FAILURE — BATTERY CHARGER BC-1 | BC-2 — I1113 — IN13
3 — SPARE — IN14
CONTROL POWER OK — 40 — IN15

(LOCATED ON BACK PAN)

ANNUNCIATOR LAYOUT (TYPICAL)

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12

LOCATION	COLOUR	DESCRIPTION
1-1	G	ENGINE RUN
1-2	R	ALARM/LOCKOUT
1-3	R	LOW OIL PRESSURE
1-4	R	OIL LEVEL
1-5	R	HIGH COOLANT TEMPERATURE
1-6	R	OVER SPEED
1-7	R	OVER CRANK
1-8	R	RUNNING TIMEOUT
1-9	R	BATTERY CHARGER FAILURE
1-10	R	AIR FILTER PLUGGED
1-11	R	HIGH EXHAUST TEMPERATURE
1-12	R	HIGH CHARGE AIR TEMP
2-1	G	LEAD ENGINE
2-2	A	NORMAL STOP
2-3	R	NOT IN AUTO
2-4	R	GENERATOR BREAKER TRIP
2-5	R	FAIL TO SYNCHRONIZE
2-6	R	OVER CURRENT
2-7	R	UNDER VOLTAGE
2-8	R	OVER VOLTAGE
2-9	R	UNDER FREQUENCY
2-10	R	OVER FREQUENCY
2-11	R	REVERSE POWER
2-12	R	CHARGE AIR VFD FAILURE

24VDC, 16 SOURCING OUTPUT
EXPANSION BLOCK
1790-T0B18X
NODE: 3 EXPANSION BLOCK 1

PLC1 ADDR

40 — VDC0
OUT0 O:1.3/00 — Q1300 — ANN1 1-12 — HIGH CHARGE AIR TEMP
OUT1 O:1.3/01 — Q1301 — ANN1 2-12 — CHARGE AIR VFD FAILURE
OUT2 O:1.3/02
OUT3 O:1.3/03
OUT4 O:1.3/04
OUT5 O:1.3/05
OUT6 O:1.3/06
OUT7 O:1.3/07
40 — VDC1
GND0 — 28
GND1 — 28
OUT8 O:1.3/08
OUT9 O:1.3/09
OUT10 O:1.3/10
OUT11 O:1.3/11
OUT12 O:1.3/12
OUT13 O:1.3/13 — Q1313 — 14 BOR 13 — 6B/37, 6B/54 — BREAKER OPEN RELAY
OUT14 O:1.3/14 — Q1314 — 14 SR 13 — 6B/15 — STOP RELAY
OUT15 O:1.3/15

(LOCATED ON BACK PAN)

CONTINUED AT UPPER RIGHT

CONTINUED FROM LOWER LEFT

24VDC, 16 SOURCING OUTPUT
BASE BLOCK 1790D-T0B16
NODE: 4 BASE BLOCK

PLC1 ADDR

40 — VDC0
OUT0 O:1.1/00 — Q1100 — ANN1 1-1 — ENGINE RUN
OUT1 O:1.1/01 — Q1101 — ANN1 1-2 — ALARM/LOCKOUT
OUT2 O:1.1/02 — Q11D2 — ANN1 1-3 — LOW OIL PRESSURE
OUT3 O:1.1/03 — Q1103 — ANN1 1-4 — OIL LEVEL
OUT4 O:1.1/04 — Q1104 — ANN1 1-5 — HIGH COOLANT TEMPERATURE
OUT5 O:1.1/05 — Q1105 — ANN1 1-6 — OVER SPEED
OUT6 O:1.1/06 — Q1106 — ANN1 1-7 — OVER CRANK
OUT7 O:1.1/07 — Q1107 — ANN1 1-8 — RUNNING TIMEOUT
40 — VDC1
GND0 — 20
GND1 — 28
OUT8 O:1.1/08 — Q1108 — ANN1 1-9 — BATTERY CHARGER FAILURE
OUT9 O:1.1/09 — Q1109 — ANN1 1-10 — AIR FILTER PLUGGED
OUT10 O:1.1/10 — Q1110 — ANN1 1-11 — HIGH EXHAUST TEMPERATURE
OUT11 O:1.1/11 — Q1111 — ANN1 2-1 — LEAD ENGINE
OUT12 O:1.1/12 — Q1112 — ANN1 2-2 — NORMAL STOP
OUT13 O:1.1/13 — Q1113 — ANN1 2-3 — NOT IN AUTO
OUT14 O:1.1/14 — Q1114 — ANN1 2-4 — GENERATOR BREAKER TRIP
OUT15 O:1.1/15 — Q1115 — ANN1 2-5 — FAIL TO SYNCHRONIZE

(LOCATED ON REAR OF DOOR)

24VDC, 16 SOURCING OUTPUT
EXPANSION BLOCK
1790-T0B16X
NODE: 4 EXPANSION BLOCK 1

PLC1 ADDR

40 — VDC0
OUT0 O:1.2/00 — Q1200 — ANN1 2-6 — OVER CURRENT
OUT1 O:1.2/01 — Q1201 — ANN1 2-7 — UNDER VOLTAGE
OUT2 O:1.2/02 — Q1202 — ANN1 2-8 — OVER VOLTAGE
OUT3 O:1.2/03 — Q12D3 — ANN1 2-9 — UNDER FREQUENCY
OUT4 O:1.2/04 — Q1204 — ANN1 2-10 — OVER FREQUENCY
OUT5 O:1.2/05 — Q1205 — ANN1 2-11 — REVERSE POWER
OUT6 O:1.2/06
OUT7 O:1.2/07
40 — VDC1
GND0 — 26
GND1 — 26
OUT8 O:1.2/08
OUT9 O:1.2/09 — Q1209 — 3200XT-G2 75 DI09 — REMOTE ACKNOWLEDGE
OUT10 O:1.2/10 — Q1210 — 76 DI10 — BASELOAD
OUT11 O:1.2/11 — Q1211 — 77 DI11 — DROOP (SPARE)
OUT12 O:1.2/12 — Q1212 — 78 DI12 — SPARE
OUT13 O:1.2/13 — Q1213 — 72 DI06 — CHARGE AIR VFD FAULT
OUT14 O:1.2/14
OUT15 O:1.2/15

3

(LOCATED ON REAR OF DOOR)

CONTINUED ON DRAWING No. W-058508-08B, LINE No. 8B/1

SECTION #4

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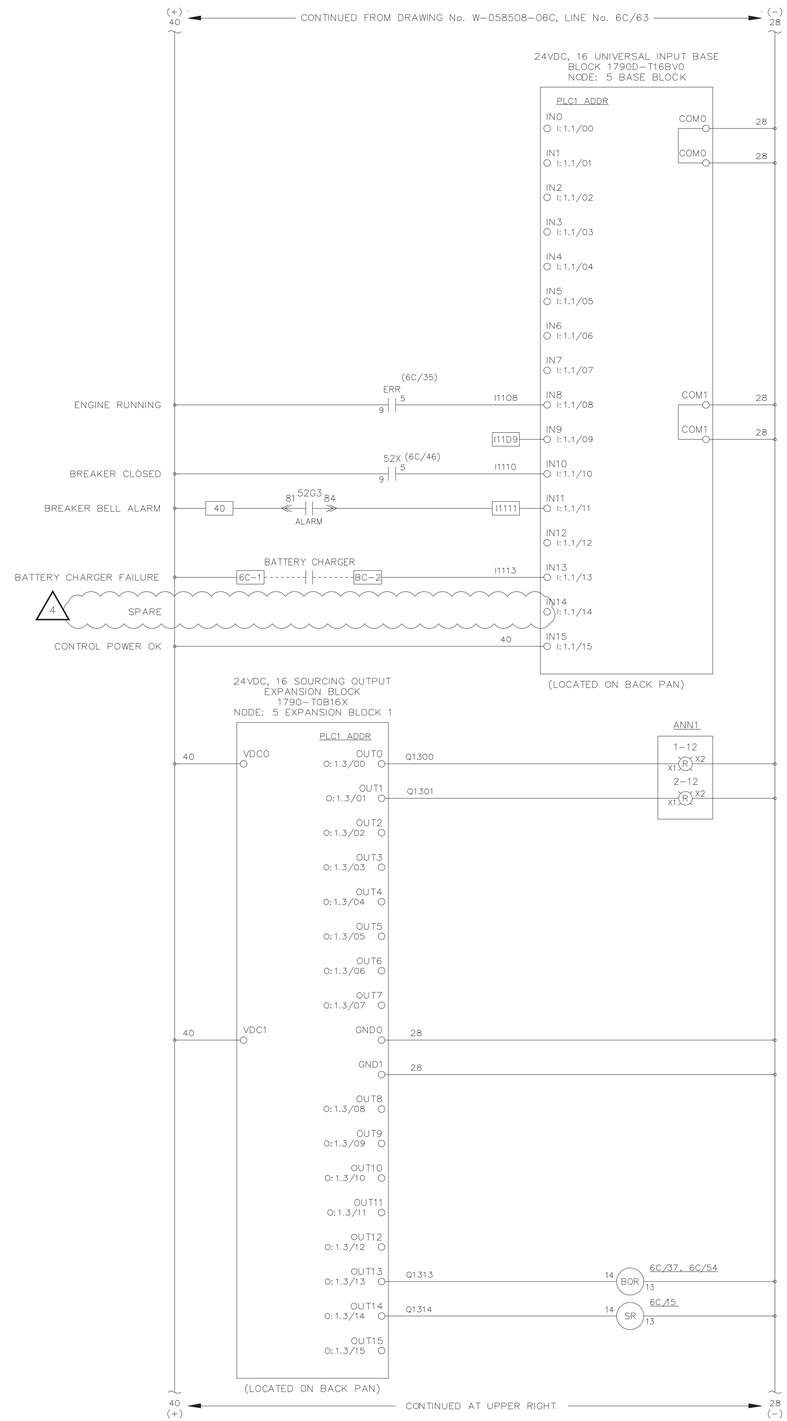
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: DATE:

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 2 - DC CONTROL SCHEMATIC
KWETHLUK SITE

