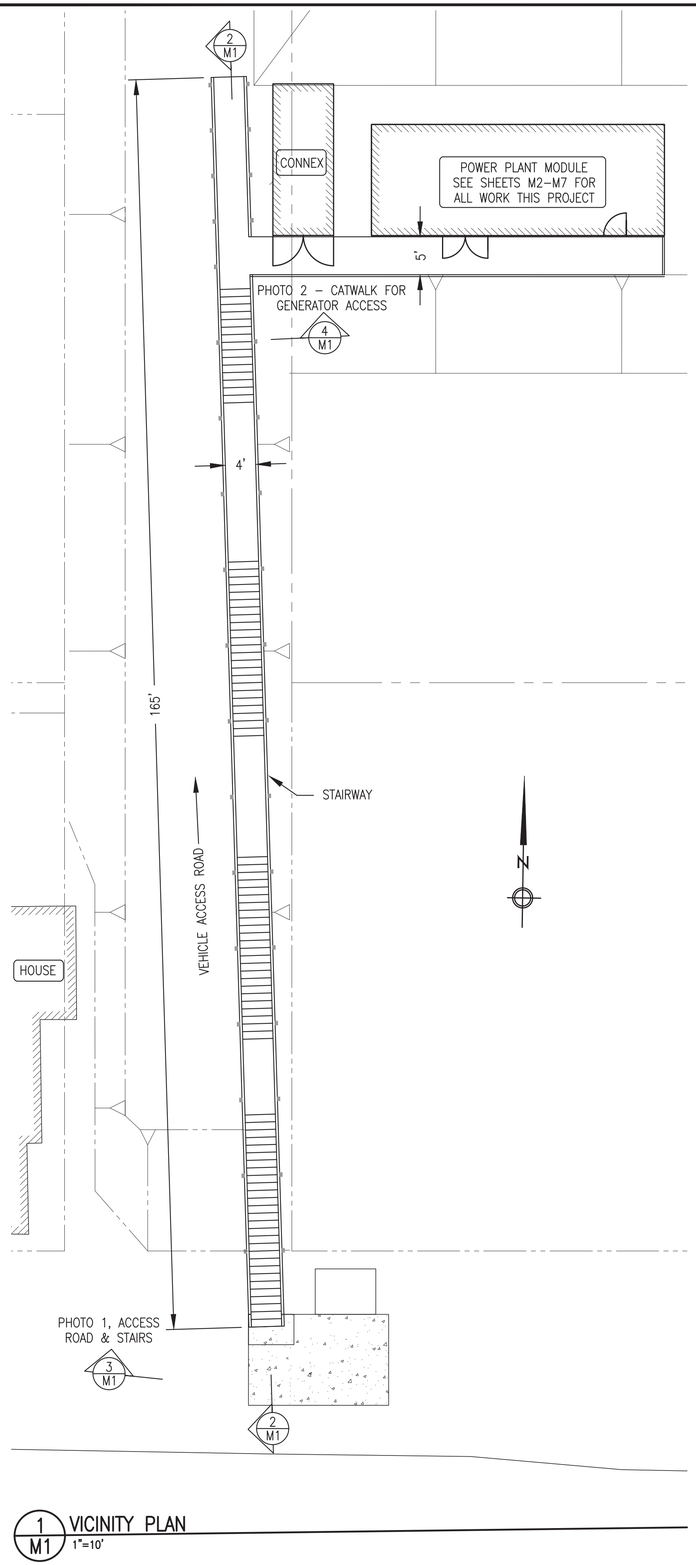
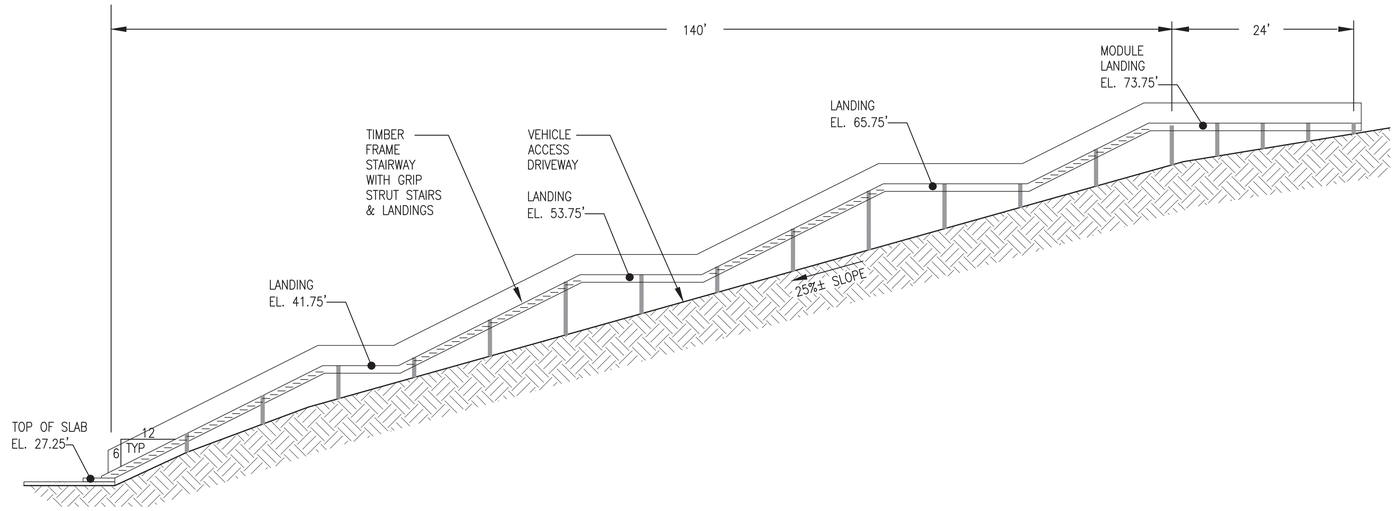


1 M1 VICINITY PLAN
1"=10'



2 M1 VEHICLE ACCESS DRIVEWAY AND STAIR PROFILE
1"=10'

3 M1 PHOTO 1 – ACCESS ROAD & STAIRS
NO SCALE

4 M1 PHOTO 2 – CATWALK FOR GENERATOR ACCESS
NO SCALE

SCHEDULE OF DRAWINGS:			
M1	POWER PLANT VICINITY PLAN & PHOTOS	E1	ELECTRICAL DEMOLITION & NEW WORK PLANS
M2	MECHANICAL DEMOLITION & NEW WORK PLANS	E2	TYPICAL GENERATOR INSTALLATION & DETAILS
M3	TYPICAL GENERATOR INSTALLATION & DETAILS	E3	12V ENGINE CONTROL WIRING JUNCTION BOX
M4	DAY TANK PIPING MODIFICATIONS	E4	DC CONTROLS SWITCHGEAR MODIFICATIONS
M5	ENGINE COOLING SYSTEM UPGRADES	E5	AC CONTROLS SWITCHGEAR MODIFICATIONS
M6	GENERATOR FABRICATION DETAILS		
M7	EXPANSION TANK ET–1 FABRICATION & INSTALLATION DETAILS		

ISSUED FOR CONSTRUCTION
MARCH 2024

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

ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA
POWER PLANT UPGRADE PROJECT

TITLE: POWER PLANT VICINITY PLAN & PHOTOS
& SCHEDULE OF DRAWINGS

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

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 3/7/24
FILE NAME: TENADERA M1–M7 | SHEET: M1
PROJECT NUMBER:

DEMOLITION GENERAL NOTES:

1. THIS PLANT PROVIDES PRIME POWER TO THE COMMUNITY OF TENAKEE SPRINGS. KEEP OUTAGES TO A MINIMUM AND COORDINATE ALL REQUIRED OUTAGES WITH THE UTILITY. NOTE THAT A MINIMUM OF TWO GENERATORS ARE REQUIRED TO BLACK START THE COMMUNITY SO TAKE ONLY ONE GENERATOR OFF LINE AT A TIME.
2. ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR REMOVAL. AREAS CONTAINING EXISTING EQUIPMENT AND PIPING TO BE REMOVED INDICATED BY HATCHING.
3. TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGE TO GENERATION EQUIPMENT BEING REMOVED DURING DEMOLITION EXCEPT ENGINE BLOCKS, SEE GENERAL NOTE 5. TARP GENERATORS AND SEAL ALL EXPOSED CONNECTIONS PRIOR TO REMOVING FROM PLANT. TURN ALL REMOVED EQUIPMENT OVER TO THE UTILITY FOR FINAL DISPOSITION.
4. DRAIN ALL PIPING PRIOR TO DEMOLITION. DRAIN ENGINE BLOCKS PRIOR TO REMOVAL. TURN USED OIL AND GLYCOL OVER TO THE UTILITY FOR FINAL DISPOSITION
5. RENDER EXISTING GEN #1 AND GEN #2 ENGINE BLOCKS UNUSABLE BY CUTTING A MINIMUM 3"x3" HOLE IN ENGINE CRANK CASE. FILL OUT A CERTIFICATE OF DESTRUCTION FOR EACH ENGINE AND INCLUDE PHOTOGRAPHIC DOCUMENTATION OF THE HOLE AND THE ASSOCIATED ENGINE NAMEPLATE.

DEMOLITION SPECIFIC NOTES:

BASE BID

1. REMOVE EXISTING GENSET IN ITS ENTIRETY ALONG WITH EXHAUST RISER PIPE FROM ENGINE TO MUFFLER AND TURN OVER TO UTILITY. MUFFLER AND OUTLET EXHAUST PIPING TO REMAIN IN PLACE.
2. REMOVE ALL EXISTING ENGINE COOLANT, PREHEAT, AND VENT HOSES AT GEN#1, GEN#2, GEN#3, AND ET-1. SEE SHEET M5.
3. SEE MECHANICAL NEW WORK.
4. SEE ELECTRICAL.
5. SEE ELECTRICAL.
6. SEE ELECTRICAL
7. SEE ELECTRICAL
8. SEE ELECTRICAL
9. SEE ELECTRICAL
10. SEE ELECTRICAL
11. SEE MECHANICAL NEW WORK

ADDITIVE ALTERNATE #1

A1. DRAIN COOLANT SYSTEM. SEE SHEET M5.

ADDITIVE ALTERNATE #2

A2. REMOVE EXPANSION TANK AND ACCESSORIES FOR REPLACEMENT. SEE SHEET M5.

ADDITIVE ALTERNATE #3

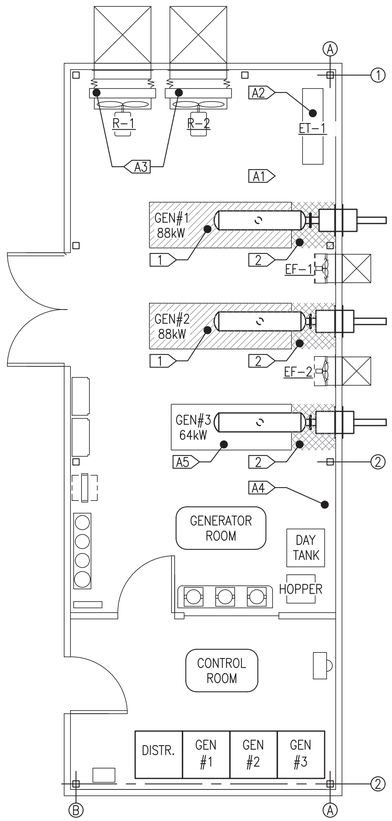
A3. REMOVE 4 EACH BUTTERFLY VALVES. SEE SHEET M5.

ADDITIVE ALTERNATE #4

A4. PERFORM DEMOLITION FOR DAY TANK PIPING MODIFICATIONS. SEE SHEET M4.

ADDITIVE ALTERNATE #5

A5. REMOVE EXISTING CRANKCASE BREATHER FILTER AND HOSES.



1 M2 DEMOLITION PLAN & NOTES
1/4"=1'-0"

NEW WORK GENERAL NOTES:

1. EXISTING EQUIPMENT AND PIPING TO REMAIN IN SERVICE SHOWN WITH LIGHT DASHED LINES.
2. NEW EQUIPMENT AND PIPING TO BE INSTALLED SHOWN WITH DARK SOLID LINES.
3. UNDER BASE BID FURNISH 20 GALLONS OF NEW EXTENDED LIFE ETHYLENE GLYCOL SOLUTION PRE-MIXED TO A RATIO OF 50% GLYCOL TO 50% WATER. NOTE THAT UNDER ADDITIVE ALTERNATE #1 THIS QUANTITY IS DELETED.

NEW WORK SPECIFIC NOTES:

BASE BID

1. INSTALL COMPLETE NEW GENSET INCLUDING COOLANT, FUEL, AND EXHAUST. SEE SHEET M3 FOR GENSET INSTALLATION DETAILS.
2. REPLACE ALL EXISTING ENGINE COOLANT, PREHEAT, AND VENT HOSES AT GEN#1, GEN#2, GEN#3, & ET-1. SEE SHEET M5.
3. INSTALL NEW CRANK VENT CONDENSATE TRAP, HOSE, AND PIPING. SEE SHEET M3.
4. SEE ELECTRICAL
5. SEE ELECTRICAL
6. SEE ELECTRICAL
7. SEE ELECTRICAL
8. SEE ELECTRICAL
9. SEE ELECTRICAL
10. SEE ELECTRICAL
11. INSTALL DECALS AS INDICATED. SEE THIS SHEET FOR DECAL SCHEDULE.

ADDITIVE ALTERNATE #1

A1. FLUSH COOLANT SYSTEM, CLEAN RADIATORS, AND REPLACE GLYCOL. SEE SHEET M5.

ADDITIVE ALTERNATE #2

A2. INSTALL NEW EXPANSION TANK AND ACCESSORIES. SEE SHEET M5.

ADDITIVE ALTERNATE #3

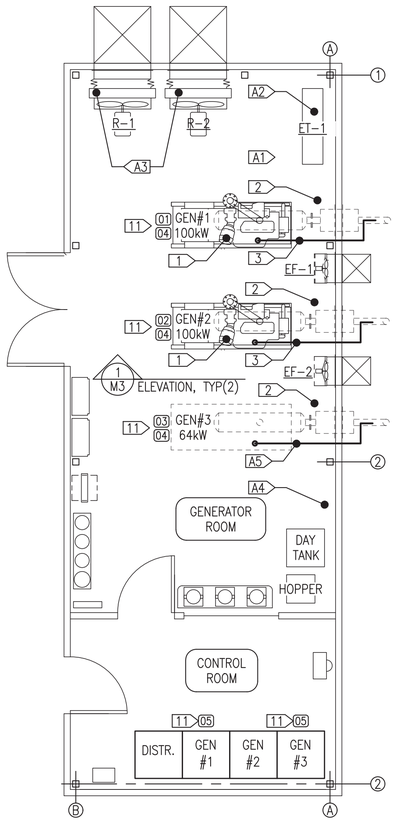
A3. INSTALL 4 EACH NEW BUTTERFLY VALVES. SEE SHEET M5.

ADDITIVE ALTERNATE #4

A4. PERFORM DAY TANK PIPING MODIFICATIONS. SEE SHEET M4.

ADDITIVE ALTERNATE #5

A5. INSTALL NEW OVERHEAD STRUT RACK, CRANK VENT CONDENSATE TRAP, HOSE, AND PIPING. SEE SHEET M3, SIMILAR WITHOUT ENGINE CONTROL J-BOX.



2 M2 NEW WORK PLAN & NOTES
1/4"=1'-0"

ENGINE GENERATOR SCHEDULE

GENSET	DESCRIPTION
GEN #1 (NEW)	ENGINE – 148 HP, 100 EKW PRIME, JOHN DEERE 4045AFM85, TIER 3 MARINE. 12 VDC STARTING & CONTROL. GENERATOR – MINIMUM 125 KW CONTINUOUS AT 105°C RISE, NEWAGE/STAMFORD UCI274E.
GEN #2 (NEW)	ENGINE – 148 HP, 100 EKW PRIME, JOHN DEERE 4045AFM85, TIER 3 MARINE. 12 VDC STARTING & CONTROL. GENERATOR – MINIMUM 125 KW CONTINUOUS AT 105°C RISE, NEWAGE/STAMFORD UCI274E.
GEN #3 (EXISTING)	ENGINE – 110 HP, 66 EKW PRIME, JOHN DEERE 4045TF150, NON-TIER. 12 VDC STARTING & CONTROL. GENERATOR – MINIMUM 64 KW CONTINUOUS AT 105°C RISE, MARATHON 362CSL1604.

FUEL SYSTEM EQUIPMENT SCHEDULE

SYMBOL	SERVICE	DESCRIPTION	MANUFACTURER/MODEL
F-DT	DAY TANK FILTER	THREE FILTER BANK WITH INDIVIDUAL FILTER ISOLATION VALVES, 3/4" NPT FEMALE INLET & OUTLET CONNECTION ADAPTERS, IMPACT RESISTANT "SEE-THRU" BOWLS, 15 PSIG WORKING PRESSURE. INSTALL 3 EACH 10 MICRON AQUABLOC FILTER ELEMENTS & FURNISH 3 SPARES.	RACOR TURBINE 791000FV10 WATER-IN-FUEL RR30880E ELEMENTS 2020V10

INSTRUMENTATION SCHEDULE

SYMBOL	SERVICE	DESCRIPTION	MANUFACTURER/MODEL
LCA	GLYCOL TANK LOW COOLANT ALARM	LOW COOLANT LEVEL ALARM FLOAT SWITCH	MURPHY EL-150-K1

DECAL SCHEDULE:

01. "GEN#1 100KW", 3"x5"
02. "GEN#2 100KW", 3"x5"
03. "GEN#3 64KW", 3"x5"
04. "CAUTION: THIS UNIT STARTS AUTOMATICALLY, LOCK & TAG OUT PRIOR TO SERVICE", 10"x14"
05. "DANGER HIGH VOLTAGE, AUTHORIZED PERSONNEL ONLY", 10x14"

DECALS TO BE WHITE NON-REFLECTIVE VINYL BACKGROUND, 3M 3650-10, WITH 3M SERIES 225 HIGH PERFORMANCE VINYL LETTERS, ONE SIDE ONLY, SELF ADHESIVE BACK. SIZE AS INDICATED WITH LETTER SIZE ADJUSTED TO FILL DECAL. WARNING LITES OR EQUAL. APPLY DECALS TO SMOOTH SURFACES OF DOORS, EQUIPMENT, OR ON ADJACENT WALL. ENSURE SURFACE IS CLEAN AND DRY PRIOR TO APPLICATION. USE HEAT GUN AS REQUIRED.

ISSUED FOR CONSTRUCTION
MARCH 2024

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

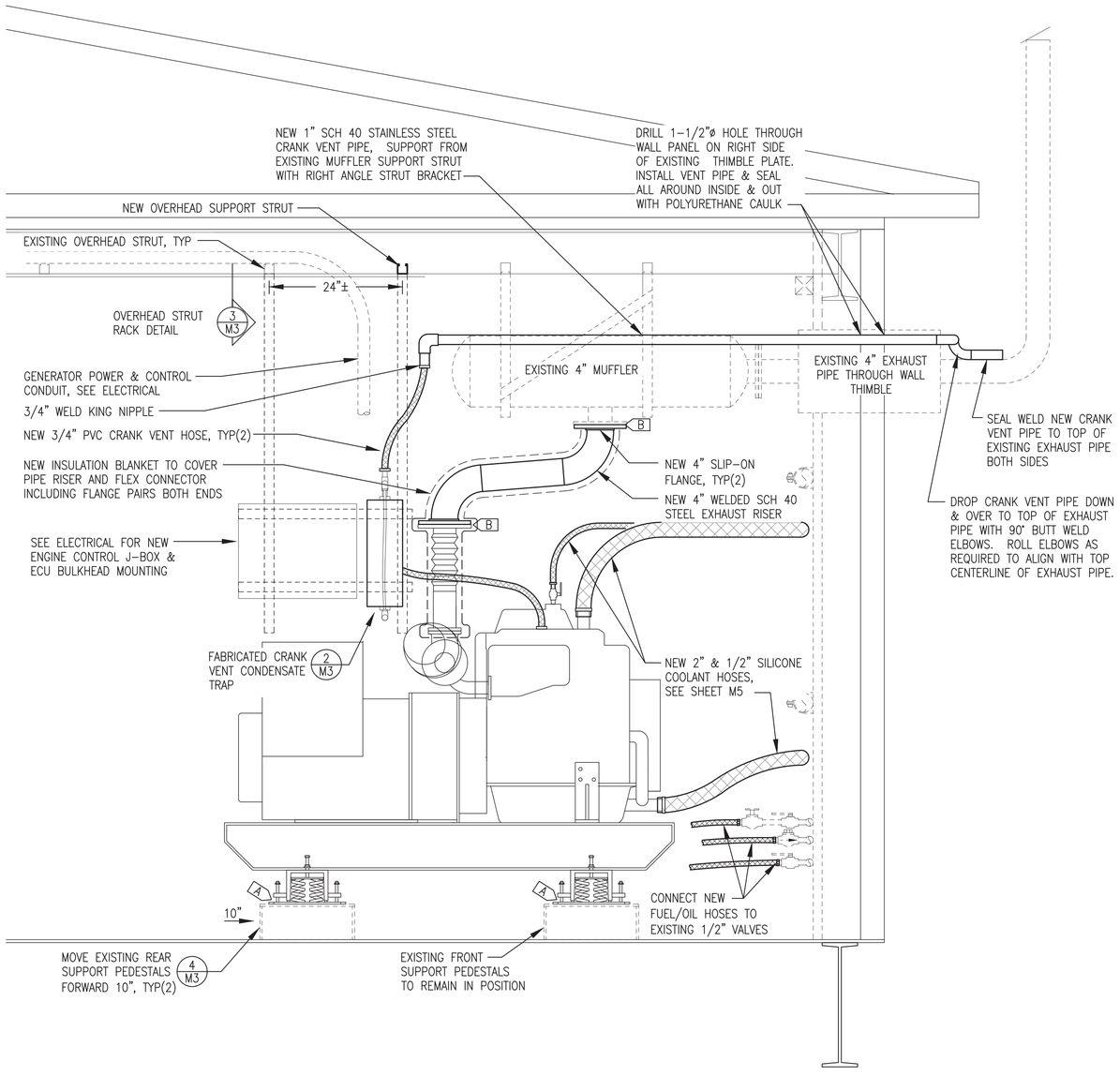
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: MECHANICAL DEMOLITION & NEW WORK PLANS

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

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 3/7/24
FILE NAME: TENADERA M1-M7 | SHEET: M2
PROJECT NUMBER:



1 M3 GEN#1 & GEN#2 INSTALLATION ELEVATION
1"=1'-0"

GENERATOR INSTALLATION GENERAL NOTES:

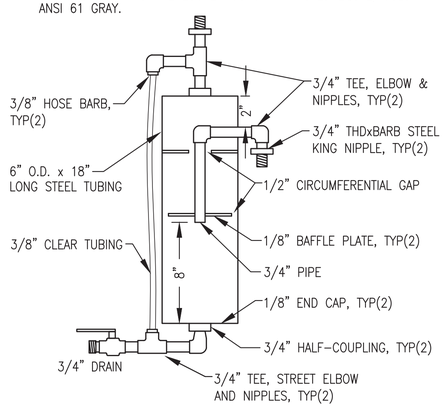
1. EXISTING EQUIPMENT AND PIPING TO REMAIN IN SERVICE SHOWN WITH LIGHT DASHED LINES.
2. NEW EQUIPMENT AND PIPING TO BE INSTALLED SHOWN WITH DARK SOLID LINES UNLESS SPECIFICALLY INDICATED OTHERWISE.
3. ALL EXHAUST AND CRANK VENT PIPING SCHEDULE 40 STEEL WITH BUTT WELD JOINTS, SIZE AS INDICATED.
4. NOT ALL COOLANT PIPE, HOSE AND FITTINGS SHOWN FOR CLARITY, SEE PIPING ISOMETRIC 1/M4 FOR ADDITIONAL DETAILS.

GENERATOR INSTALLATION SPECIFIC NOTES:

A PLACE GENERATOR ON EXISTING AND MODIFIED SUPPORT PEDESTALS AND CENTER VIBRATION ISOLATORS. DRILL NEW HOLES IN PEDESTALS AS REQUIRED AND FASTEN WITH 1/2" BOLTS. ADJUST SPRING VIBRATION ISOLATOR LEVELING BOLTS TO ACHIEVE A UNIFORM INSTALLATION HEIGHT OF APPROXIMATELY 5-3/4" THEN TIGHTEN LOCKING NUTS. ADJUST NUTS ON STABILIZER BOLTS TO ACHIEVE A UNIFORM CLEARANCE OF APPROXIMATELY 1/8" THEN TIGHTEN LOCKING NUTS. VERIFY UNIT MOVES FREELY ON ISOLATORS.

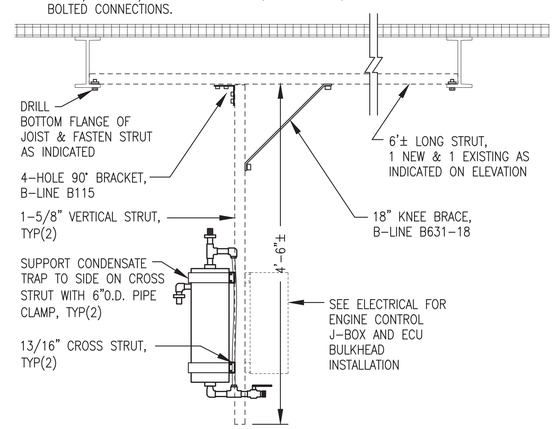
B AFTER ADJUSTING ISOLATORS, FABRICATE EXHAUST RISER FROM NEW FLEX TO EXISTING MUFFLER. LEAVE APPROXIMATE 1/8" GAP PRIOR TO FLANGE BOLT UP FOR THERMAL EXPANSION. INSTALL WITH NEW HIGH TEMP FLANGE GASKETS, NEW BOLT SETS, AND NEW INSULATION BLANKET AS INDICATED.

NOTES:
1. ALL PIPE & FITTINGS 3/4" THREADED UNLESS INDICATED OTHERWISE.
2. UPON COMPLETION OF FABRICATION, ROUND ALL CORNERS AND SHARP EDGES. SANDBLAST OR WIRE BRUSH EXTERIOR TO REMOVE ALL SCALE, SLAG, RUST, ETC. PRIME AND TOP COAT WITH TWO COATS EPOXY, PPG AMERLOC 2 VOC OR APPROVED EQUAL, COLOR ANSI 61 GRAY.



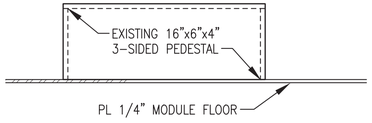
2 M3 CONDENSATE TRAP FABRICATION
NO SCALE

NOTES:
1. ONE SUPPORT SHOWN. PROVIDE TWO IDENTICAL SUPPORTS FOR EACH STRUT RACK.
2. USE 1/2" OR 3/8" HEX HEAD BOLTS, STRUT NUTS, AND LOCK WASHERS FOR ALL BOLTED CONNECTIONS.



3 M3 OVERHEAD STRUT RACK DETAIL
NO SCALE

NOTES:
1. THE EXISTING PEDESTAL IS WELDED TO THE FLOOR PLATE ON 3 SIDES. CUT COMPLETELY LOOSE FROM FLOOR & GRIND WELDS FLUSH.
2. MOVE PEDESTAL FORWARD 10" TO ALIGN WITH NEW GENERATOR. ATTACH TO FLOOR WITH CONTINUOUS FILLET WELD ALL AROUND.
3. AFTER WELDING, GRIND SMOOTH AND WIRE BRUSH AFFECTED WELD AREAS TO REMOVE SLAG AND SHARP EDGES.



4 M3 SUPPORT PEDESTAL RELOCATION
NO SCALE

ISSUED FOR CONSTRUCTION
MARCH 2024

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

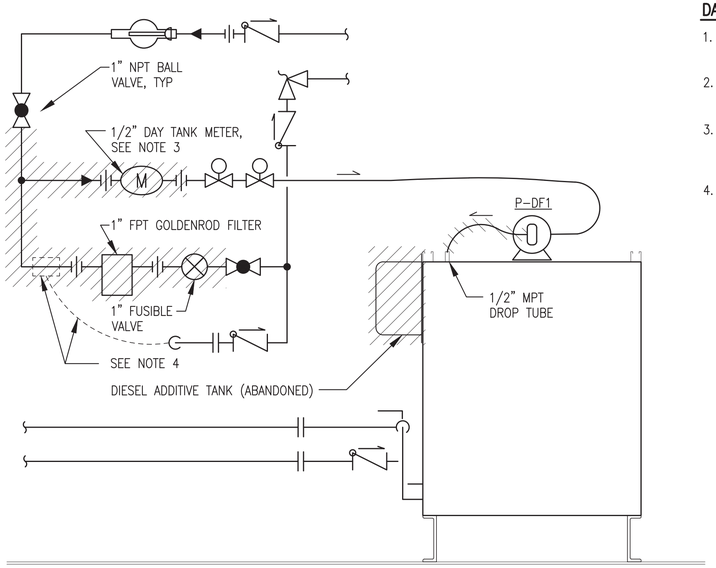
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: TYPICAL GENERATOR INSTALLATION & DETAILS

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

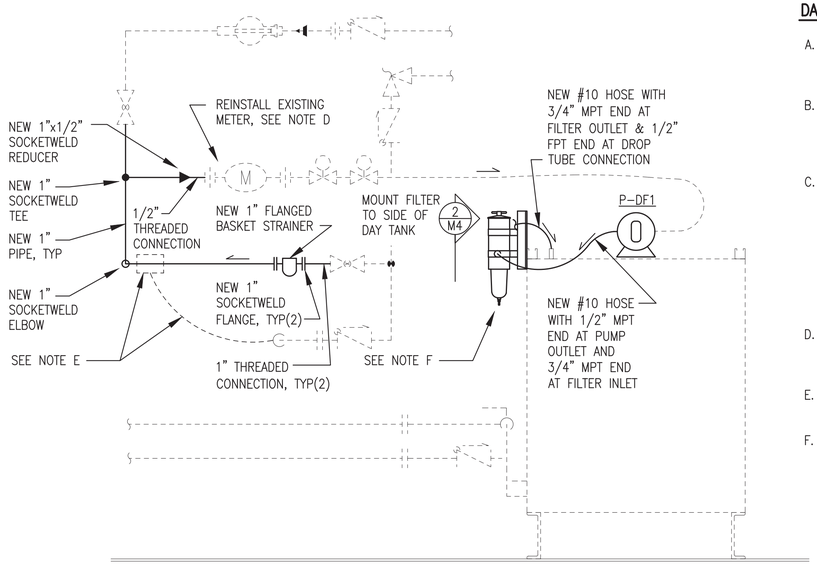
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 3/7/24
FILE NAME: TENADERA M1-M7	SHEET: M3
PROJECT NUMBER:	



DEMOLITION

DAY TANK PIPING DEMOLITION NOTES:

1. ALL DAY TANK PIPING NOT SHOWN FOR CLARITY. SEE 2007 RECORD DRAWINGS FOR COMPLETE INSTALLATION
2. ALL EXISTING FUEL SYSTEM EQUIPMENT, PIPE, HOSE & FITTINGS TO BE REMOVED SHOWN HATCHED.
3. CAREFULLY REMOVE DAY TANK METER WITH INTEGRAL 1/2" THREADED UNIONS, PROTECT FROM DAMAGE, AND SAVE FOR REINSTALLATION.
4. CAREFULLY REMOVE EXISTING CHROMALOX HEAT TRACE CONTROLLER FROM PIPE AND PROTECT FROM DAMAGE, AND SAVE FOR REINSTALLATION.



NEW WORK

DAY TANK & PIPING NEW WORK NOTES

A. ALL DAY TANK PIPING NOT SHOWN FOR CLARITY. SEE 2007 RECORD DRAWINGS FOR COMPLETE INSTALLATION.

B. ALL EXISTING FUEL PIPING AND PLANT EQUIPMENT SHOWN WITH LIGHT-DASHED LINES. ALL NEW FUEL SYSTEM PIPING & EQUIPMENT SHWON WITH DARK-SOLID LINES.

C. ALL NEW PIPING 1" SCH 80 STEEL. INSTALL WITH SOCKET WELD CONNECTIONS EXCEPT FOR THREADED CONNECTIONS TO VALVES AND EQUIPMENT AS INDICATED. CAREFULLY INSPECT ALL NEW AND EXISTING THREADED ENDS. CLEAN AND RECONDITION THREADS AS REQUIRED. THOROUGHLY COAT MALE PIPE ENDS WITH TEFLON TAPE AND TEFLON PIPE JOINT COMPOUND PRIOR TO ASSEMBLING.

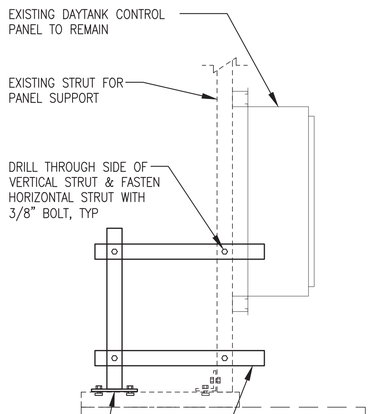
D. THOROUGHLY INSPECT AND CLEAN METER CONNECTION UNIONS AND CAREFULLY REINSTALL METER TO ELIMINATE FUEL DRIPS.

E. REINSTALL EXISTING CHROMALOX HEAT TRACE CONTROLLER ON NEW PIPE.

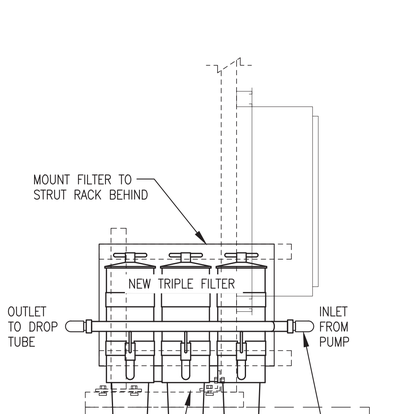
F. INSTALLATION OF THE FILTER WILL TEMPORARILY DISRUPT FUEL SUPPLY TO THE POWER PLANT. PRIOR TO INSTALLING COORDINATE WITH THE PLANT OPERATOR TO ENSURE ADEQUATE FUEL SUPPLY TO KEEP POWER ON.

1/M4 DAY TANK PIPING MODIFICATIONS

NO SCALE



STRUT SUPPORT RACK



FILTER INSTALLATION

2/M4 NEW TRIPLE FILTER INSTALLATION ON DAY TANK LEFT SIDE

NO SCALE

ISSUED FOR CONSTRUCTION MARCH 2024

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

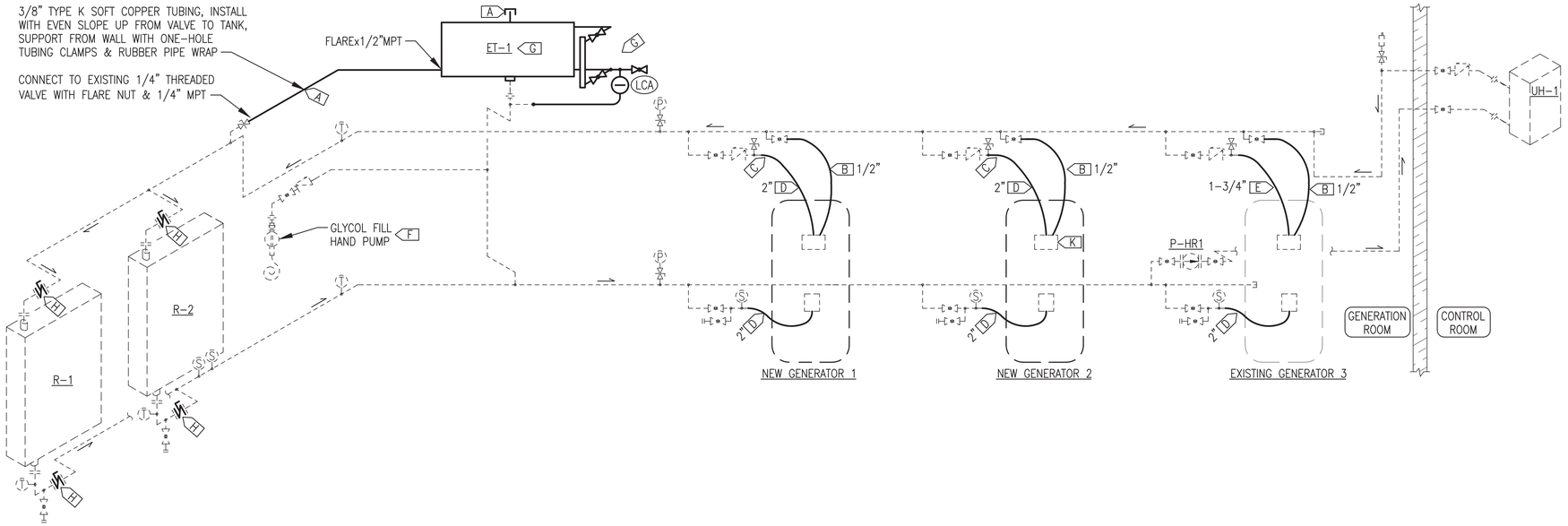
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: DAY TANK PIPING MODIFICATIONS

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

DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 3/7/24
FILE NAME: TENADERA M1-M7	SHEET: M4
PROJECT NUMBER:	



1 M5 COOLING SYSTEM PIPING ISOMETRIC
NO SCALE

ADDITIVE ALTERNATE #1 ENGINE COOLING SYSTEM FLUSH & GLYCOL REPLACEMENT INSTRUCTIONS

ENGINE COOLING SYSTEM GLYCOL REPLACEMENT GENERAL NOTES:

1. THIS ENTIRE ENGINE COOLING SYSTEM GLYCOL REPLACEMENT PROCEDURE WILL BE PERFORMED WITH EXISTING (OLD) GENSETS PRIOR TO PERFORMING BASE BID COOLING SYSTEM UPGRADE & INSTALLING NEW GENSETS.
2. ENGINE COOLANT SYSTEM VOLUME IS APPROXIMATELY 90 GALLONS. PROVIDE A MINIMUM OF 4 EACH EMPTY 55 GALLON DRUMS TO CONTAIN CONTAMINATED COOLANT AND CLEANING SOLUTION.
3. FURNISH 2 EACH 55 GALLON DRUMS OF NEW EXTENDED LIFE ETHYLENE GLYCOL SOLUTION PRE-MIXED TO A RATIO OF 50% GLYCOL TO 50% WATER.
4. PLAN WORK TO MINIMIZE OUTAGES AND SCHEDULE ALL OUTAGES IN ADVANCE WITH THE UTILITY.
5. WHEN DRAINING FLUID AS NOTED BELOW, DRAIN FROM ALL LOW POINTS AND USE LOW PRESSURE AIR AS REQUIRED TO CLEAR ISOLATED SECTIONS.
6. TURN OVER DRUMS OF USED GLYCOL AND CLEANING SOLUTION TO UTILITY FOR FINAL DISPOSITION.