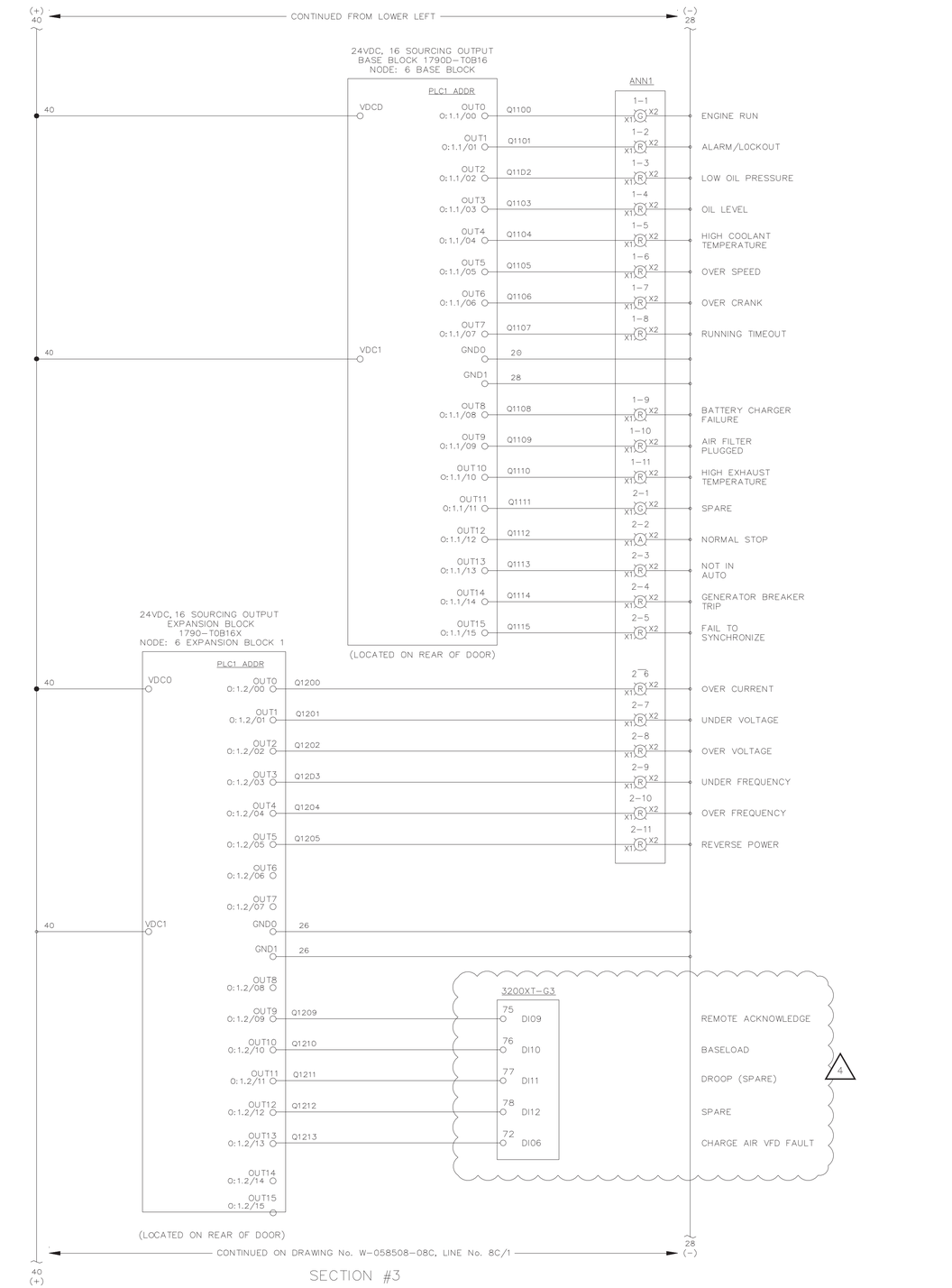
CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02-15-23
REV	3
DRAWING/FILE No.	W-058508-07B
SHEET	7B



ANNUNCIATOR LAYOUT (TYPICAL)

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12

LOCATION	COLOUR	DESCRIPTION
1-1	G	ENGINE RUN
1-2	R	ALARM/LOCKOUT
1-3	R	LOW OIL PRESSURE
1-4	R	OIL LEVEL
1-5	R	HIGH COOLANT TEMPERATURE
1-6	R	OVER SPEED
1-7	R	OVER CRANK
1-8	R	RUNNING TIMEOUT
1-9	R	BATTERY CHARGER FAILURE
1-10	R	AIR FILTER PLUGGED
1-11	R	HIGH EXHAUST TEMPERATURE
1-12	R	HIGH CHARGE AIR TEMP
2-1	G	SPARE
2-2	A	NORMAL STOP
2-3	R	NOT IN AUTO
2-4	R	GENERATOR BREAKER TRIP
2-5	R	FAIL TO SYNCHRONIZE
2-6	R	OVER CURRENT
2-7	R	UNDER VOLTAGE
2-8	R	OVER VOLTAGE
2-9	R	UNDER FREQUENCY
2-10	R	OVER FREQUENCY
2-11	R	REVERSE POWER
2-12	R	CHARGE AIR VFD FAILURE



SECTION #3

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☐ MULTIPLE UNIT WORK ORDER
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		4	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		3	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		2A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		2	AS BUILT	LR	RR	09-08-06
		1	CUSTOMER APPROVAL MOD'S	RR	RR	09-06-10

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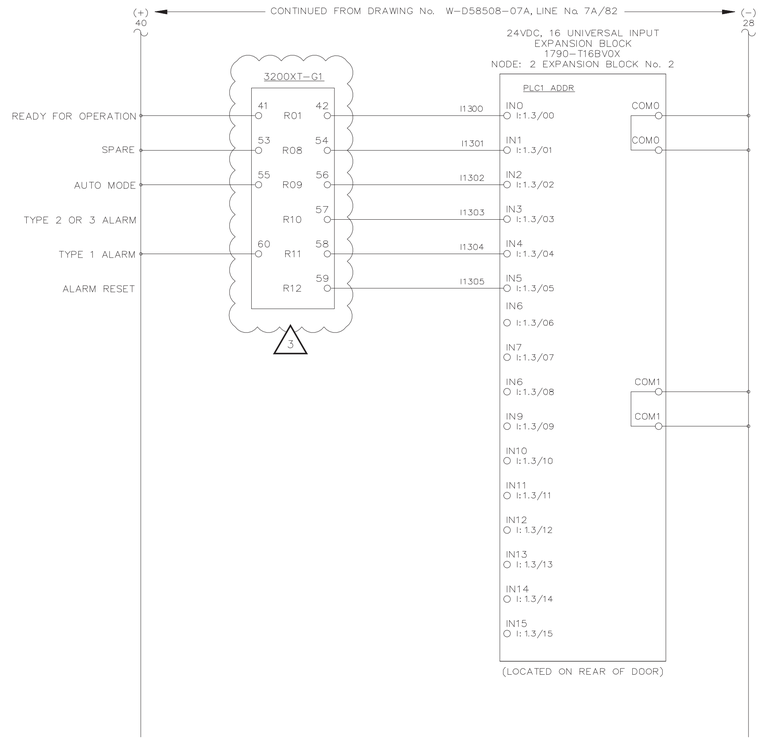
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 3 - DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02-15-23
REV	4
DRAWING/FILE No.	W-058508-07C
SHEET	7C

8A/1 8A/2 8A/3 8A/4 8A/5 8A/6 8A/7 8A/8 8A/9 8A/10 8A/11 8A/12 8A/13 8A/14 8A/15 8A/16 8A/17 8A/18 8A/19 8A/20 8A/21 8A/22 8A/23 8A/24 8A/25 8A/26 8A/27 8A/28 8A/29 8A/30 8A/31 8A/32 8A/33 8A/34 8A/35 8A/36 8A/37 8A/38 8A/39 8A/40 8A/41



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DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		2	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

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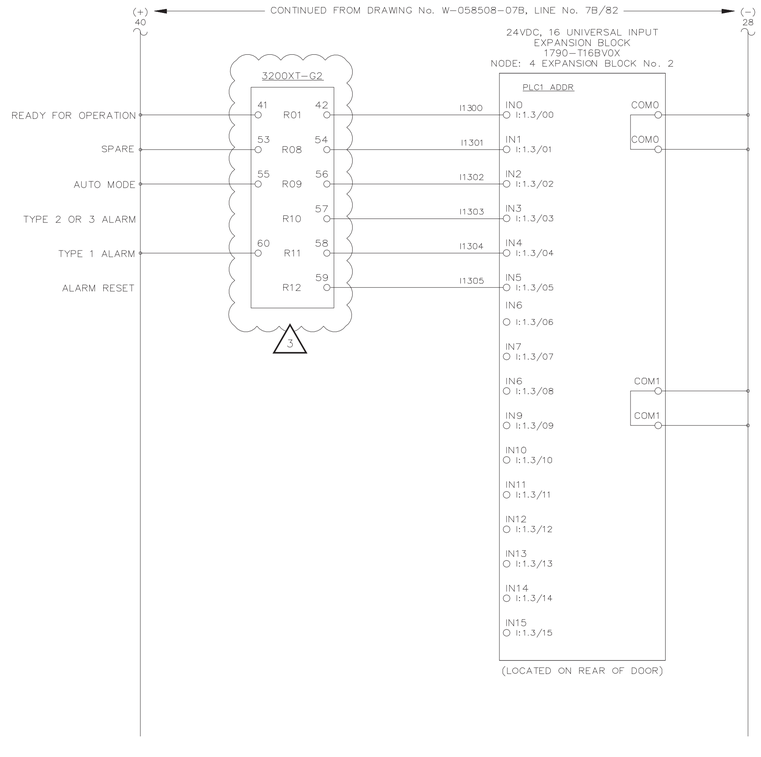
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 1 - DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	AUTH BY	DATE	REV
JRV	JRP	02-15-23	3
DRAWING/FILE No.	W-058508-08A	SHEET	8A



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SECTION #4

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		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

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GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 2 - DC CONTROL SCHEMATIC
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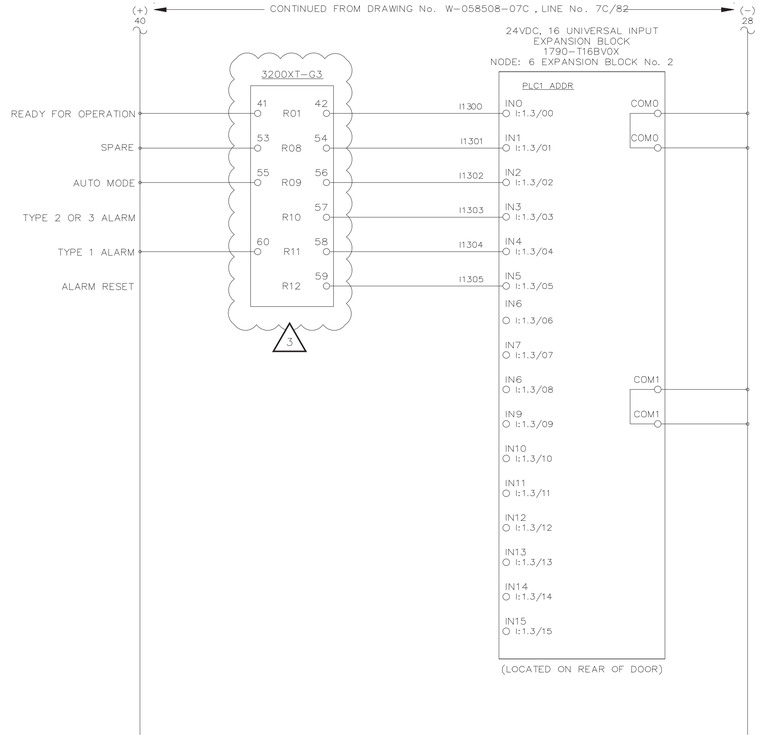
CUSTOMER ALASKA ENERGY AUTHORITY
CUSTOMER JOB No. 21116
DRAWN BY JRV | AUTH BY JRP | DATE 02-15-23 | REV 3
DRAWING/FILE No. W-058508-08B | SHEET 8B



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SECTION #3

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DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
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		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		1	AS BUILT	LR	RR	09-08-06