STEP 1: ENGINE COOLING SYSTEM DRAIN/CLEAN

7. TAKE COMMUNITY OUTAGE. SHUT DOWN AND LOCK/TAG OUT ALL GENSETS. TURN OFF PUMP P-HR1.
8. DRAIN THE EXISTING COOLANT INTO DRUMS AND TURN OVER TO UTILITY.
9. REMOVE ALL GENSET THERMOSTATS TO ENSURE FULL FLOW IN PIPING FROM ENGINE WATER PUMPS.
10. FILL SYSTEM WITH FRESH WATER AND HEAVY DUTY ALKYLINE-BASED ENGINE CLEANING SOLUTION, CUMMINS FLEETGUARD RESTORE, OR EQUAL, 1 GALLON PER 10 GALLONS OF FRESH WATER.
11. TO PROVIDE MAXIMUM CIRCULATION OF THE CLEANING SOLUTION WHILE FLUSHING MANUALLY PARALLEL GEN#3 WITH GEN#1 OR GEN#2. TURN ON PUMP P-HR1. SWAP GEN #2 AND GEN #1 TO RUN FOR APPROXIMATELY EQUAL TIME. BRING SYSTEM UP TO OPERATING TEMPERATURE AND OPERATE FOR 24 HOURS MINIMUM.
12. WHILE CIRCULATING COOLING SYSTEM CLEANING SOLUTION, VALVE OFF AND SHUT DOWN EACH RADIATOR ONE AT A TIME SO THAT EACH RADIATOR GETS 4 HOURS OF STAND-ALONE RUN TIME. DURING EACH 4 HOUR RADIATOR SHUT DOWN PERIOD LOCK/TAG OUT THE MOTOR, WRAP/TAPE MOTOR WATER TIGHT IN PLASTIC SHEET, AND PRESSURE WASH RADIATOR AIR SURFACES TO REMOVE ALL DEBRIS. AFTER WASHING BOTH RADIATORS CONTINUE TO RUN FOR AN ADDITIONAL 2 HOURS WITH BOTH RADIATORS IN SERVICE.
13. SHUT DOWN ALL GENERATORS AND LOCK/TAG OUT. TURN OFF PUMP P-HR1.

STEP 2: ENGINE COOLING SYSTEM DRAIN/FLUSH/DRAIN

14. IMMEDIATELY DRAIN THE USED CLEANING SOLUTION FROM THE SYSTEM TO AVOID SETTLING OUT SOLIDS. DRAIN INTO DRUMS AND TURN OVER TO UTILITY.
15. FILL SYSTEM WITH FRESH WATER.
11. MANUALLY PARALLEL GEN#3 WITH GEN#1 OR GEN#2. TURN ON PUMP P-HR1. BRING SYSTEM UP TO OPERATING TEMPERATURE AND OPERATE FOR 2 HOURS MINIMUM WITH ONE HOUR MINIMUM ON GEN #2 AND GEN #1. CAREFULLY INSPECT THE ENTIRE SYSTEM FOR ANY LEAKS WHILE FLUSHING. IF ANY LEAKS ARE DETECTED, SHUT OFF GENERATORS, REPAIR AS REQUIRED, AND BEGIN THIS STEP OVER.
12. SHUT DOWN ALL GENERATORS AND LOCK/TAG OUT. TURN OFF PUMP P-HR1.
13. DRAIN THE WATER.

STEP 3: ENGINE COOLING SYSTEM FILL/COMMISSION

14. VALVE OFF AND LOCK/TAG OUT EXISTING GEN#1 IN PREPARATION FOR DEMOLITION.
15. SEE SPECIFIC NOTE G FOR ALL WORK ASSOCIATED WITH ADDITIVE ALTERNATE #2 "EXPANSION TANK AND ACCESSORIES REPLACEMENT".
16. SEE SPECIFIC NOTE H FOR ALL WORK ASSOCIATED WITH ADDITIVE ALTERNATE #3 "BUTTERFLY VALVE REPLACEMENT".
17. REINSTALL EXISTING ENGINE THERMOSTAT WITH NEW GASKET ON EXISTING GEN#3, SEE TABLE THIS SHEET FOR ENGINE SERIAL NUMBER FOR THERMOSTAT GASKET PART NUMBER CROSS REFERENCE.
18. FILL SYSTEM WITH NEW 50% EXTENDED LIFE ETHYLENE GLYCOL SOLUTION.
19. MANUALLY PARALLEL GEN#2 AND GEN#3 TO PROVIDE COOLING SYSTEM FINAL TEST WHILE POWERING THE COMMUNITY. TURN ON PUMP P-HR1. BRING SYSTEM UP TO OPERATING TEMPERATURE. CAREFULLY PURGE ALL AIR FROM SYSTEM AND INSPECT THE ENTIRE SYSTEM FOR ANY LEAKS. ENSURE THAT COOLANT LEVEL IS ABOVE 50% ON EXPANSION TANK SITE GAUGE AND SYSTEM PRESSURE IS 8 PSIG MINIMUM AT CONCLUSION OF TEST.
20. PUT THE SWITCHGEAR BACK IN AUTOMATIC SYSTEM MODE TO SHUT DOWN ONE ENGINE IN ACCORDANCE WITH DEMAND CONTROL.

ADDITIVE ALTERNATE #2 EXPANSION TANK AND ACCESSORIES SPECIFIC NOTES:

G WHILE SYSTEM IS DRAINED DOWN, REPLACE EXISTING EXPANSION TANK AND ACCESSORIES WITH COMPLETE NEW NEW EXPANSION TANK ASSEMBLY, SEE INSTALLATION DETAIL 1/M7.

ADDITIVE ALTERNATE #3 BUTTERFLY VALVE REPLACEMENT SPECIFIC NOTES:

H WHILE SYSTEM IS DRAINED DOWN, REPLACE EXISTING 3" BUTTERFLY VALVE, 4 TOTAL. SEE SPECIFICATIONS FOR NEW HIGH PERFORMANCE ETHYLENE GLYCOL SERVICE BUTTERFLY VALVES.

GEN#3 DIESEL ENGINE MODEL & SERIAL NUMBER

EXISTING GEN#3 ENGINE	JOHN DEERE MODEL 4045TF150, SERIAL # PE4045T463807

COOLING SYSTEM UPGRADES GENERAL NOTES:

1. EXISTING ENGINE COOLING SYSTEM PIPING AND DEVICES TO REMAIN UNCHANGED SHOWN WITH LIGHT DASHED LINES.
2. PIPING MODIFICATIONS AND NEW HOSES SHOWN WITH DARK SOLID LINES.
3. PERFORM TASKS UNDER BASE BID OR AWARDED ADDITIVE ALTERNATES AS INDICATED BY SPECIFIC NOTES.
4. PERFORM BASE BID HOSE REPLACEMENTS, TASKS B THROUGH E ON EACH NEW GENSET ONE AT A TIME DURING INSTALLATION, FIRST ON NEW GEN#1 WHILE POWERING COMMUNITY ON EXISTING (OLD) GEN#2 AND THEN ON NEW GEN#2 WHILE POWERING THE COMMUNITY ON NEW GEN#1. PERFORM BASE BID TASKS ON GEN#3 AFTER COMPLETION OF GEN#1 AND GEN#2 INSTALLATIONS.
5. THIS WORK WILL LIKELY REQUIRE MULTIPLE POWER OUTAGES. PLAN WORK TO MINIMIZE OUTAGES AND SCHEDULE ALL OUTAGES IN ADVANCE WITH THE UTILITY. NOTE THAT A MINIMUM OF TWO GENERATORS ARE REQUIRED TO BLACK START THE COMMUNITY SO TAKE ONLY ONE GENERATOR OFF LINE AT A TIME.

BASE BID COOLING SYSTEM UPGRADES SPECIFIC NOTES:

A NOTE: IF ADDITIVE ALTERNATE #1 "COOLANT SYSTEM FLUSH & GLYCOL REPLACEMENT" IS AWARDED, PERFORM THIS TASK WHILE COOLING SYSTEM IS DRAINED DOWN. OTHERWISE TAKE SHORT OUTAGE AS NECESSARY TO REPLACE COOLANT SYSTEM VENT AND PRESSURE CAP AS INDICATED ON ISOMETRIC. PROVIDE NEW 3/8" SOFT COPPER VENT LINE WITH FLARE BY 1/4" AND 1/2" FOR CONNECTION TO VALVE AND ET-1. PROVIDE NEW 2" MPT FILLER NECK ADAPTER AND 12 PSI MIN TO 15 PSI MAX PRESSURE CAP. SEE DETAIL 1/M7 SIMILAR.

B REPLACE ENGINE VENT/PREHEAT HOSE WITH NEW 1/2" SILICONE HOSE AND CLAMPS. CONNECT ONE END TO EXISTING 3/4" BALL VALVE ON COOLING MANIFOLD WITH 3/4" MPT x 1/2" BARB BRASS KING NIPPLE. CONNECT OTHER END TO 1/2" BARB KING NIPPLE ON ENGINE. NOTE ON GEN #3 PROVIDE NEW 1/4"MPTx1/2" BARB BRASS KING NIPPLE.

C REPLACE EXISTING 2"MPTx1-3/4" CUSTOM CRIMP BARBED KING NIPPLE WITH NEW 2"MPTx2" BARBED KING NIPPLE.

D REPLACE EXISTING ENGINE HOSE WITH NEW 2" SILICONE HOSE AND CLAMPS.

E REPLACE GEN#3 ENGINE DISCHARGE HOSE WITH NEW 1-3/4" SILICONE HOSE AND CLAMPS.

F FURNISH 2 EACH 5 GALLON PAILS OF NEW EXTENDED LIFE ETHYLENE GLYCOL SOLUTION PRE-MIXED TO A RATIO OF 50% GLYCOL TO 50% WATER (10 GALLONS TOTAL MIX).

ISSUED FOR CONSTRUCTION MARCH 2024

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

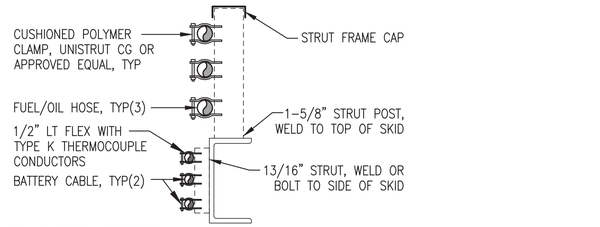
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

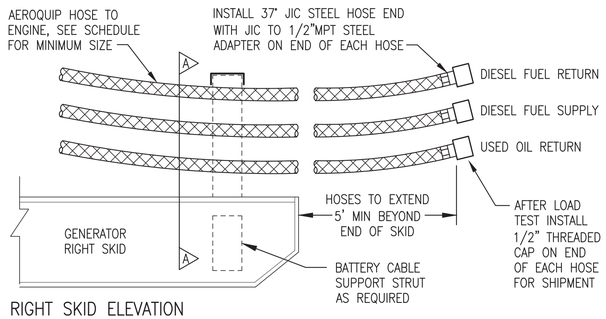
TITLE: ENGINE COOLING SYSTEM UPGRADES

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

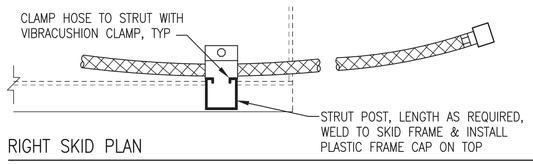
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 3/7/24
FILE NAME: TENADERA M1-M7 | SHEET: M5
PROJECT NUMBER:



RIGHT SKID SECTION A–A



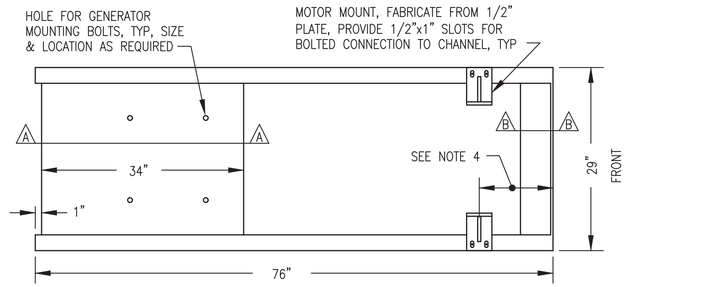
RIGHT SKID ELEVATION



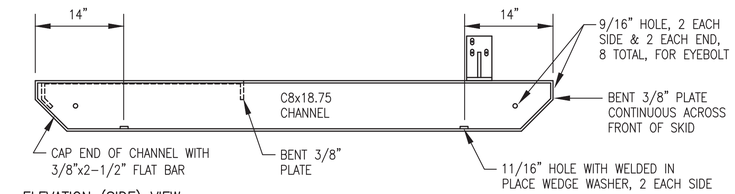
RIGHT SKID PLAN

1 M6 FUEL & OIL HOSE TERMINATIONS

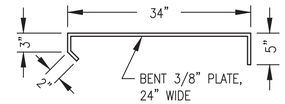
NO SCALE



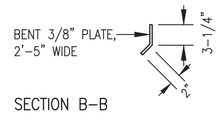
PLAN (TOP) VIEW



ELEVATION (SIDE) VIEW



SECTION A–A



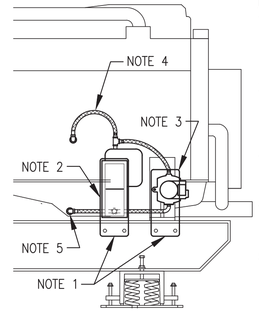
SECTION B–B

NOTES:

1) FABRICATE FROM ASTM A–36 STEEL. BEND PLATES & CUT ENDS OF CHANNELS AT 90° & 45° AS SHOWN.
2) EXCEPT WHERE INDICATED AS BOLTED MAKE ALL CONNECTIONS WITH CONTINUOUS WELDS (FILLET OR FULL–PENETRATION GROOVE AS REQUIRED) IN ACCORDANCE WITH CURRENT AWS STANDARD CODE.
3) ROUND ALL CORNERS & GRIND WELDS SMOOTH AFTER FABRICATION. PAINT TO MATCH ENGINE–GENERATOR.
4) PLACE ENGINE ON SKID SO THAT THE CENTERLINE OF THE EXHAUST RISER IS 39" FROM THE FRONT OF THE SKID.

2 M6 GEN#1 & GEN#2 (JOHN DEERE 4045) SKID DESIGN

NO SCALE



NOTES:

1) 1/4" STEEL SUPPORT PLATE(S) PRE–DRILLED TO MATCH GAUGE & SWITCH MOUNTS AND BOTTOM HOSE ENTRANCE. BOLT TO INSIDE (BACK) OF CHANNEL SKID AT HEIGHT AS REQUIRED TO CENTER GAUGE AT NORMAL FULL OIL LEVEL.
2) MOUNT MURPHY L129CK1 OIL LEVEL SITE GAUGE/SWITCH TO STEEL SUPPORT PLATE WITH RUBBER SHOCK MOUNTS. ADJUST SWITCH CONTACTS TO 1/2" ABOVE AND BELOW NORMAL FULL LEVEL. PAINT MARK A RED LINE AT BOTH SWITCH LEVELS.
3) MOUNT MURPHY EL150K1 OIL LEVEL SWITCH TO STEEL SUPPORT PLATE WITH RUBBER SHOCK MOUNTS. ALIGN SWITCH TRIP POINT 3/4" BELOW NORMAL OIL FULL.
4) CONNECT TOP (VENT) PORT TO ENGINE CRANK CASE WITH #8 HOSE WITH NPT JIC SWIVEL ENDS. ROUTE UPPER HOSE WITH HIGH POINT 4" MIN ABOVE TOP OF SITE GAUGE.
5) CONNECT BOTTOM PORT TO ENGINE OIL PAN WITH #8 HOSE WITH NPT JIC SWIVEL ENDS. DO NOT TEE INTO OIL DRAIN LINE. ROUTE LOWER HOSE BACK THROUGH PRE–DRILLED HOLE IN STEEL PLATE.

3 M6 OIL LEVEL GAUGE/SWITCH INSTALLATION

NO SCALE

ISSUED FOR CONSTRUCTION MARCH 2024

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

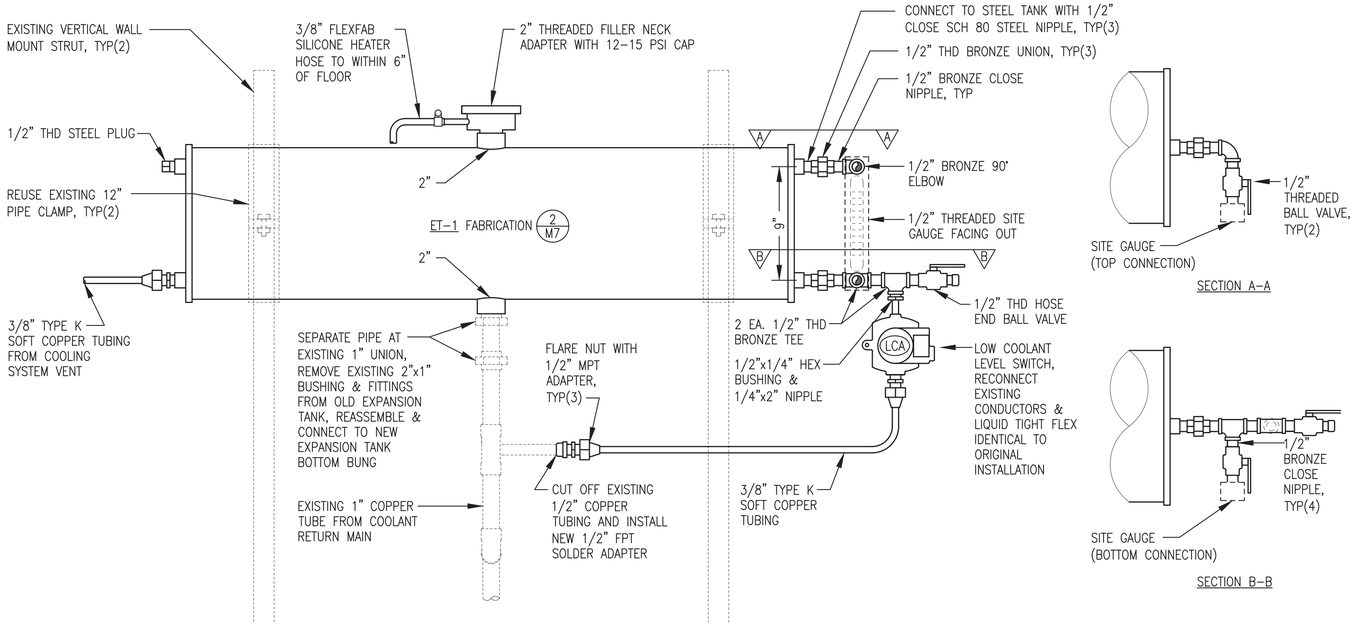
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: GENERATOR FABRICATION DETAILS

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

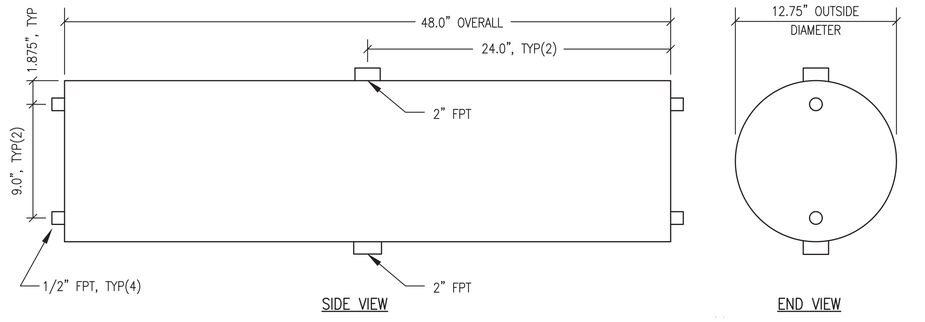
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: BCG	DATE: 3/7/24
FILE NAME: TENADERA M1–M7	SHEET: M6
PROJECT NUMBER:	



1/M7 24 GALLON EXPANSION TANK ET-1 INSTALLATION
NO SCALE

EXPANSION TANK GENERAL NOTES:

1) FABRICATE SINGLE WALL 24 GALLON NOMINAL CAPACITY GLYCOL EXPANSION TANK.
2) FABRICATE SHELL FROM MINIMUM 10 GAUGE ASTM A-36 PLATE STEEL ROLLED AND WELDED OR SCHEDULE 5 LIGHTWALL ASTM A53 STEEL PIPE. FABRICATE HEADS FROM 3/16" THICK ASTM A-36 PLATE STEEL. MAKE ALL JOINTS WITH CONTINUOUS FULL-PENETRATION WELDS.
3) PROVIDE WITH ALL OPENINGS INDICATED USING MINIMUM 3000# FORGED STEEL PIPE HALF COUPLINGS IN ACCORDANCE WITH U.L 142 FIGURE 7.1 #2.
4) PRESSURE TEST COMPLETED ASSEMBLY TO 15 PSIG MINIMUM.
5) UPON COMPLETION OF FABRICATION, ROUND ALL CORNERS AND SHARP EDGES. SANDBLAST TANK EXTERIOR AND ALL ATTACHMENTS IN ACCORDANCE WITH SSPC-SP-6. PRIME AND TOP COAT WITH TWO COATS EPOXY, PPG AMERLOC 2 VOC OR APPROVED EQUAL, COLOR ANSI 61 GRAY.
6) UPON COMPLETION FLUSH INTERIOR OF TANK TO REMOVE ALL DIRT AND DEBRIS, AIR DRY INTERIOR, AND SEAL ALL TANK OPENINGS WITH PLASTIC PLUGS.



2/M7 24 GALLON GLYCOL EXPANSION TANK ET-1 FABRICATION
1"=6"

ISSUED FOR CONSTRUCTION MARCH 2024

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

ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: EXPANSION TANK ET-1 FABRICATION & INSTALLATION DETAILS

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

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: BCG | DATE: 3/7/24
FILE NAME: TENADERA M1-M7 | SHEET: M7
PROJECT NUMBER:

DEMOLITION GENERAL NOTES:

1. THIS PLANT PROVIDES PRIME POWER TO THE COMMUNITY OF TENAKEE SPRINGS. KEEP OUTAGES TO A MINIMUM AND COORDINATE ALL REQUIRED OUTAGES WITH THE UTILITY. NOTE THAT A MINIMUM OF TWO GENERATORS ARE REQUIRED TO BLACK START THE COMMUNITY SO TAKE ONLY ONE GENERATOR OFF LINE AT A TIME.
2. ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR REMOVAL. AREAS CONTAINING EXISTING EQUIPMENT TO BE REMOVED INDICATED BY HATCHING.
3. ENSURE ALL EQUIPMENT & CIRCUITS TO BE REMOVED ARE DE-ENERGIZED PRIOR TO BEGINNING DEMOLITION. LOCK & TAG OUT ALL AFFECTED CIRCUIT BREAKERS & DISCONNECTS.
4. TAKE ALL PRECAUTIONS TO MINIMIZE DAMAGE TO ELECTRICAL EQUIPMENT AND CONDUCTORS BEING SALVAGED FOR REUSE. TURN ALL REMOVED MATERIALS AND EQUIPMENT OVER TO THE UTILITY FOR FINAL DISPOSITION IF NOT REUSED.

DEMOLITION SPECIFIC NOTES:

BASE BID

1> GENSET TO BE REMOVED IN ITS ENTIRETY (SEE MECHANICAL). ALL EXISTING POWER & CONTROL CONDUCTORS TO REMAIN. CAREFULLY DISCONNECT POWER AND CONTROL CONDUCTORS FROM TERMINALS IN GENERATOR ENCLOSURE. DEMOLISH LIQUID TIGHT FLEX RISERS AND MOGUL LB'S BETWEEN GENERATOR ENCLOSURE AND OVERHEAD CONDUIT LEAVING EXISTING EMT CONDUIT AND CONDUCTORS IN PLACE. SAVE 1-1/2" FLEX FOR REUSE. INSPECT ALL CONDUCTORS FOR WEAR OR DAMAGE, TAPE ENDS, AND COIL IN SECURE TEMPORARY LOCATION TO PROTECT FROM DAMAGE DURING GENERATOR REPLACEMENT.

2> DISCONNECT EXISTING TRIAD FROM COOLANT RETURN RTD TO GENERATOR ENCLOSURE TERMINAL STRIP. RTD TO REMAIN IN PLACE FOR REUSE. TRIAD FROM GENERATOR TO SWITCHGEAR TO REMAIN FOR RECONNECTION TO NEW J-BOX.

3> SEE MECHANICAL

4> DEMOLISH EXISTING BATTERY AND #1/0 BATTERY LEADS (BATTERY CHARGER AND 2#10 CHARGING LEADS TO REMAIN).

5> REMOVE EXISTING BATTERY (BATTERY CHARGER, CHARGING LEADS, AND GENSET STARTER LEADS TO REMAIN).

6> REMOVE EXISTING SWITCHGEAR COMPONENTS AND WIRING IN GENERATOR SECTION AS REQUIRED FOR NEW ELECTRONICALLY CONTROLLED GENSET INSTALLATION. SEE SHEETS E4 AND E5.

7> REMOVE EXISTING MAIN FEEDER CONTACTOR FOR REPLACEMENT.

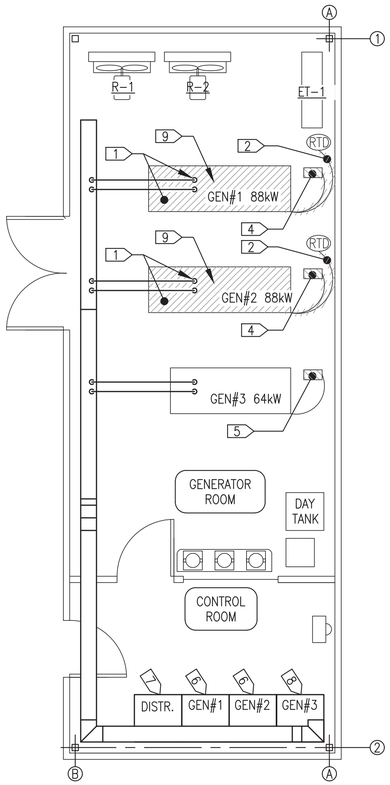
8> REMOVE EXISTING GEN#3 MOLDED CASE BREAKER FOR REPLACEMENT.

9> DISCONNECT AND CAREFULLY REMOVE EXISTING 4-20mA VACUUM SENSOR FROM GEN#1&#2 AIR CLEANER AND SALVAGE FOR REINSTALLATION.

10> SEE NEW WORK

11> SEE MECHANICAL

SEE MECHANICAL FOR ADDITIVE ALTERNATES



1 E1 DEMOLITION PLAN & NOTES
1/4"=1'-0"

NEW WORK GENERAL NOTES:

1. EXISTING EQUIPMENT TO REMAIN IN SERVICE SHOWN WITH LIGHT DASHED LINES.
2. NEW EQUIPMENT TO BE INSTALLED SHOWN WITH DARK SOLID LINES.
3. RECONNECT EXISTING POWER & CONTROL CONDUCTORS & ASSOCIATED CONDUIT & FITTINGS TO NEW GENSETS AS INDICATED.

NEW WORK SPECIFIC NOTES:

BASE BID

1> INSTALL NEW GEN CONTROL J-BOX, ROUTE NEW 2-1/2" POWER FLEX AND CONNECT EXISTING POWER CONDUCTORS TO NEW GENERATOR END. REINSTALL EXISTING 1-1/2" CONTROL FLEX & CONDUCTORS TO NEW J-BOX. SEE ELEVATION 1/E2.

2> ROUTE NEW SHIELDED TRIAD FROM EXISTING COOLANT RETURN RTD TO NEW ENGINE CONTROL J-BOX. SEE ELEVATION 1/E2.

3> SEE MECHANICAL

4> INSTALL NEW 12V BATTERY AND ROUTE NEW #2/0 BATTERY CABLES FROM NEW GENERATOR. SEE ELECTRICAL EQUIPMENT SCHEDULE AND ELEVATION 1/E2.

5> INSTALL NEW 12V BATTERY AT GEN#3 AND RECONNECT TO EXISTING CABLES. SEE ELECTRICAL EQUIPMENT SCHEDULE.

6> INSTALL NEW TERMINALS AND WIRING IN SWITCHGEAR GENERATOR SECTION AS REQUIRED FOR NEW ELECTRONICALLY CONTROLLED GENSET INSTALLATION. SEE SHEETS E4 AND E5.

7> REPLACE EXISTING MAIN FEEDER CONTACTOR WITH IDENTICAL NEW CONTACTOR. SEE ELECTRICAL EQUIPMENT SCHEDULE. RECONNECT ALL POWER AND CONTROL CONDUCTORS IN ACCORDANCE WITH ATTACHED 2023 SWITCHGEAR ASBUILT DRAWINGS.

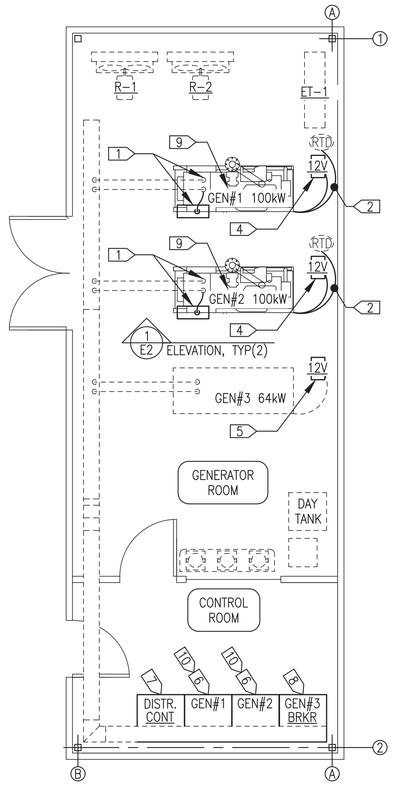
8> REPLACE EXISTING GEN#3 MOLDED CASE BREAKER WITH EQUIVALENT NEW BREAKER. SEE ELECTRICAL EQUIPMENT SCHEDULE. REVISE MOUNTING AS REQUIRED TO UTILIZE EXISTING DOOR CUTOUT. RECONNECT ALL POWER AND CONTROL CONDUCTORS IN ACCORDANCE WITH ATTACHED 2023 SWITCHGEAR ASBUILT DRAWINGS.

9> INSTALL SALVAGED 4-20mA VACUUM SENSOR ON GEN#1&#2 AIR CLEANER AND CONNECT TO WIRING ON NEW GENERATOR.

10> REPROGRAM EXISTING EASYGEN FOR NEW ELECTRONICALLY CONTROLLED ENGINES INCLUDING ALL CANBUS MONITORING AND FOR NEW VOLTAGE REGULATORS. SEE WSET FILE IN SPECIFICATIONS. REMOVE EXISTING "88 KW" NAMEPLATE FROM FRONT OF DOOR AND INSTALL NEW "100 KW" ENGRAVED NAMEPLATE IN SAME LOCATION. SIZE 1"x4". BLACK FACE WITH WHITE LETTERS.

11> SEE MECHANICAL

SEE MECHANICAL FOR ADDITIVE ALTERNATES



2 E1 NEW WORK PLAN & NOTES
1/4"=1'-0"

Existing Demand Control Table				
Demand Control	Generator(s) On Line	On-line kW (Overload)	Level Increase	Level Decrease
Level 1	#3	64	58	---
Level 2	#1 or #2	88	79	51
Level 3	#1 or #2 & #3	152	137	70
Level 4	#1 & #2	176	158	122
Level 5	All	240	---	141
Final Demand Control Table With New Gen #1 & #2				
Level 1	#3	64	58	---
Level 2	#1 or #2	100	90	51
Level 3	#1 or #2 & #3	164	148	80
Level 4	#1 & #2	200	180	131
Level 5	All	264	---	160

Notes:
Gen #1 & #2 are equal capacity. Manually select lead unit.
AEA will revise Demand Control prior to construction.

ELECTRICAL CONDUCTOR SCHEDULE

SERVICE/FUNCTION	DESCRIPTION	MFR.	NOTES:
(EXISTING) GENERATOR 480V POWER LEADS	HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE, TIN COATED COPPER CONDUCTOR. THERMOSET EPDM INSULATION, UL 3340/3374, MINIMUM 600V, LISTED 150°C FOR NON-FLEXING	COBRA	IF EXISTING LUGS ARE NOT REUSED, TERMINATE WITH COPPER COMPRESSION LUGS RATED FOR THE FULL AMPACITY OF THE CABLE AT 150°C.
GENERAL USE CONDUCTORS	CLASS B CONCENTRIC STRANDED, SOFT DRAWN COPPER. TYPE XHHW INSULATION, 600V AND 75C RATED.		
SHIELDED/TWISTED INSTRUMENT CONDUCTORS	SINGLE TRIAD, #18 AWG STRANDED TINNED COPPER CONDUCTORS, 300V PE INSULATION, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH STRANDED TINNED COPPER DRAIN WIRE & PVC OUTER JACKET	BELDEN 9365	GROUND SHIELD DRAIN WIRE AT PANEL END ONLY.
SWITCHGEAR CANBUS CONDUCTOR	CLASS 2 THIN #22 & #24 PAIRED AWG STRANDED TINNED COPPER CONDUCTORS, 300V FRFPE INSULATION, 100% INDIVIDUAL PAIR ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH OVERALL 65% STRANDED TINNED COPPER DRAIN WIRE & PVC OUTER JACKET	BELDEN 3084A	

COLOR CODING - UNLESS SPECIFICALLY INDICATED OTHERWISE COLOR CODE CONDUCTORS AS FOLLOWS:
- 480-VOLT POWER CONDUCTORS
  - PHASE A - BROWN
  - PHASE B - ORANGE
  - PHASE C - YELLOW
  - NEUTRAL - WHITE W/YELLOW STRIPE
- 120/208-VOLT POWER CONDUCTORS
  - PHASE A - BLACK
  - PHASE B - RED
  - PHASE C - BLUE
  - NEUTRAL - WHITE
- 24 VOLT DC CONDUCTORS
  - +24VDC - RED
  - -24VDC - BLACK

CONTROL & INSTRUMENT CONDUCTORS COLOR CODED PER MANUFACTURER'S STANDARD

NOTES:
1) GROUNDING - PROVIDE A SEPARATE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH RACEWAY. DO NOT USE THE CONDUIT AS AN EQUIPMENT GROUNDING CONDUCTOR. EQUIPMENT GROUNDING CONDUCTORS SHALL BE OF THE SAME TYPE AS THE PHASE CONDUCTORS AND SHALL BE SIZED AS INDICATED ON THE DRAWINGS. CONDUCTORS NOT INDICATED SHALL BE SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.
2) COLOR CODING FOR NO. 6 AWG AND SMALLER CONDUCTORS SHALL BE BY USING CONDUCTORS WITH CONTINUOUS COLOR EMBEDDED IN THE INSULATION.
3) COLOR CODING FOR CONDUCTORS LARGER THAN NO. 6, SHALL BE BY:
   A) CONTINUOUS COLOR EMBEDDED IN THE INSULATION, OR
   B) BLACK CABLE WITH SCOTCH 35 OR APPROVED EQUAL MARKING (PHASE) TAPE. AT EVERY ACCESSIBLE LOCATION A MINIMUM 3" LONG SECTION OF CONDUCTOR SHALL BE SPIRAL WRAPPED. NOTE THAT PHASE TAPE MAY NOT BE USED ON COLORED CABLE, BLACK CABLE ONLY.

ENGINE GENERATOR SCHEDULE

GENSET	DESCRIPTION
GEN #1 GEN #2 (NEW)	ENGINE - 148 HP, 100 EKW PRIME, JOHN DEERE 4045AFM85, TIER 3 MARINE. 12 VDC STARTING & CONTROL. GENERATOR - MINIMUM 125 KW CONTINUOUS AT 105°C RISE, NEWAGE/STAMFORD UCI274E.
GEN #3 (EXISTING)	ENGINE - 110 HP, 66 EKW PRIME, JOHN DEERE 4045TF150, NON-TIER. 12 VDC STARTING & CONTROL. GENERATOR - MINIMUM 64 KW CONTINUOUS AT 105°C RISE, MARATHON 362CSL1604.

ELECTRICAL EQUIPMENT SCHEDULE

SYMBOL	SERVICE/FUNCTION	DESCRIPTION	MANUFACTURER/MODEL
12V	12 VOLT ENGINE BATTERY	GROUP SIZE 8D, MIN 1400 CCA	INTERSTATE 8D-MHD OR EQUAL
CONT	FEEDER CONTACTOR	400A, 600V, 3 POLE CONTACTOR, 277VAC COIL, WITH INTEGRAL N.O./N.C. AUXILIARY CONTACT, PLUS OUTSIDE MOUNT N.O./N.C. AUXILIARY CONTACT	ALLEN BRADLEY MODEL 100-E400EN11 100-S4-11
BRKR	GEN #3 BREAKER	250AF, 150AT MOLDED CASE BREAKER WITH 24VDC SHUNT TRIP, 2 EA. N.O./N.C. AUXILIARY CONTACTS, BELL ALARM, AND 250A LUG KITS	ABB Tmax WITH ADJUSTABLE THERMAL TRIP XT4SU3150BFF000XXX SHUNT TRIP KXTASORCFPB AUX CONTACTS & BELL KXTAAXC2OSYFP LINE/LOAD LUGS KXT4CUAL2-3PC

ISSUED FOR CONSTRUCTION
MARCH 2024

STATE OF ALASKA 49TH
CLOIS W. VERSYP
EE 7802
REGISTERED PROFESSIONAL ENGINEER

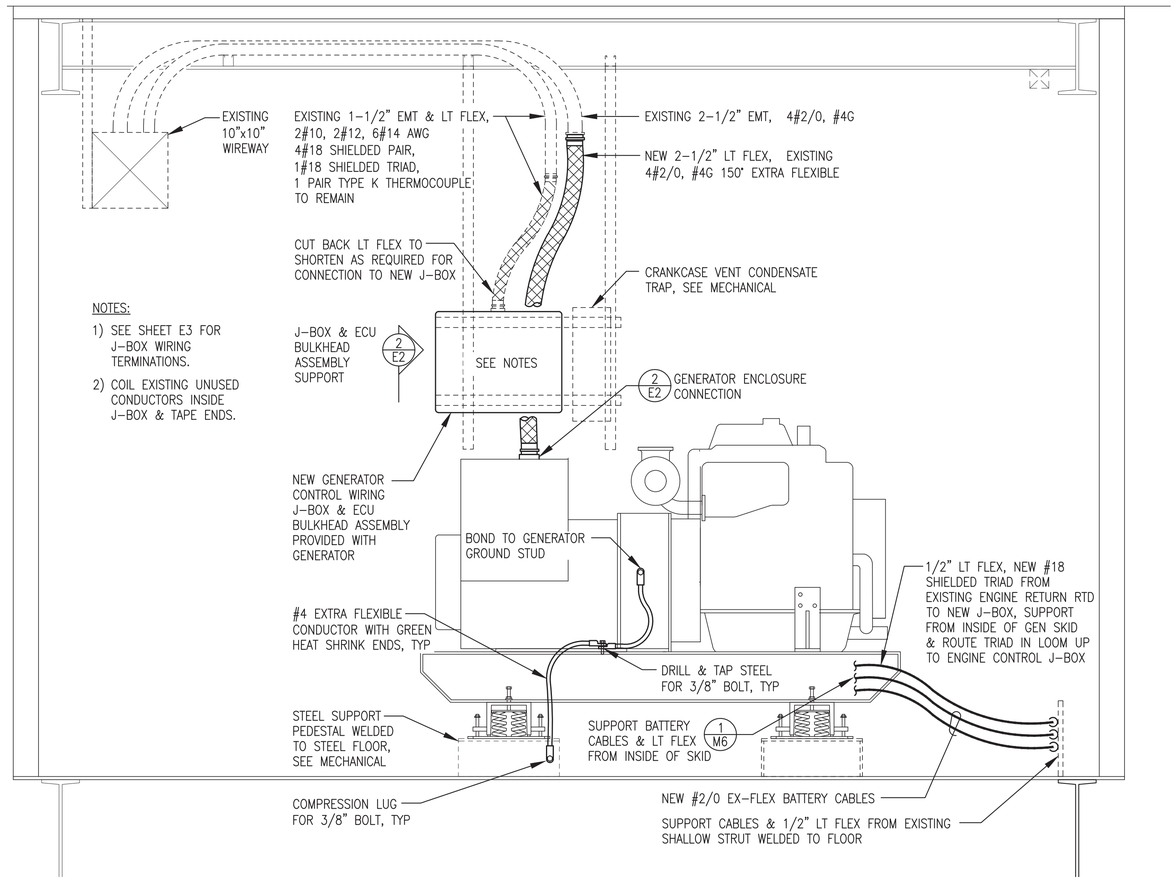
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

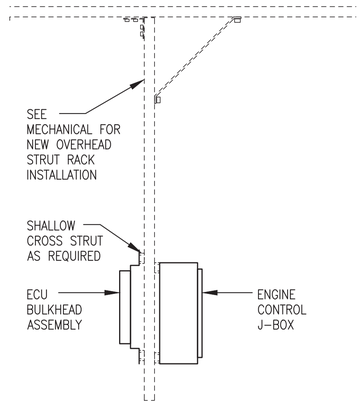
TITLE: ELECTRICAL DEMOLITION & NEW WORK PLANS

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

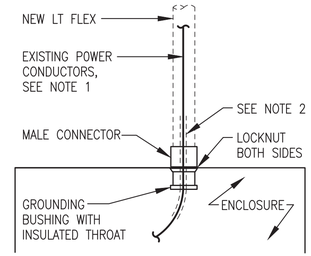
DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: CWV/BCG | DATE: 3/7/24
FILE NAME: TENADERA E1-E5 | SHEET: E1
PROJECT NUMBER:



1 E2 TYPICAL GENERATOR INSTALLATION
1-1/2"=1'-0"



2 E2 J-BOX & ECU BULKHEAD SUPPORT
1-1/2"=1'-0"



NOTES:

1) THE EXISTING CONDUCTORS HAVE MINOR ABRASIONS FROM WEAR IN THE OLD CONDUIT FITTINGS. INSTALL A MINIMUM 1" LONG LAYER OF HEAT SHRINK OVER EACH ABRASION.
2) PROTECT CONDUCTORS FROM WEAR THROUGH MALE CONNECTOR AND GROUNDING BUSHING BY INSTALLING A 12" LONG LAYER OF HEAT SHRINK CENTERED IN CONNECTOR.

3 E2 TYPICAL GENERATOR ENCLOSURE CONNECTION
NO SCALE

ISSUED FOR CONSTRUCTION
MARCH 2024

STATE OF ALASKA 49TH
CLOIS W. VERSYP
EE 7802
REGISTERED PROFESSIONAL ENGINEER

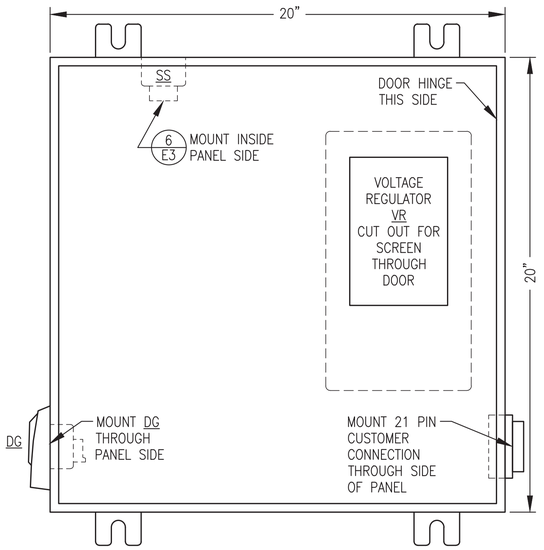
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

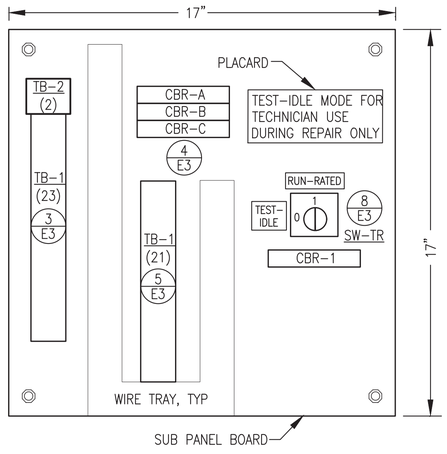
TITLE: TYPICAL GENERATOR INSTALLATION & DETAILS

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

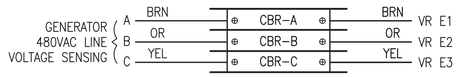
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: CWV/BCG	DATE: 3/7/24
FILE NAME: TENADERA E1-E5	SHEET: E2
PROJECT NUMBER:	



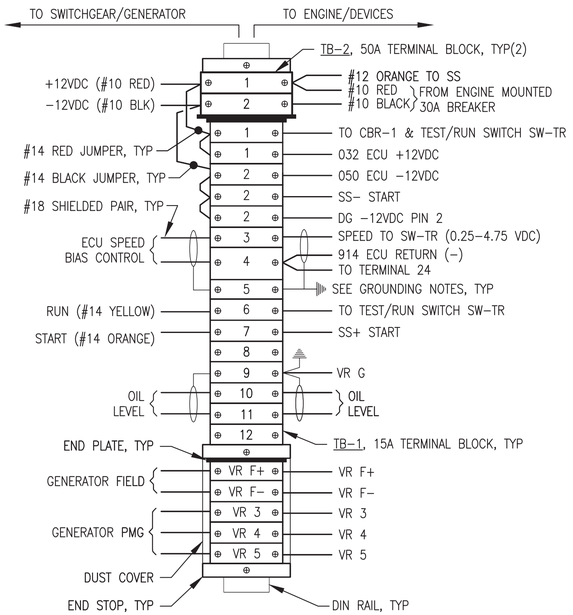
1 E3 JUNCTION BOX FRONT PANEL LAYOUT
NO SCALE



2 E3 JUNCTION BOX SUB PANEL LAYOUT
NO SCALE

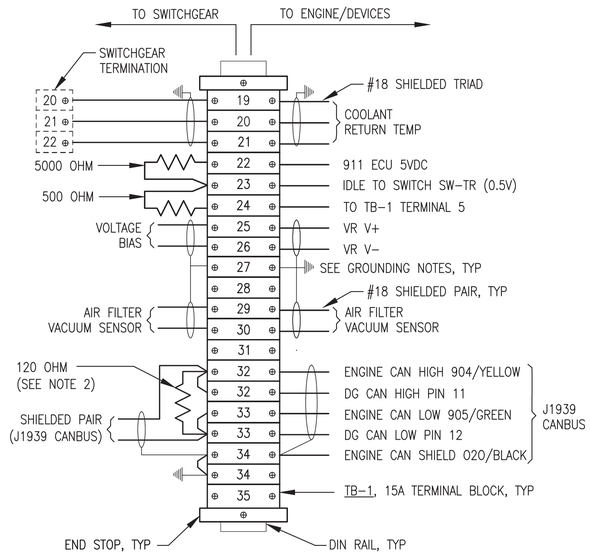


4 E3 CIRCUIT BREAKER CONNECTIONS
NO SCALE



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

3 E3 TERMINAL STRIP CONNECTIONS
NO SCALE



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

5 E3 TERMINAL STRIP CONNECTIONS
NO SCALE

BILL OF MATERIALS

TAG	MANUFACTURER	MODEL	DESCRIPTION
21 PIN	JOHN DEERE OR DEUTZ		21 PIN CUSTOMER CONNECTION ASSY
CBR-A/B/C	ALLEN-BRADLEY	1489-M1-C010	RAIL MOUNT CIRCUIT BREAKER, 1P, 1A
CBR-1	ALLEN-BRADLEY	1489-M1-C050	RAIL MOUNT CIRCUIT BREAKER, 1P, 5A
DG	JOHN DEERE	DG-14	DIAGNOSTIC GAUGE WITH HARNESS PROGRAMMED FOR MARINE TIER 3 WITH UNIQUE JOHN DEERE FAULT CODE
ENCL.	HOFFMAN	A20H20ALP	20x20x8" NEMA 12
	HOFFMAN	A20P20	BACK PANEL
SS	JOHN DEERE	AT141011	STARTER AUXILIARY SOLENOID, 12V
SW-TR	ALLEN-BRADLEY	194L-A12-225-2	CHANGEOVER SWITCH, 12A, 2P
	ALLEN-BRADLEY	194L-HE-4A-175	90 DEGREE I-O HANDLE
TB-1	IDEC	BNH15LW	15A DIN RAIL-MOUNT TERMINAL BLOCK
TB-2	IDEC	BNH50W	50A DIN RAIL-MOUNT TERMINAL BLOCK
VR	BASLER	DECS-150 5NS1V1N1S	DIGITAL VOLTAGE REGULATOR

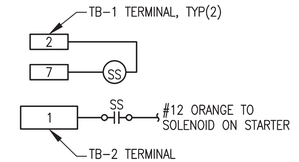
BRAND SPECIFIC NOTE: SPECIFIC PARTS MANUFACTURER AND MODEL SELECTED NOT ONLY TO MEET PERFORMANCE FUNCTION BUT ALSO TO COORDINATE AND INTERFACE WITH OTHER DEVICES AND SYSTEMS. APPROVED EQUAL SUBSTITUTIONS WILL BE ALLOWED ONLY BY ENGINEER'S APPROVAL. TO OBTAIN APPROVAL, SUBMITTALS MUST CLEARLY DEMONSTRATE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

SHOP FABRICATION NOTES:

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

FIELD INSTALLATION NOTES:

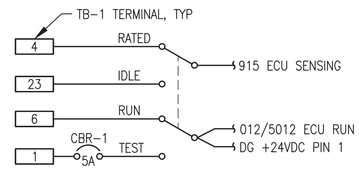
1) PERFORM ALL FIELD WIRING IN ACCORDANCE WITH SPECIFICATIONS. LABEL BOTH ENDS OF ALL FIELD WIRING WITH THE ENGINE PANEL TERMINAL NUMBER.
2) ON SHIELDED CONDUCTORS GROUND ALL SHIELD DRAIN WIRES AT ENGINE J-BOX ONLY. CLIP DRAIN WIRES AT OPPOSITE ENDS.



6 E3 STARTER AUX SOLENOID SS WIRING
NO SCALE

NOT USED

7 E3 EXHAUST RTD CONNECTOR
NO SCALE



8 E3 TEST-IDLE/RUN-RATED SWITCH SW-TR WIRING
NO SCALE

ISSUED FOR CONSTRUCTION MARCH 2024

STATE OF ALASKA 49TH
CLOIS W. VERSYP EE 7802
REGISTERED PROFESSIONAL ENGINEER

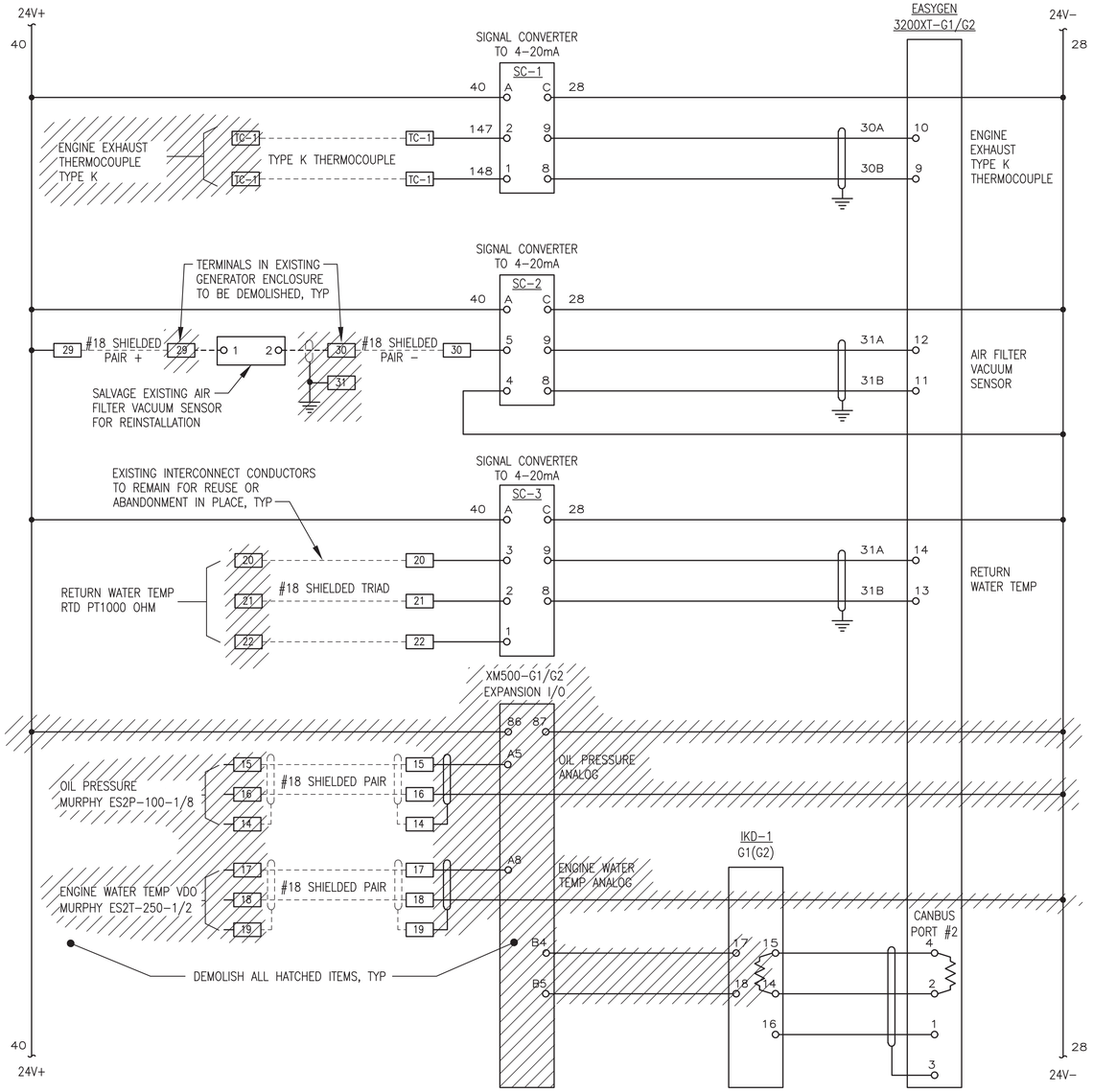
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: 12VDC ENGINE CONTROL WIRING JUNCTION BOX

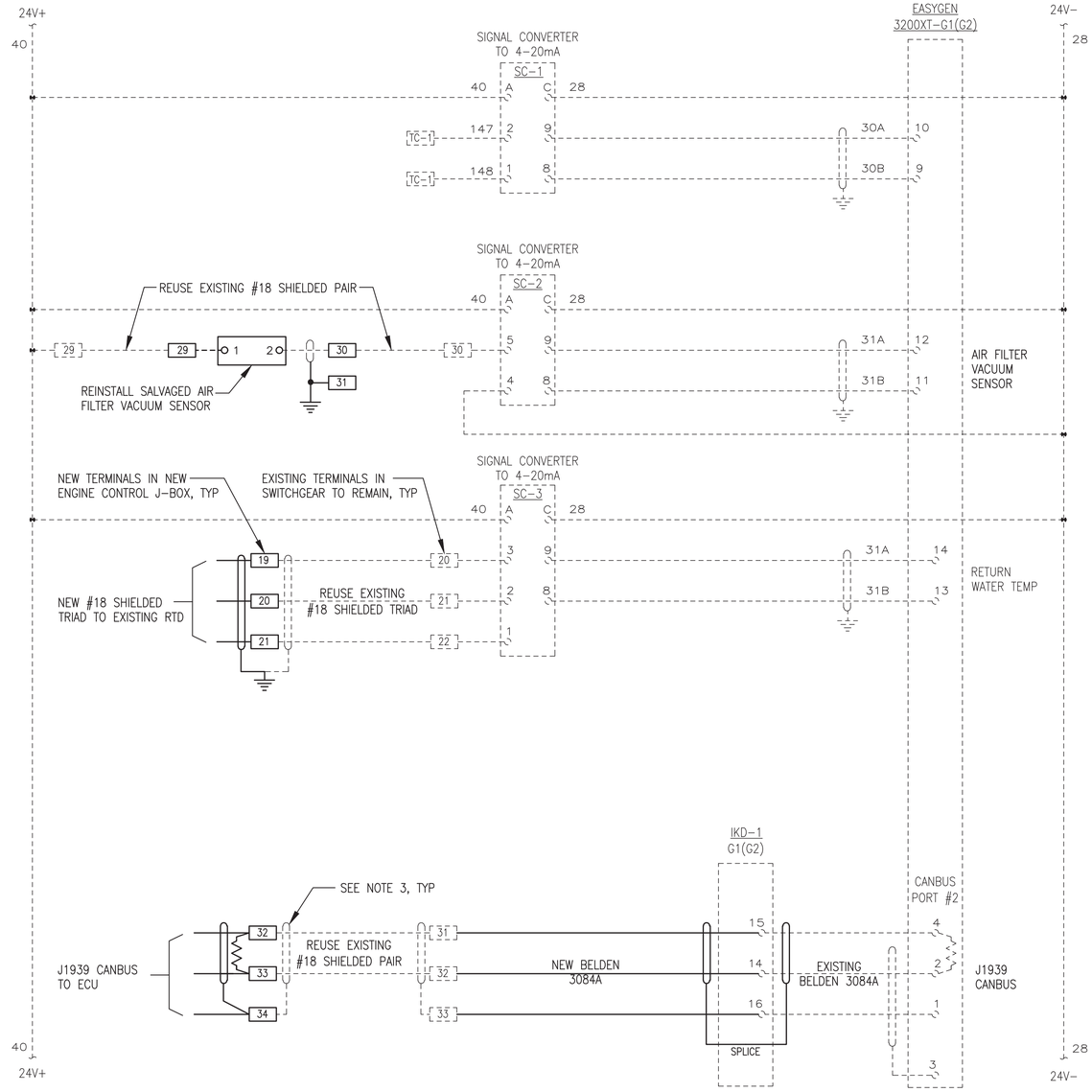
Gray Stassel Engineering, Inc.
P.O. 111405, Anchorage, AK 99511 (907)349-0100

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: CWV/BCG | DATE: 3/7/24
FILE NAME: TENADERA E1-E5 | SHEET: E3
PROJECT NUMBER:



1 E4 TYPICAL GEN1/GEN2 DC CONTROL DEMOLITION

NO SCALE



2 E4 TYPICAL GEN1/GEN2 DC CONTROL NEW WORK

NO SCALE

NOTES:

1. EXISTING SWITCHGEAR & ENGINE J-BOX COMPONENTS AND CONDUCTORS TO REMAIN SHOWN WITH LIGHT-DASHED LINES.
2. NEW SWITCHGEAR & ENGINE J-BOX COMPONENTS AND CONDUCTORS ADDED THIS PROJECT SHOWN WITH DARK-SOLID LINES.
3. ON ALL SHIELDED PAIRS AND TRIADS CHECK SWITCHGEAR END FOR TERMINATION. IF DRAIN WIRE IS GROUNDED THEN DO NOT GROUND AT ENGINE J-BOX.

ISSUED FOR CONSTRUCTION
MARCH 2024

STATE OF ALASKA
49TH
CLOIS W. VERSYP
EE 7802
REGISTERED PROFESSIONAL ENGINEER

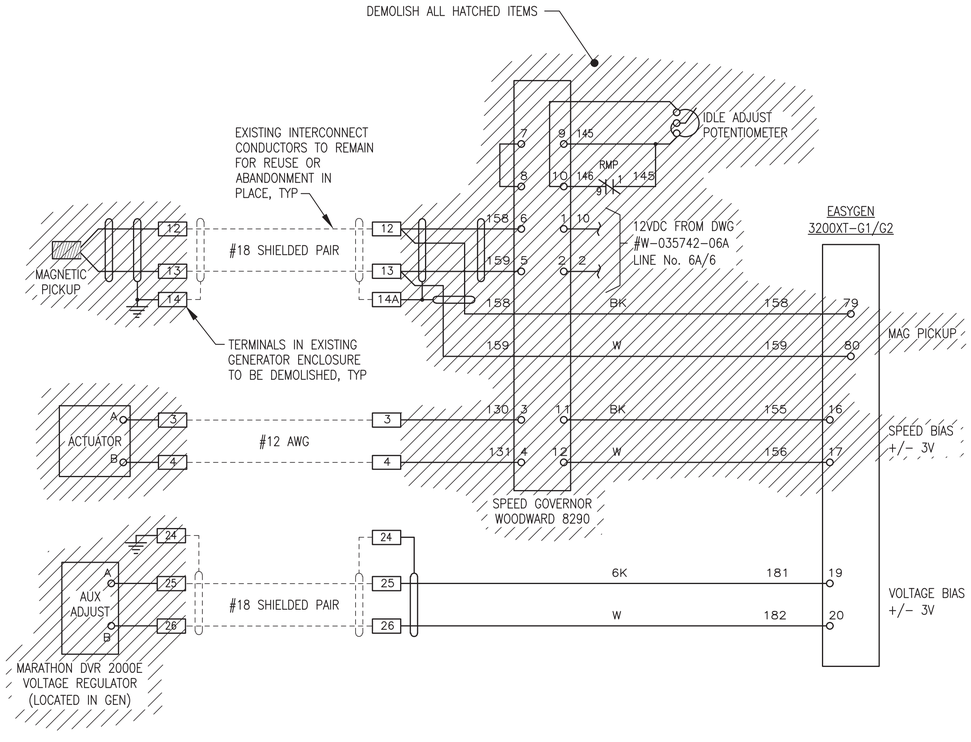
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: GEN1/GEN2 DC CONTROL SWITCHGEAR MODIFICATIONS

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

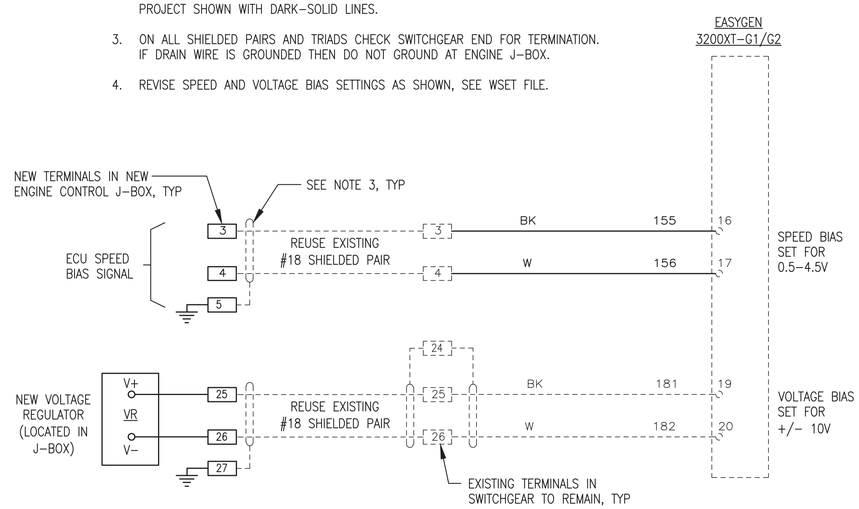
DRAWN BY: JTD	SCALE: AS NOTED
DESIGNED BY: CWV/BCG	DATE: 3/7/24
FILE NAME: TENADERA E1-E5	SHEET: E4
PROJECT NUMBER:	



1 E5 TYPICAL GEN1/GEN2 AC CONTROL DEMOLITION
NO SCALE

NOTES:

1. EXISTING SWITCHGEAR & ENGINE J-BOX COMPONENTS AND CONDUCTORS TO REMAIN SHOWN WITH LIGHT-DASHED LINES.
2. NEW SWITCHGEAR & ENGINE J-BOX COMPONENTS AND CONDUCTORS ADDED THIS PROJECT SHOWN WITH DARK-SOLID LINES.
3. ON ALL SHIELDED PAIRS AND TRIADS CHECK SWITCHGEAR END FOR TERMINATION. IF DRAIN WIRE IS GROUNDED THEN DO NOT GROUND AT ENGINE J-BOX.
4. REVISE SPEED AND VOLTAGE BIAS SETTINGS AS SHOWN, SEE WSET FILE.



2 E5 TYPICAL GEN1/GEN2 AC CONTROL NEW WORK
NO SCALE

ISSUED FOR CONSTRUCTION MARCH 2024

STATE OF ALASKA 49TH
CLOIS W. VERSYP EE 7802
REGISTERED PROFESSIONAL ENGINEER

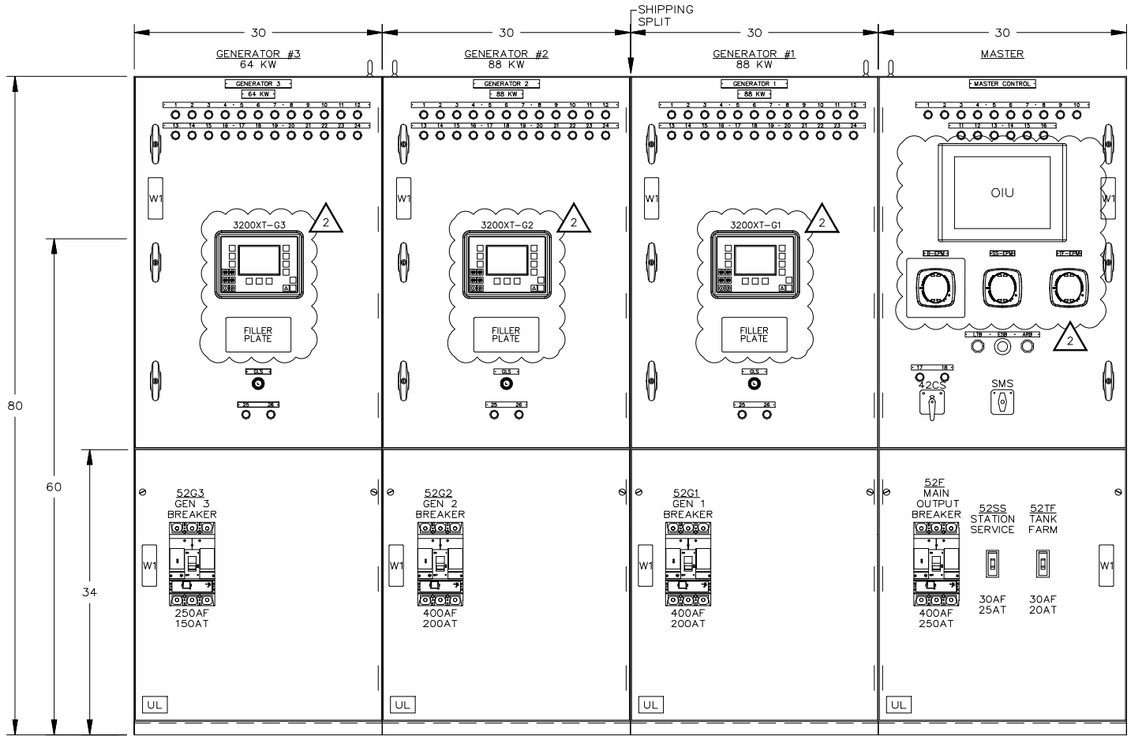
ALASKA ENERGY AUTHORITY

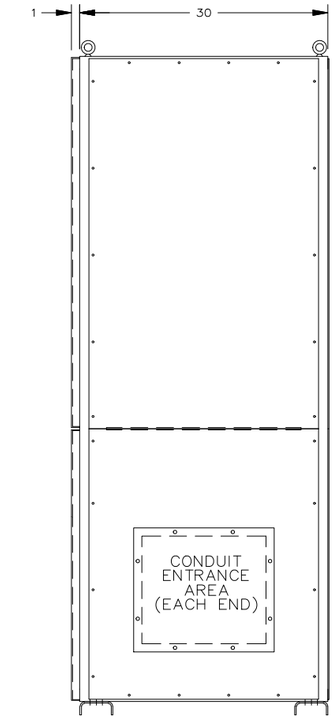
PROJECT: TENAKEE SPRINGS 2024 DERA POWER PLANT UPGRADE PROJECT

TITLE: GEN1/GEN2 AC CONTROL SWITCHGEAR MODIFICATIONS

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

DRAWN BY: JTD | SCALE: AS NOTED
DESIGNED BY: CWV/BCG | DATE: 3/7/24
FILE NAME: TENADERA E1-E5 | SHEET: E5
PROJECT NUMBER:





DEVICE LEGEND	
ARB	ALARM RESET BUTTON
B-EPM	BUS ELECTRONIC POWER METER – SHARK 250
ESB	EMERGENCY STOP BUTTON
EZG	GENERATOR CONTROL PACKAGE – EASYGEN
GLS	GENERATOR LOCKOUT SWITCH
OIU	OPERATOR INTERFACE UNIT
LTB	LAMP TEST BUTTON
SMS	MASTER CONTROL SWITCH (AUTO-MANUAL)
SS-EPM	STATION SERVICE POWER METER – SHARK 250
TF-EPM	STATION SERVICE POWER METER – SHARK 250
42xx	CONTACTOR
42CS	CONTACTOR CONTROL SWITCH
52xx	CIRCUIT BREAKER

GENERATOR ANNUNCIATOR LEGEND:			
1	ENGINE RUN	14	NOT IN AUTO POSITION
2	ENGINE IDLE	15	GENERATOR BREAKER OPEN
3	ENGINE ALARM	16	FAIL TO SYNCHRONIZE
4	LOW OIL PRESSURE	17	OVERCURRENT
5	LOW OIL LEVEL	18	UNDER VOLTAGE
6	HIGH EXHAUST TEMPERATURE	19	OVER VOLTAGE
7	HIGH WATER TEMPERATURE	20	UNDER FREQUENCY
8	AIR FILTER PLUGGED	21	OVER FREQUENCY
9	OVERSPEED	22	LOSS OF EXCITATION
10	OVERCRANK	23	REVERSE POWER
11	COOLDOWN/LOCKOUT	24	LEAD GEN (GEN 1 & 2)
12	BATTERY CHARGER FAILURE		
13	NORMAL STOP		

MASTER ANNUNCIATOR LEGEND:			
1	FIRE ALARM LIGHT	10	SPARE
2	EMERGENCY STOP LIGHT	11	SPARE
3	SYSTEM LOW WATER LEVEL LIGHT	12	SPARE
4	LOW FUEL LEVEL LIGHT	13	SPARE
5	BUS UNDER/OVER VOLTAGE LIGHT	14	SPARE
6	BUS UNDER/OVER FREQUENCY LIGHT	15	SPARE
7	FEEDER BREAKER OVERCURRENT LIGHT	16	SPARE
8	PRIMARY PLC FAILURE	17	SPARE

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 NUMBERS 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 TWO PIECES
8	FULL LENGTH COPPER GROUND BUS 0.25" X 2.5" C/W (6) #6–250MCM GROUND LUGS
9	POWER CABLES: GEN & LOAD TOP. FRONT ACCESS ONLY REQUIRED.
10	LAMICOIDS BLACK C/W WHITE LETTERS, MECHANICALLY ATTACHED
11	CABLE LUG SIZES: GEN 1,2: (1) #8 – 600MCM Cu/AL PER PHASE GEN 3: (1) #8 – 350MCM Cu/AL PER PHASE LOAD: (2) #8 – 600MCM Cu/AL PER PHASE SS: (1) #12 – 3/0 Cu/AL PER PHASE TANK FARM: (1) #12 – 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	
1	PHYSICAL LAYOUT
2	SINGLE LINE DIAGRAM
3	BLANK
4A	GENERATOR 1 AC SCHEMATIC
4B	GENERATOR 2 AC SCHEMATIC
4C	GENERATOR 3 AC SCHEMATIC
5	MASTER AC & DISTRIBUTION 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
76	GENERATOR 2 DC CONTROL SCHEMATIC
7C	GENERATOR 3 DC CONTROL SCHEMATIC
8A	GENERATOR 1 DC CONTROL SCHEMATIC
86	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 DC CONTROL SCHEMATIC
12	BLANK
13	BLANK
14	PLC COMMUNICATION DIAGRAM
15	COMMUNICATION NETWORK DIAGRAM
16	CANBUS COMMUNICATION DIAGRAM
17	HEATER & LIGHTING CONTROL SCHEMATIC
18	CONTROL SWITCH TARGET DIAGRAM
19	NAMEPLATE DETAILS
20	INTERCONNECTION DIAGRAM

EASYGEN 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. AIR FILTER VACUUM SENSOR
2. ENGINE EXHAUST TEMP

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

EASYGEN FUNCTIONS
* INCLUDES, BUT NOT LIMITED TO:
27/59, 81 o/u, 32, 50/51, 40, 47

REFER TO SHEET #

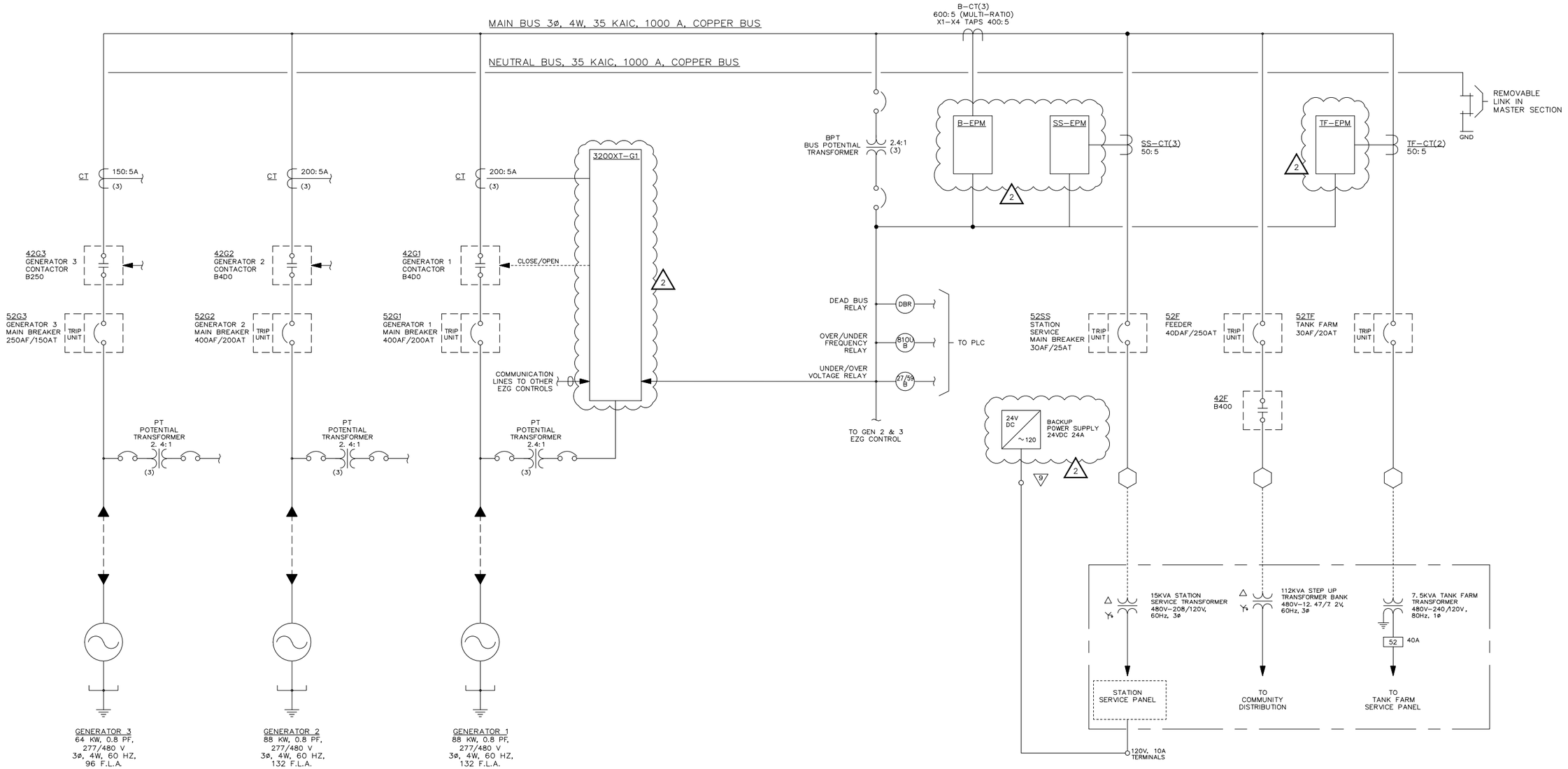
☐ APPROVED FOR CONSTRUCTION
☐ MASTER COPY ☐ REFERENCE COPY ____ OF ____
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		2	AS-BUILT FOR M&I 21116 UPGRADES	JRV	JRP	23-02-20
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22-12-09
		1	AS BUILT	JBG	VI	06-03-29

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

GENERATOR CONTROL PANEL
MODEL GCS 2200
PHYSICAL LAYOUT
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C–025420
WORK ORDER No.	W–035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22–12–09
REV	2
DRAWING/FILE No.	W–035742–01
SHEET	1



NOTE:
GENERATORS 2 & 3 SIMILAR TO GENERATOR 1.