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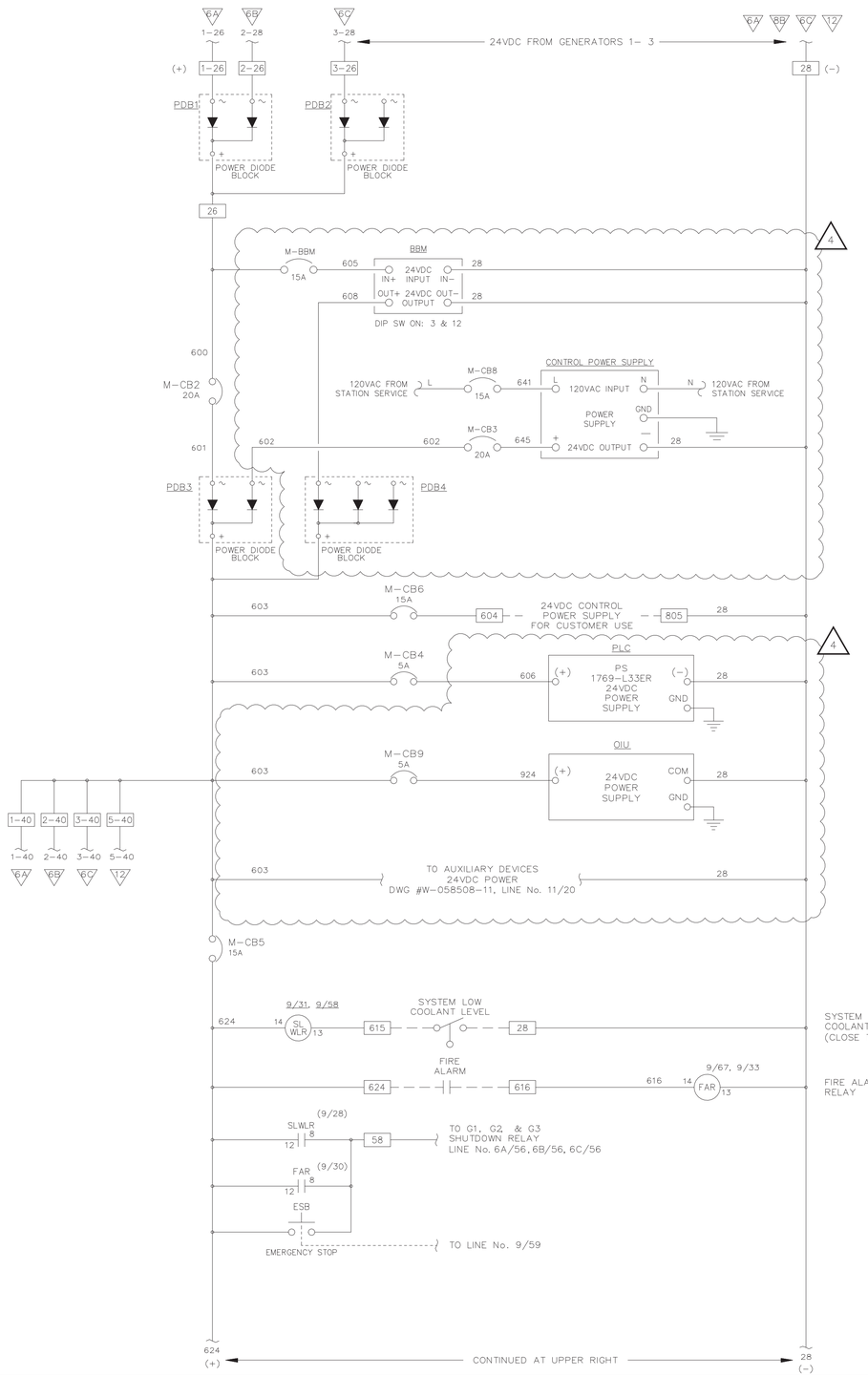
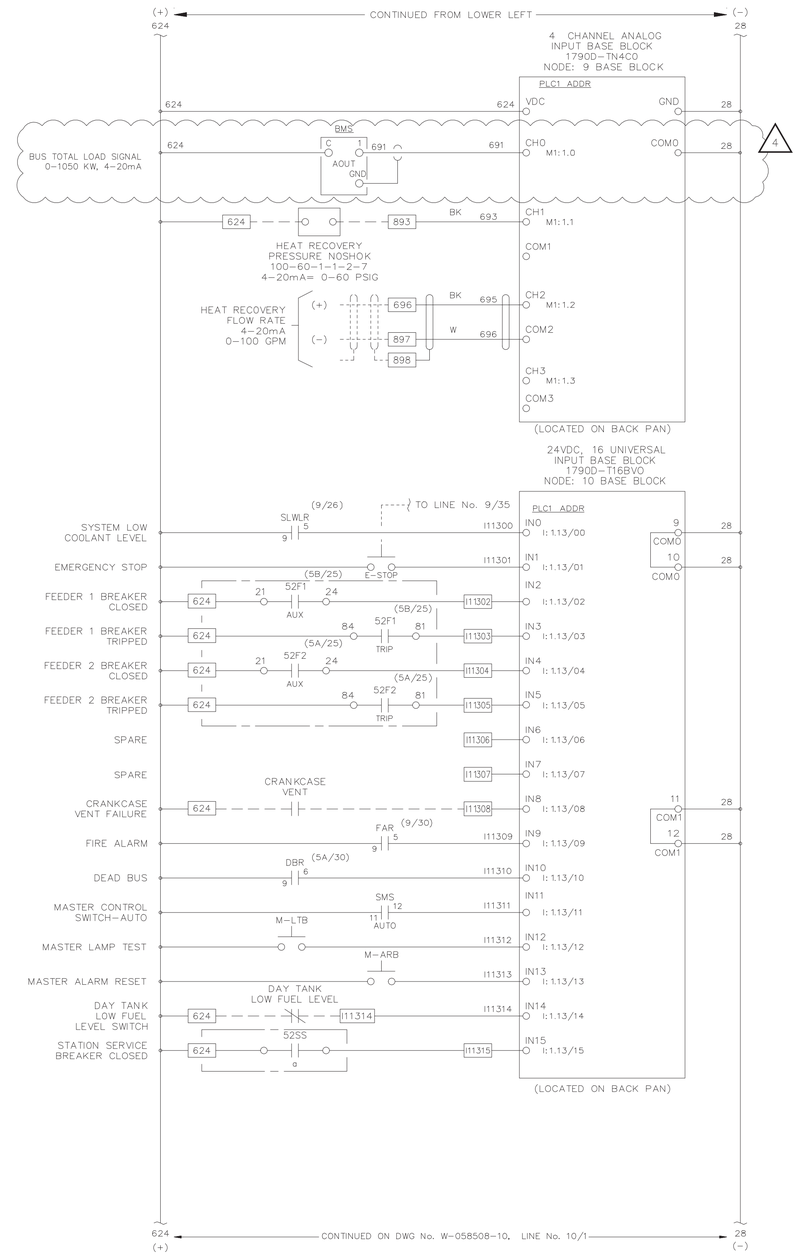
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GENERATOR 3 - DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	AUTH BY	DATE	REV
JRV	JRP	02-15-23	3
DRAWING/FILE No.	W-058508-08C	SHEET	8C





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		4	AS–BUILT – M&I 21116	JRV	JRP	03–31–23
		3	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03–13–23
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		2	AS BUILT	LR	RR	09–08–06
		1	AS BUILT	LR	RR	09–08–06

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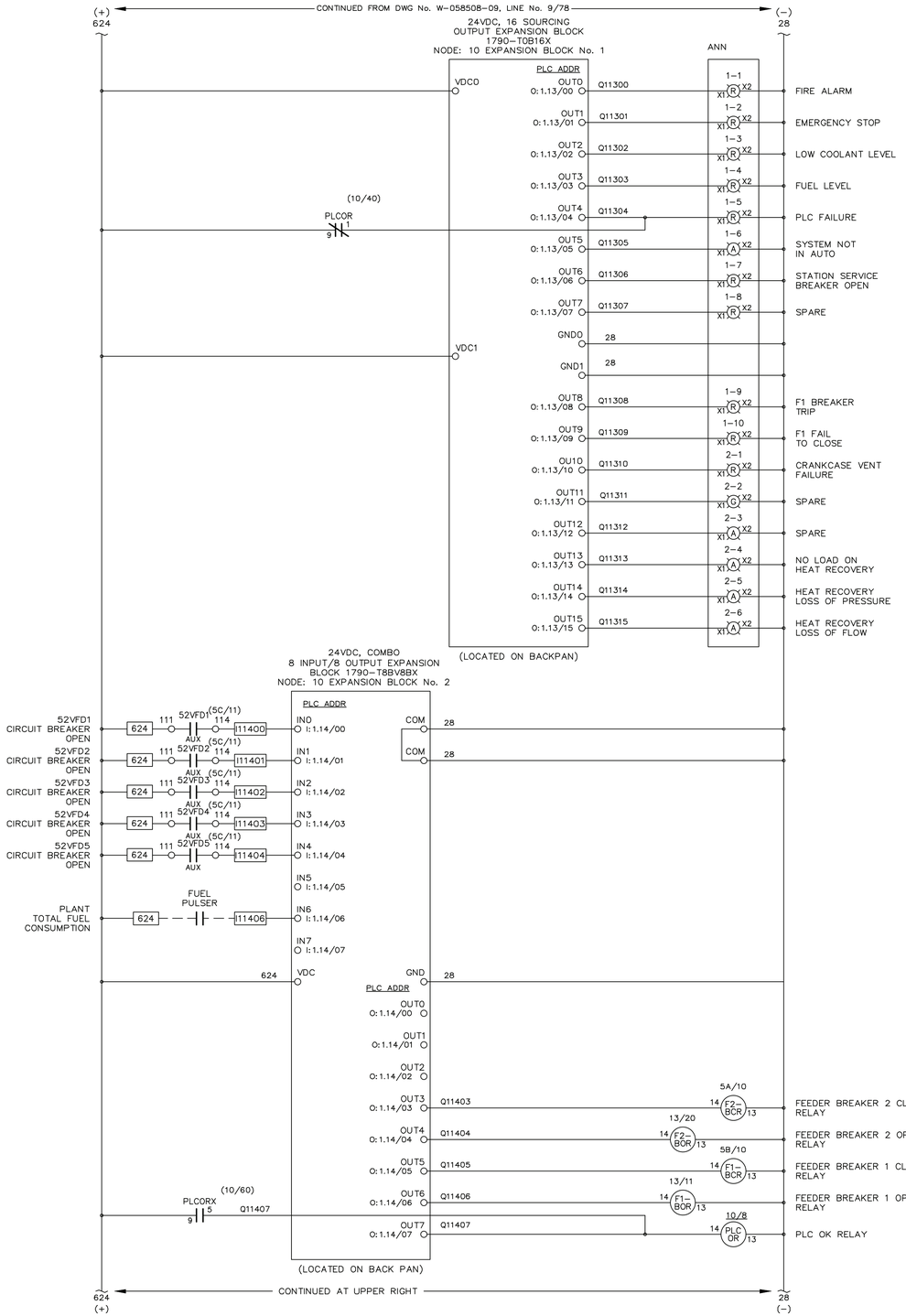
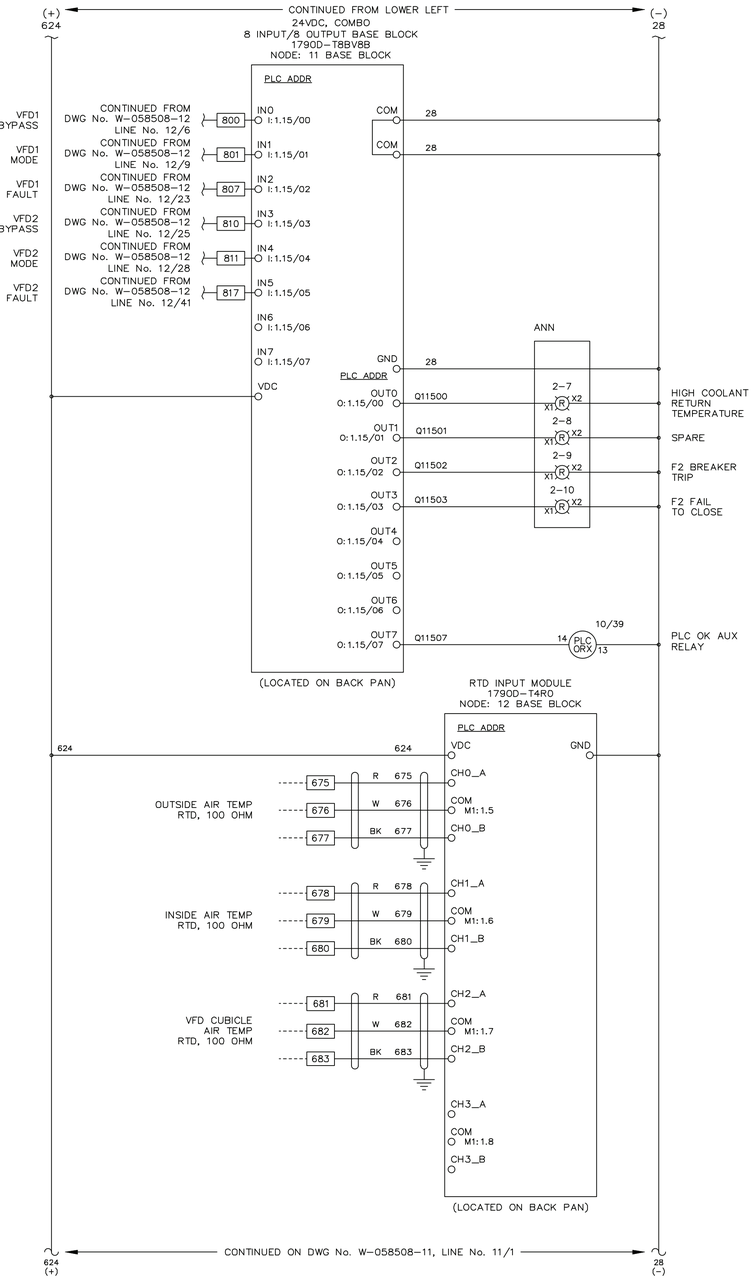
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No. 21116			
DRAWN BY JRV	AUTH BY JRP	DATE 02–15–23	REV 4
DRAWING/FILE No. W–058508–09		SHEET 9	