REFER TO SHEET #

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☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
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		1	AS BUILT	JBG	VI	06-03-29

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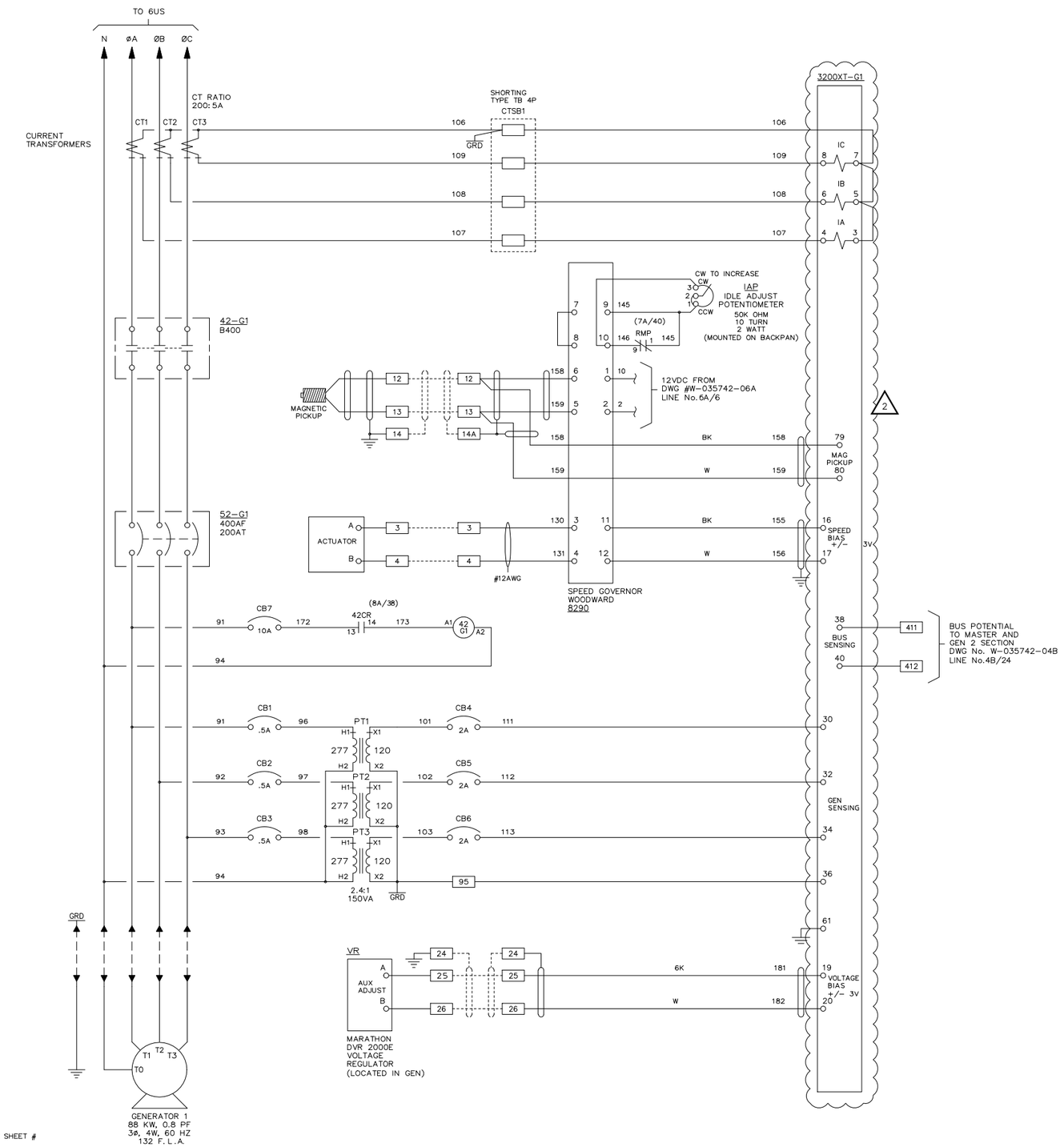
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL PANEL
MODEL GCS 2200
SINGLE LINE DIAGRAM
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-02	SHEET	2



SECTION #3

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

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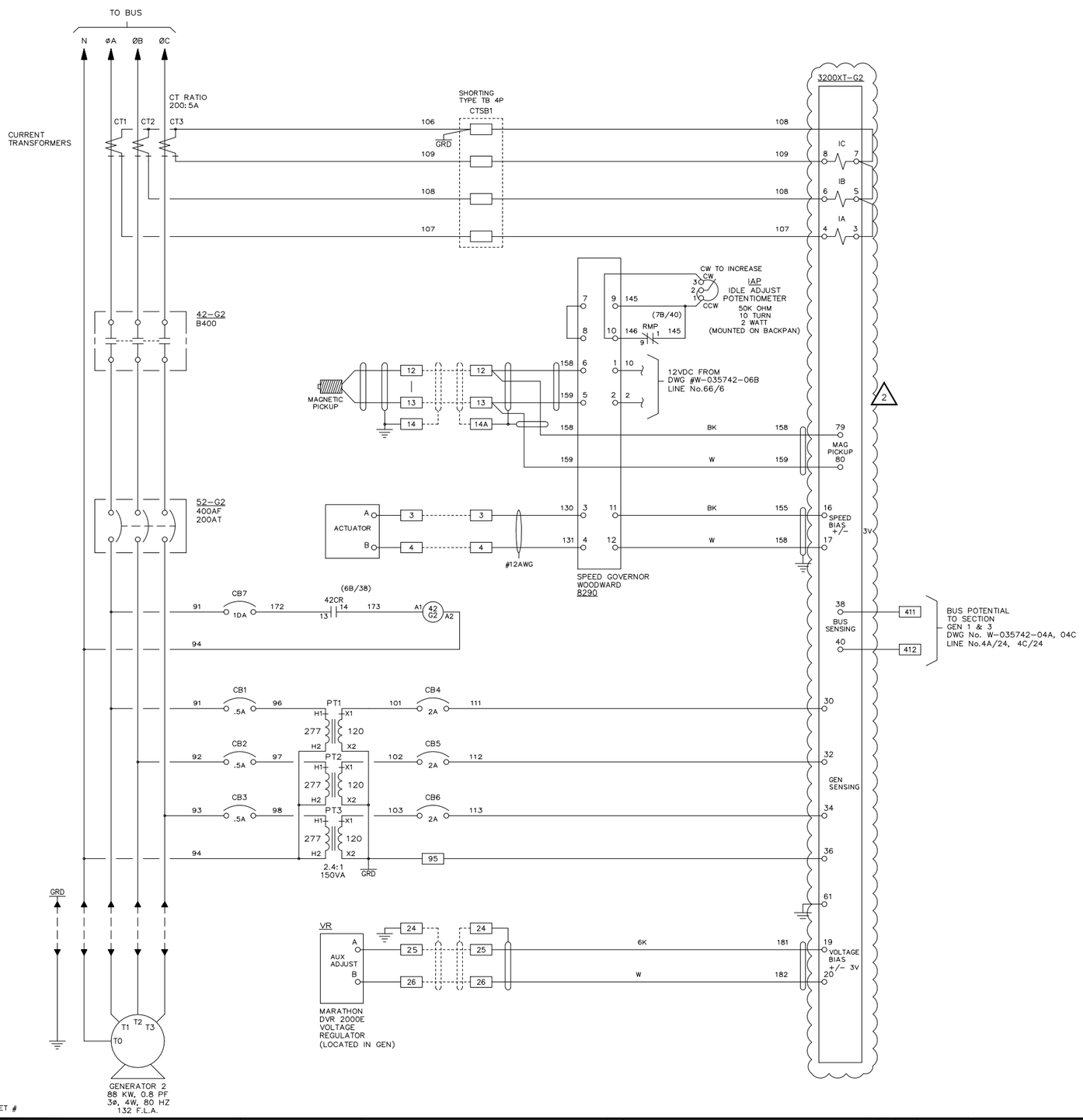
		2	AS-BUILT FOR M&I 21116 UPGRADES	JRV	JRP	23-02-20
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22-12-09
		1	AS BUILT	JBG	VI	06-03-29

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

GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR #1 AC SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-04A	SHEET	4A



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AUTH. BY: ____ DATE: ____

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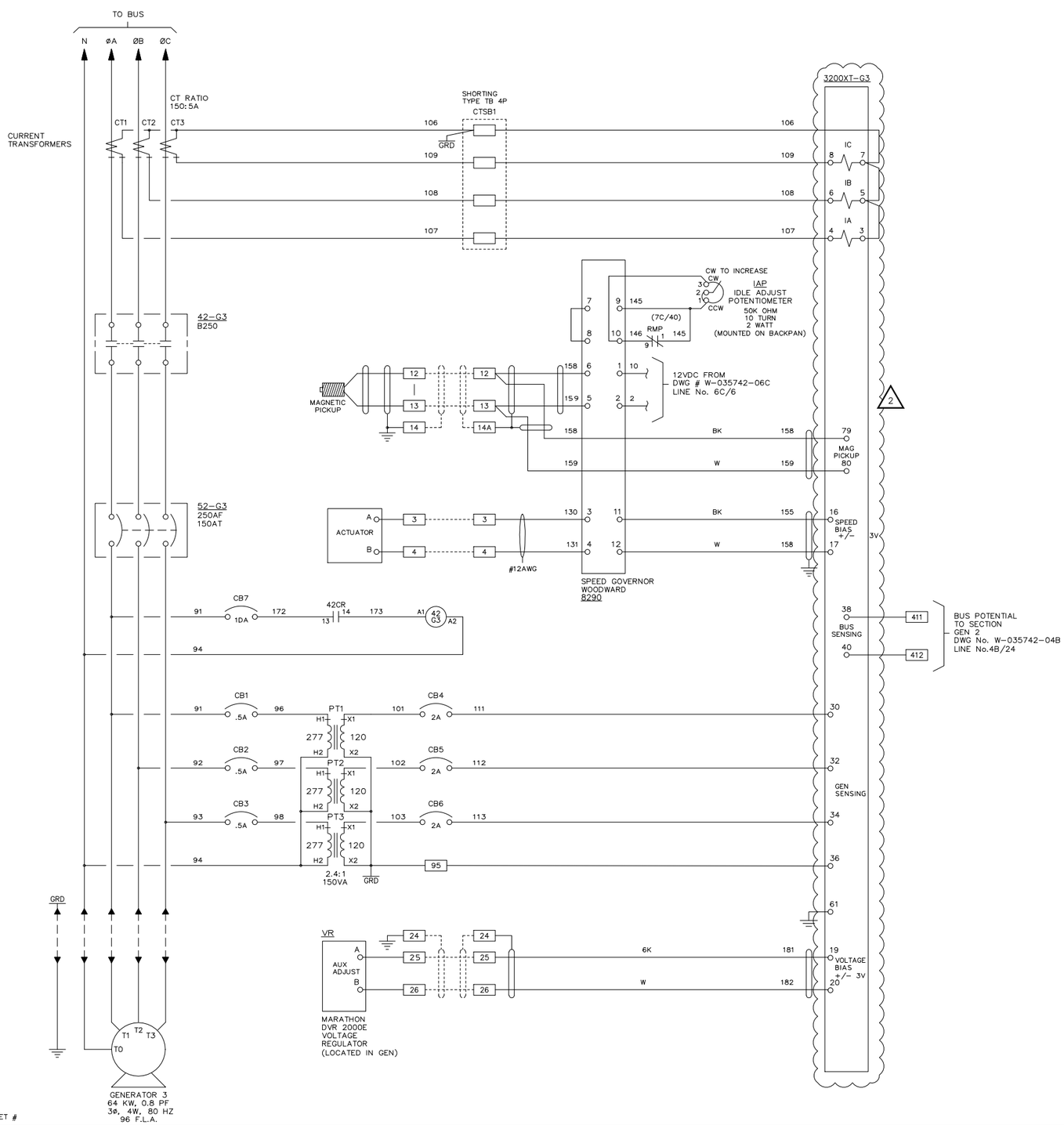
		1	AS BUILT	JBG	VI	06-03-29

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

GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR #2 AC SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-04B	SHEET	4B



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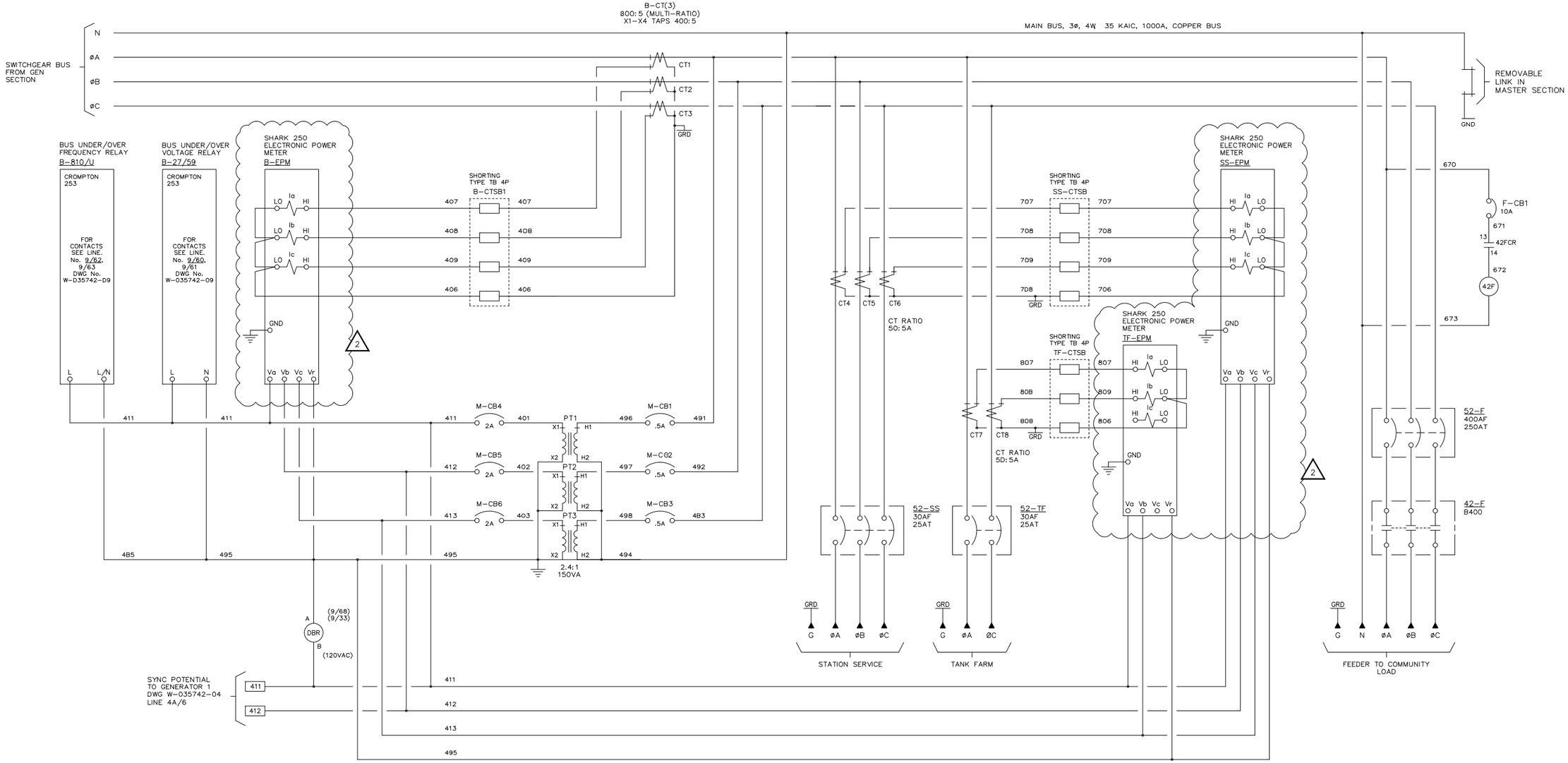
GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR #3 AC SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-04C	SHEET	4C



SECTION #4

2 REFER TO SHEET #

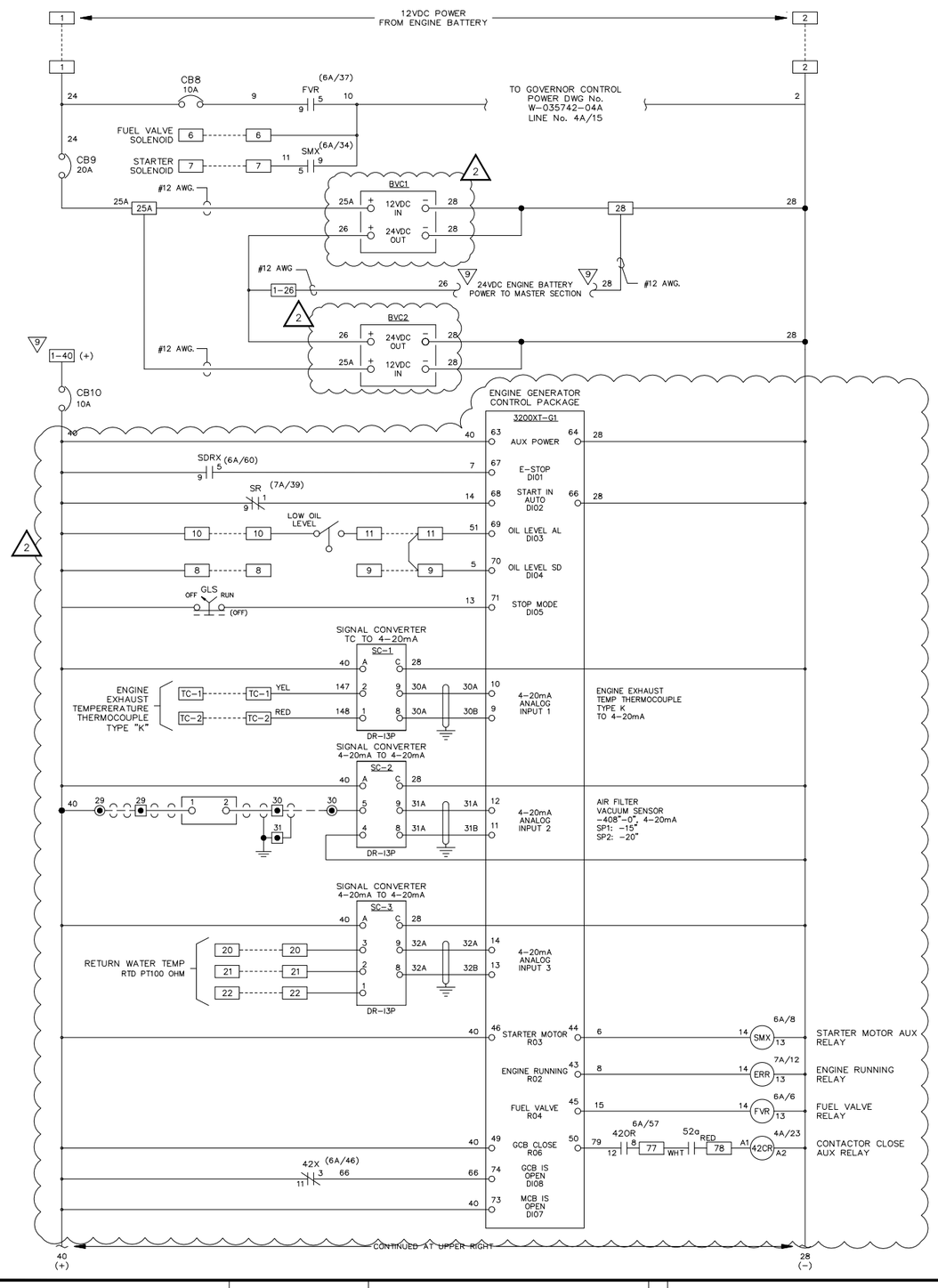
☐ APPROVED FOR CONSTRUCTION
☐ MASTER COPY ☐ REFERENCE COPY ____ OF ____
☐ MULTIPLE UNIT WORK ORDER
☐ RELEASED FOR INFORMATION
AUTH. BY: DATE:

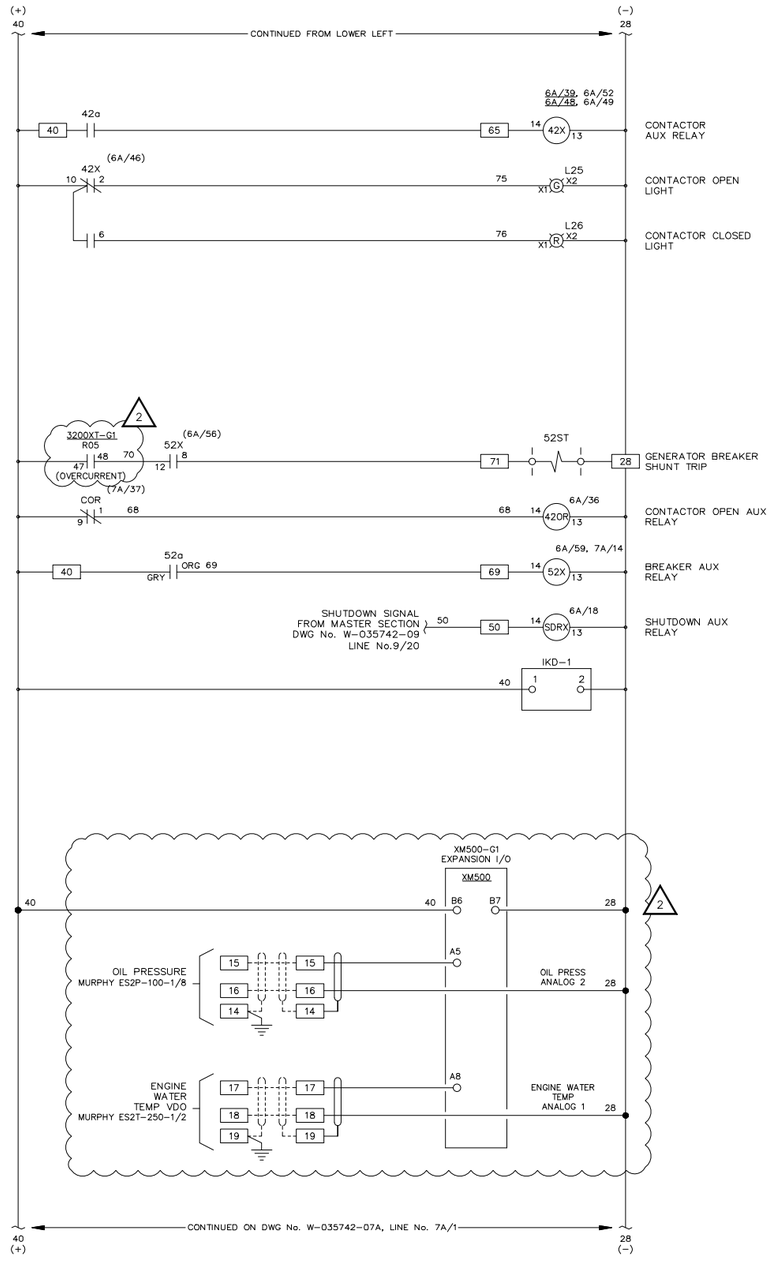
DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		2	AS-BUILT FOR M&I 21116 UPGRADES	JRV	JRP	23-02-20
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22-12-09
		1	AS BUILT	JBG	VI	06-03-29

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

GENERATOR CONTROL PANEL
MODEL GCS 2200
MASTER AC & DISTRIBUTION SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-05	SHEET	5





SECTION #3

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ALASKA ENERGY AUTHORITY
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813 W. NORTHERN LIGHTS BLVD.
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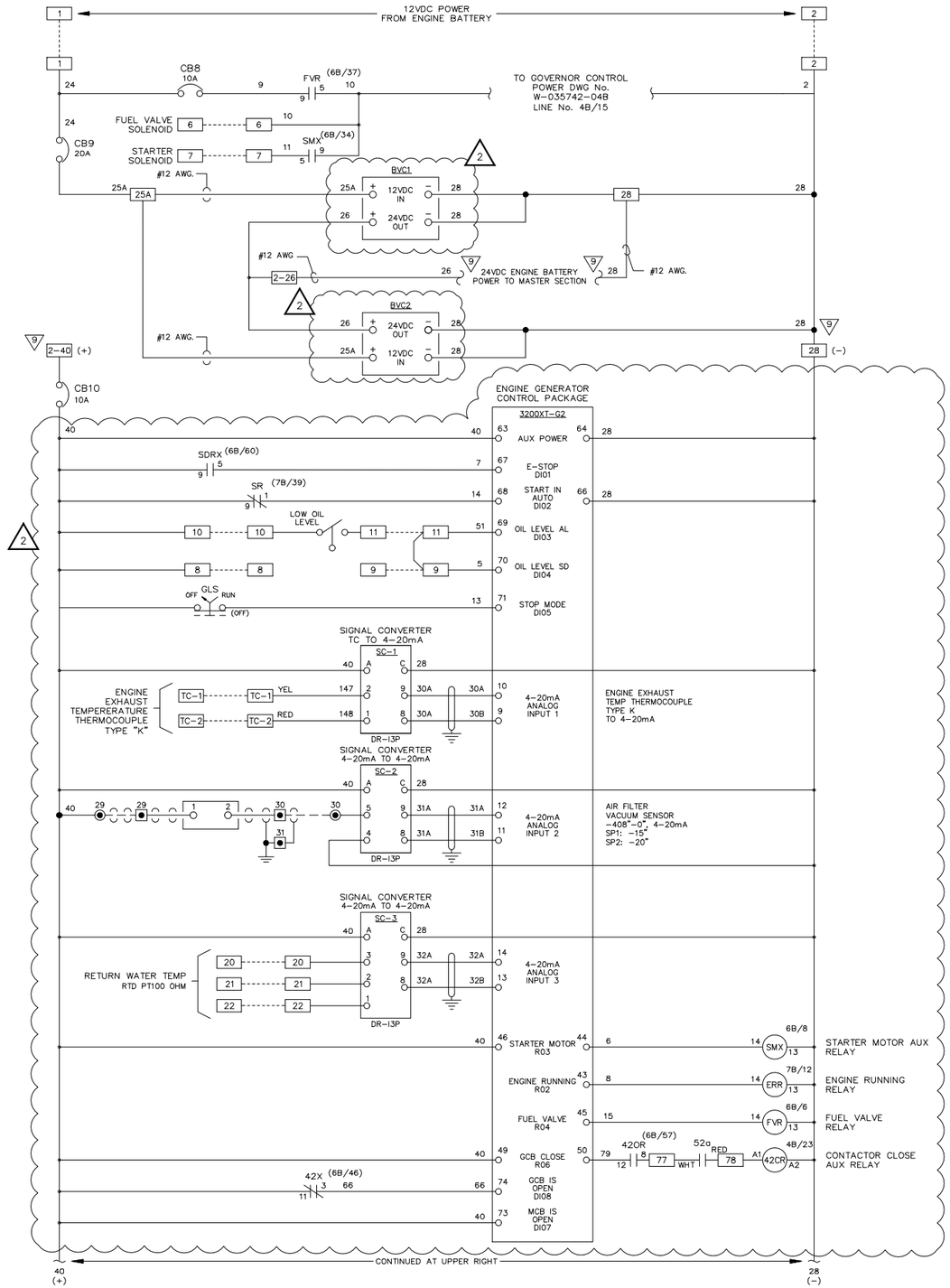
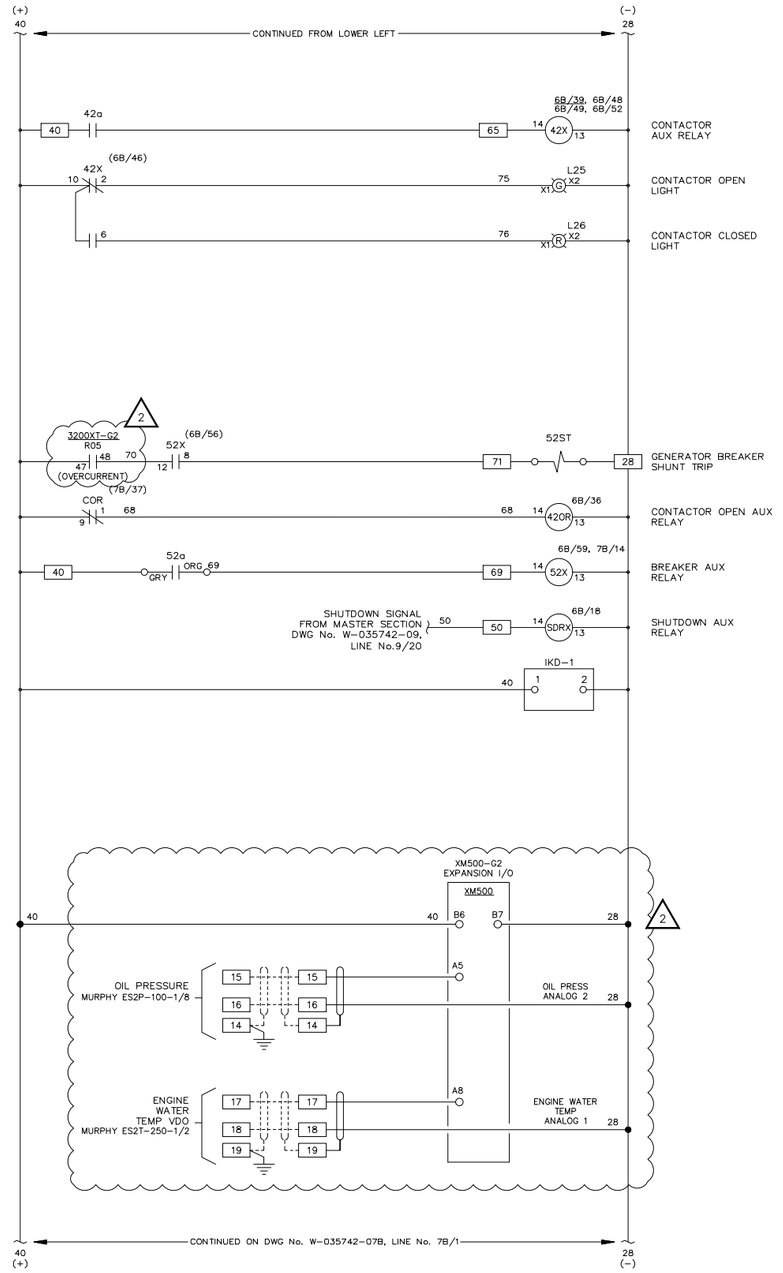
HTTP://WWW.AEA.ORG

GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 1 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-025420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-06A
SHEET	6A





SECTION #2

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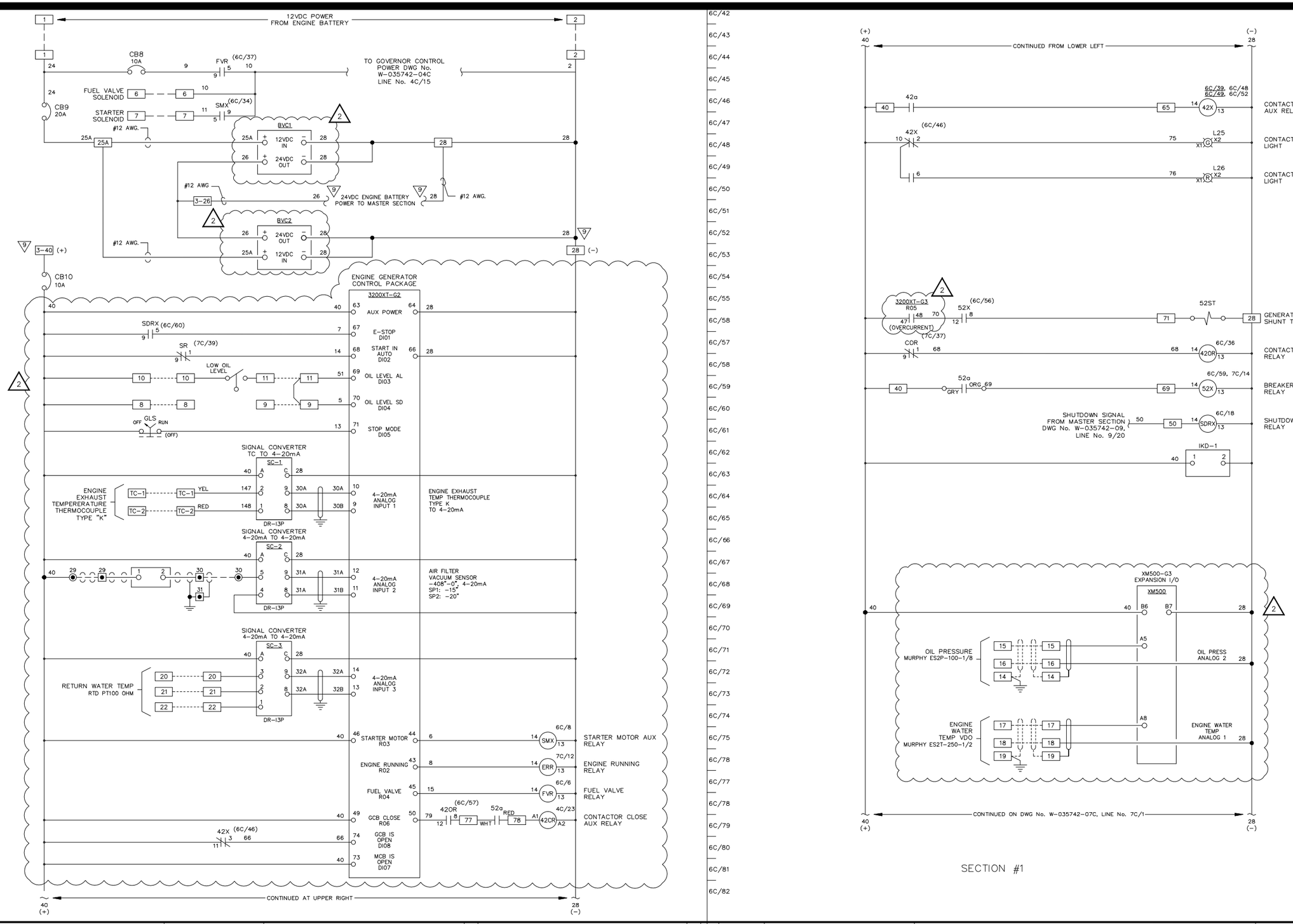
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22-12-09
		1	AS BUILT	JBG	VI	06-03-29

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

GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 2 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No. C-D25420		WORK ORDER No. W-035742	
DRAWN BY JBG	AUTH BY VI	DATE 22-12-09	REV. 2
DRAWING/FILE No. W-035742-06B		SHEET 6B	



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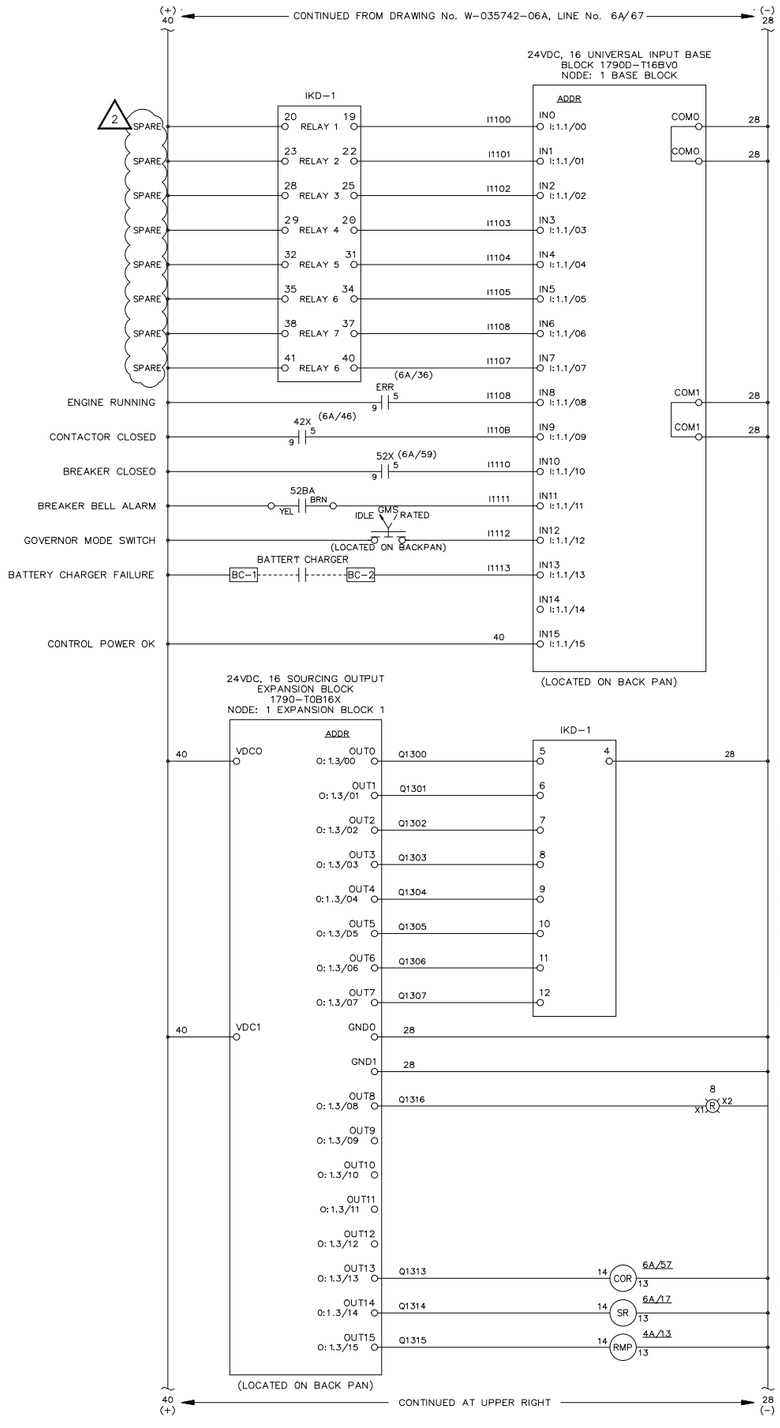
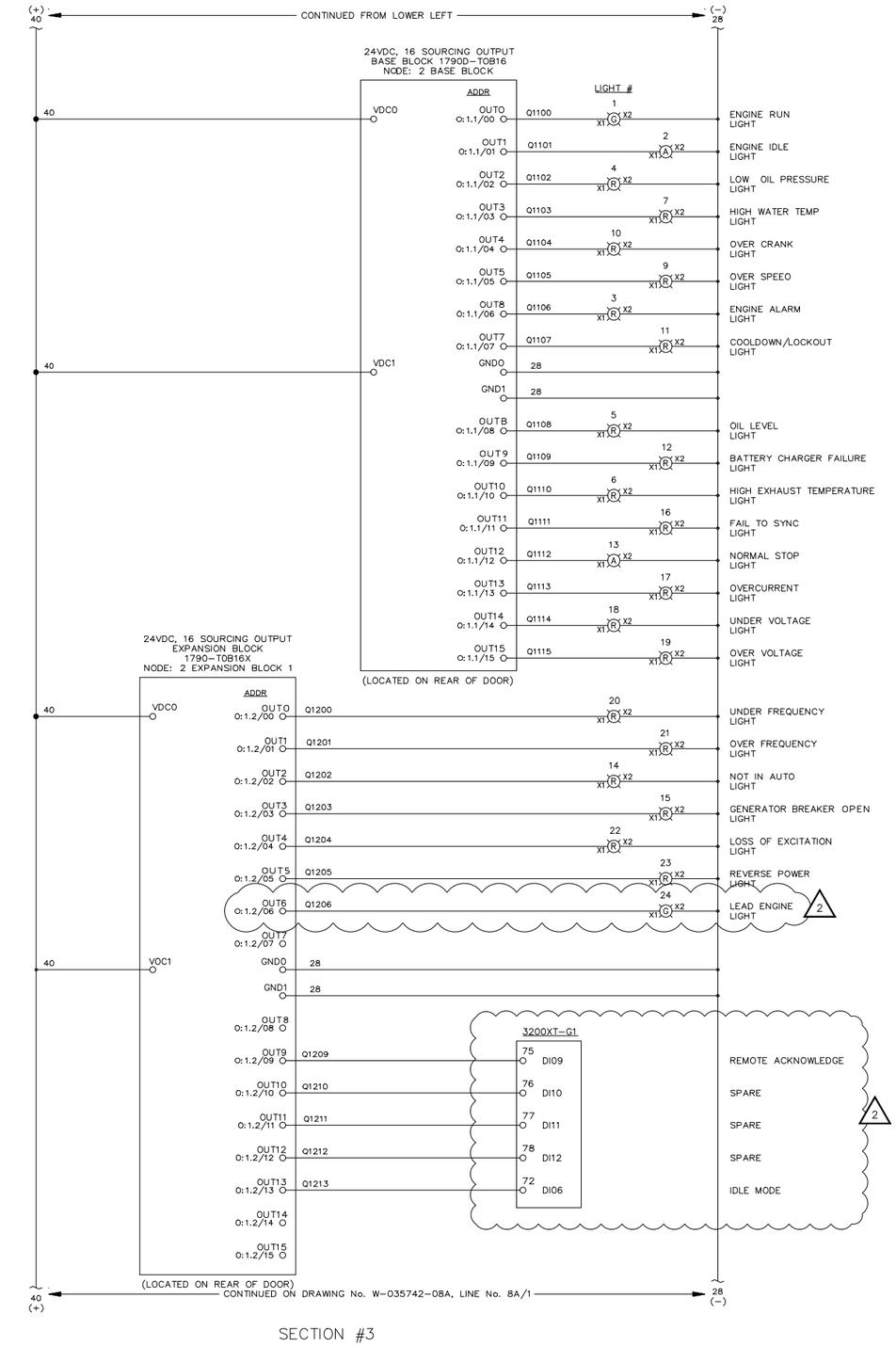
GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 3 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-D25420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-06C
SHEET	6C





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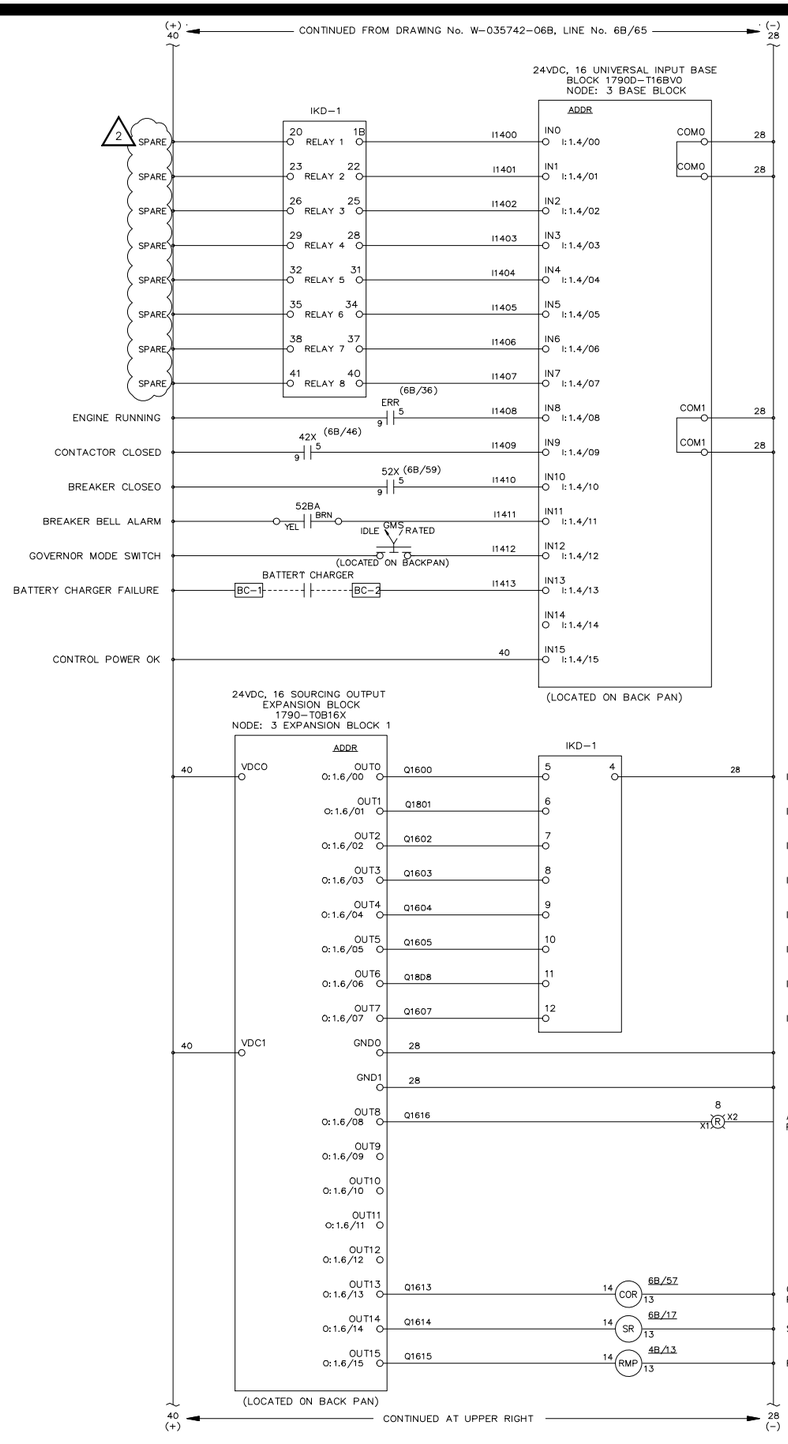
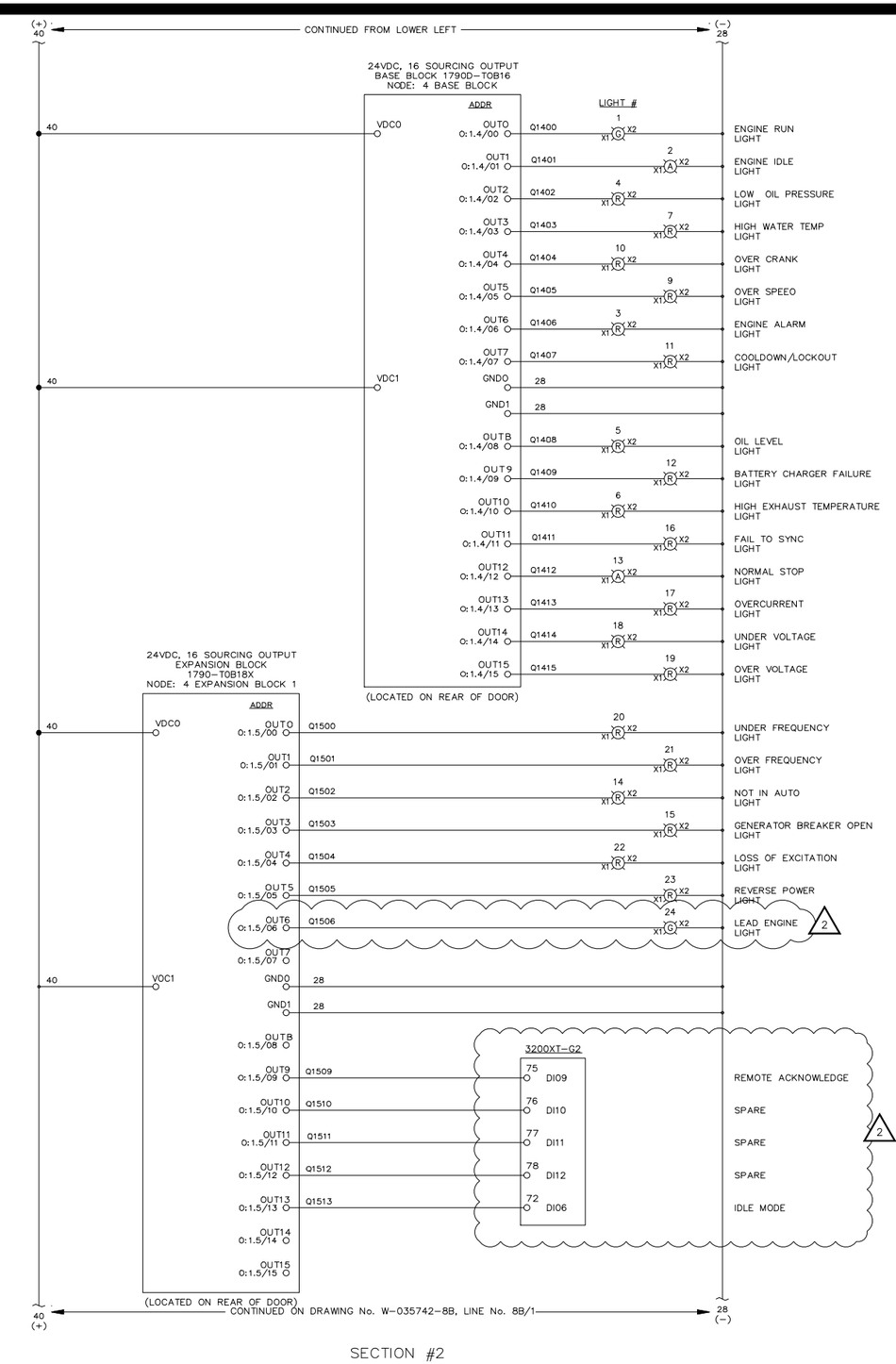
GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 1 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-025420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-07A
SHEET	7A





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GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 2 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
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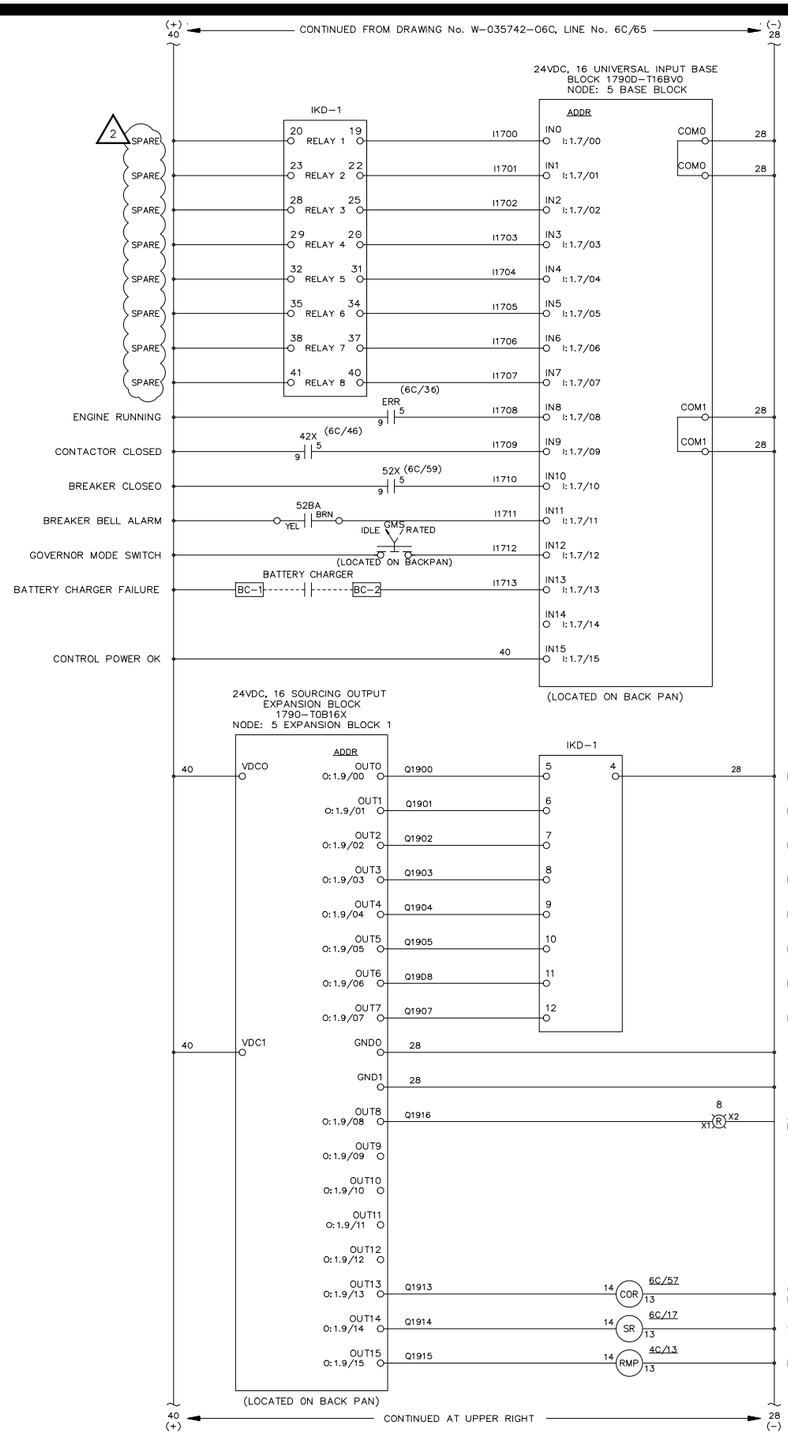
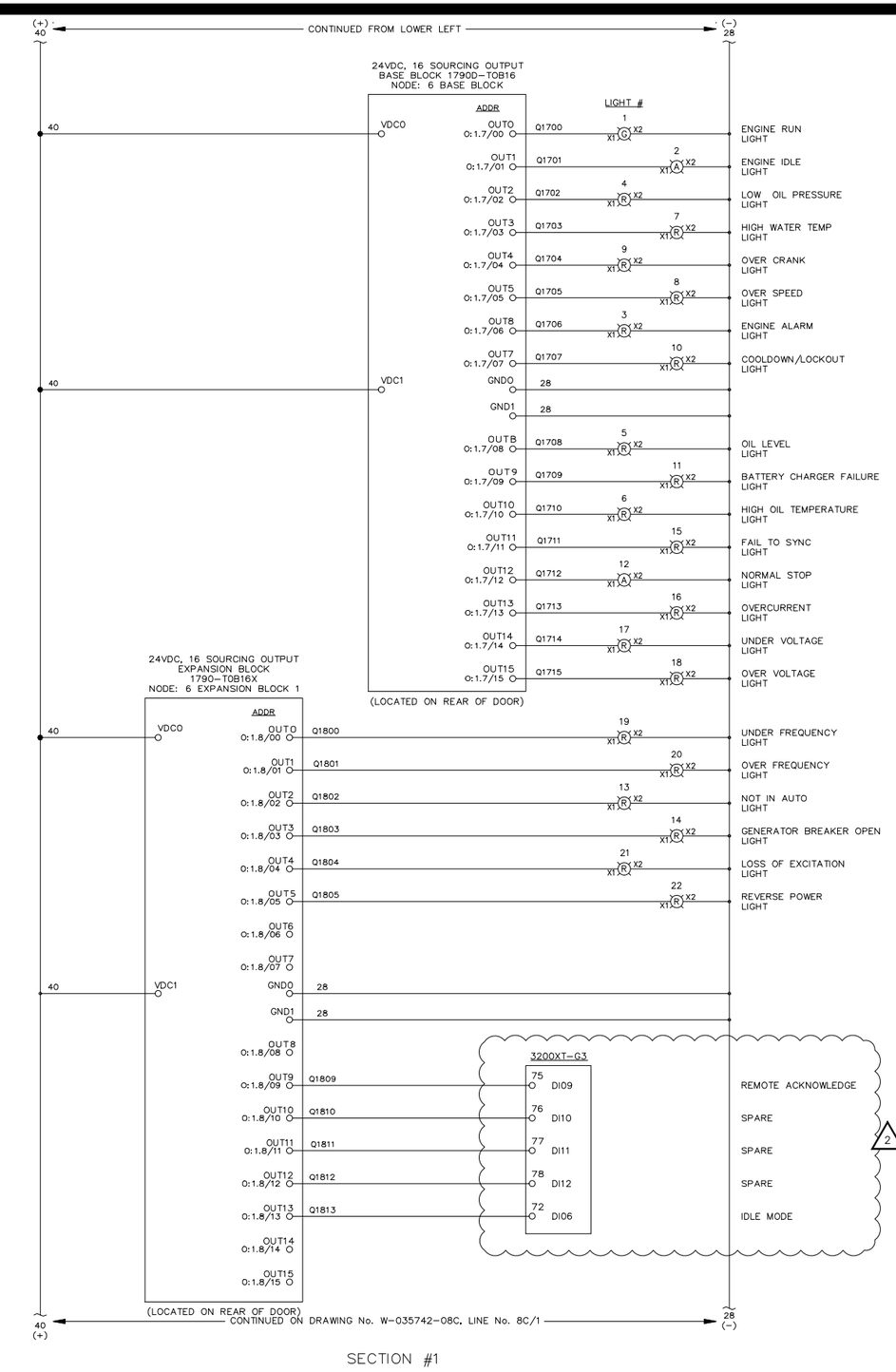
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-07B
SHEET	7B





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GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 3 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-025420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-07C
SHEET	7C

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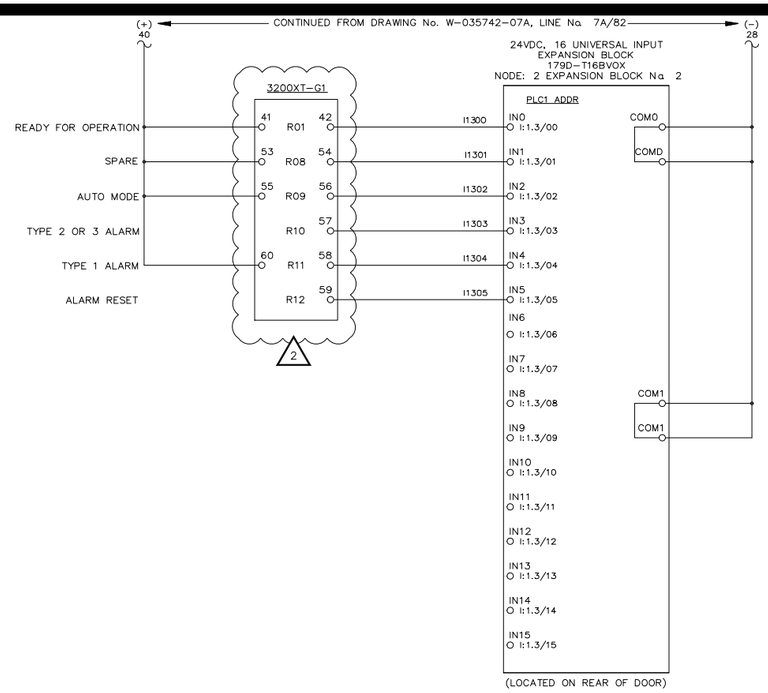

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GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 1 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No. C-025420		WORK ORDER No. W-035742	
DRAWN BY JBG	AUTH BY VI	DATE 22-12-09	REV 2
DRAWING/FILE No. W-035742-08A		SHEET 8A	

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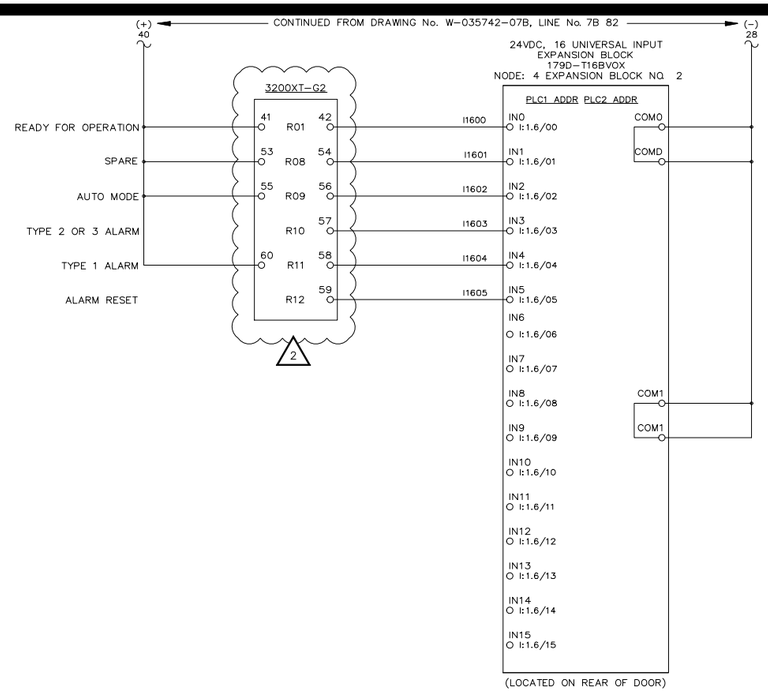

SECTION #2

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GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 2 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

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DRAWING/FILE No. W-035742-08B		SHEET 8B	

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8C/3B
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8C/41

CONTINUED FROM DRAWING No. W-035742-07C, LINE No. 7C/82

(+) 40

(-) 28

24VDC, 16 UNIVERSAL INPUT
EXPANSION BLOCK
1791D-T16BVOX
NODE: 6 EXPANSION BLOCK No 2

3200XT-G3

					PLC1 ADDR	PLC2 ADDR
READY FOR OPERATION	41	R01	42	I1900	IN0	I:1.9/00
SPARE	53	R08	54	I1901	IN1	I:1.9/01
AUTO MODE	55	R09	56	I1902	IN2	I:1.9/02
TYPE 2 OR 3 ALARM		R10	57	I1903	IN3	I:1.9/03
TYPE 1 ALARM	60	R11	58	I1904	IN4	I:1.9/04
ALARM RESET		R12	59	I1905	IN5	I:1.9/05
					IN6	I:1.9/06
					IN7	I:1.9/07
					IN8	I:1.9/08
					IN9	I:1.9/09
					IN10	I:1.9/10
					IN11	I:1.9/11
					IN12	I:1.9/12
					IN13	I:1.9/13
					IN14	I:1.9/14
					IN15	I:1.9/15

COM0
COMD
COM1
COM1

2

(LOCATED ON REAR OF DOOR)

SECTION #1

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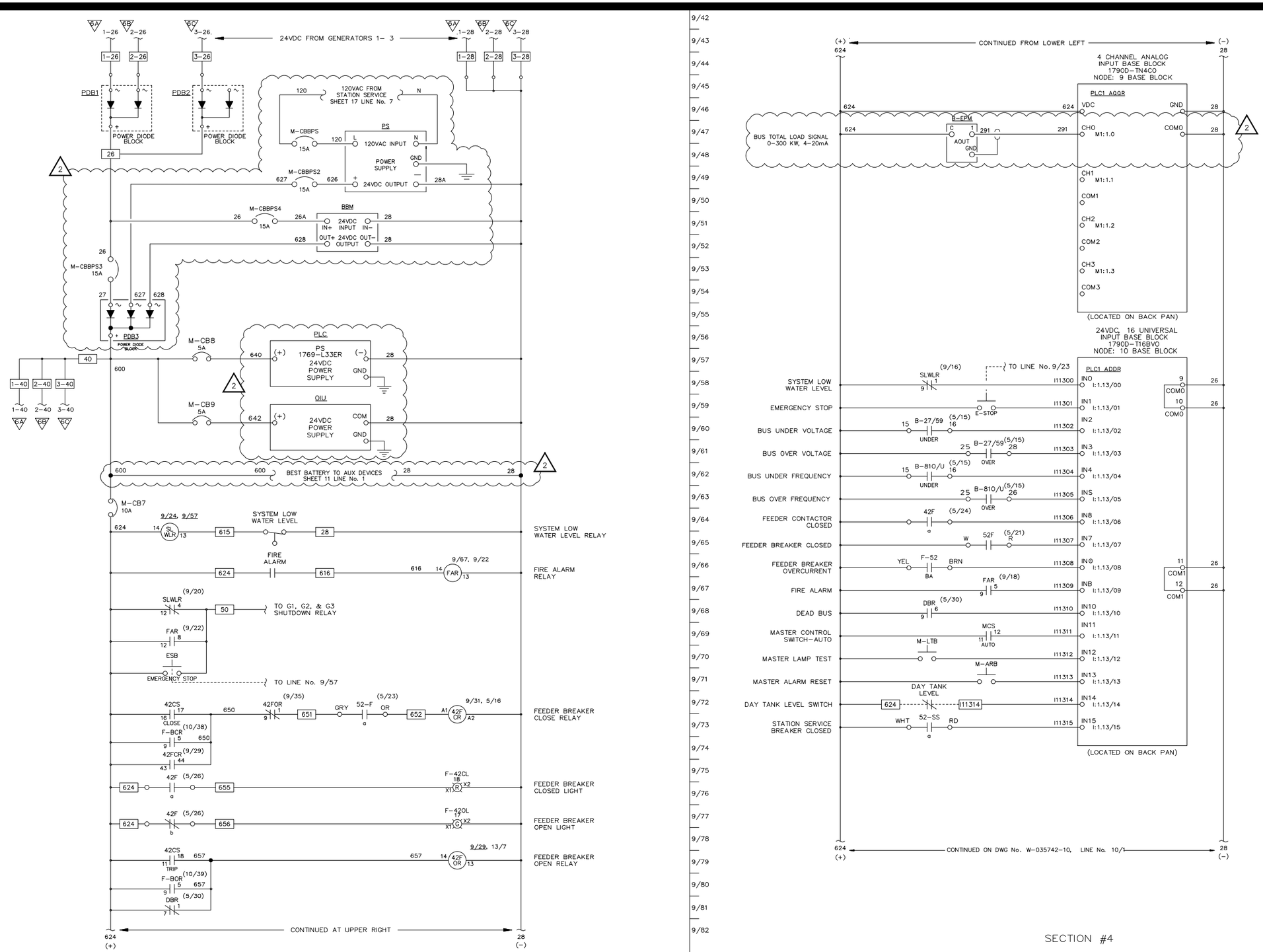
RURAL ENERGY GROUP
813 W. NORTHERN LIGHTS BLVD.
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEEA.ORG

GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 3 DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No. C-025420
WORK ORDER No. W-035742
DRAWN BY JBG
AUTH BY VI
DATE 22-12-09
REV 2
DRAWING/FILE No. W-035742-08C
SHEET 8C



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GENERATOR CONTROL PANEL
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-09	SHEET	9

CONTINUED FROM DWG No. W-035742-09, LINE No. 9/78

(+) 624

(-) 28

24VDC, 16 SOURCING
OUTPUT EXPANSION BLOCK
1790-TOB16X
NODE: 10 EXPANSION BLOCK No. 1

PLC2 ADDR	PLC1 ADDR			
VDC0	OUT0	Q11300	1	FIRE ALARM LIGHT
0:1.14/01	OUT1	Q11301	2	EMERGENCY STOP LIGHT
0:1.14/02	OUT2	Q11302	3	SYSTEM LOW WATER LEVEL LIGHT
0:1.14/03	OUT3	Q11303	4	LOW FUEL LEVEL LIGHT
0:1.14/04	OUT4	Q11304	5	BUS UNDER/OVER VOLTAGE LIGHT
0:1.14/05	OUT5	Q11305	6	BUS UNDER/OVER FREQUENCY LIGHT
0:1.14/06	OUT6	Q11306	7	FEEDER BREAKER OVERCURRENT LIGHT
0:1.14/07	OUT7	Q11307	8	PRIMARY PLC FAILURE LIGHT
	GND0		28	
VDC1				
	GND1		28	
0:1.14/08	OUT8	Q11308	9	(SPARE) LIGHT
0:1.14/09	OUT9	Q11309	10	(SPARE) LIGHT
0:1.14/10	OU10	Q11310	11	(SPARE) LIGHT
0:1.14/11	OUT11	Q11311	12	(SPARE) LIGHT
0:1.14/12	OUT12	Q11312	13	(SPARE) LIGHT
0:1.14/13	OUT13	Q11313	14	(SPARE) LIGHT
0:1.14/14	OUT14	Q11314	15	(SPARE) LIGHT
0:1.14/15	OUT15	Q11315	16	(SPARE) LIGHT

(10/40) PLCOR 9 1 Q11307

(LOCATED ON BACKPAN)

24VDC, COMBO
8 INPUT/8 OUTPUT EXPANSION
BLOCK 1790-T8BV8BX
NODE: 10 EXPANSION BLOCK No. 2

PLC1 ADDR	PLC2 ADDR		
IN0	I:1.14/00	I:1.84/00	COM 28
IN1	I:1.14/01	I:1.84/01	COM 28
IN2	I:1.14/02	I:1.84/02	
IN3	I:1.14/03	I:1.84/03	
IN4	I:1.14/04	I:1.84/04	
IN5	I:1.14/05	I:1.84/05	
IN6	I:1.14/06	I:1.84/06	
IN7	I:1.14/07	I:1.84/07	
VDC 624			GND 28

52TF 624 Q11410

FUEL 624 11406 TOTAL FUEL PULSER

(10/60) PLCORX 9 5 Q11407

PLC2 ADDR	PLC1 ADDR			
	OUT0			
0:1.15/00	0:1.14/00			
	OUT1			
0:1.15/01	0:1.14/01			
	OUT2			
0:1.15/02	0:1.14/02			
	OUT3			
0:1.15/03	0:1.14/03			
	OUT4	Q11404	14 RAR 13	REMOTE ALARM RELAY
0:1.15/04	0:1.14/04			
	OUT5	Q11405	14 F-BCR 13	FEEDER CONTACTOR CLOSE RELAY
0:1.15/05	0:1.14/05			
	OUT6	Q11406	14 F-BOR 13	FEEDER CONTACTOR OPEN RELAY
0:1.15/06	0:1.14/06			
	OUT7	Q11407	14 PLC OR 13	PLC OK RELAY
0:1.15/07	0:1.14/07			

11/34, 11/34
11/34, 11/34
9/26
9/32
10/11, 11/6

(LOCATED ON BACK PAN)

CONTINUED AT UPPER RIGHT

(+) 624

(-) 28

REFER TO SHEET #

CONTINUED FROM LOWER LEFT

(+) 624

(-) 28

24VDC, COMBO
8 INPUT/8 OUTPUT BASE BLOCK
1790D-T8BV8B
NODE: 11 BASE BLOCK

PLC1 ADDR		
IN0	I:1.15/00	COM 28
IN1	I:1.15/01	COM 28
IN2	I:1.15/02	
IN3	I:1.15/03	
IN4	I:1.15/04	
IN5	I:1.15/05	
IN6	I:1.15/06	
IN7	I:1.15/07	GND 28
VDC 624		

PLC1 ADDR			
OUT0	0:1.15/00		
OUT1	0:1.15/01		
OUT2	0:1.15/02		
OUT3	0:1.15/03		
OUT4	0:1.15/04		
OUT5	0:1.15/05		
OUT6	0:1.15/06		
OUT7	0:1.15/07	Q11507	14 PLC ORX 13 — 10/39 — PLC OK AUX RELAY

(LOCATED ON BACK PAN)

RTD INPUT MODULE
1790D-T4RO
NODE: 12 BASE BLOCK

PLC1 ADDR	PLC2 ADDR		
VDC 624		GND 624	
CH0_A		675	R
COM	M1:1.5	I:1.85	W 676
CH0_B		677	BK
CH1_A		678	R
COM	M1:1.6	I:186	W 679
CH1_B		680	BK
CH2_A			
COM	M1:1.7	I:187	
CH2_B			
CH3_A			
COM	M1:1.8	I:188	
CH3_B			

OUTSIDE AIR TEMP RTD, 100 OHM

INSIDE AIR TEMP RTD, 100 OHM

(LOCATED ON BACK PAN)

CONTINUED ON DWG No. W-035742-11, LINE No. 11/42

(+) 624

(-) 28

SECTION #4

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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
		2	AS-BUILT FOR M&I 21116 UPGRADES	JRV	JRP	23-02-20
		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22-12-09
		1	AS BUILT	JBG	VI	06-03-29

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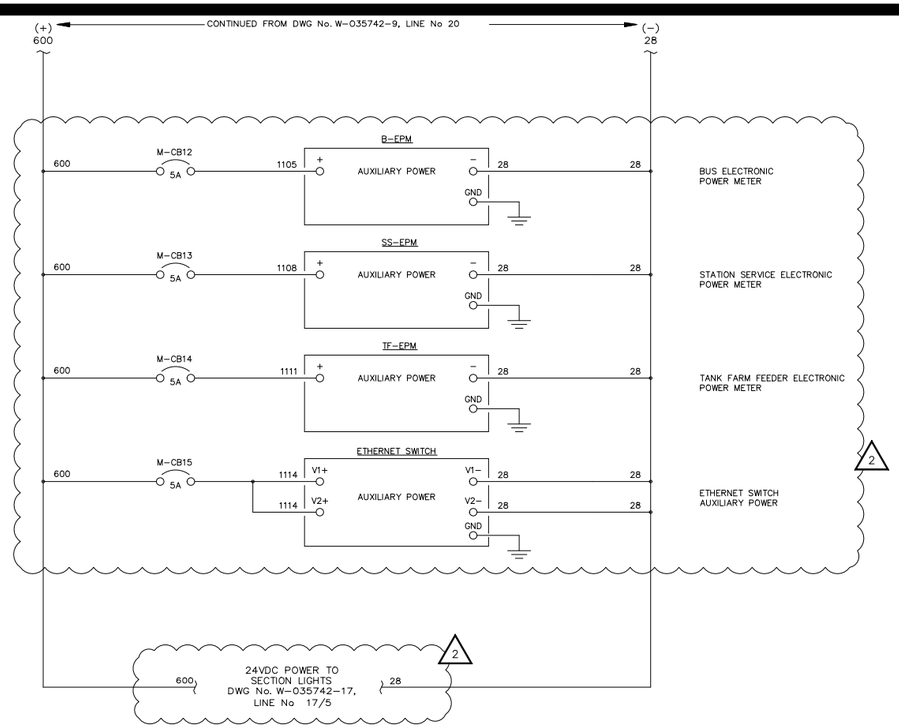
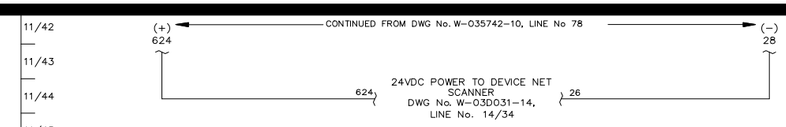
ANCHORAGE, ALASKA 99503
HTTP://WWW.AEA.ORG

GENERATOR CONTROL PANEL
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-10	SHEET	10





SECTION #4

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		1	AS BUILT	JBG	VI	06-03-29

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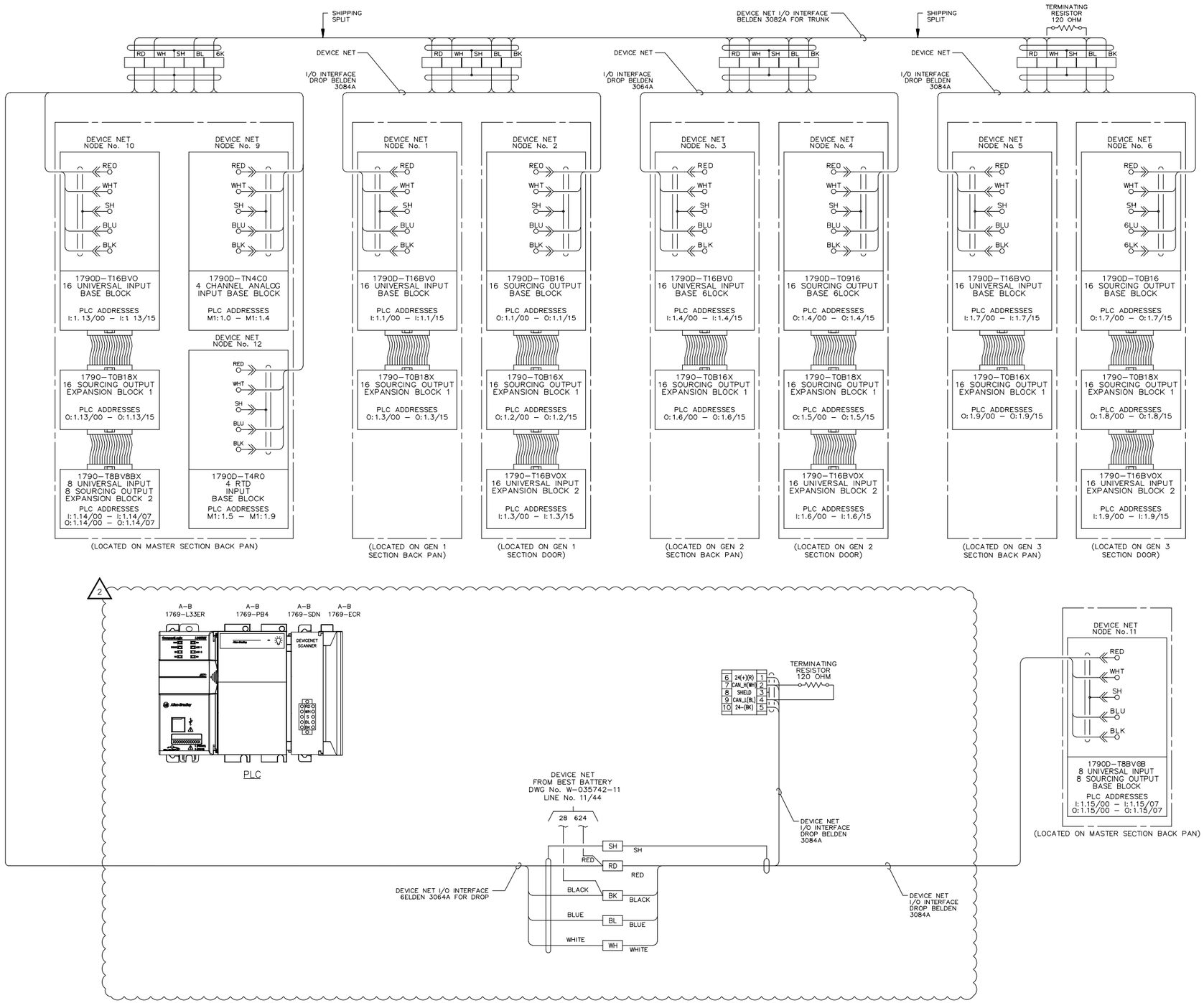
GENERATOR CONTROL PANEL
MODEL GCS 2200
MASTER DC CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No. C-025420		WORK ORDER No. W-035742	
DRAWN BY JBG	AUTH BY VI	DATE 22-12-09	REV 2
DRAWING/FILE No. W-035742-11			SHEET 11