ANNUNCIATOR LAYOUT (TYPICAL)

1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10
2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10

LOCATION	COLOUR	DESCRIPTION
1-1	R	FIRE ALARM
1-2	R	EMERGENCY STOP
1-3	R	LOW COOLANT LEVEL
1-4	R	FUEL LEVEL
1-5	R	PLC FAILURE
1-6	A	SYSTEM NOT IN AUTO
1-7	R	STATION SERVICE BREAKER OPEN
1-8	R	SPARE
1-9	R	F1 BREAKER TRIP
1-10	R	F1 FAIL TO CLOSE
2-1	R	CRANKCASE VENT FAILURE
2-2	G	SPARE
2-3	A	SPARE
2-4	A	NO LOAD ON HEAT RECOVERY
2-5	A	HEAT RECOVERY LOSS OF PRESSURE
2-6	A	HEAT RECOVERY LOSS OF FLOW
2-7	R	HIGH COOLANT RETURN TEMPERATURE
2-8	R	SPARE
2-9	R	F2 BREAKER TRIP
2-10	R	F2 FAIL TO CLOSE

SECTION #2

AS BUILT

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DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT	LR	RR	09-08-06

THOMSON TECHNOLOGY® POWER & CONTROL A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-035807	WORK ORDER No.	W-058508
DRAWN BY	MS	AUTH BY	RR
DATE	09-03-25	REV	1
DRAWING/FILE No.	W-058508-10	SHEET	10

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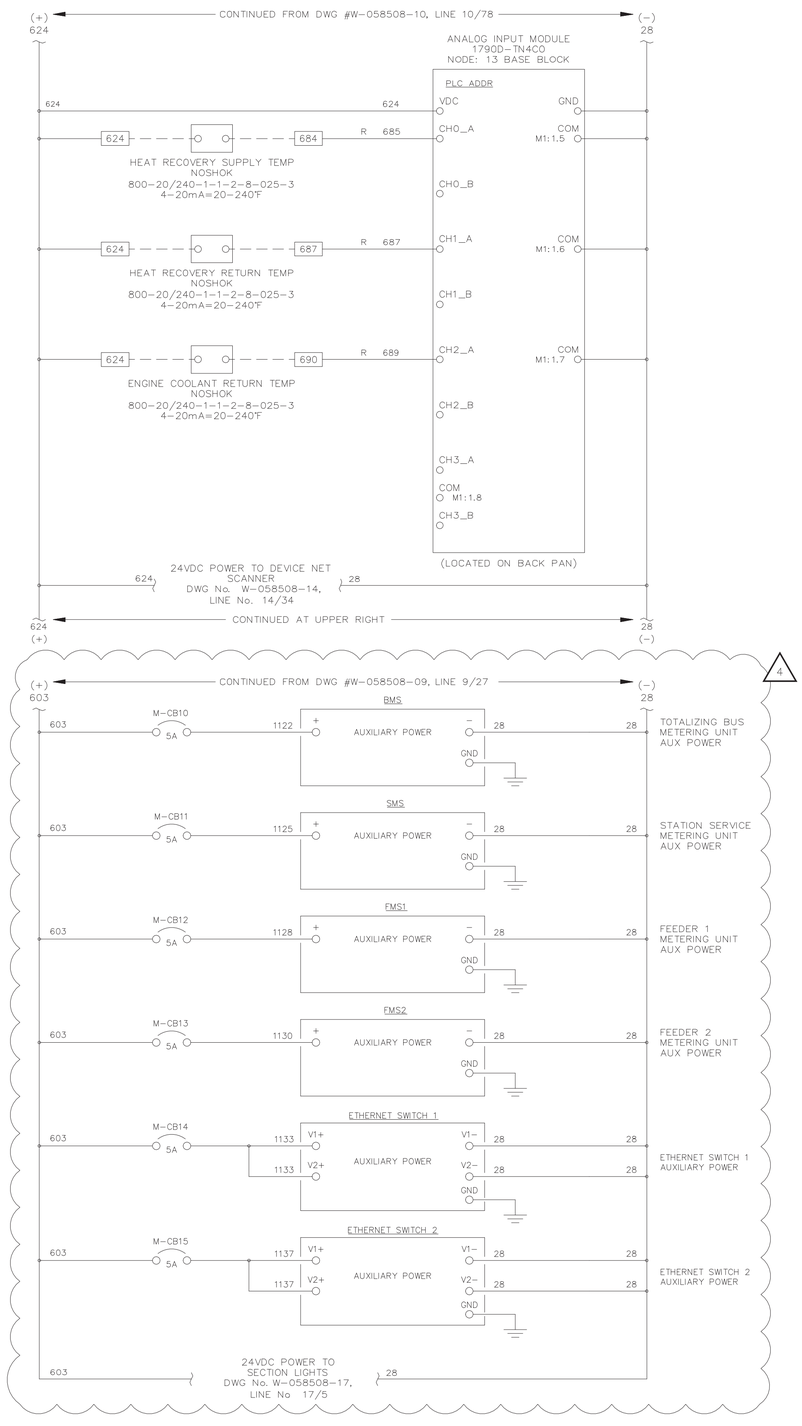