SECTION #4

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AUTH. BY: _____ DATE: _____

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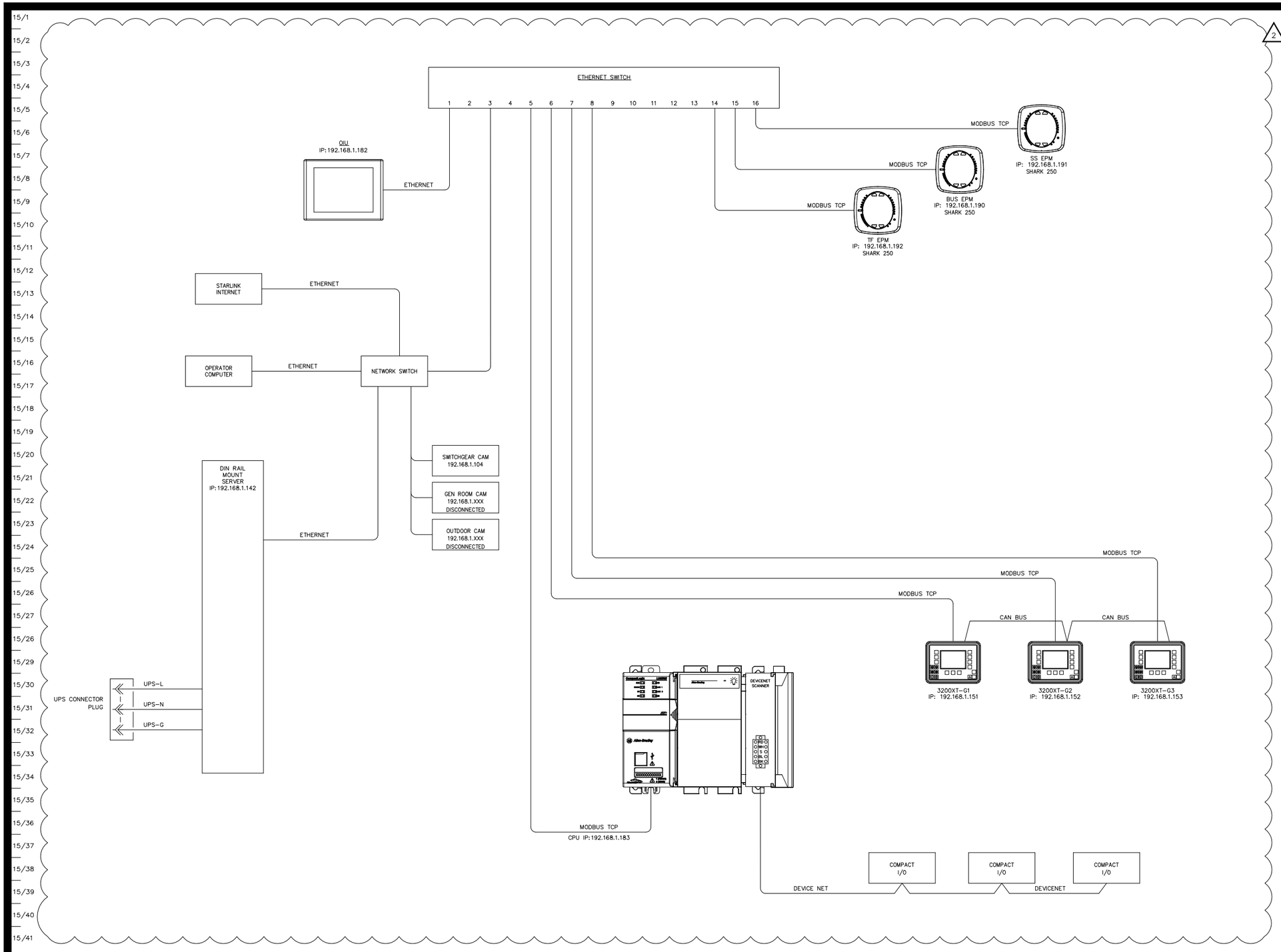
GENERATOR CONTROL PANEL
MODEL GCS 2200
PLC COMMUNICATION DIAGRAM
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-025420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	22-12-09
REV	2
DRAWING/FILE No.	W-035742-14
SHEET	14



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		1	AS BUILT	JBG	VI	06-03-29

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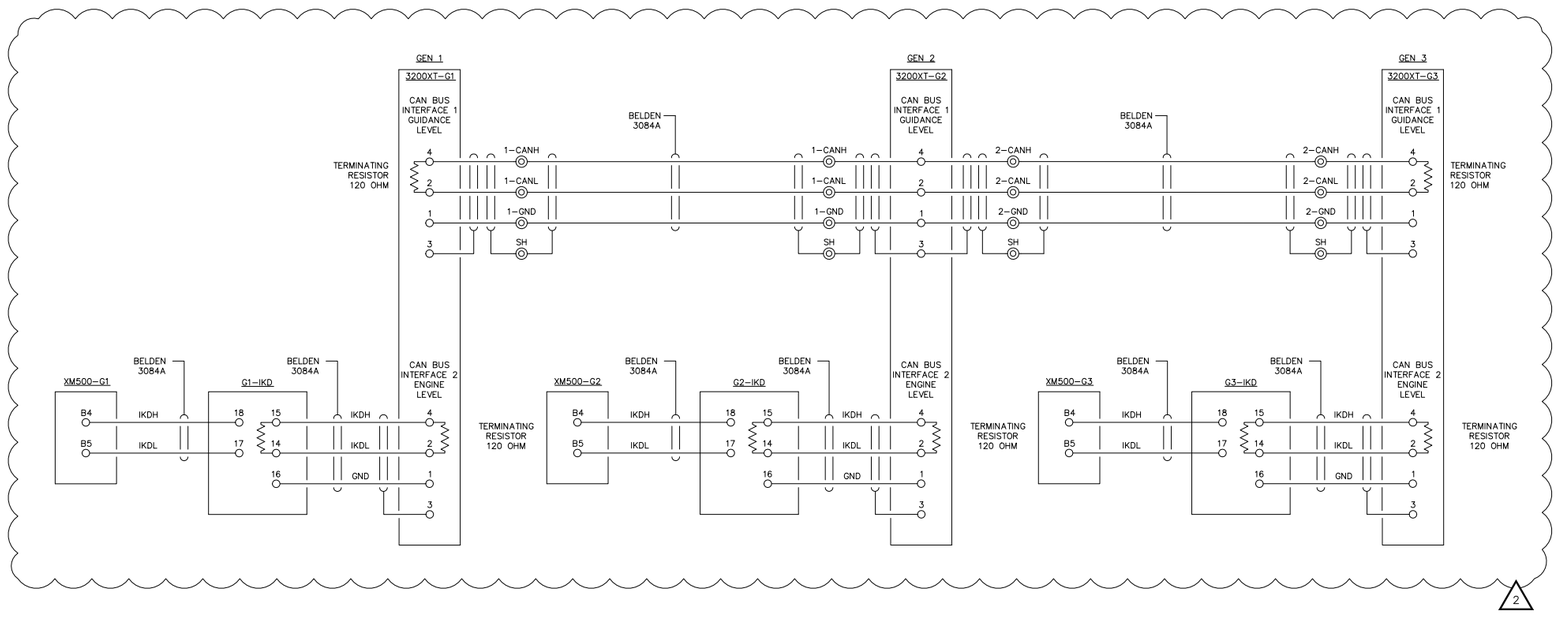
GENERATOR CONTROL PANEL
MODEL GCS 2200
COMMUNICATION NETWORK DIAGRAM
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-15	SHEET	15



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		1	AS BUILT	JBG	VI	06-03-29

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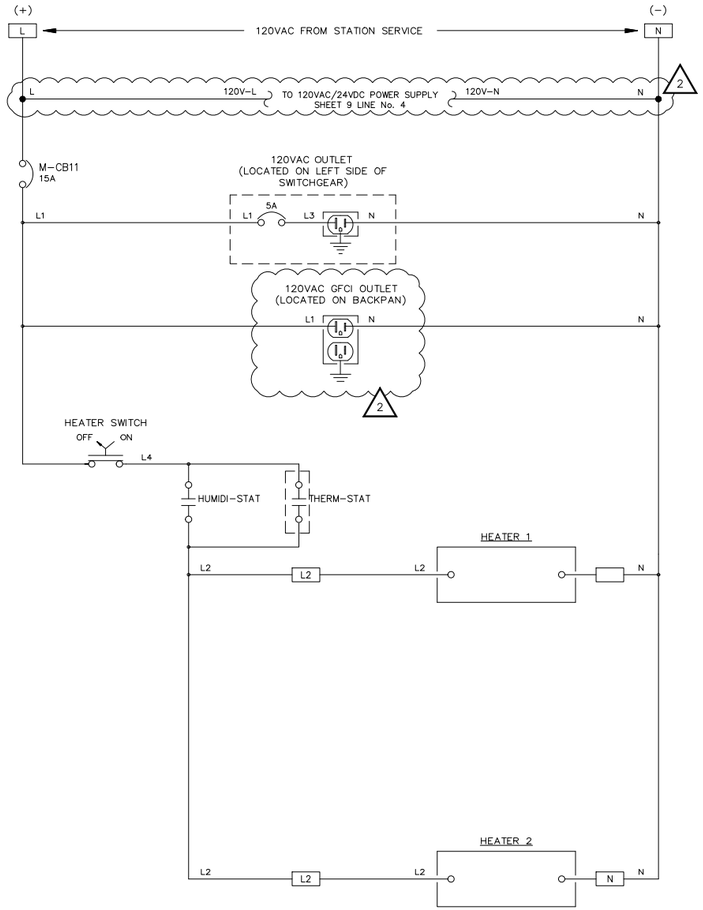
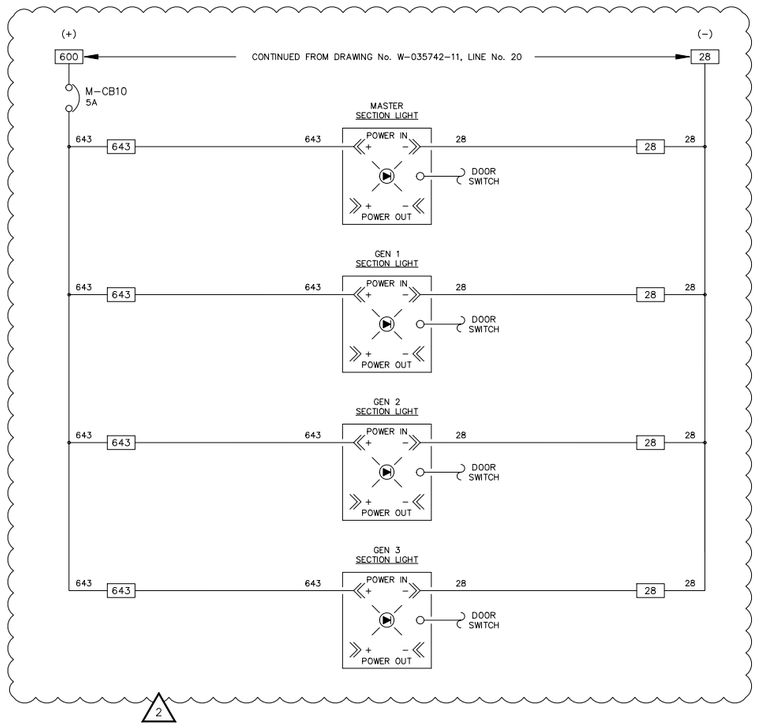
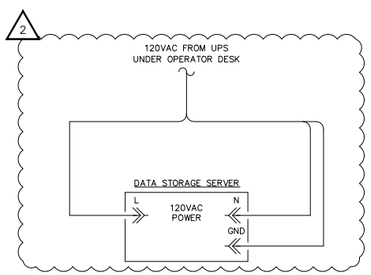
GENERATOR CONTROL PANEL
MODEL GCS 2200
CANBUS COMMUNICATION DIAGRAM
TEENAKEESPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C-025420	WORK ORDER No.	W-035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22-12-09	REV	2
DRAWING/FILE No.	W-035742-16	SHEET	16







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

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		1A	ISSUED FOR REVIEW FOR SWITCHGEAR UPDATE	JRV	JRP	22–12–09
		1	AS BUILT	JBG	VI	06–03–29

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GENERATOR CONTROL PANEL
MODEL GCS 2200
HEATER & LIGHTING CONTROL SCHEMATIC
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C–025420	WORK ORDER No.	W–035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22–12–09	REV	2
DRAWING/FILE No.	W–035742–17	SHEET	17

NP_1 TEXT 1/8" QUANTITY 3 SCALE 1/1

ENGINE RUNNING	ENGINE IDLE	ENGINE ALARM	LOW OIL PRESSURE	LOW OIL LEVEL	HIGH OIL TEMPERATURE	HIGH WATER TEMPERATURE	AIR FILTER PLUGGED	OVERSPEED	OVERCRANK	COOLDOWN/ LOCKOUT	BATTERY CHARGER FAILURE

NP_2 TEXT 1/8" QUANTITY 3 SCALE 1/1

NORMAL STOP	NOT IN AUTO POSITION	GENERATOR BREAKER OPEN	FAIL TO SYNCHRONIZE	OVERCURRENT	UNDER VOLTAGE	OVER VOLTAGE	UNDER FREQUENCY	OVER FREQUENCY	LOSS OF EXCITATION	REVERSE POWER

NP_3 TEXT 1/8" QUANTITY 1 SCALE 1/1

FIRE ALARM	EMERGENCY STOP	SYSTEM LOW WATER LEVEL	LOW FUEL LEVEL	BUS UNDER/ OVER VOLTAGE	BUS UNDER/ OVER FREQUENCY	FEEDER BREAKER OVERCURRENT	PRIMARY PLC FAILURE	OPERATING ON BACKUP PLC	BACKUP PLC FAILURE

NP_4 TEXT 1/8" QUANTITY 1 SCALE 1/1

NP_5 TEXT 1/8" QUANTITY 1 SCALE 1/1

LAMP TEST	EMERGENCY STOP	ALARM RESET

NP_7 TEXT 1/8" QUANTITY 1 SCALE 1/1

COMMUNITY CONTACTOR OPEN	CLOSED

NP_8 TEXT 1/8" QUANTITY 3 SCALE 1/1

CONTACTOR OPEN	CLOSED

NP_9 TEXT 1/2" QUANTITY 1 SCALE 1/1

MASTER CONTROL

NP_10 TEXT 1/2" QUANTITY 1 SCALE 1/1

GENERATOR 1

NP_11 TEXT 1/2" QUANTITY 1 SCALE 1/1

GENERATOR 2

NP_12 TEXT 1/2" QUANTITY 1 SCALE 1/1

GENERATOR 3

NP_14 TEXT 1/8" QUANTITY 1 SCALE 1/1

GENERATOR 1

NP_15 TEXT 1/8" QUANTITY 1 SCALE 1/1

GENERATOR 2

NP_16 TEXT 1/8" QUANTITY 1 SCALE 1/1

GENERATOR 3

NP_18 TEXT 1/8" QUANTITY 1 SCALE 1/1

BUS TOTALIZING

NP_19 TEXT 1/8" QUANTITY 2 SCALE 1/1

STATION SERVICE

NP_20 TEXT 1/8" QUANTITY 1 SCALE 1/1

COMMUNITY FEEDER

NP_21 TEXT 1/8" QUANTITY 2 SCALE 1/1

TANK FARM

NP_22 TEXT 1/8" QUANTITY 3 SCALE 1/1

GOVERNOR MODE IDLE	RATED

NP_23 TEXT 1/8" QUANTITY 1 SCALE 1/1

HEATER OFF	ON

NP_24 TEXT 1/8" QUANTITY 3 SCALE 1/1

IDLE ADJUST INCREASE →

NP_25 TEXT 1/2" QUANTITY 1 SCALE 1/1

64 KW

NP_26 TEXT 1/2" QUANTITY 2 SCALE 1/1

88 KW

NP_28 TEXT 1/8" QUANTITY 4 SCALE 1/1

GENERATOR LOCKOUT FOR SERVICE OFF	RUN

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

FOR REFERENCE ONLY

REFER TO SHEET #

AS BUILT

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DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
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GENERATOR CONTROL PANEL
MODEL GCS 2200
NAMEPLATE ENGRAVING SCHEDULE, FABRICATION DETAIL
TENAKEE SPRINGS RURAL POWER SYSTEM UPGRADE

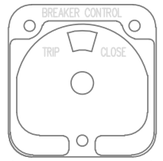
CUSTOMER	ALASKA ENERGY AUTHORITY
CUSTOMER ORDER No.	C-025420
WORK ORDER No.	W-035742
DRAWN BY	JBG
AUTH BY	VI
DATE	06-02-01
REV	1
DRAWING/FILE No.	W-035742-19
SHEET	19

SYSTEM MODE SWITCH – SMS

DECK	CONTACTS	POS. AUTO	POS. MAN
1	12 – 11	X	
	13 – 15		X
	16 – 17	X	

(ELECTROSWITCH 24201C)
KNURLED HANDLE
QTY 1

MAIN CONTACTOR CONTROL SWITCH – 42CS



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

(ELECTROSWITCH 2438D)
PISTOL GRIP HANDLE
SPRING RETURN TO CENTER
QTY 1

GOVERNOR MODE SWITCH – GMS

GOVERNOR MODE
IDLE RATED

POS IDLE	POS RATED
/	\
X	

(RATED)

(MAINTAINED)
LOCATED ON BACK PAN

HEATER CONTROL SWITCH – HCS

HEATER
OFF ON

POS OFF	POS ON
/	\
X	

(ON)

(MAINTAINED)
LOCATED ON MASTER BACK PAN

ENGINE CONTROL SWITCH – GLS

GENERATOR LOCKOUT FOR SERVICE
OFF RUN

POS OFF	POS RUN
/	\
X	

(OFF) (OFF)

(MAINTAINED)

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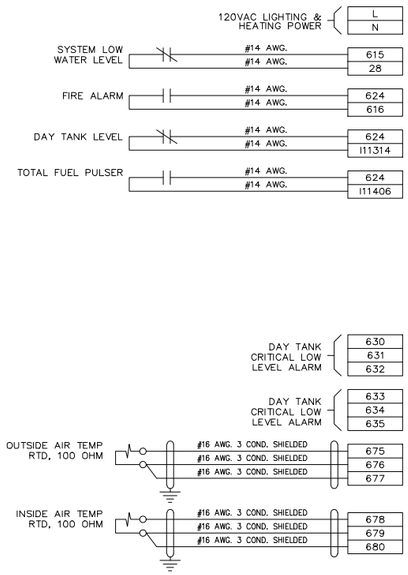
DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
		1	AS BUILT	JBG	VI	06–03–29

THOMSON TECHNOLOGY
INDUSTRIAL SYSTEMS
POWER & CONTROL

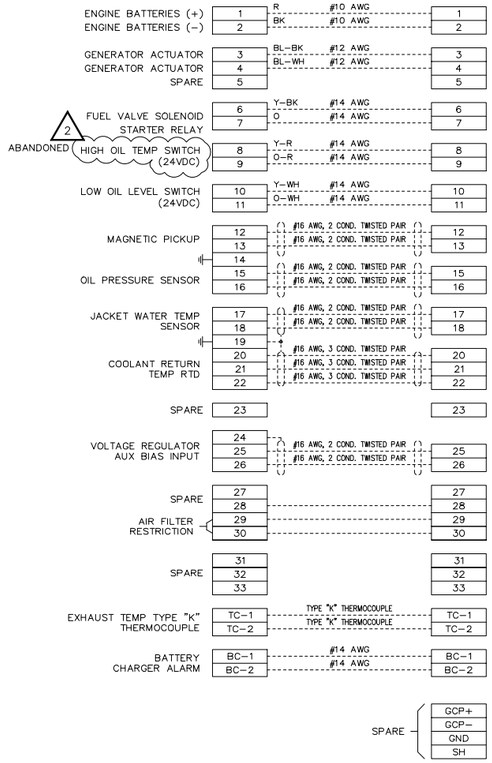
GENERATOR CONTROL PANEL
MODEL GCS 2200
CONTROL SWITCH TARGET DIAGRAM
TENAKEE SPRINGS RURAL POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.		WORK ORDER No.	
C– 025420		W– 035742	
DRAWN BY	AUTH BY	DATE	REV.
JBG	VI	06–02–02	1
DRAWING/FILE No.		SHEET	
W–035742–18		18	

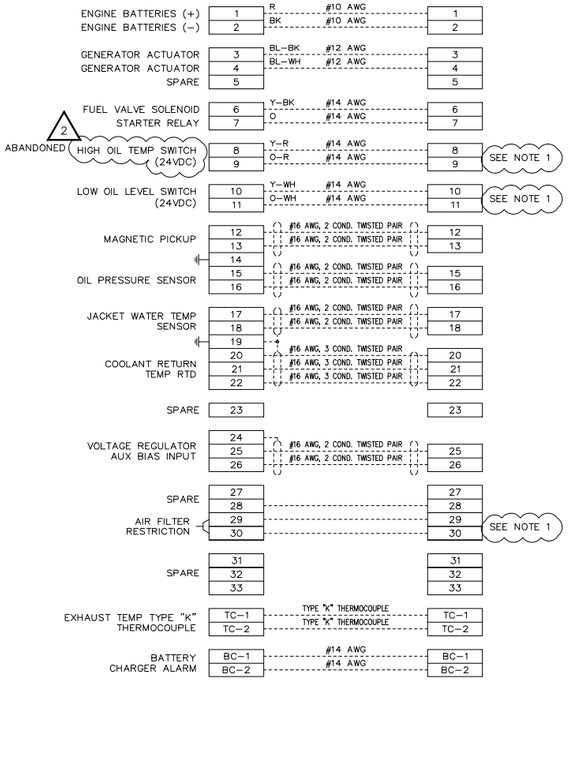
MASTER CONTROL



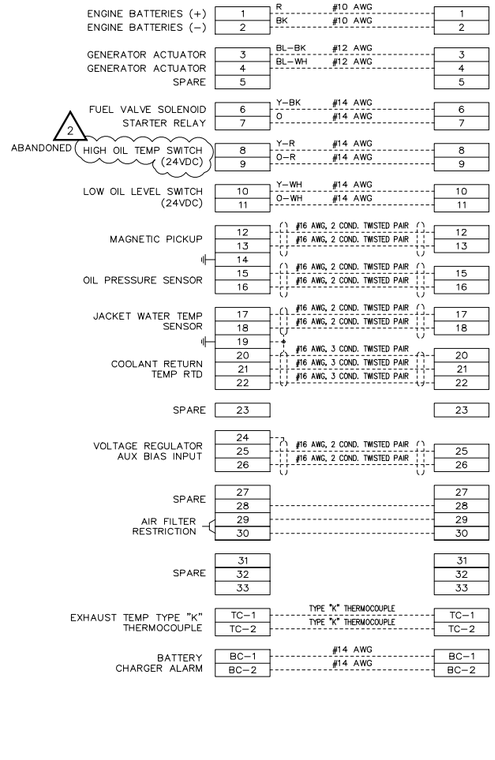
GENERATOR 1



GENERATOR 2



GENERATOR 3



NOTES:

1. GEN 2 OIL TEMP SENSOR, OIL LEVEL SWITCH, AND AIR FILTER RESTRICTION TEMPORARILY DISCONNECTED DUE TO INTERMITTENT SHORTING. WIRE # 40 (+24VDC) DISCONNECTED AT LOWER LEFT TERMINALS

REFER TO SHEET

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		1	AS BUILT	JBG	VI	06–03–29

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GENERATOR CONTROL PANEL
MODEL GCS 2200
INTERCONNECTION DIAGRAM
TEENAKEE SPRINGS POWER SYSTEM UPGRADE

CUSTOMER	ALASKA ENERGY AUTHORITY		
CUSTOMER ORDER No.	C–025420	WORK ORDER No.	W–035742
DRAWN BY	JBG	AUTH BY	VI
DATE	22–12–09	REV	2
DRAWING/FILE No.	W–035742–20	SHEET	20

BILL OF MATERIAL

ESTIMATED QUANTITY	DESCRIPTION	MANUFACTURER/CATALOG NUMBER
3	GENSET CONTROLLER 3200XT–P1	WOODWARD / 8440–2082
3	MURPHY XM500 EXPANSION I/O	MURCAL / 78700420
9	ANALOG SIGNAL CONVERTER	OMEGA / DR–I3P
3	MURPHY PRESSURE SENSOR	MURCAL / ES2P–100
3	MURPHY TEMPERATURE SENSOR	MURCAL / ES2T–250/300–1/2
3	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
2	SHARK 250 DIGITAL METERS – SS, TF	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/P1101
1	DATA STORAGE SERVER	ONLOGIC / ML100G–53
1	REDLION N–TRON 116TX NETWORK SWITCH	REDLION / 116TX
1	BATTERY BUFFER MODULE	SIEMENS / 6EP1933–2EC51
1	POWER BRIDGE RECTIFIER, 60 AMP	CRYDOM / M5060THC1200
1	120 VAC – 24 VDC POWER SUPPLY 480WATT	PULS / CP20.241–S1
6	12 VDC – 24 VDC CONVERTER 96WATT	PULS / CD5.243
1	15 AMP GFCI CONVENIENCE OUTLET	PHOENIX CONTACT / 5600639
1	1500VA RACK/TOWER MOUNT UPS	TRIPP–LITE / SMART1500LCD
4	LED ENCLOSURE LIGHT 1200 LUMEN	HOFFMAN / EL1200D24V
4	LED DOOR SWITCH KIT	HOFFMAN / ELD0801U
4	LED LIGHT MOUNTING KIT	HOFFMAN / ELA02SF
4	LED LIGHT TERMINAL KIT	HOFFMAN / ELCN124V
4	5 AMP CIRCUIT BREAKER	ABB / SU201M–C5
3	15 AMP CIRCUIT BREAKER	ABB / SU201M–C15
3	GPR FILLER PLATE (12 GAUGE, ANSI 61 LG)	SHOP FABRICATED
1	EPM FILLER PLATE (12 GAUGE, ANSI 61 LG)	SHOP FABRICATED

REV.	DATE	DESCRIPTION	BY
1	02–20–23	AS–BUILT FOR M&I 21116 UPGRADES	JRV

AEA JOB No. 21116

TITLE: TENAKEE SPRINGS SWITCHGEAR UPGRADE BILL OF MATERIALS

SCALE: NONE	DATE: 12–09–22	DWN. BY: JRV
DWG. No: 21116–TS–BOM	SHEET: 1 OF 1	CKD. BY: JRP

JOB: TENAKEE SPRINGS

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

** 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. WHERE STRUT IS WELDED TO TANKS OR STRUCTURES PROVIDE PLAIN (UN-FINISHED BLACK) SOLID BACK STRUT – 12 GAUGE, 1-5/8" x 1-5/8", B-LINE B22-PLN OR EQUAL. ON ALL EXTERIOR INSTALLATIONS PROVIDE TYPE 304 STAINLESS STEEL STRUT AND FITTINGS.

FITTINGS AND ACCESSORIES – PROVIDE FITTINGS, BRACKETS, CHANNEL NUTS, AND ACCESSORIES DESIGNED SPECIFICALLY FOR USE WITH SPECIFIED CHANNEL STRUT. GALVANIZED OR ZINC-PLATED CARBON STEEL EXCEPT FOR EXTERIOR INSTALLATIONS TYPE 304 STAINLESS STEEL.

PIPE CLAMPS – TWO-PIECE PIPE CLAMP DESIGNED TO SUPPORT PIPE TIGHT TO STRUT. B-LINE B20## OR EQUAL. ZINC-PLATED CARBON STEEL EXCEPT FOR EXTERIOR INSTALLATIONS TYPE 304 STAINLESS 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 FOR EXTERIOR INSTALLATIONS TYPE 316 STAINLESS STEEL.

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

** PAINTING AND INSULATION **

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 SPEEDENAMEL 4318 OR EQUAL, COLOR HAZE GRAY EXCEPT WHEN 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 – INSULATE GLYCOL COOLANT SUPPLY AND RETURN MAINS AS INDICATED. INSTALL 1" PRE-FORMED RIGID FIBERGLASS PIPE INSULATION, JOHNS-MANVILLE MICRO-LOK OR EQUAL. PROVIDE EXTERIOR GRADE CORRUGATED 0.016" THICK ALUMINUM JACKETING, CHILDERS OR EQUAL. PROVIDE PRE-FORMED ALUMINUM COVERS FOR ALL FITTINGS.

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

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.

FLEXIBLE CONNECTORS – TYPE 321 STAINLESS STEEL CORRUGATED HOSE, TYPE 304 STAINLESS STEEL WIRE DOUBLE BRAIDED OUTER SHIELD. SCH 80 MPT OR 150# ANSI FLANGED ENDS (FIXED OR FLOATING AS INDICATED) 125 PSIG MINIMUM WORKING PRESSURE, DIAMETER AND LIVE (HOSE) OR OVERALL LENGTH AS INDICATED. PENFLEX PW 721 OR EQUAL. FURNISH WITH CERTIFICATION OF MINIMUM 125 PSIG PRESSURE TEST.

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, GLASS FILLED TEFLON SEAT, GRAPHITE SEALS, LOCKABLE HANDLE, 150 PSIG MINIMUM WORKING PRESSURE, NACE MR0175 CONFORMANCE, FIRE SAFE PER API 607. PBV C-5410-31-2236-GLNL, NO SUBSTITUTES.

THREADED BALL VALVES – CARBON STEEL BODY, THREADED ENDS, STAINLESS STEEL BALL AND TRIM, PTFE SEAT, GRAPHITE SEALS, LOCKABLE HANDLE, 150 PSIG MINIMUM WORKING PRESSURE, NACE MR0175 CONFORMANCE, FIRE SAFE PER API 607. PBV C-5312-38-2236-TL-NC, NO SUBSTITUTES.

FLANGED SWING CHECK VALVES (2" AND LARGER) – CARBON STEEL BODY, ANSI 150# RF FLANGED ENDS, STEEL DISC AND TRIM, 150 PSIG MINIMUM WORKING PRESSURE. CRANE CLASS 150 NO. 147 OR EQUAL.

FLANGED SWING CHECK VALVES (SMALLER THAN 2") – CARBON STEEL BODY, ANSI 150# RF FLANGED ENDS, STAINLESS STEEL TRIM AND SEATS, 150 PSIG MINIMUM WORKING PRESSURE. BONNEY FORGE L1-61 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.

FLANGED PRESSURE RELIEF VALVES – STEEL BODY, ANSI 150# RAISED FACE FLANGE INLET AND OUTLET, 1/2" SOFT SEAT ORIFICE, CLOSED CAP, SIZE AND PRESSURE SETTING AS INDICATED. HYDROSEAL 1FLARV00 OR EQUAL.

THREADED PRESSURE RELIEF VALVES – 1/2" SIZE – STEEL BODY, MPT INLET X FPT OUTLET, CLOSED CAP, SIZE AND PRESSURE SETTING AS INDICATED, HYDROSEAL 4FRV00 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.

** DIESEL FUEL AND LUBE OIL PIPING AND VALVES ** (CONTINUED)

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.

** DIESEL FUEL AND LUBE OIL EQUIPMENT AND SPECIALTIES **

DAY TANK – RECTANGULAR HEAVY GAUGE WELDED STEEL TANK MANUFACTURED IN ACCORDANCE WITH UL STANDARD 142 AND AEA STANDARD POWER PLANT TANK FABRICATION DETAILS, NOMINAL 100 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, 1% 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.

FLANGED STRAINERS – "Y" TYPE CARBON STEEL BODY, ANSI 150# RAISED FACE FLANGED ENDS 150 PSIG WORKING PRESSURE, MUELLER #781 OR EQUAL. PROVIDE WITH OPTIONAL 100 MESH STAINLESS STEEL SCREEN.

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.

DAY TANK METER – 3/4" MPT INLET AND OUTLET, ACCURATE TO +/-1% AT 8 GPH, O-RINGS AND SEALS COMPATIBLE WITH #1 DIESEL FUEL, DIRECT READ REGISTER WITH REED SWITCH PULSER ASSEMBLY. AMCO PART# OIL 92146.

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.

GAUGE HATCH – BRASS CAP AND CHAIN, BUNA-N GASKET, 2" FPT CONNECTION. MORRISON FIGURE 307 OR EQUAL.

CLOCK-TYPE LIQUID LEVEL GAUGE – ALUMINUM BODY, 2" MPT CONNECTION, STAINLESS STEEL FLOAT SIZED TO PASS THROUGH 2" BUNG OPENING, CLOCK-STYLE GAUGE WITH READOUT IN FEET AND INCHES UP TO 12 FEET, ACCURATE WITHIN 1/4" OVER FULL SCALE. MORRISON FIGURE 818 OR EQUAL.

FILL LIMITERS – 2" FPT FLOAT-TYPE MECHANICAL SHUT-OFF VALVE. ALUMINUM BODY, CLOSED CELL BUNA-N FLOAT, BRASS PLUNGER, STAINLESS STEEL TRIM, 100 PSIG SHUT-OFF PRESSURE. MORRISON FIGURE 9095-A OR EQUAL. PROVIDE WITH 2" ALUMINUM DROP TUBE CUT TO LENGTH AT 45 DEGREES AS REQUIRED TO TERMINATE WITHIN 6" ABOVE TANK BOTTOM.

PRESSURE/VACUUM WHISTLE VENTS – ALUMINUM BODY AND HOOD, STAINLESS STEEL SCREENS AND FLOAT, BRASS INTERNALS, VITON SEALS. 2" FPT CONNECTION, 8 OZ/SQUARE INCH PRESSURE SETTING, 1 OZ/SQUARE INCH VACUUM SETTING. HIGH INTENSITY WHISTLE ALARM ON RISE OF FLOAT AT ADJUSTABLE LEVEL. MORRISON FIGURE 922 OR EQUAL.

EMERGENCY VENTS – ALUMINUM BODY, CAST IRON COVER, 16 OZ/SQUARE INCH PRESSURE SETTING, FLANGED CONNECTION. 8" SIZE – 465,000 CFH RELIEF CAPACITY AT 2.5 PSIG, 10" SIZE – 576,000 CFH RELIEF CAPACITY AT 2.5 PSIG. MORRISON FIGURE 244-F OR EQUAL.

VENT CAPS – ALUMINUM BODY, STAINLESS STEEL SCREEN, FPT CONNECTION, SIZE AS INDICATED. MORRISON FIGURE 155 OR EQUAL.

** GLYCOL PIPING, VALVES, AND SPECIALTIES **

GLYCOL PIPING (ECS, ECR, HRS, HRR) – PROVIDE COPPER PIPE AND FITTINGS. PROVIDE FLEXIBLE HOSE FOR CONNECTION TO ALL ENGINES. PROVIDE SMALL DIAMETER AEROQUIP HOSE WHERE INDICATED FOR INSTRUMENTATION AND BLEED LINES (SEE DIESEL FUEL PIPING SPECIFICATIONS). 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 – SIZE AS INDICATED ON DRAWINGS, SAE J 1527, USCG TYPE B-2, THERMOID BELLOWSFLEX #7910 OR EQUAL. INSTALL WITH STAINLESS STEEL T-BOLT CLAMPS. WHERE HOSE PASSES WITHIN 12" OF HOT EXHAUST COMPONENTS INSTALL HIGH TEMPERATURE SILICONE SLEEVES, EATON WEATHERHEAD A69## OR EQUAL.

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.

GLYCOL FILTER – SCREW-ON CANISTER STYLE FILTER ELEMENT WITH 3/8" NPT CONNECTIONS ON HEAD. WIX #24019 HEAD WITH #24069 ELEMENT 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.

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.

DIFFERENTIAL PRESSURE GAUGES – 2-1/2" DIAMETER DIAL, BRASS BODY, 1/4" IN-LINE CONNECTION, SPDT SWITCH WITH TERMINAL STRIP, 0-15 PSID RANGE. ASHCROFT 25-1132-A-25S-XV6-15, NO SUBSTITUTES. FACTORY SET SWITCH TO ACTIVATE AT 7 PSID

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.

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.

** SEQUENCE OF OPERATION **

VENTILATION AIR INTAKE AND EXHAUST MOTORIZED DAMPERS WILL OPEN ANY TIME ASSOCIATED EXHAUST FAN OPERATES. RADIATOR INTAKE AND DISCHARGE DAMPERS WILL OPEN ANY TIME ASSOCIATED RADIATOR FAN OPERATES. 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, 70F, ADJUSTABLE.

UNIT HEATER UH-1 AND CIRCULATING PUMP P-HR1 WILL OPERATE ON A CALL FOR HEATING THROUGH A LINE VOLTAGE THERMOSTAT TO MAINTAIN CONTROL ROOM TEMPERATURE, 70F, ADJUSTABLE.

LEAD RADIATOR R-1 VARIABLE FREQUENCY DRIVE WILL MODULATE FAN SPEED TO MAINTAIN ENGINE COOLANT RETURN TEMPERATURE AT 170F, ADJUSTABLE. BACKUP RADIATOR R-2 VARIABLE FREQUENCY DRIVE WILL MODULATE FAN SPEED TO MAINTAIN ENGINE COOLANT RETURN TEMPERATURE AT 180F, ADJUSTABLE. FANS WILL SHUT OFF WHEN SPEED IS BELOW 10%, ADJUSTABLE, OR WHEN COOLANT RETURN TEMPERATURE IS MORE THAN 10F BELOW SETPOINT, ADJUSTABLE.

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

** 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 AND EVERY 1,000 HOURS THEREAFTER.

LEGEND

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

SCHEDULE OF DRAWINGS

M1	SPECIFICATIONS, LEGEND, & SCHEDULE OF DRAWINGS
M2	EQUIPMENT LAYOUT PLAN & GENERATOR INSTALLATION DETAILS
M3	COOLANT PIPING PLAN, ISOMETRICS, DETAILS, & EQUIPMENT SCHEDULE
M4	DIESEL FUEL & USED OIL PIPING PLAN, DETAILS, & OIL PUMP SCHEDULE
M5	EXHAUST PLAN, MISCELLANEOUS DETAILS, & VALVE TAG SCHEDULE
M6	VENTILATION PLAN, DETAILS, & SPECIFICATIONS
M7	MECHANICAL SITE PLANS & DETAILS
MS1	MECHANICAL SUPPORT PLAN & DETAILS
FS1	FIRE SUPPRESSION SYSTEM PLAN, SECTION, & LEGEND
FS2	FIRE SUPPRESSION SYSTEM SPECIFICATIONS

RECORD DRAWING

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

DATE: 9/06/07

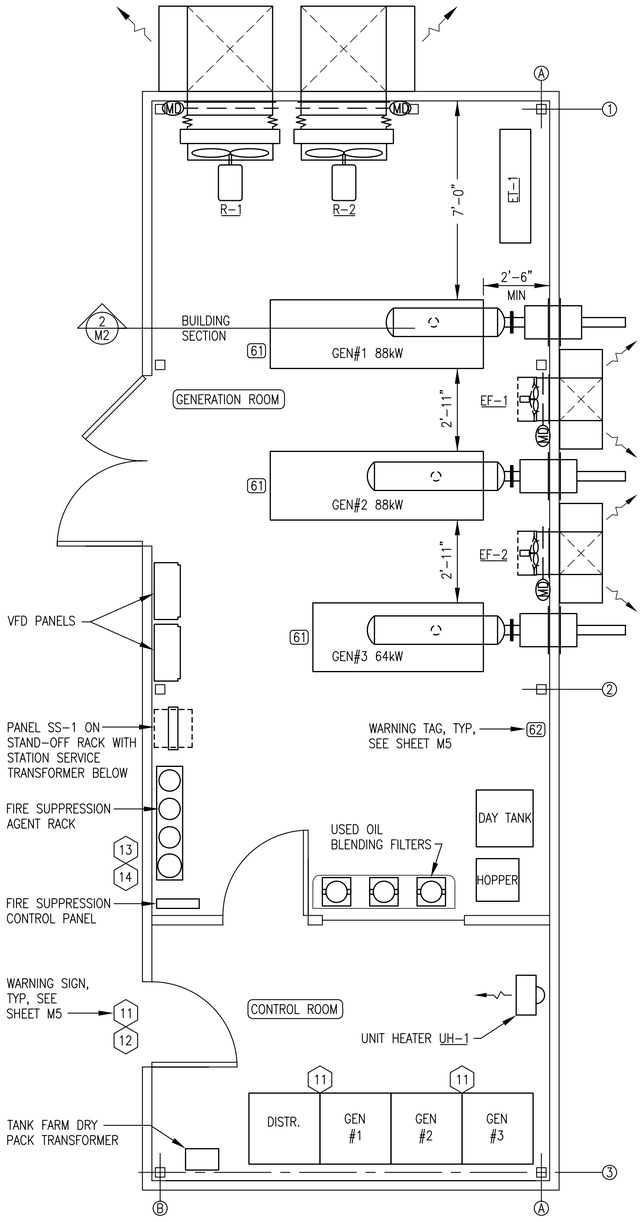
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

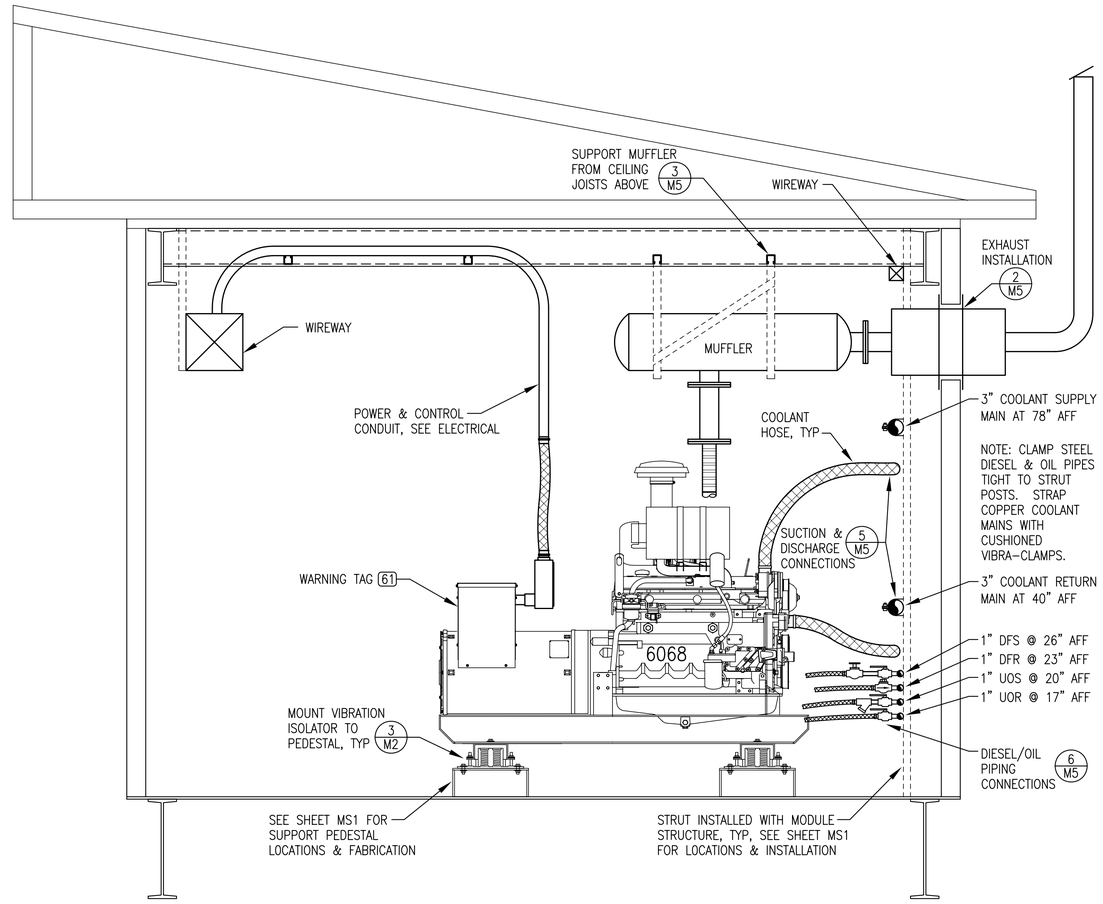
TITLE: SPECIFICATIONS, LEGEND, & SCHEDULE OF DRAWINGS

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

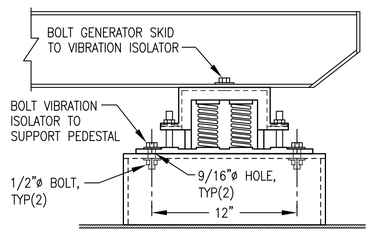
DRAWN BY: BCG	SCALE: NO SCALE	FILE NAME: TENAPP-M1A	SHEET: M1	OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841		



1 M2 EQUIPMENT LAYOUT PLAN
3/8"=1'-0"



2 M2 BUILDING SECTION/GENERATOR INSTALLATION
3/4"=1'-0"



NOTE: VIBRATION ISOLATORS FURNISHED WITH GENERATORS. VERIFY GENERATOR SKID & VIBRATION ISOLATOR BOLTING DIMENSIONS PRIOR TO DRILLING PEDESTALS.

3 M2 VIBRATION ISOLATOR INSTALLATION
1"=6"

RECORD DRAWING

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DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	DELETE BATTERY CHARGERS FROM CONTROL ROOM	1/10/06	BCG

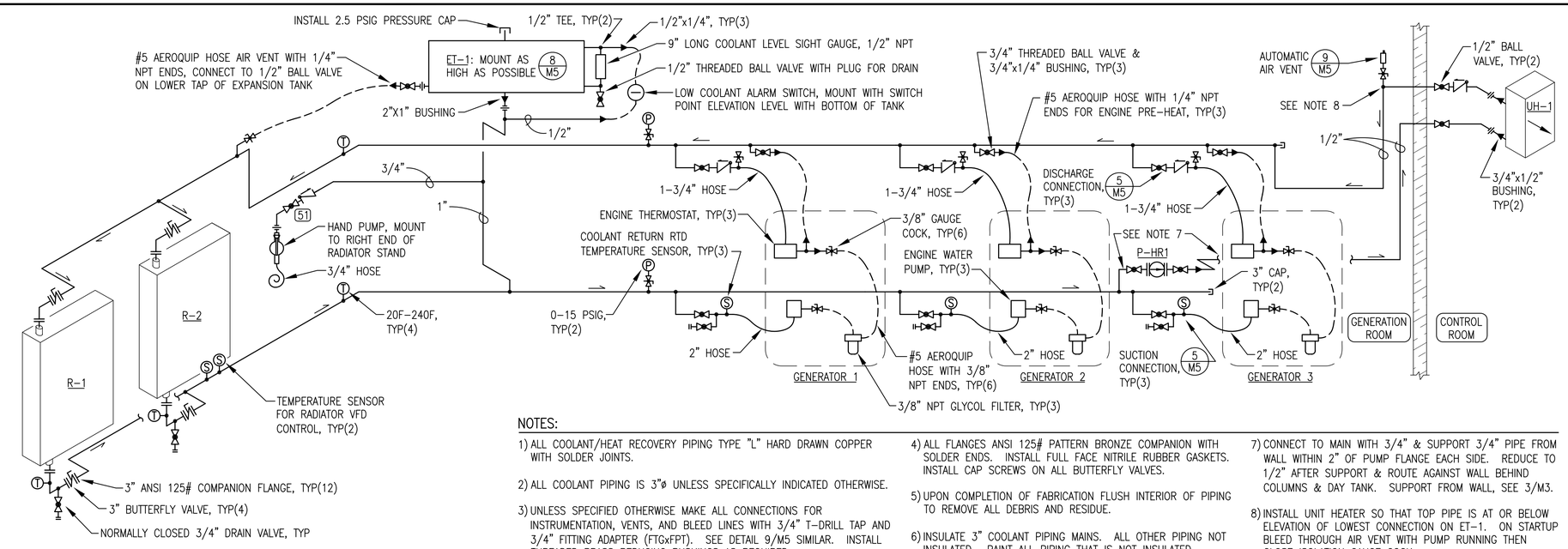
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: EQUIPMENT LAYOUT PLAN & GENERATOR INSTALLATION DETAILS

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

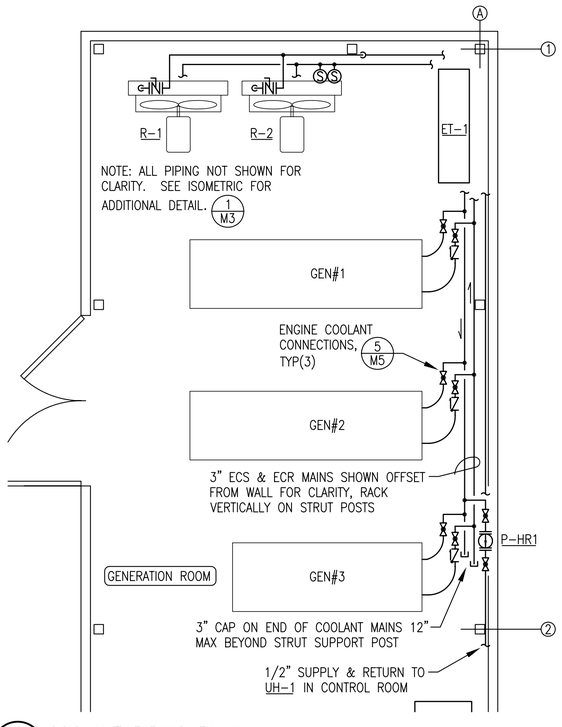
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: TENAPP-M2	SHEET: M2 OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



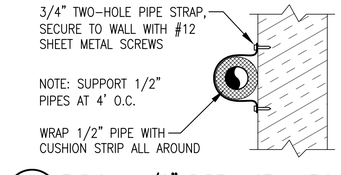
1/M3 COOLING SYSTEM PIPING ISOMETRIC
NO SCALE

NOTES:

1) ALL COOLANT/HEAT RECOVERY PIPING TYPE "L" HARD DRAWN COPPER WITH SOLDER JOINTS.
2) ALL COOLANT PIPING IS 3"ø UNLESS SPECIFICALLY INDICATED OTHERWISE.
3) 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 9/M5 SIMILAR. INSTALL THREADED BRASS REDUCING BUSHINGS AS REQUIRED.
4) ALL FLANGES ANSI 125# PATTERN BRONZE COMPANION WITH SOLDER ENDS. INSTALL FULL FACE NITRILE RUBBER GASKETS. INSTALL CAP SCREWS ON ALL BUTTERFLY VALVES.
5) UPON COMPLETION OF FABRICATION FLUSH INTERIOR OF PIPING TO REMOVE ALL DEBRIS AND RESIDUE.
6) INSULATE 3" COOLANT PIPING MAINS. ALL OTHER PIPING NOT INSULATED. PAINT ALL PIPING THAT IS NOT INSULATED.
7) CONNECT TO MAIN WITH 3/4" & SUPPORT 3/4" PIPE FROM WALL WITHIN 2" OF PUMP FLANGE EACH SIDE. REDUCE TO 1/2" AFTER SUPPORT & ROUTE AGAINST WALL BEHIND COLUMNS & DAY TANK. SUPPORT FROM WALL, SEE 3/M3.
8) INSTALL UNIT HEATER SO THAT TOP PIPE IS AT OR BELOW ELEVATION OF LOWEST CONNECTION ON ET-1. ON STARTUP BLEED THROUGH AIR VENT WITH PUMP RUNNING THEN CLOSE ISOLATION GAUGE COCK.



2/M3 COOLANT PIPING PLAN
3/8"=1'-0"



3/M3 TYPICAL 1/2" PIPE INSTALLATION
NO SCALE

COOLANT EQUIPMENT SCHEDULE

R-1 R-2	REMOTE RADIATOR	SINGLE PASS, VERTICAL CORE RADIATOR, 3" FLANGED CONNECTIONS, 2HP MOTOR, 208V, 3PH, 10:1 TURNDOWN RATIO SUITABLE FOR VFD OPERATION. L&M MESABI PART # 113969, NO SUBSTITUTES.
ET-1	COOLANT EXP. TANK	24 GALLON CAPACITY STEEL TANK FABRICATED IN ACCORDANCE WITH AEA STANDARD POWER PLANT TANK FABRICATION DETAILS.
UH-1	CONTROL ROOM HEAT	HORIZONTAL DISCHARGE HOT WATER UNIT HEATER, 13 MBH AT 2 GPM 200F EWT AND 60F EAT, 1/25HP, 120V, 1ø. MODINE HS-18 NO SUBSTITUTES.
P-HR1	CONTROL ROOM HEAT	2 GPM AT 15' TDH, 1/25HP, 115V, 1ø. GRUNDFOS UPS15-42F, SPD 3, NO SUBST, WITH 3/4" NPT COMPANION FLANGES, GASKETS, AND BOLTS.

RECORD DRAWING

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DATE: 9/06/07

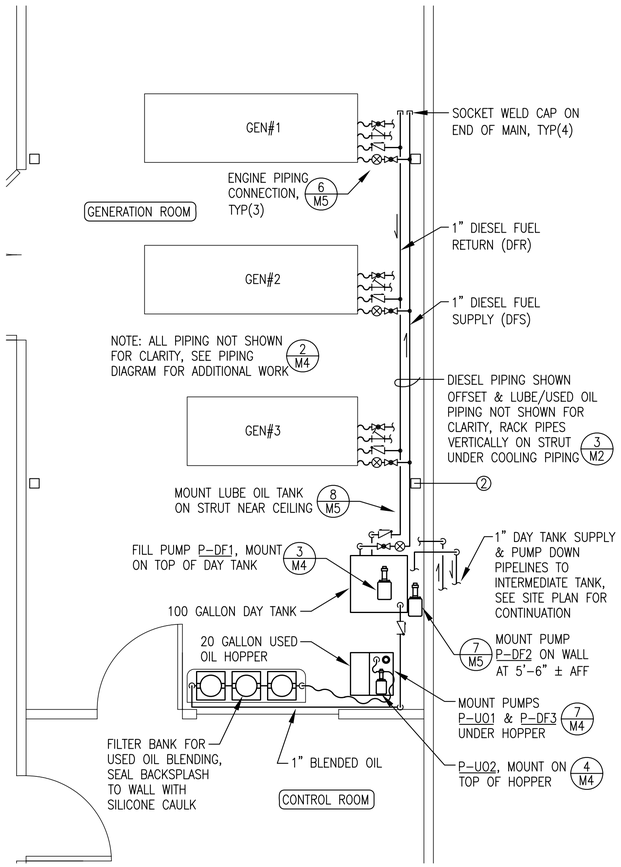
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: COOLANT PIPING PLAN, ISOMETRICS, DETAILS, & EQUIPMENT SCHEDULE

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: TENAPP-M3	SHEET: M3 OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



1/M4 DIESEL FUEL & USED OIL PIPING PLAN

3/8"=1'-0"

GENERAL NOTES:

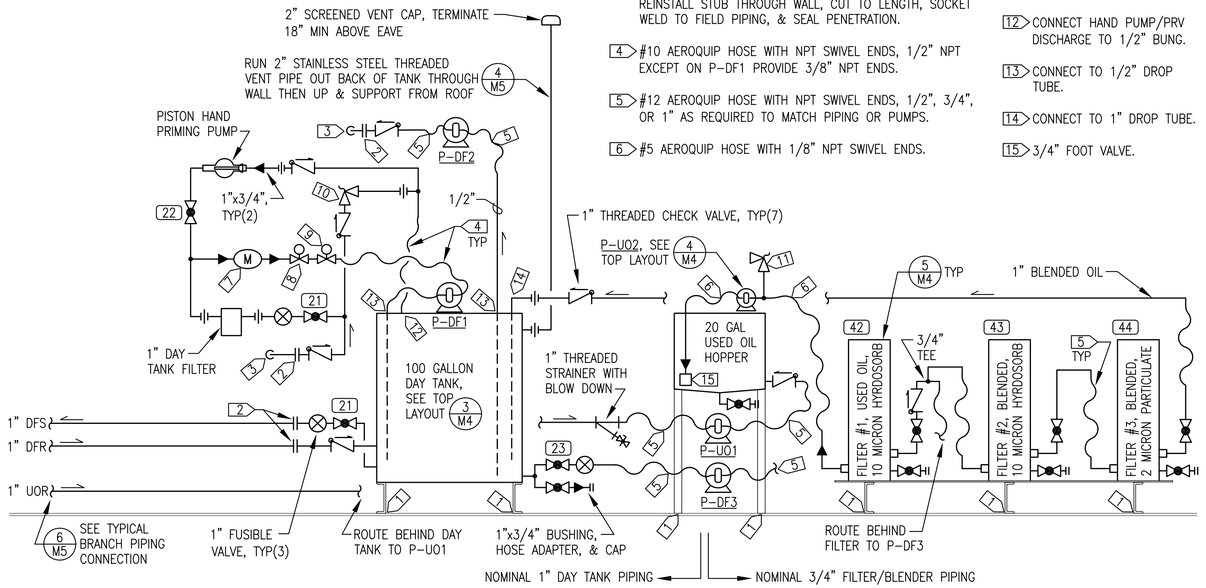
1) FABRICATE DAY TANK, LUBE OIL TANK, AND HOPPER IN ACCORDANCE WITH AEA STANDARD POWER PLANT TANK FABRICATION DETAILS. PLUG/CAP ALL SPARE OPENINGS.

2) ALL PIPING BLACK STEEL EXCEPT STAINLESS VENT PIPE AS NOTED. ALL DAY TANK PIPING, VALVES, & FITTINGS 1" THREADED. ALL FILTER/BLENDER PIPING, VALVES, & FITTINGS 3/4" THREADED UNLESS SPECIFICALLY NOTED OTHERWISE. SUPPORT PIPING FROM WALL, SEE DETAIL 7/M5.

3) LABEL TOP OF EACH FILTER WITH NUMBER AND DESCRIPTION SHOWN ON EACH FILTER. INSTALL 0-15 PSI DIFFERENTIAL PRESSURE GAUGE ON EACH FILTER, SET SWITCH TO 7 PSI.

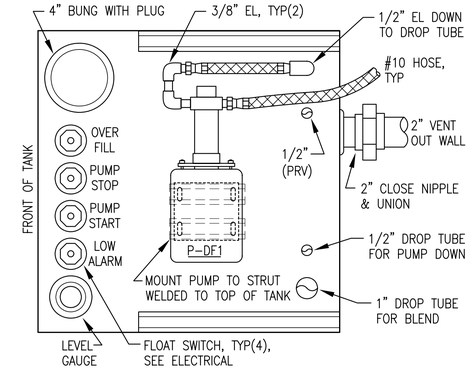
SPECIFIC NOTES:

1. FASTEN BASE TO FLOOR WITH 3/8" SELF-TAPPING SCREWS.
2. SOCKET WELD/THREADED FLANGE PAIR.
3. 1" DAY TANK SUPPLY/PUMP DOWN OUT WALL. SHOP FABRICATE & TEMPORARILY INSTALL SOCKET WELD ELBOW WITH 20" LONG PIPE STUB THROUGH WALL WITH THREADED END FOR TEMPORARY CONNECTION. REMOVE FOR SHIPPING AFTER COMPLETION OF TESTING. ON FINAL INSTALLATION REINSTALL STUB THROUGH WALL, CUT TO LENGTH, SOCKET WELD TO FIELD PIPING, & SEAL PENETRATION.
4. #10 AEROQUIP HOSE WITH NPT SWIVEL ENDS, 1/2" NPT EXCEPT ON P-DF1 PROVIDE 3/8" NPT ENDS.
5. #12 AEROQUIP HOSE WITH NPT SWIVEL ENDS, 1/2", 3/4", OR 1" AS REQUIRED TO MATCH PIPING OR PUMPS.
6. #5 AEROQUIP HOSE WITH 1/8" NPT SWIVEL ENDS.
7. 3/4" DAY TANK METER.
8. 1/2" NO SOLENOID VALVE.
9. 1/2" NC SOLENOID VALVE.
10. 1" THREADED PRV, 25 PSIG.
11. 1/4" THREADED PRV, 30 PSIG.
12. CONNECT HAND PUMP/PRV DISCHARGE TO 1/2" BUNG.
13. CONNECT TO 1/2" DROP TUBE.
14. CONNECT TO 1" DROP TUBE.
15. 3/4" FOOT VALVE.



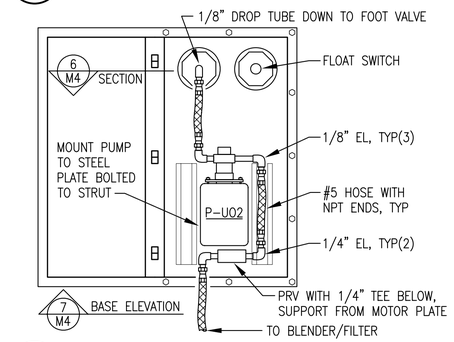
2/M4 DIESEL FUEL & USED OIL PIPING DIAGRAM

NO SCALE



3/M4 TOP OF DAY TANK - PLAN VIEW

NO SCALE



4/M4 TOP OF HOPPER - PLAN VIEW

NO SCALE

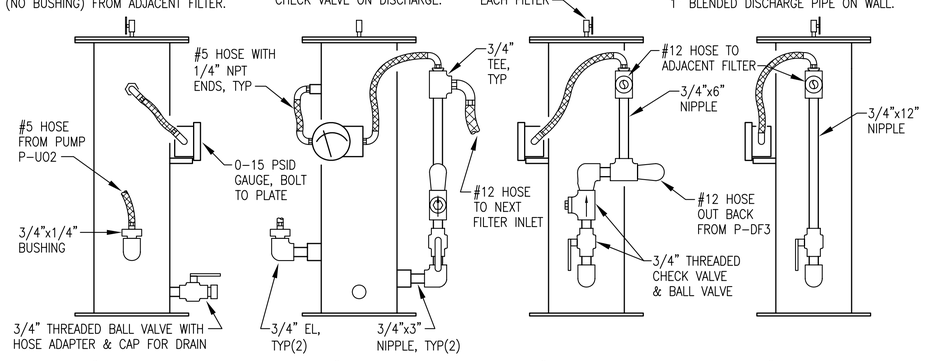
OIL PUMP SCHEDULE		
P-DF1	DAY TANK FILL PUMP	ROTARY GEAR PUMP, 3/8" FPT INLET AND OUTLET, BRONZE CONSTRUCTION WITH STAINLESS STEEL SHAFTS, BUNA-N LIP SEAL, CARBON BEARINGS, DIRECT FLEX COUPLED TO 1725 RPM ODP THERMALLY PROTECTED, AUTO RESET MOTOR, 1/3 HP, 115 V, 1 PH, 60 HZ, 1.98 GPM @ 20 PSID. OBERDORFER N991-32M F01, 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.

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.

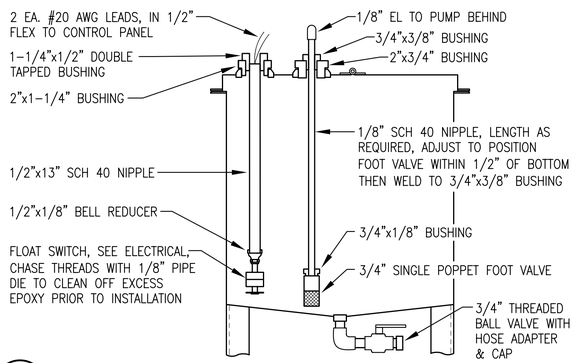
1/4" GAUGE COCK WITH PLUG FOR AIR BLEED, TYP EACH FILTER

NOTE: FILTER #3 OUTLET ELEVATION SIMILAR TO FILTER #2 EXCEPT ROUTE #12 HOSE TO 1" BLENDED DISCHARGE PIPE ON WALL.



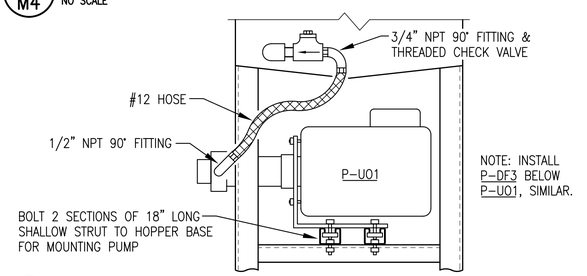
5/M4 FILTER PIPING ELEVATIONS

NO SCALE



6/M4 SECTION THROUGH HOPPER

NO SCALE



7/M4 HOPPER BASE ELEVATION

NO SCALE

REV.	DESCRIPTION	DATE	BY
1	MINOR PIPING CHANGES TO FILTER/BLENDER & ADD FILTER TAGS	1/10/06	BCG

RECORD DRAWING

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DATE: 9/06/07

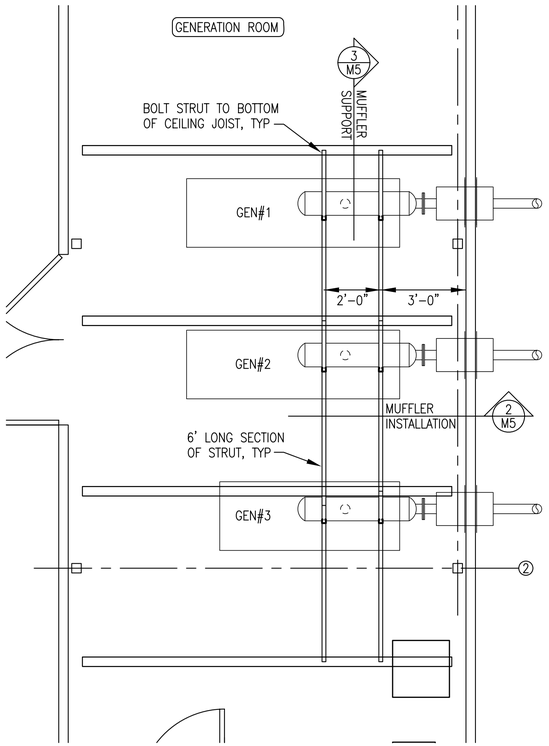
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

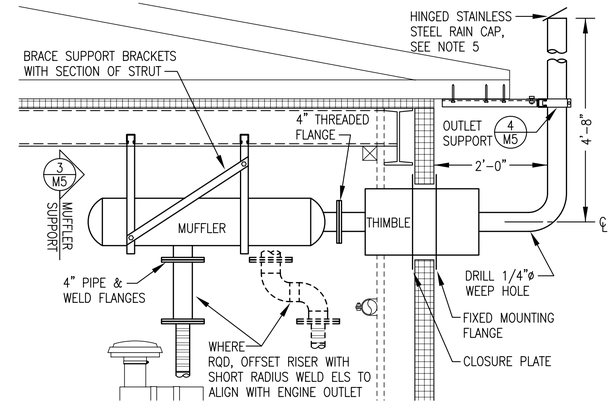
TITLE: DIESEL FUEL & USED OIL PIPING PLAN, DETAILS, & OIL PUMP SCHEDULE

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: TENAPP-M4	SHEET: M4 OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



1 M5 EXHAUST SYSTEM PLAN
3/8"=1'-0"



NOTES:

1) MUFFLERS, CLAMPS, AND FLEXES FURNISHED WITH GENERATORS. MUFFLERS TO BE CRITICAL GRADE. THIMBLES FURNISHED AS PART OF MODULE CONSTRUCTION. THIMBLES TO BE STAINLESS STEEL, TRIPLE-WALL, INSULATED, VENTILATED, AND LISTED FOR ZERO CLEARANCE TO COMBUSTIBLES.

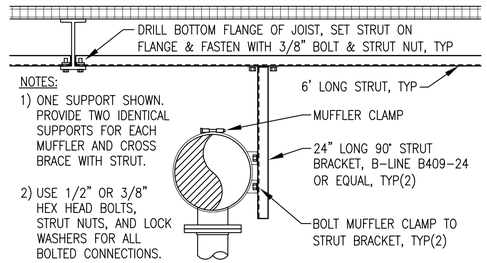
2) CONNECTING PIPE, FLANGES, STRUT, AND ACCESSORIES TO BE FURNISHED AS PART OF MODULE CONSTRUCTION. ALL PIPE 4"ø SCH 40. ALL FLANGES 4"ø ANSI 150# FLAT FACED. ALL PIPE AND FITTINGS UPSTREAM OF MUFFLER (RISER) CARBON STEEL. ALL PIPE AND FITTINGS DOWNSTREAM OF MUFFLER (OUTLET) TYPE 316L STAINLESS STEEL. INSTALL HIGH TEMPERATURE FULL FACE STAINLESS STEEL AND GRAPHITE GASKETS, GARLOCK 312555 OR EQUAL.

3) INSULATE MUFFLER AND RISER PIPE WITH 1" HIGH DENSITY FIREGLASS WITH FIBERGLASS LAGGING.

4) SHOP FABRICATE AND INSTALL COMPLETE ASSEMBLY AS SHOWN, INCLUDING INSULATION, FOR MODULE LOAD TEST. REMOVE THIMBLE AND OUTLET PIPE FOR SHIPPING. IN FIELD, RE-INSTALL THIMBLE AND OUTLET PIPE. SEAL THIMBLE MOUNTING FLANGE AND CLOSURE PLATE TO WALL OPENING FRAME TO WITH SILICONE CAULKING AND FASTEN WITH SELF-TAPPING STAINLESS STEEL SCREWS ALL AROUND. SEE DETAIL 7/M6, SIMILAR.

5) ON 37 kW GENERATORS INSTALL 4"x3" CONCENTRIC WELD REDUCER AND 3"ø CAP. ON ALL OTHER GENERATORS INSTALL 4"ø CAP.

2 M5 MUFFLER INSTALLATION
3/4"=1'-0"



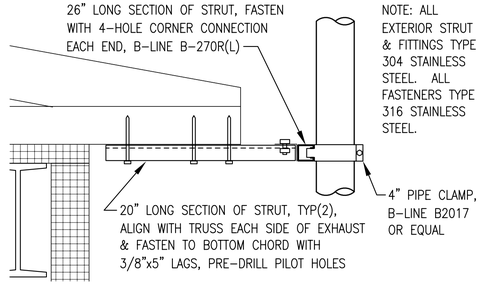
NOTES:

1) ONE SUPPORT SHOWN. PROVIDE TWO IDENTICAL SUPPORTS FOR EACH MUFFLER AND CROSS BRACE WITH STRUT.

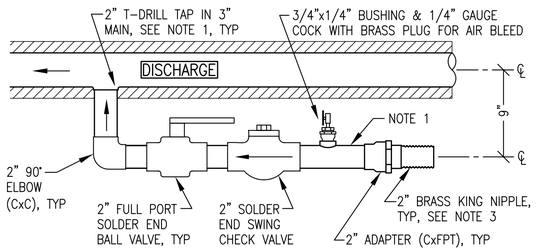
2) USE 1/2" OR 3/8" HEX HEAD BOLTS, STRUT NUTS, AND LOCK WASHERS FOR ALL BOLTED CONNECTIONS.

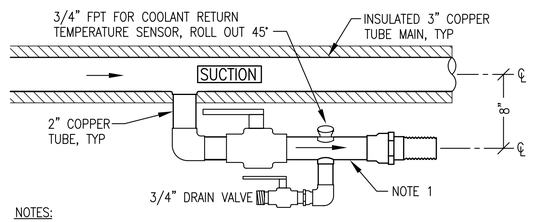
3 M5 MUFFLER SUPPORT
1"=1'-0"

NOTE: DAY TANK VENT SUPPORT SIMILAR EXCEPT USE 2" PIPE CLAMP.



4 M5 OUTLET PIPE SUPPORT
1"=1'-0"





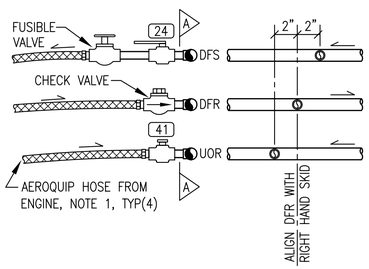
NOTES:

1) INSTALL 3" MAINS ON WALL THEN LOCATE 2" BRANCH TAPS TO ALIGN VALVES WITH COOLANT HOSES WITH 90° BEND IN HOSE. LAY OUT BRANCH PIPING TO ALLOW 2" PIPE TO BE STRAPPED TO STRUT SUPPORT POST AT ONE POINT DOWNSTREAM OF BALL VALVE.

2) MAKE 3/4" THREADED CONNECTIONS WITH 3/4" FITTING ADAPTER (FTGxFPT) OR 3/4" PIPE & ADAPTER IN 3/4" T-DRILL TAP.

3) FOR 1-7/8" & 1-3/4" HOSES INSTALL CUSTOM FIT 2" KING NIPPLE WITH BARBED END PRESSED TO HOSE I.D. FOR 1-1/2" HOSES INSTALL 2"x1-1/2" BRASS BUSHING AND 1-1/2" KING NIPPLE.

5 M5 TYPICAL ENGINE COOLANT PIPING CONNECTIONS
NO SCALE



NOTES:

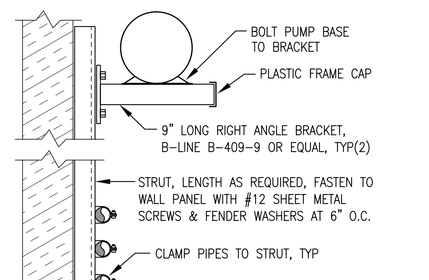
1) AEROQUIP HOSES PROVIDED WITH ENGINE, SIZE VARIES PER ENGINE & PRODUCT. ALL EQUIPPED WITH 1/2" MPT SWIVEL ENDS. CUT TO LENGTH & INSTALL ENDS.

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

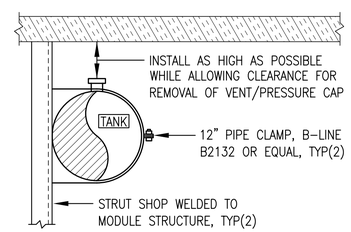
3) ALL PIPING & NIPPLES SCH 80.

4) ALL VALVES 1/2" SIZE WITH THREADED ENDS.

6 M5 TYPICAL ENGINE FUEL/OIL PIPING CONNECTION
NO SCALE

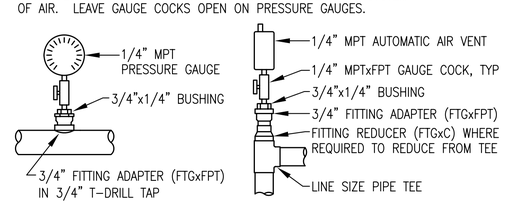


7 M5 DAY TANK PUMP & PIPING SUPPORT
NO SCALE



8 M5 EXPANSION/LUBE OIL TANK SUPPORT
NO SCALE

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



9 M5 TYPICAL AIR VENT & PRESSURE GAUGE
NO SCALE

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.

SKY BLUE (#2 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 OPEN, CLOSE ONLY TO SERVICE ACTUATOR VALVE"

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"

TOMATO RED (WARNING)

61 "CAUTION: THIS UNIT STARTS AUTOMATICALLY, LOCK & TAG OUT PRIOR TO SERVICE"
62 "NORMALLY OFF, DAY TANK SUPPLY PIPE HEAT TRACE, TURN ON IN COLD WEATHER"

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.

WARNING SIGN SCHEDULE:

WARNING SIGNS – 10"x14"x0.08" ALUMINUM, 3/16" HOLES IN ALL FOUR CORNERS. WHITE NON-REFLECTIVE VINYL BACKGROUND, 3M 3650-10, WITH RED 3M SERIES 225 HIGH PERFORMANCE VINYL LETTERS, ONE SIDE ONLY. WARNING LITES OR EQUAL.

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"

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

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

RECORD DRAWING

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

DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	ADD FILTER TAGS 42, 43, & 44	1/10/06	BCG

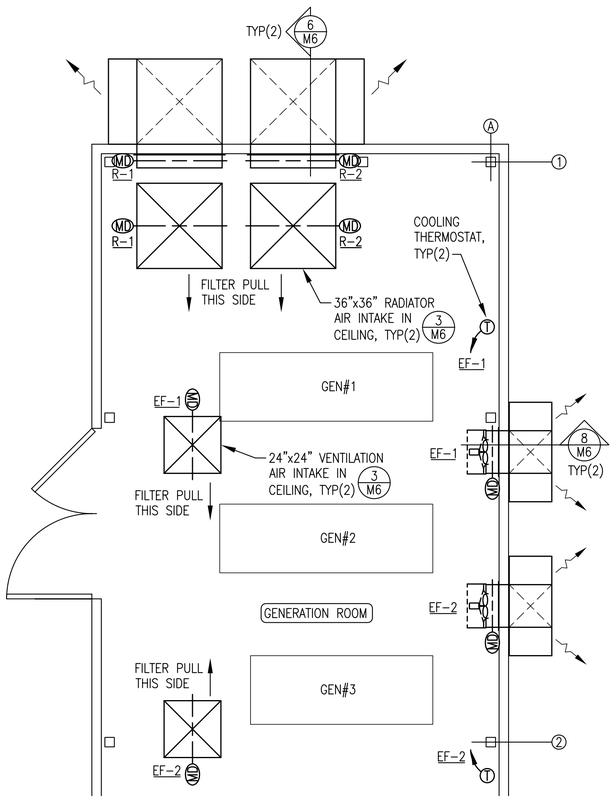
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

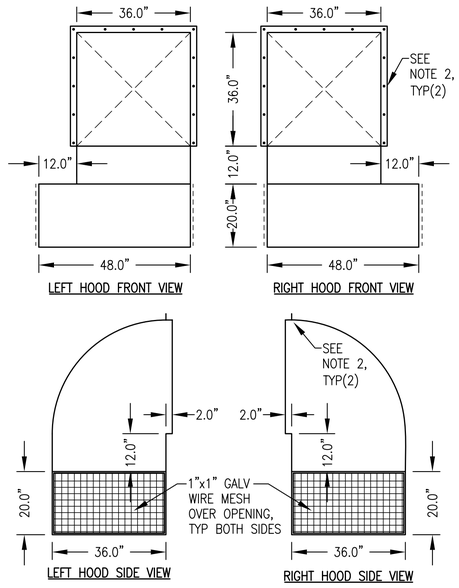
TITLE: EXHAUST PLAN, MISCELLANEOUS DETAILS, & VALVE TAG SCHEDULE

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: TENAPP-M5	SHEET: M5	OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841		



1 M6 VENTILATION PLAN
3/8"=1'-0"

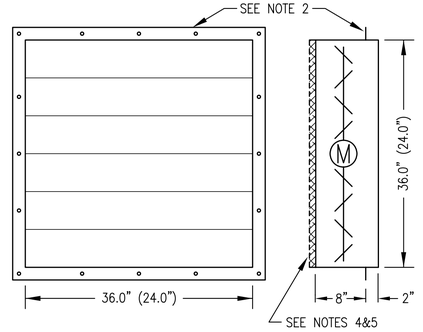


NOTES: 1) FABRICATE ONE SET OF MIRROR IMAGE HOODS (2 TOTAL).