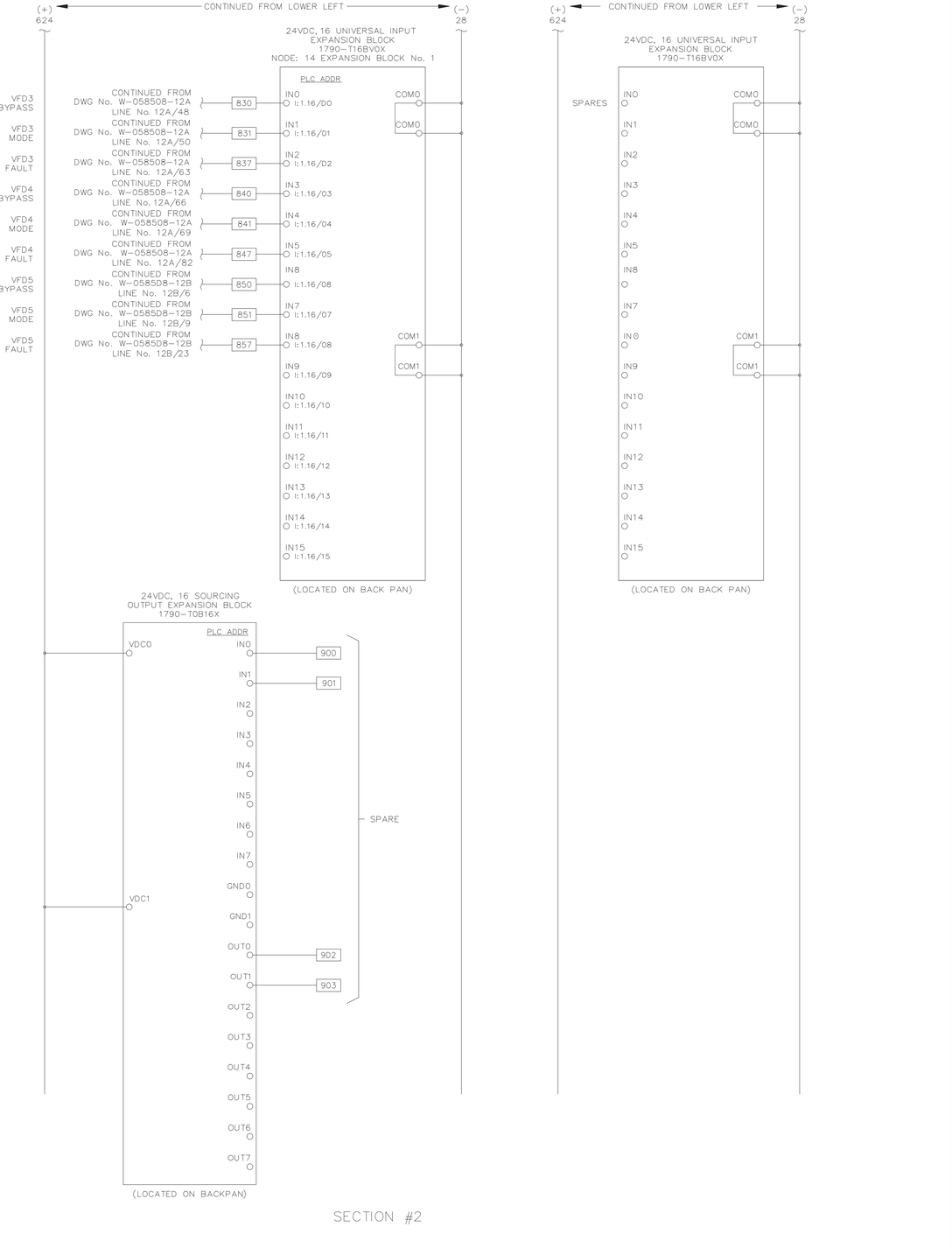

SECTION #2

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

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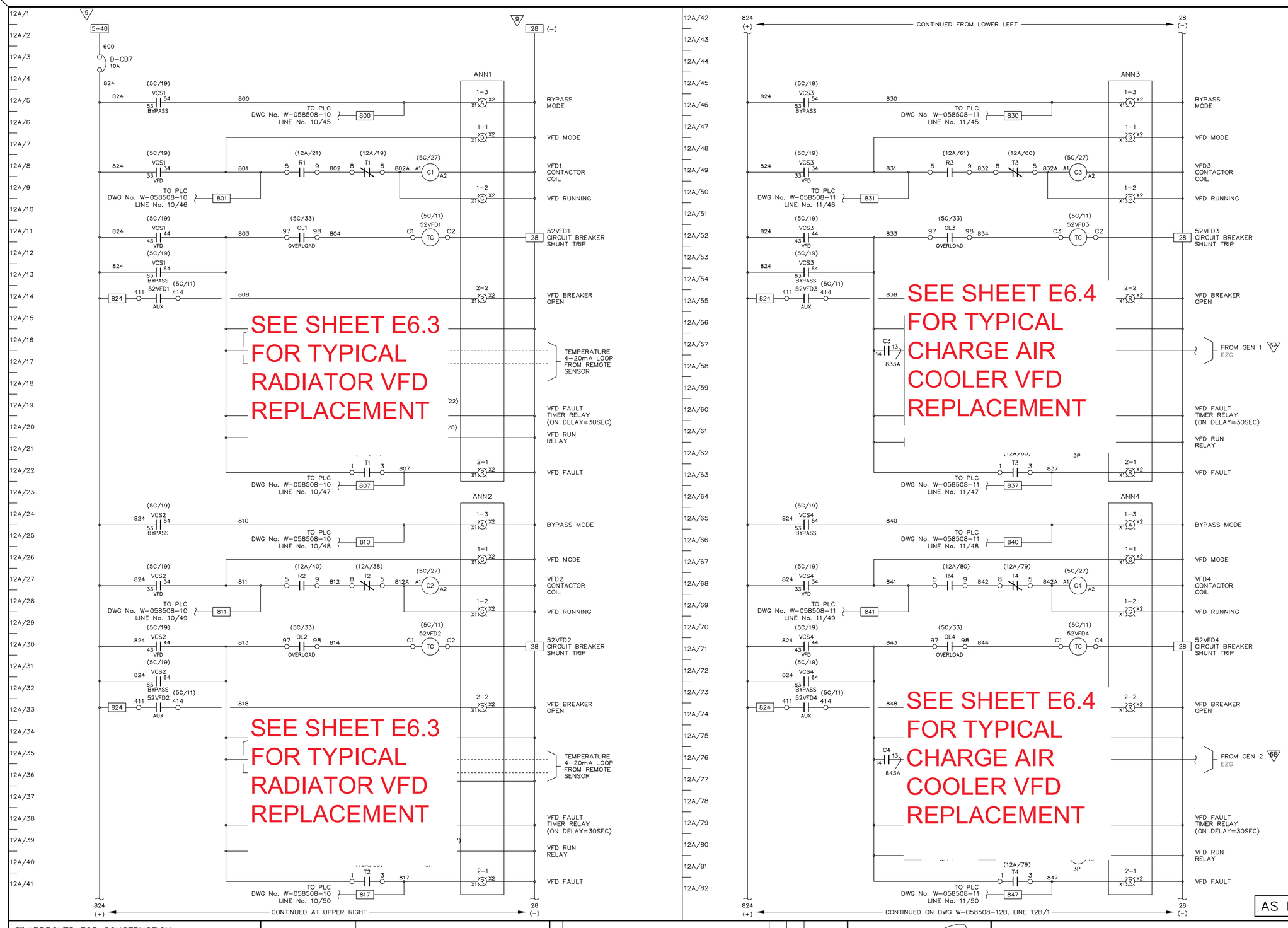
		4	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		3	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		2A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		2	AS BUILT	LR	RR	09-08-06
		1	AS BUILT	LR	RR	09-08-06

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	JRV	AUTH BY	JRP
DATE	02-15-23	REV	4
DRAWING/FILE No.	W-058508-11	SHEET	11



ANNUNCIATOR LAYOUT (TYPICAL) ANN1 TO ANN5

1-1	1-2	1-3
2-1	2-2	2-3

LOCATION	COLOUR	DESCRIPTION
1-1	G	VFD MODE
1-2	G	VFD RUNNING
1-3	A	BYPASS MODE
2-1	R	VFD FAULT
2-2	R	VFD BREAKER OPEN
2-3	R	SPARE

SECTION #1

AS BUILT

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

No.	REVISIONS	BY	AUTH	DATE
2	AS BUILT	LR	RR	09-08-06
1	CUSTOMER APPROVAL MOD'S	RR	RR	09-06-10

DRAWING No. | REFERENCE DRAWINGS

THOMSON TECHNOLOGY® POWER & CONTROL A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
VFD CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.	WORK ORDER No.		
C-035807	W-058508		
DRAWN BY	AUTH BY	DATE	REV
MS	RR	09-03-25	2
DRAWING/FILE No.		SHEET	
W-058508-12A		12A	

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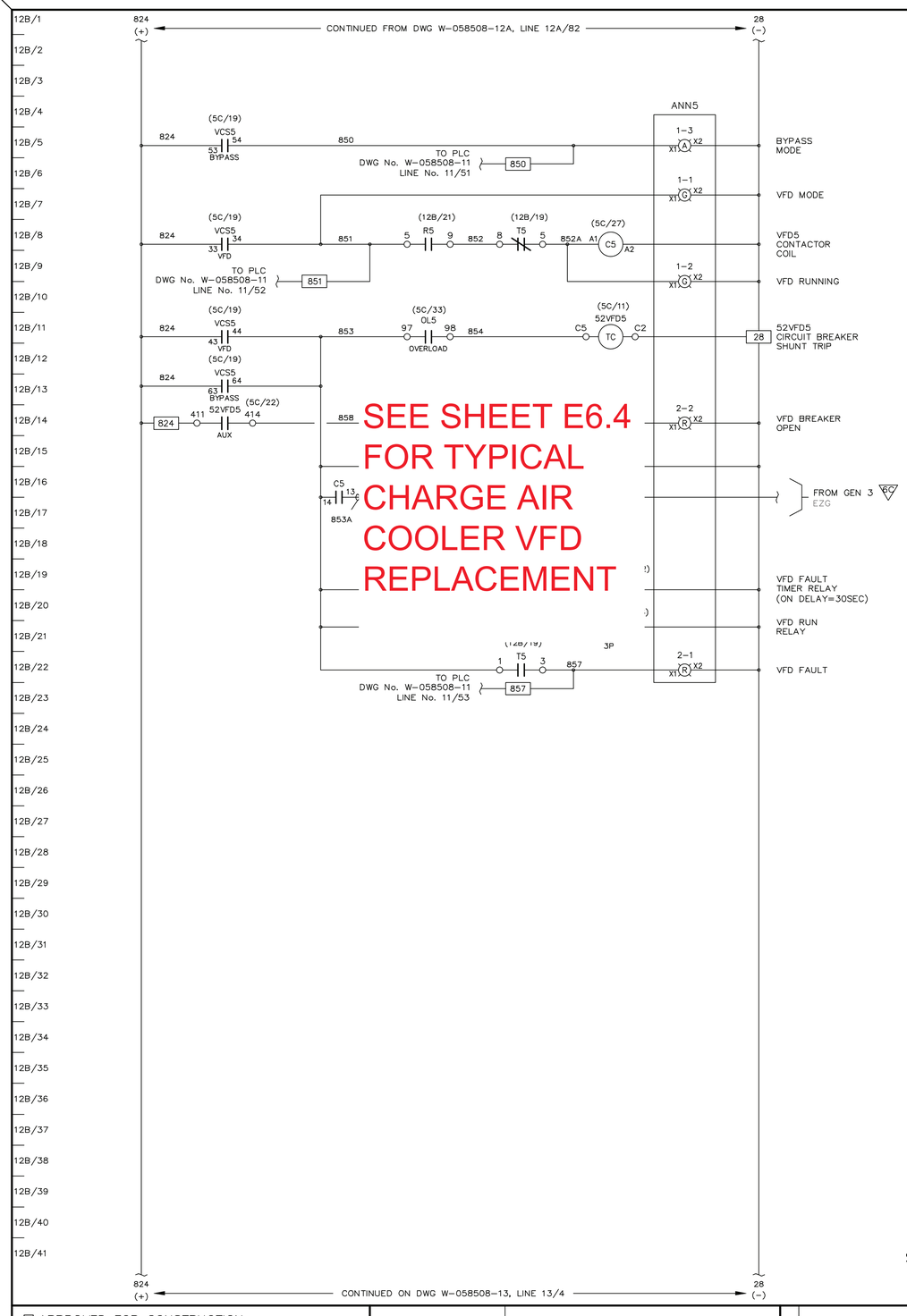

SECTION #1

AS BUILT

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DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
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1	CUSTOMER APPROVAL MOD'S	RR	RR	09-06-10

THOMSON TECHNOLOGY
POWER & CONTROL
A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
VFD CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.		WORK ORDER No.	
C-035807		W-058508	
DRAWN BY	AUTH BY	DATE	REV
MS	RR	09-03-25	2
DRAWING/FILE No.		SHEET	
W-058508-12B		12B	

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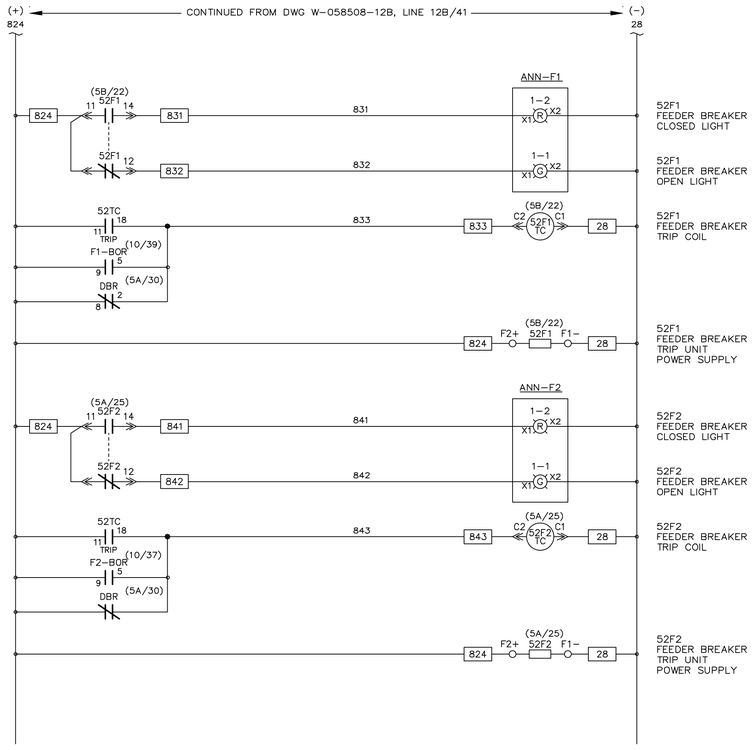

SECTION #2

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DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE

THOMSON TECHNOLOGY®
POWER & CONTROL
A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
FEEDER BREAKER DC CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.	WORK ORDER No.		
C-035807	W-058508		
DRAWN BY	AUTH BY	DATE	REV
MS	RR	09-03-25	0
DRAWING/FILE No.		SHEET	
W-058508-13		13	

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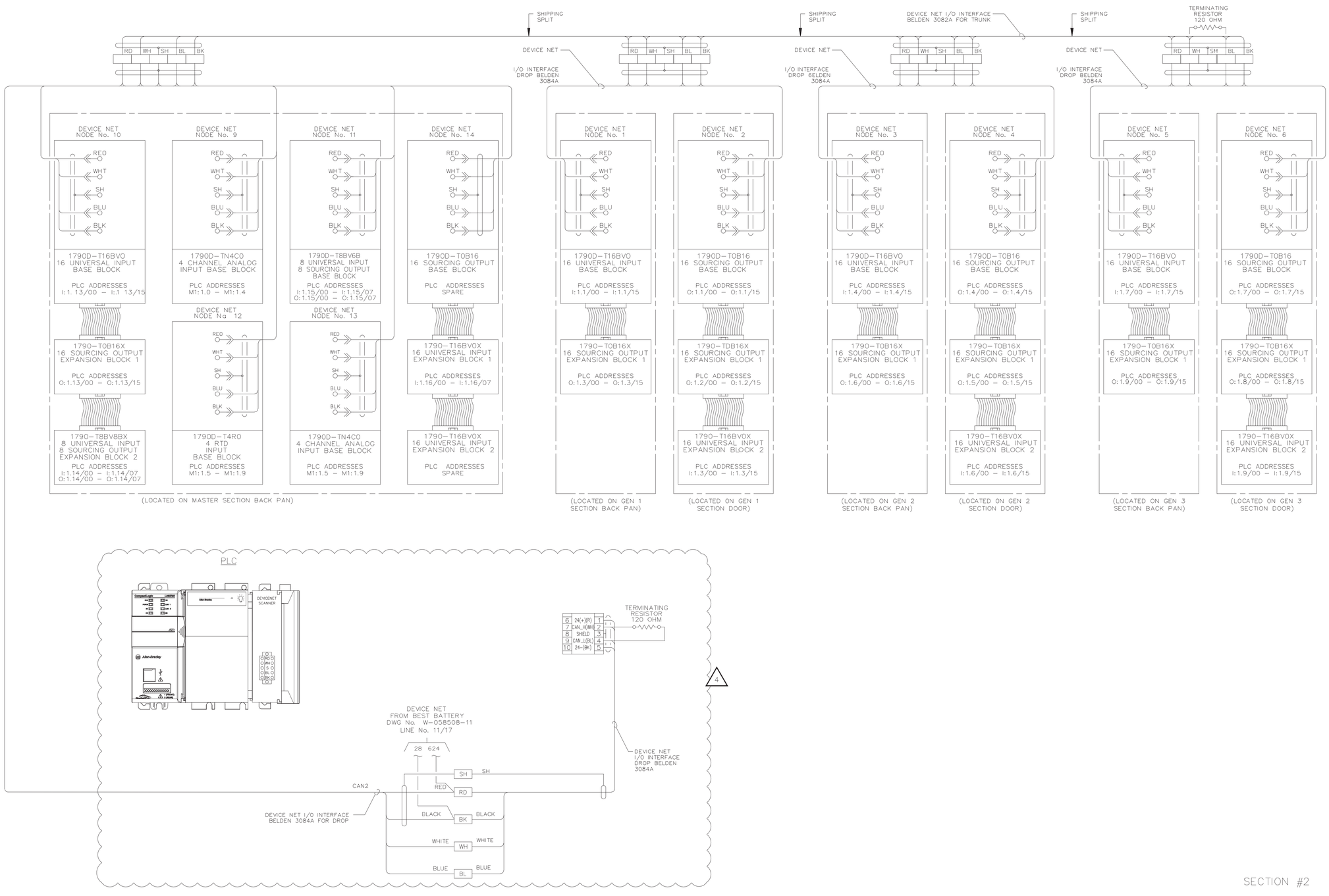

SECTION #2

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		4	AS-BUILT – M&I 21116	JRV	JRP	03-31-23
		3	ISSUED FOR CONSTRUCTION – M&I 21116	JRV	JRP	03-13-23
		2A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		2	AS BUILT	LR	RR	09-08-06
		1	PRE-PRODUCTION MODS	LR	RR	09-06-17

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
PLC COMMUNICATION DIAGRAM
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY
CUSTOMER JOB No. 21116
DRAWN BY JRV | AUTH BY JRP | DATE 02-15-23 | REV 4
DRAWING/FILE No. W-058508-14 | SHEET 14

PORT NUMBERS ARE REPRESENTATIVE ONLY. VERIFY CABLE LABELING BEFORE DISCONNECTING.

FUEL COOLER VFD
192.168.1.176

COMM RACK
ROUTER

BUILDING CAMERAS
SWITCHGEAR: 192.168.1.104
GEN ROOM 1: 192.168.1.105
GEN ROOM 2: 192.168.1.106

OIU
IP:192.168.1.182

ETHERNET

DIN RAIL
MOUNT
SERVER
IP:192.168.1.142

ETHERNET

UPS CONNECTOR
PLUG

UPS-L
UPS-N
UPS-G

ETHERNET SWITCH 1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

TO IES EQUIPMENT

ADD NEW GEN#3 CAT
DATA LINK GATEWAY

ETHERNET SWITCH 2

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

MODBUS TCP
F2 EPM
IP: 192.168.1.193
SHARK 250

MODBUS TCP
F1 EPM
IP: 192.168.1.192
SHARK 250

MODBUS TCP
SS EPM
IP: 192.168.1.191
SHARK 250

MODBUS TCP
BUS EPM
IP: 192.168.1.190
SHARK 250

5

CAC2 VFD — CAC3-VFD — IP:192.168.1.175
CAC2 VFD — CAC2-VFD — IP:192.168.1.174
CAC1 VFD — CAC1-VFD — IP:192.168.1.173
R2 VFD — R2-VFD — IP:192.168.1.172
R1 VFD — R1-VFD — IP:192.168.1.171

5

ALL VFD'S HAVE BAD
COMMUNICATION CARDS

IP: 192.168.1.161 — CDL GATEWAY — 2 WIRE CAT DATA LINK — GEN 1 ECU

IP: 192.168.1.162 — CDL GATEWAY — 2 WIRE CAT DATA LINK — GEN 2 ECU

SUPPLIED BY AEA
MOUNTED AT ENGINE

MODBUS TCP
MODBUS TCP
MODBUS TCP

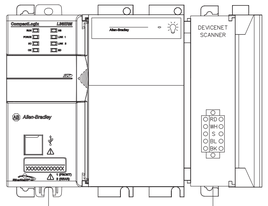
CAN BUS
CAN BUS

3200XT-G1
IP: 192.168.1.151

3200XT-G2
IP: 192.168.1.152

3200XT-G3
IP: 192.168.1.153

ENGINE CANBUS — GEN 3 ECU



MODBUS TCP
CPU IP:192.168.1.183

DEVICE NET

COMPACT I/O — DEVICE NET (×10)

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DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		5	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		4	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		3A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	02-15-23
		3	AS BUILT	LR	RR	09-08-06
		2	PRE-PRODUCTION MOD'S	RR	RR	09-06-24

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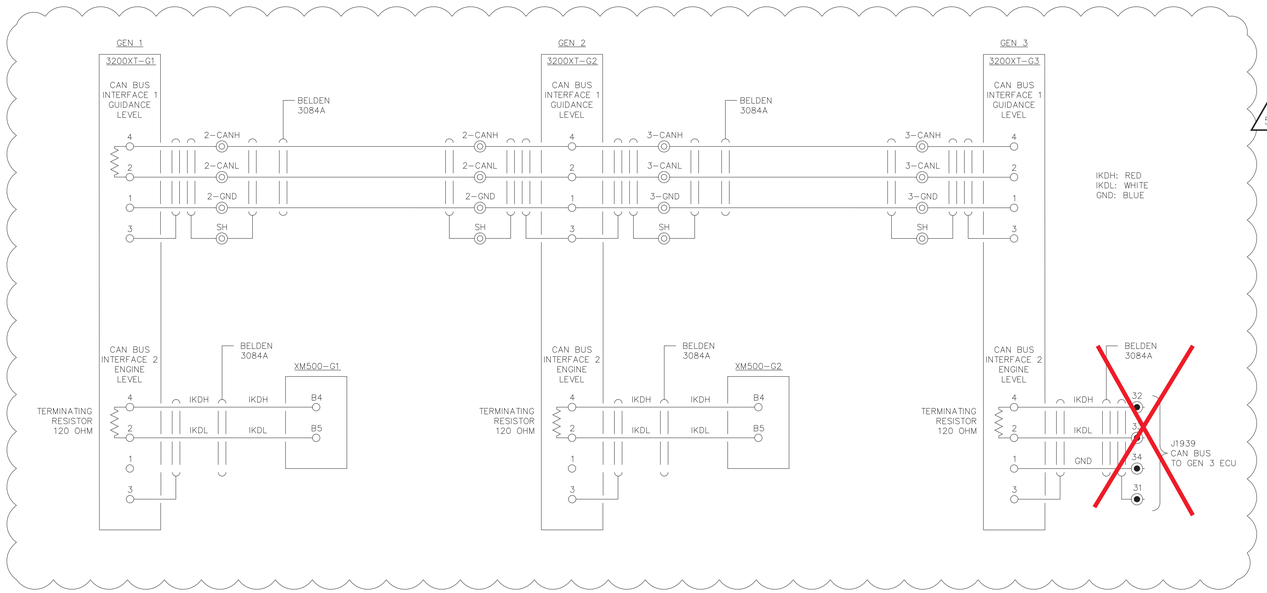
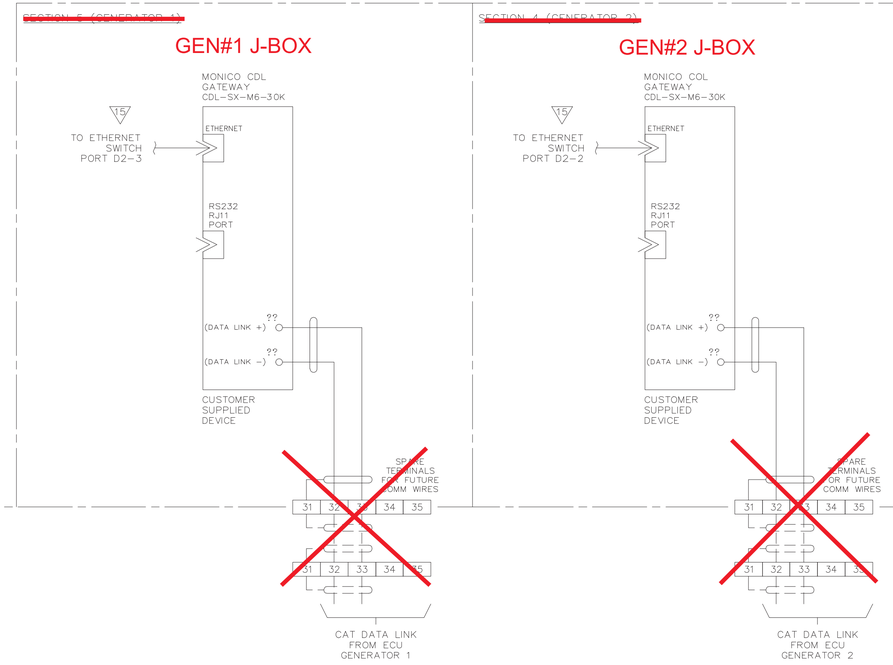
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
COMMUNICATION NETWORK DIAGRAM
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	JRV	AUTH BY	JRP
DATE	02-15-23	REV	5
DRAWING/FILE No.	W-058508-15	SHEET	15



CONNECT DEVICENET
TO NEW GEN#3
XM500 IDENTICAL
TO GEN#1 & GEN#2,
SEE SHEET E6.6

NOTE:
BOTH EXISTING
GATEWAYS
ARE LOCATED
IN THE J-BOX
AS SHOWN HERE



INSTALL NEW GEN#3
ETHERNET FROM
SWITCHGEAR TO J-BOX
IDENTICAL TO
GEN#1 & GEN#2,
SEE SHEET E6.6

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☐ MULTIPLE UNIT WORK ORDER
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		5	AS-BUILT - M&I 21116	JRV	JRP	03-31-23
		4	ISSUED FOR CONSTRUCTION - M&I 21116	JRV	JRP	03-13-23
		3A	ISSUED FOR REVIEW FOR SWITCHGEAR UPGRADE	JRV	JRP	12-16-22
		3	AS BUILT	LR	RR	09-08-06
		2	PRE-PRODUCTION MOD'S	RR	RR	09-06-23

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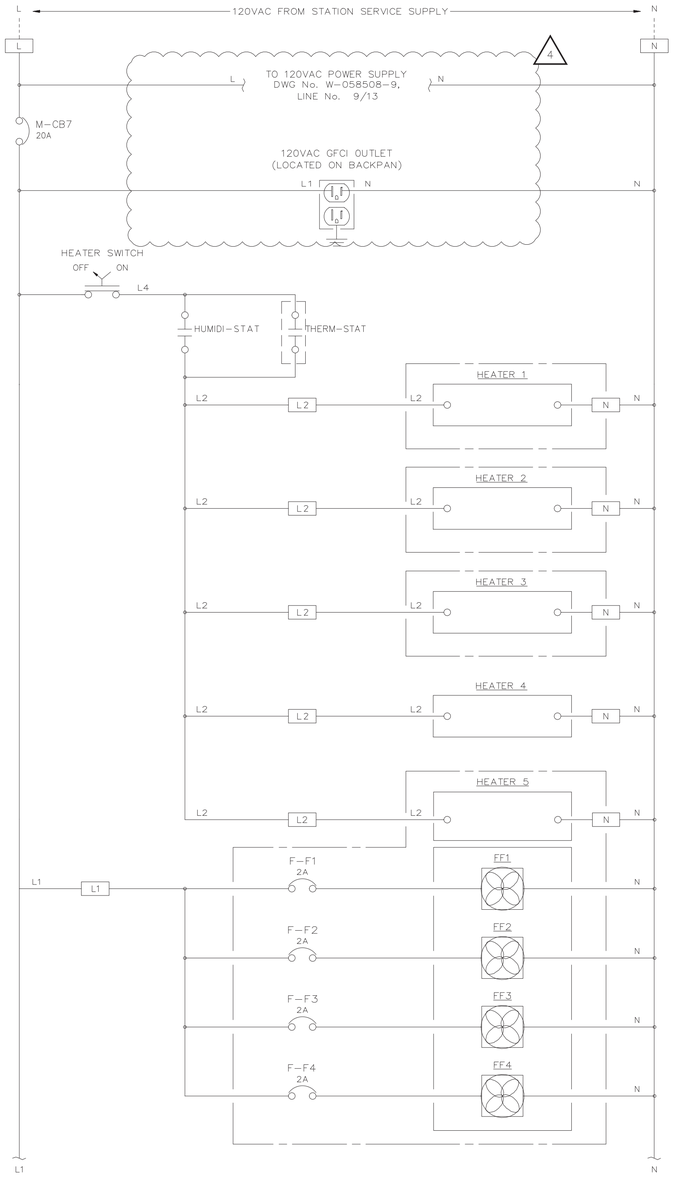
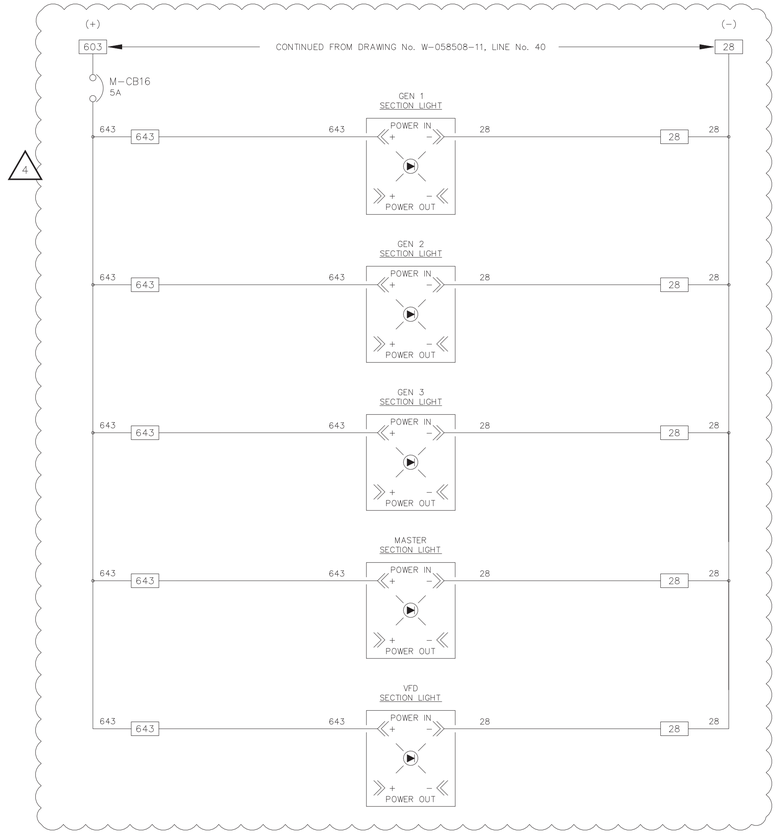
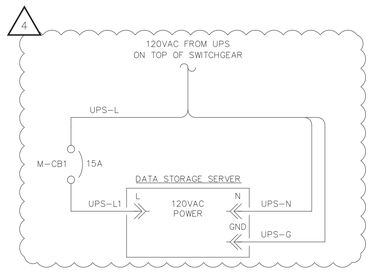
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
GEN CANBUS COMMUNICATION DIAGRAM
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	AUTH BY	DATE	REV
JRV	JRP	12-16-22	5
DRAWING/FILE No.	W-058506-16	SHEET	16







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		2	AS BUILT	LR	RR	09-08-06
		1	CUSTOMER APPROVAL MOD'S.	RR	RR	09-06-11

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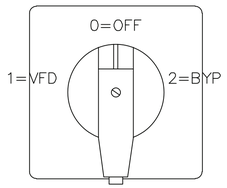
GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
HEATER & LIGHTING CONTROL SCHEMATIC
KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER JOB No.	21116		
DRAWN BY	AUTH BY	DATE	REV
JRV	JRP	02-15-23	4
DRAWING/FILE No.	W-058508-17	SHEET	17

VFD MODE SWITCH – VCS



1	POSITION
MD	43 — 44
	33 — 34
71300	1T1 — 1L1
	1T2 — 1L2
	1T3 — 1L3
	2T1 — 2L1
	2T2 — 2L2
	2T3 — 2L3
ME	54 — 53
	64 — 63
2	POSITION

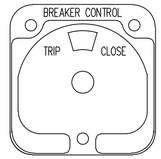
(SALZER/H216-71322-013V1)
QTY=5

SYSTEM MODE SWITCH – SMS

DECK	CONTACTS	POS. AUTO	POS. MAN
1	12 — 11		X
	16 — 15	X	
	17		

(ELECTROSWITCH 24201C)
KNURLED HANDLE
QTY 1

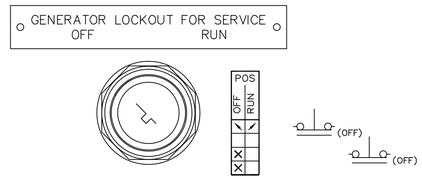
BREAK TRIP/CLOSE SWITCH – 52TC



DECK	CONTACTS	POS. TRIP	POS. NORM. CLOSE
1	11 — 18	X	
	16 — 17		X

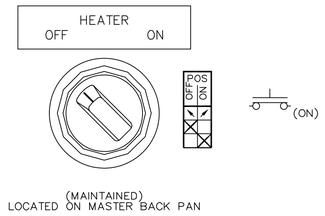
(ELECTROSWITCH 2438D)
PISTOL GRIP HANDLE
SPRING RETURN TO CENTER
QTY 2

ENGINE CONTROL SWITCH – GLS



(MAINTAINED)
QTY 3

HEATER CONTROL SWITCH – HCS



(MAINTAINED)
LOCATED ON MASTER BACK PAN

AS BUILT

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DRAWING No.	REFERENCE DRAWINGS

No.	REVISIONS	BY	AUTH	DATE
2	AS BUILT	LR	RR	09-08-06
1	ADDED SWITCH POSITION DESCRIPTION ON THE VFD SWITCH	RR	RR	09-06-11

THOMSON TECHNOLOGY®
POWER & CONTROL
A REGAL-BELOIT COMPANY

GENERATOR CONTROL SYSTEMS
MODEL GCS 2200
CONTROL SWITCH TARGET CHART
KWETHLUK SITE

CUSTOMER ALASKA ENERGY AUTHORITY

CUSTOMER ORDER No.	WORK ORDER No.		
C-035807	W-058508		
DRAWN BY	AUTH BY	DATE	REV
MS	RR	09-03-25	2
DRAWING/FILE No.		SHEET	
W-058508-18		18	

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VFD CONTROL

RADIATOR 1 — #14 AWG ×3 — R1A, R1B, R1C, SHD

RADIATOR 2 — #14 AWG ×3 — R2A, R2B, R2C, SHD

CAC 1 — #14 AWG ×3 — R1A, R1B, R1C, SHD

CAC 2 — #14 AWG ×3 — R2A, R2B, R2C, SHD

CAC 3 — #14 AWG ×3 — R2A, R2B, R2C, SHD

TEMPERATURE 4–20mA LOOP FROM REMOTE SENSOR — (+) (–) #16 AWG, 2 COND. SHIELDED — VFD1: R1–1, R1–2

TEMPERATURE 4–20mA LOOP FROM REMOTE SENSOR — (+) (–) #16 AWG, 2 COND. SHIELDED — VFD2: R2–1, R2–2

TEMPERATURE 4–20mA LOOP FROM REMOTE SENSOR — (+) (–) #16 AWG, 2 COND. SHIELDED — VFD3: R3–1, R3–2

TEMPERATURE 4–20mA LOOP FROM REMOTE SENSOR — (+) (–) #16 AWG, 2 COND. SHIELDED — VFD4: R4–1, R4–2

TEMPERATURE 4–20mA LOOP FROM REMOTE SENSOR — (+) (–) #16 AWG, 2 COND. SHIELDED — VFD5: R5–1, R5–2

MASTER CONTROL

120VAC FROM STATION SERVICE CIRCUIT 24 — L, N

24VDC CONTROL POWER SUPPLY FOR CUSTOMER USE — 604, 605

PANEL INTERFACE CONNECTOR — DISCONNECTED

ETHERNET (RJ45)
SPARE (RJ–11)
MODEM (RJ–11)
DEVICES (USB)
DEVICES (USB)
KEYBOARD (PS2)
MOUSE (PS2)
MONITOR (VGA)
COM (SERIAL)

3

SYSTEM LOW COOLANT LEVEL — #14 AWG, #14 AWG — 615, 28

FIRE ALARM — #14 AWG, #14 AWG — 624, 616

SPARE — I11306
SPARE — I11307

DAY TANK LOW FUEL LEVEL — #14 AWG, #14 AWG — 624, I11314

PLANT TOTAL FUEL CONSUMPTION — #14 AWG, #14 AWG — 624, I11406

CRANK CASE VENT FAILURE — #14 AWG, #14 AWG — 624, I11308

OUTSIDE AIR TEMP RTD, 100 OHM — #16 AWG, 3 COND. SHIELDED — 675, 676, 677

INSIDE AIR TEMP RTD, 100 OHM — #16 AWG, 3 COND. SHIELDED — 678, 679, 680

624

HEAT RECOVERY SUPPLY TEMPERATURE 4–20mA — (+) (–) #16 AWG, 2 COND. SHIELDED — 684, 685, 686

624

HEAT RECOVERY RETURN TEMPERATURE 4–20mA — (+) (–) #16 AWG, 2 COND. SHIELDED — 687, 688, 689

624

ENGINE COOLANT RETURN TEMPERATURE 4–20mA — (+) (–) #16 AWG, 2 COND. SHIELDED — 690, 691, 692

624

HEAT RECOVERY PRESSURE 4–20mA — (+) (–) #16 AWG, 2 COND. SHIELDED — 693, 694, 695

HEAT RECOVERY FLOW RATE 4–20mA — (+) (–) #16 AWG, 2 COND. SHIELDED — 696, 697, 698

GENERATOR 3

ENGINE BATTERIES (+)	1	R, #8 AWG	1
ENGINE BATTERIES (–)	2	BK, #8 AWG	2
ECU SPEED BIAS CONTROL	3, 4, 5	#16 AWG, 2 COND. TWISTED PAIR ×2	3, 4, 5
ECM RUN STARTER RELAY	6, 7	#14 AWG ×2	6, 7
SPARE	8, 9		8, 9
OIL LEVEL SWITCH (24VDC)	10, 11, 12	#16 AWG, 2 COND. TWISTED PAIR ×2	10, 11, 12
SPARE	13, 14, 15, 16, 17, 18		13, 14, 15, 16, 17, 18
EXHAUST TEMPERATURE	19, 20, 21	100 OHM 2 WIRE RTD ×2	19, 20, 21
SPARE	22, 23		22, 23
VOLTAGE REGULATOR AUX BIAS INPUT	24, 25, 26	#18 AWG, 2 COND. TWISTED PAIR ×2	25, 26
INTAKE AIR TEMPERATURE SENSOR 4–20mA	27, 28	#16 AWG, 2 COND. TWISTED PAIR ×2	27, 28
AIR FILTER VACCUM SENSOR 4–20mA	29, 30	#16 AWG, 2 COND. TWISTED PAIR ×2	29, 30
J1939 CANBUS FROM ECU	31, 32, 33, 34	#22–24 AWG, 3 COND. TWISTED PAIR ×2	31, 32, 33, 34
SPARE	35, 36		35, 36
3 BATTERY CHARGER ALARM	BC–1, BC–2	#14 AWG ×2	BC–1, BC–2

CHARGER ALARM DISCONNECTED WHEN NEW CHARGER WAS INSTALLED

GENERATOR 2

ENGINE BATTERIES (+)	1	R, #8 AWG	1
ENGINE BATTERIES (–)	2	BK, #8 AWG	2
ECU SPEED BIAS CONTROL	3, 4, 5	#16 AWG, 2 COND. TWISTED PAIR ×2	3, 4, 5
ECM RUN STARTER RELAY	6, 7	#14 AWG ×2	6, 7
SPARE	8, 9		8, 9
OIL LEVEL SWITCH (24VDC)	10, 11	#16 AWG, 2 COND. TWISTED PAIR ×2	10, 11
MAGNETIC PICKUP	12, 13, 14	#16 AWG, 2 COND. TWISTED PAIR ×2	12, 13, 14
OIL PRESSURE SENSOR	15, 16	#16 AWG, 2 COND. TWISTED PAIR ×2	15, 16
JACKET WATER TEMPERATURE SENSOR	17, 18	#16 AWG, 2 COND. TWISTED PAIR ×2	17, 18
EXHAUST TEMPERATURE	19, 20, 21	100 OHM 2 WIRE RTD ×2	19, 20, 21
SPARE	22, 23		22, 23
VOLTAGE REGULATOR AUX BIAS INPUT	24, 25, 26	#18 AWG, 2 COND. TWISTED PAIR ×2	25, 26
INTAKE AIR TEMPERATURE SENSOR 4–20mA	27, 28	#16 AWG, 2 COND. TWISTED PAIR ×2	27, 28
AIR FILTER VACCUM SENSOR 4–20mA	29, 30	#16 AWG, 2 COND. TWISTED PAIR ×2	29, 30
CAT DATA LINK FROM ECU	31, 32, 33, 34		31, 32, 33, 34
SPARE	35, 36		35, 36
3 BATTERY CHARGER ALARM	BC–1, BC–2	#14 AWG ×2	BC–1, BC–2

CHARGER ALARM DISCONNECTED WHEN NEW CHARGER WAS INSTALLED

GENERATOR 1

ENGINE BATTERIES (+)	1	R, #8 AWG	1
ENGINE BATTERIES (–)	2	BK, #8 AWG	2
ECU SPEED BIAS CONTROL	3, 4, 5	#16 AWG, 2 COND. TWISTED PAIR ×2	3, 4, 5
ECM RUN STARTER RELAY	6, 7	#14 AWG ×2	6, 7
SPARE	8, 9		8, 9
OIL LEVEL SWITCH (24VDC)	10, 11	#16 AWG, 2 COND. TWISTED PAIR ×2	10, 11
MAGNETIC PICKUP	12, 13, 14	#16 AWG, 2 COND. TWISTED PAIR ×2	12, 13, 14
OIL PRESSURE SENSOR	15, 16	#16 AWG, 2 COND. TWISTED PAIR ×2	15, 16
JACKET WATER TEMPERATURE SENSOR	17, 18	#16 AWG, 2 COND. TWISTED PAIR ×2	17, 18
EXHAUST TEMPERATURE	19, 20, 21	100 OHM 2 WIRE RTD ×2	19, 20, 21
SPARE	22, 23		22, 23
VOLTAGE REGULATOR AUX BIAS INPUT	24, 25, 26	#18 AWG, 2 COND. TWISTED PAIR ×2	25, 26
INTAKE AIR TEMPERATURE SENSOR 4–20mA	27, 28	#16 AWG, 2 COND. TWISTED PAIR ×2	27, 28
AIR FILTER VACCUM SENSOR 4–20mA	29, 30	#16 AWG, 2 COND. TWISTED PAIR ×2	29, 30
CAT DATA LINK FROM ECU	31, 32, 33, 34		31, 32, 33, 34
SPARE	35, 36		35, 36
3 BATTERY CHARGER ALARM	BC–1, BC–2	#14 AWG ×2	BC–1, BC–2

CHARGER ALARM DISCONNECTED WHEN NEW CHARGER WAS INSTALLED

NEW GEN#3 INTERCONNECT WIRING IDENTICAL TO EXISTING GEN#1 & GEN#2, SEE SHEET E6.6 FOR NEW J-BOX TERMINATIONS

EXISTING CAT DATA LINK IS VIA ETHERNET

☐ APPROVED FOR CONSTRUCTION
☐ MASTER COPY ☐ REFERENCE COPY ____ OF ____
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: DATE:

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		3	AS–BUILT – M&I 21116	JRV	JRP	03–31–23
		2	AS BUILT	LR	RR	09–08–06
		1	CUSTOMER APPROVAL MOD'S.	RR	RR	09–06–11

ALASKA ENERGY AUTHORITY — RURAL ENERGY GROUP, 813 W. NORTHERN LIGHTS BLVD. ANCHORAGE, ALASKA 99503, HTTP://WWW.AIDEA.ORG

GENERATOR CONTROL SYSTEMS MODEL GCS 2200 INTERCONNECTION DIAGRAM

KWETHLUK SITE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER JOB No.	21116
DRAWN BY	JRV
AUTH BY	JRP
DATE	02–15–23
REV	3
DRAWING/FILE No.	W–058508–19
SHEET	19

BILL OF MATERIAL

ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER
3	GENSET CONTROLLER 3200XT-P1	WOODWARD / 8440-2082
2	MURPHY XM500 EXPANSION I/O	MURCAL / 78700420
9	ANALOG SIGNAL CONVERTER	OMEGA / DR-I3P
2	MURPHY PRESSURE SENSOR	MURCAL / ES2P-100
2	MURPHY TEMPERATURE SENSOR	MURCAL / ES2T-250/300-1/2
2	MURPHY TEMPERATURE SENSOR TERMINAL BOOT	MURCAL / 00-00-3624
1	SHARK 250 DIGITAL METER - BUS	ELECTRO IND. / SHARK250-60-10-V2-D-INP100S-20mAOS-X
3	SHARK 250 DIGITAL METER - STATION SERVICE	ELECTRO IND. / SHARK250-60-10-V2-D-INP100S-X-X
1	ALLEN-BRADLEY PLC CONTROLLER	ALLEN-BRADLEY / 1769-L33ER
1	ALLEN-BRADLEY PLC POWER SUPPLY	ALLEN-BRADLEY / 1769-PB4
1	ALLEN-BRADLEY DEVICENET SCANNER	ALLEN-BRADLEY / 1769-SDN
1	ALLEN-BRADLEY PLC END CAP	ALLEN-BRADLEY / 1769-ECR
1	15" TOUCHSCREEN HMI	CINCOZE / CV-115C/P1001
1	DATA STORAGE SERVER	ONLOGIC / ML100G-53
2	REDLION N-TRON 116TX NETWORK SWITCH	REDLION / 116TX
1	BATTERY BUFFER MODULE	SIEMENS / 6EP1933-2EC51
1	120 VAC - 24 VDC POWER SUPPLY 480WATT	PULS / CP20.241-S1
1	15 AMP GFCI CONVENIENCE OUTLET	PHOENIX CONTACT / 5600639
1	1500VA RACK MOUNT UPS	TRIPP-LITE / SMART1500LCD
5	LED ENCLOSURE LIGHT 400 LUMEN / MOTION	STEGO / 025411-00
5	TERMINAL CONNECTION KIT	STEGO / 264059
2	15 AMP CIRCUIT BREAKER	ABB / SU201M-C15
8	5 AMP CIRCUIT BREAKER	ABB / SU201M-C5

REV.	DATE	DESCRIPTION	BY
1	03-31-23	AS-BUILT - M&I 21116	JRV
0	03-13-23	ISSUED FOR CONSTRUCTION - M&I 21116	JRV

AEA JOB No. 21116

TITLE: KWETHLUK SWITCHGEAR UPGRADE BILL OF MATERIALS

SCALE: NONE	DATE: 02-15-23	DWN. BY: JRV
DWG. No: 21116-KWK-BOM	SHEET: 1 OF 1	CKD. BY: JRP

JOB: KWETHLUK GENERATOR SWITCHGEAR UPGRADE

ALASKA ENERGY AUTHORITY
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
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