2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 5/16" HOLES AT 9" O.C.

3) INSTALL 1" SOUND LINER ON ALL INTERIOR SURFACES ABOVE LEVEL OF INTAKE OPENINGS.

2 M6 RADIATOR HOOD FABRICATION
1/2"=1'-0"



NOTES:

1) FABRICATE TWO 24"x24" VENTILATION INTAKE ASSEMBLIES, TWO 36"x36" RADIATOR INTAKE ASSEMBLIES, AND TWO 36"x36" RADIATOR ASSEMBLIES.

2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 5/16" HOLES AT 9" O.C.

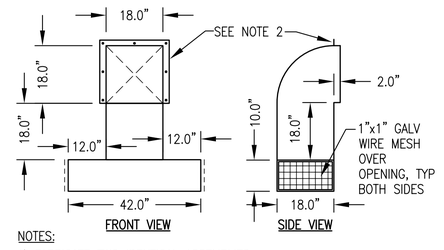
3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON ONE SIDE. ON 24"x24" DAMPERS INSTALL BELIMO LF-120-US ACTUATOR, ON 36"x36" DAMPERS INSTALL BELIMO AF-120-US ACTUATOR, NO SUBSTITUTES. FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.

4) ON 36"x36" RADIATOR INTAKE ASSEMBLIES INSTALL FRAME FOR REMOVABLE 18"x18"x1" FURNACE FILTERS. ON 24"x24" VENTILATION INTAKE ASSEMBLIES INSTALL FRAME FOR 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. PROVIDE TWO COMPLETE SETS OF FILTERS FOR ALL ASSEMBLIES.

5) ON RADIATOR ASSEMBLIES PROVIDE 10" LONG FABRIC FLEX DUCT INSTEAD OF FILTER RACK FOR CONNECTION TO RADIATOR.

6) SEE PLAN VIEW FOR DAMPER ACTUATOR AND FILTER PULL ORIENTATION.

3 M6 INTAKE AIR/RADIATOR DAMPER FABRICATION
1"=1'-0"

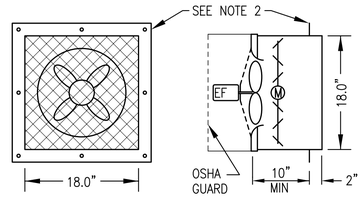


NOTES:

1) FABRICATE TWO IDENTICAL ASSEMBLIES.

2) PROVIDE 2" WIDE MOUNTING FLANGE ON TOP & SIDES WITH 5/16" HOLES AT 9" O.C.

4 M6 EXHAUST HOOD FABRICATION
1/2"=1'-0"



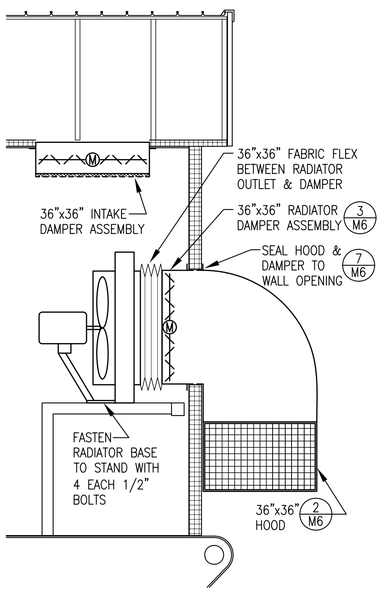
NOTES:

1) FABRICATE TWO IDENTICAL ASSEMBLIES COMPLETE WITH FAN AND DAMPER MOUNTED AND SEALED TO DUCT.

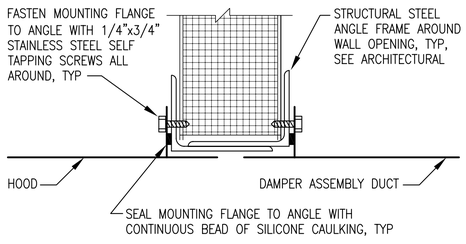
2) PROVIDE 2" WIDE MOUNTING FLANGE ALL AROUND WITH 5/16" HOLES AT 10" O.C.

3) PROVIDE MIN 3" DAMPER ROD EXTENSION ON THE SAME SIDE FOR BOTH ASSEMBLIES. INSTALL BELIMO LF-120-US ACTUATOR, NO SUBSTITUTES. FABRICATE SHEET METAL STAND-OFF BRACKET TO FULLY SUPPORT THE ACTUATOR FROM THE DAMPER FRAME.

5 M6 EXHAUST FAN ASSEMBLY FABRICATION
1"=1'-0"

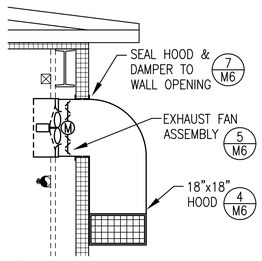


6 M6 RADIATOR INSTALLATION
1/2"=1'-0"



NOTE: WALL PENETRATION SHOWN, CEILING SIMILAR EXCEPT NO HOOD.

7 M6 TYPICAL WALL/CEILING PENETRATION
3"=1'-0"



8 M6 EXHAUST FAN INSTALLATION
1/2"=1'-0"

VENTILATION EQUIPMENT SPECIFICATIONS

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

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 FROM MINIMUM 16 GAUGE GALVANIZED SHEET METAL USING CONTINUOUS SEAL WELDS FOR ALL JOINTS. UPON COMPLETION OF FABRICATION PAINT AS INDICATED BELOW. INSTALL 1" NEOPRENE FACED FIBERGLASS SOUND LINER WHERE INDICATED.

PAINTING – UPON COMPLETION OF FABRICATION WIRE BRUSH WELD AREAS AND FINISH WITH COLD GALVANIZING COMPOUND, ZRC OR EQUAL. ETCH ENTIRE EXTERIOR SURFACE OF HOOD WITH ACID TO PREPARE FOR PAINTING. PRIME WITH ONE COAT OF EPOXY, DEVOE BAR-RUST 236, NO SUBSTITUTES, COLOR WHITE, TO 6 MILS MINIMUM DRY FILM THICKNESS. FINISH WITH ONE COAT OF ALIPHATIC URETHANE ENAMEL, DEVOE DEVTHANE 389, NO SUBSTITUTES, COLOR WHITE, TO 3 MILS MINIMUM DRY FILM THICKNESS. PERFORM ALL PAINTING IN A WARM DRY ENVIRONMENT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS INCLUDING DRYING TIME TO RE-COAT.

EXHAUST FANS – DIRECT DRIVE 12"ø PROPELLER SIDEWALL EXHAUST FAN, 1,280 CFM AT 0.25" SP, 1,750 RPM, 1/4 HP, 115 V, 1 PH. GREENHECK SE1-12-432-A4 OR EQUAL. PROVIDE WITH OSHA APPROVED GUARD.

DAMPERS – OPPOSED BLADE LOW-LEAKAGE CONTROL DAMPER. GALVANIZED STEEL CONSTRUCTION, 304 STAINLESS STEEL BEARINGS AND JAMB SEALS, EPDM BLADE SEALS. GREENHECK VCD-23 OR EQUAL. SEE FABRICATION DETAILS FOR SIZES.

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

INSTALLATION – SHOP INSTALL ALL FAN AND DAMPER ASSEMBLIES. SHOP VERIFY HOOD FIT BUT SHIP LOOSE FOR FIELD INSTALLATION.

RECORD DRAWING

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DATE: 9/06/07

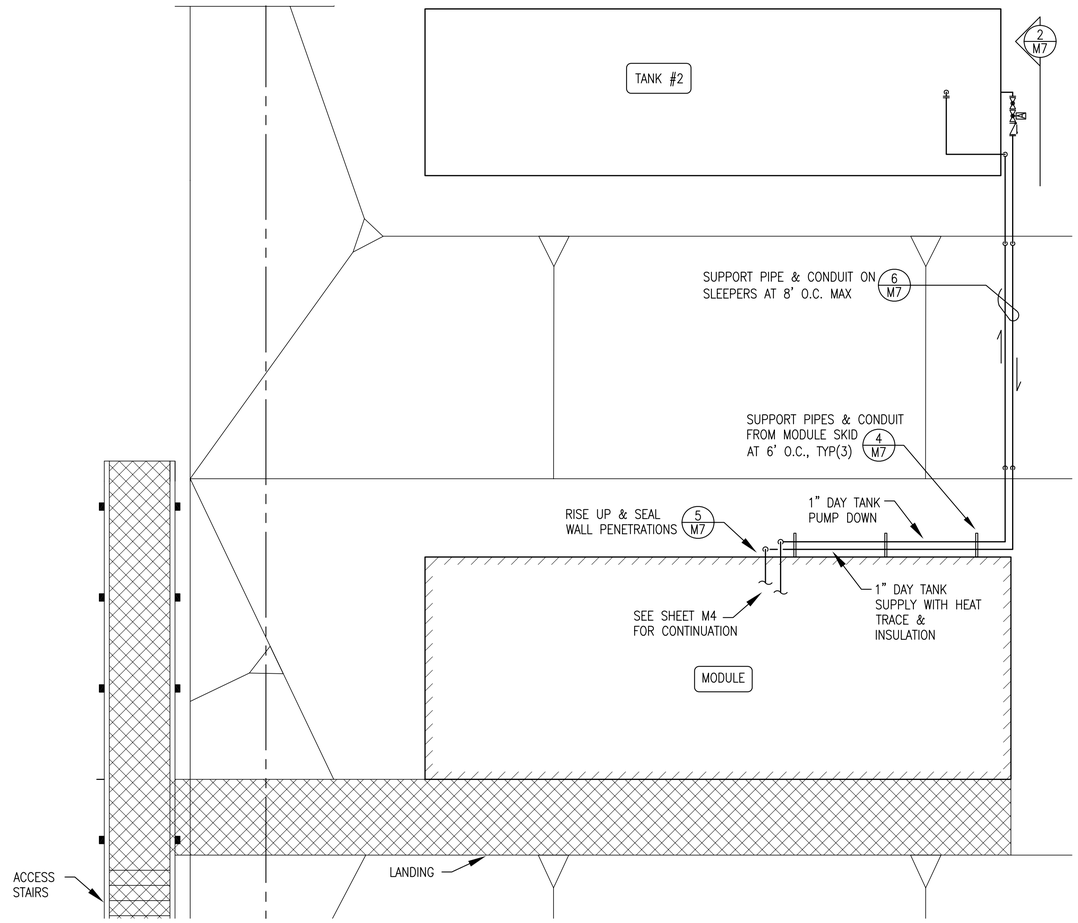
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: VENTILATION PLAN, DETAILS, & 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: TENAPP-M6	SHEET: M6 OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



1 M7 MECHANICAL SITE PLAN
1"=5'

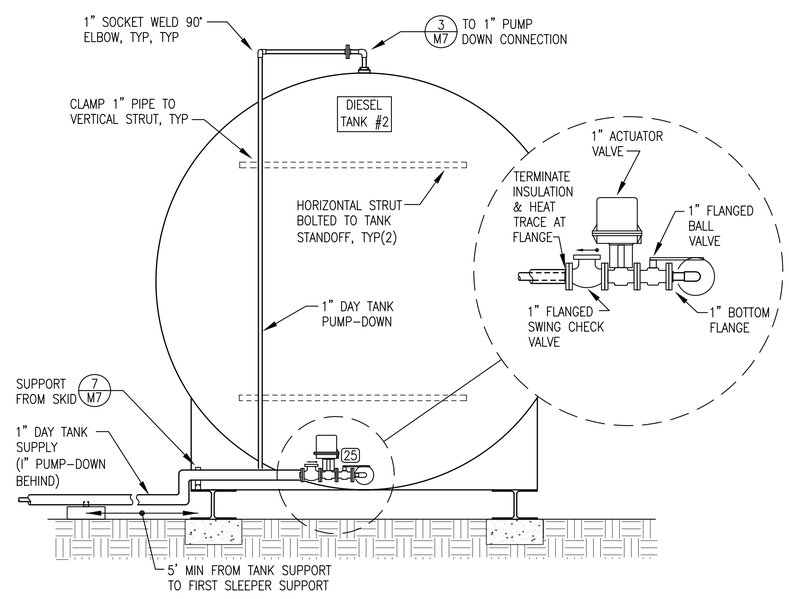
GENERAL NOTES:

1) ALL EXTERIOR STRUT, BRACKETS, FITTINGS, PIPE CLAMPS, AND FASTENERS HOT DIPPED GALVANIZED STEEL EXCEPT FOR SELF TAPPING SCREWS TYPE 420 STAINLESS STEEL.

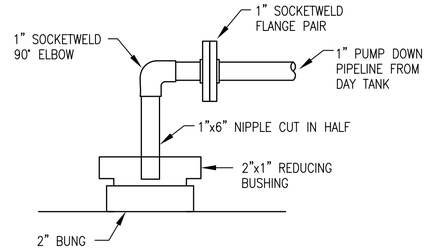
2) DAY TANK SUPPLY AND PUMP DOWN PIPING 1" DIAMETER SCHEDULE 160 STEEL PIPE. PUMP DOWN PIPE TO BE HDPE COATED. SUPPLY PIPE TO BE PAINTED, HEAT TRACED, AND INSULATED. SEE BULK FUEL UPGRADE DESIGN FOR PIPE, COATING, AND PAINTING SPECIFICATIONS.

3) INSTALL SELF LIMITING ELECTRICAL HEAT TRACE ON DAY TANK SUPPLY PIPE, 3 WATT PER FOOT, 120V, CHROMALOX SRL3 OR EQUAL. INSTALL STRAIGHT (NOT SPIRAL WRAPPED) ALONG THE FULL LENGTH FROM THE WALL PENETRATION AT THE MODULE TO THE FLANGE AT THE TANK VALVES AS INDICATED. FASTEN TO PIPE AT 12" O.C. MAXIMUM.

4) INSTALL INSULATATION OVER ENTIRE RUN OF HEAT TRACED DAY TANK SUPPLY PIPELINE. INSTALL 1" THICK CLOSED CELL FOAM INSULATION, ARMSTRONG AP ARMAFLEX OR EQUAL. COVER INSULATION WITH EXTERIOR GRADE CORRUGATED 0.016" THICK ALUMINUM JACKETING, CHILDERS CLEAR COATED ALUMINUM JACKETING OR EQUAL. PROVIDE PRE-FORMED ALUMINUM COVERS FOR ALL FITTINGS.

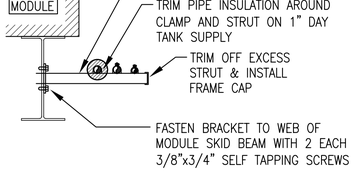


2 M7 TANK #2 END VIEW
1"=2'

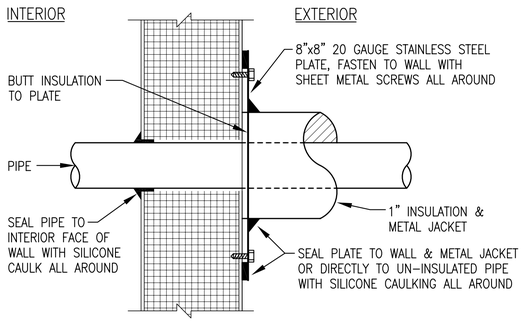


3 M7 1" PUMP DOWN CONNECTION
NO SCALE

NOTE: ALL STRUT & FITTINGS THIS DETAIL TYPE 304 STAINLESS STEEL. SELF TAPPING SCREWS TYPE 420 STAINLESS STEEL.

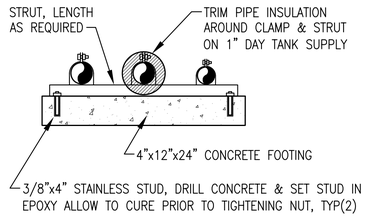


4 M7 PIPING SUPPORT FROM MODULE
NO SCALE



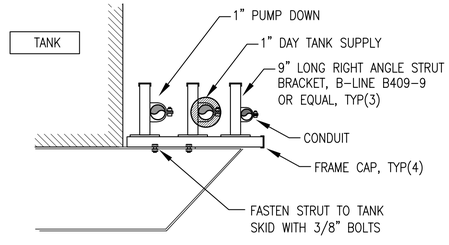
5 M7 MODULE WALL FUEL PIPE PENETRATION
NO SCALE

NOTE: ALL STRUT & FITTINGS THIS DETAIL TYPE 304 STAINLESS STEEL, ALL FASTENERS TYPE 316 STAINLESS STEEL.



6 M7 SLEEPER SUPPORT
NO SCALE

NOTE: ALL STRUT & FITTINGS THIS DETAIL TYPE 304 STAINLESS STEEL, ALL FASTENERS TYPE 316 STAINLESS STEEL.



7 M7 PIPING SUPPORT FROM SKID
NO SCALE

RECORD DRAWING

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DATE: 9/06/07

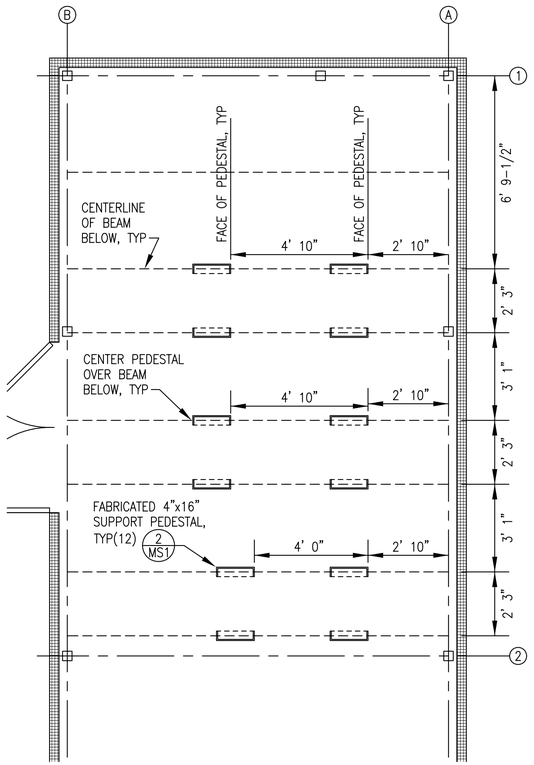
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: MECHANICAL SITE PLAN & DETAILS

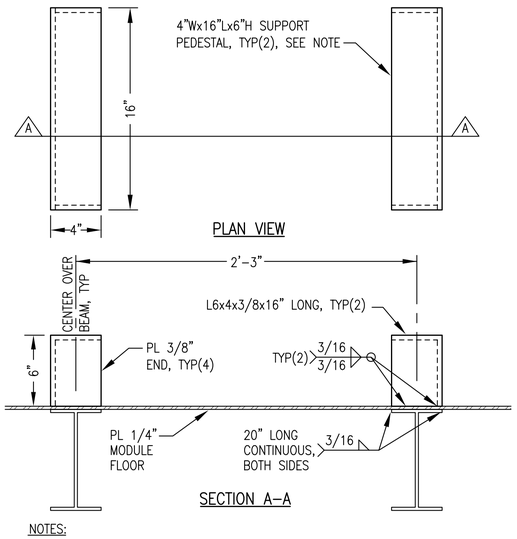
ALASKA ENERGY AND ENGINEERING, INC
P.O. BOX 111405 ANCHORAGE, ALASKA 99511-1405 PHONE (907) 349-0100

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: TENAPP-M7A	SHEET: M7 OF 7
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



1 MS1 PEDESTAL LAYOUT PLAN

3/8"=1'-0"



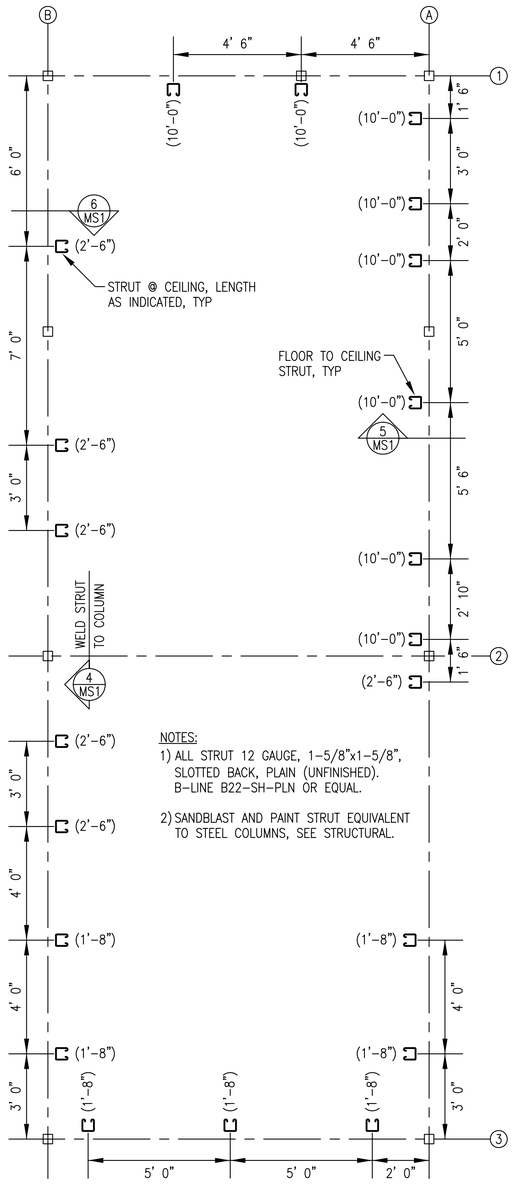
NOTES:

1) FABRICATE PEDESTALS FROM ANGLE WITH END PLATES AS SHOWN. MAKE ALL JOINTS WITH CONTINUOUS GROOVE OR FILLET WELDS.

2) SANDBLAST AND PAINT SUPPORT PEDESTALS EQUIVALENT TO STEEL FLOOR, SEE STRUCTURAL.

2 MS1 SUPPORT PEDESTAL FABRICATION

1"=6"



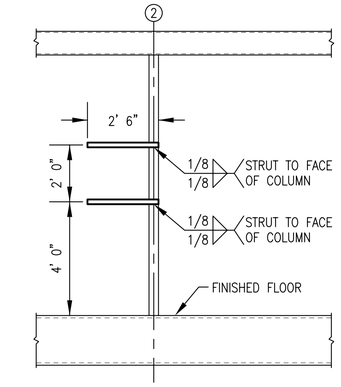
NOTES:

1) ALL STRUT 12 GAUGE, 1-5/8"x1-5/8", SLOTTED BACK, PLAIN (UNFINISHED). B-LINE B22-SH-PLN OR EQUAL.

2) SANDBLAST AND PAINT STRUT EQUIVALENT TO STEEL COLUMNS, SEE STRUCTURAL.

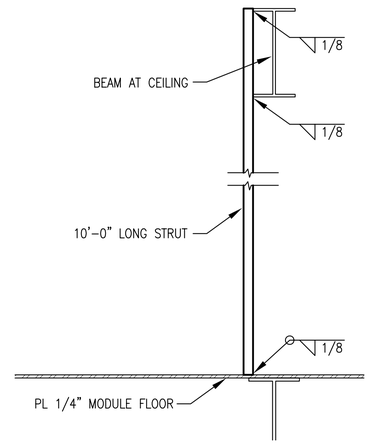
3 MS1 STRUT SUPPORT LAYOUT PLAN

3/8"=1'-0"



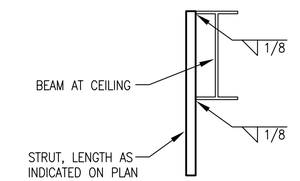
4 MS1 STRUT OFF COLUMN – ELEVATION

3/8"=1'-0"



5 MS1 FLOOR TO CEILING STRUT

NO SCALE



6 MS1 STRUT AT CEILING

NO SCALE

RECORD DRAWING

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DATE: 9/06/07

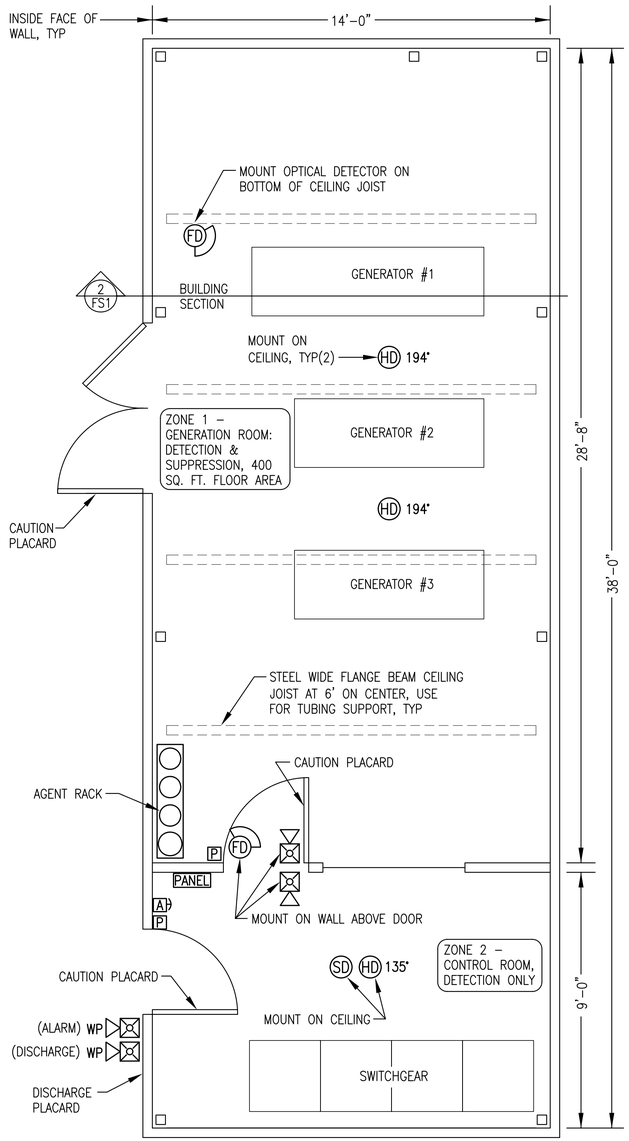
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

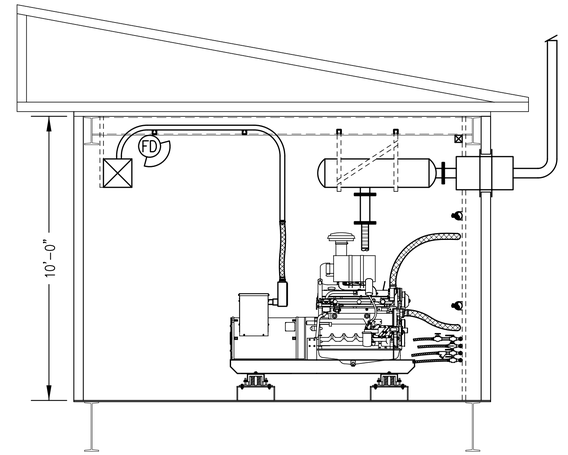
TITLE: MECHANICAL SUPPORT PLANS & DETAILS

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: TENAPP-MS1	SHEET: MS1	OF 1
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841		



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



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

NOTES:
1) INTERIOR FINISH OF ALL WALLS AND CEILINGS STEEL SIDING. FLOOR WELDED STEEL PLATE. CEILING HEIGHT IN ALL ROOMS 10'-0" ABOVE FINISHED FLOOR.
2) ALL DOORS SELF-CLOSING WITH GASKETS. ALL BUILDING PIPING AND CONDUIT PENETRATIONS SEALED LIQUID TIGHT. ALL BUILDING DUCT PENETRATIONS EQUIPPED WITH MOTORIZED DAMPERS THAT CLOSE ON GENERATOR SHUT DOWN.

FIRE SUPPRESSION SYMBOL LEGEND

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

RECORD DRAWING

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DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	ADD DISCHARGE PLACARD	11/14/05	BCG

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: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: FIRE SUPPRESSION SYSTEM PLAN, SECTION, & LEGEND

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: TENAPP-FS1A	SHEET: FS1	OF 2
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841		

PART 1 GENERAL

1.01 SCOPE

A. The work involves design, installation, testing, and certification of a high pressure water mist automatic fire suppression system for a power generation module. The module will contain three diesel engine generators as indicated.

B. The module will be completely fabricated in Anchorage. All generation equipment and supporting mechanical and electrical systems will be installed prior to installation of the fire suppression system. All fire suppression system installation, testing, certification, and training will occur in Anchorage. Upon final acceptance by the AEA the module will be shipped to a remote location for installation and commissioning.

1.02 WORK INCLUDED

A. CAD drawings for pre-construction submittal, construction drawings, and as-built drawings.

B. Obtain a State of Alaska, Fire Marshal Plan Review Permit.

C. Furnish equipment and deliver to designated location. Materials not specifically detailed in this specification, but required for system completion shall be provided by Contractor, at no additional cost to AEA.

D. Field installation of agent rack and discharge piping system.

E. Field completion of final terminations of devices to wiring, programming fire control panel, and acceptance testing and certification of completed system.

F. Minimum four hours operation training with the owner and/or designees.

G. Operation and Maintenance Manuals.

H. The Contractor shall make a technician available via telephone as required for consultation during the field commissioning of the module for troubleshooting and programming revisions after system certification.

I. Excluded from scope are all wire, conduit, conduit hangers, fasteners, and field installation of equipment and devices (except for agent rack and piping and final electrical connections as indicated).

1.03 QUALITY ASSURANCE

A. Design shall be prepared by a registered mechanical engineer or technician with minimum NICET Level 3 certification. Designer shall have an appropriate State of Alaska design permit.

B. All equipment shall be new and shall be listed for the intended application. The entire system shall be designed and fabricated in accordance with recognized and acceptable engineering and industry practices.

1.04 REFERENCED STANDARDS:

A. National Electrical Manufacturer's Association (NEMA).

B. Underwriters Laboratories (UL) UL 864 Control Units for Fire Protective Signaling Systems

C. National Fire Protection Association (NFPA) NFPA 72 National Fire Alarm Code and NFPA 750 Standard on Water Mist Fire Protection Systems.

1.05 SUBMITTALS

A. Upon award of contract, provide a proposed schedule for system completion. Schedule to include dates for: engineering submittal; Fire Marshal Plan Review Permit application; system installation; and system testing, certification, and training.

B. Provide three copies of a complete engineering submittal for review and approval by AEA. Submittal to include:
1. Manufacturer, model numbers and quantity of each device.
2. Manufacturer and model of control panel, including installed options.
3. Suppression agent freeze protection level, volume, and quantity of nozzles.
4. Calculations.
5. Three sets of pre-construction shop drawings. The shop drawings shall indicate compliance with all requirements of the specifications and shall contain at a minimum floor plans, wiring diagrams, panel configuration, device installation details, piping isometrics, material lists, specifications, installation notes, and system sequence of operation.
6. Outline of topics for operator training.

C. Based on approved pre-construction shop drawings, issue final construction drawings for field installation of fire suppression system.

D. Submit a copy of State of Alaska, Fire Marshal Plan Review Permit to AEA.

E. Prior to training session, provide three bound sets of Operation and Maintenance Manuals. Manuals to include system description, manufacturer's catalog information, programming, instructions, operations and maintenance literature, Material Safety Data Sheets (MSDS) for extinguishing agent, and as-built drawings of completed system.

1.06 SUBSTITUTIONS

A. All substitutions shall be noted on equipment submittals.

1.07 WARRANTY

A. Provide a one-year manufacturer's warranty covering all materials and workmanship of all products supplied. Warranty shall commence from the date of system certification.

PART 2 MATERIALS

2.01 Fire Suppression System

A. Provide a complete high pressure water mist fire suppression system. The system shall be designed and engineered to utilize high pressure nitrogen as the driving medium and shall not utilize electric pumps.

2.02 Fire Control Panel

A. The Fire Control Panel shall be a Fike Cheetah 10-052-R1 or equal, and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with, supervise and control the following types of equipment used to make up the system: intelligent self-calibrating smoke and flame detectors, addressable modules, annunciators, and other system controlled devices.

B. Basic equipment to be included with Fire Control Panel shall be main board with display and keypad, door, hardware, and backbox for panel surface mount installation.

C. System Capacity and General Operation
1. The control panel shall provide, or be capable of expansion to 198 intelligent/addressable devices.
2. The system shall include four Class B (NFPA Style Y) programmable Notification Appliance Circuits. It shall also include four additional programmable Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC.
3. The system shall support up to 99 programmable EIA-485 driven relays for an overall system capacity of 301 circuits.
4. The Fire Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire system.
5. All programming or editing of the existing program in the system shall be achieved without special equipment, and without interrupting the alarm monitoring functions of the Fire Control Panel.
6. The Fire Control Panel shall provide the following features:
a. Automatic detect test and drift compensation to extend detector accuracy over life (smoke and flame detectors monitored and automatically calibrated)
b. Sensitivity Test, meeting requirements of NFPA 72, Chapter 5.
c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
d. System Status Reports to display.
e. Positive Alarm Sequence pre-signal, meeting NFPA 72 3-8.3 requirements.
f. Periodic Detector Test, conducted automatically by software.
g. Pre-alarm for advanced fire warning.
h. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
i. Walk Test, with check for two detectors set to same address.
j. Adjustable delay and discharge timers.
k. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
l. The detector software shall allow manual or automatic sensitivity adjustment.
m. Event history file in nonvolatile memory.
n. Panel to have abort option to manually prevent release of extinguishing agent.
o. Battery back-up in the event of normal AC power failure.
p. Unit to be able to release extinguishing agent in at least two independent hazard zones.

2.03 SECONDARY POWER SOURCE BATTERIES

A. Secondary power shall be provided by 12 volt, gelled electrolyte battery(ies). The battery(ies) shall be completely maintenance free. Fluid level checks and refilling shall not be required.

B. Battery(ies) shall have sufficient capacity to power the fire system for not less than twenty-four hours plus 30 minutes of alarm upon a normal AC power failure.

2.04 AGENT RACK

A. A floor mounted rack shall be provided that contains the agent cylinders, nitrogen cylinder, and piping. The rack shall be designed for floor mounting. Marioff Hi-Fog MAU 150 FS, no substitutes.

B. The system shall be charged with potable water.

C. The system shall be furnished complete with a fully charged nitrogen cylinder.

2.05 NORMAL TEMPERATURE HEAT DETECTOR

A. UL Listed, adjustable temperature heat detector, set to activate at 135°F. Fike 60-1028 or equal.

2.06 HIGH TEMPERATURE HEAT DETECTOR

A. UL Listed, fixed temperature heat detector, set to activate at 194°F. Fike 60-026 or equal.

2.07 FLAME (OPTICAL) DETECTOR

A. UL Listed, flame detectors shall be multi-spectrum, electro-optical, automatic calibrating, digital fire detectors. Fire Sentry Corporation Model SS4-A or equal.

2.08 SMOKE (PHOTOELECTRIC) DETECTOR

A. UL Listed, automatic calibrating type, photoelectric smoke detector. Detector to be addressable and provide analog signal to the control panel which may be used for maintenance of detector. Fike 63-1021 or equal.

2.09 ANNUNCIATORS

A. Interior Annunciator (Alarm) – UL Listed, Horn/strobe combination, minimum 30 candela. Fike 20-123-30WR or equal.

B. Exterior Annunciator (Alarm) – Weatherproof, UL Listed horn/strobe combination, minimum 75 candela. Fike 20-123-75WR or equal.

C. Exterior Strobe (Discharge) – Weatherproof, UL Listed strobe, minimum 75 candela. Fike 20-124-75WR or equal.

2.10 MANUAL PULL STATION

A. Manual pull station(s) shall be UL Listed, addressable, double action, and provide visible indication that station has been operated. Fike 02-3710 or equal.

2.11 ABORT STATION

A. UL Listed, mushroom button abort station. Station coloring to be highly visible. Label or provide placard. Fike 10-1639 or equal.

2.12 DEVICE MONITORING MODULES

A. UL Listed modules designed for use with intelligent and addressable equipment as required. Fike 55-02(#) or equal.

2.13 PLACARDS

A. Provide placards in compliance with NFPA where indicated and as required. Caution placards for each entrance door to read "CAUTION, ROOM PROTECTED BY WATER MIST, IN CASE OF FIRE KEEP DOOR CLOSED". Placard adjacent to second exterior alarm to read "FLASHING LIGHT MEANS WATER MIST HAS DISCHARGED".

2.14 RACEWAYS AND CONDUCTORS

A. AEA will furnish and install separate dedicated raceways for all fire suppression system wiring at no cost to Contractor. All raceways shall be electrical metallic tubing (EMT). Cover plates on all junction and pull boxes shall be painted red.

B. AEA will furnish and install conductors for all fire suppression system wiring at no cost to Contractor. All conductors shall be soft drawn copper, Type THHN insulation; 600V and 75C rated; gauge, color, and type as indicated by service.
120V AC Power – 12 AWG, stranded, color per building station service scheme.
24V DC Power – 14 AWG, solid, Red & Black
Detection Circuits – 14 AWG, solid, Blue & Yellow
Annunciation Circuits – 14 AWG, solid, Brown & Orange

2.15 PIPING

A. Contractor shall furnish, install, and pressure test stainless steel tubing for all agent discharge piping in accordance with manufacturer's recommendations.

2.16 SUPPORT

A. Contractor shall furnish and install industry standard hangers for agent discharge piping.

B. AEA will furnish and install all hangers and supports for panel and raceways at no cost to Contractor.

PART 3 EXECUTION

3.01 DESIGN

A. Design fire suppression system with two zones of coverage as shown on the plan.

1. Generator room shall contain agent rack and discharge nozzles. Two flame detectors shall be cross-zoned so that any one detector will set off alarm and shut-down generators. Any second detector will begin a 30 second countdown to agent release. Two high temperature heat detectors shall be cross-zoned in the same sequence as the flame detectors. Exit shall have a manual pull station.

2. Control room shall contain one smoke detector and one normal temperature heat detector. Either detector will set off alarm and will shut-down generators. Exit shall have a manual pull station and abort station.

B. Suppression system to be designed to provide a rapid deployment of agent. Provide quantity and distribution of nozzles as required to flood zone.

C. Provide one interior annunciator in each zone and one exterior annunciator on the outside of the building to indicate alarm. Provide a second exterior strobe on the outside of the building to indicate agent discharge.

3.02 EXECUTION

A. The system shall be designed and installed in accordance with the latest adopted editions of all applicable codes and standards and manufacturer's requirements. Perform all work with skilled craftsmen specializing in said work with all required certifications. Install all materials in a neat, orderly, and secure fashion, as required by these specifications and commonly recognized standards of good workmanship.

B. Contractor shall deliver materials to designated Anchorage area location provided by AEA after award of contract.

C. AEA will install panel, devices, conduit, and wiring upon receipt of materials from Contractor.

D. Contractor shall install agent rack and agent discharge piping and shall terminate all wiring, program panel, test and certify system, and provide training within two weeks of notification by AEA.

RECORD DRAWING

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

DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
2	REVISE SPECIFICATIONS TO ADD WIRING COLOR & GAUGE REQUIREMENTS	1/10/06	BCG
1	REVISE SPECIFICATIONS TO LATEST AEA STANDARDS	11/14/05	BCG

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

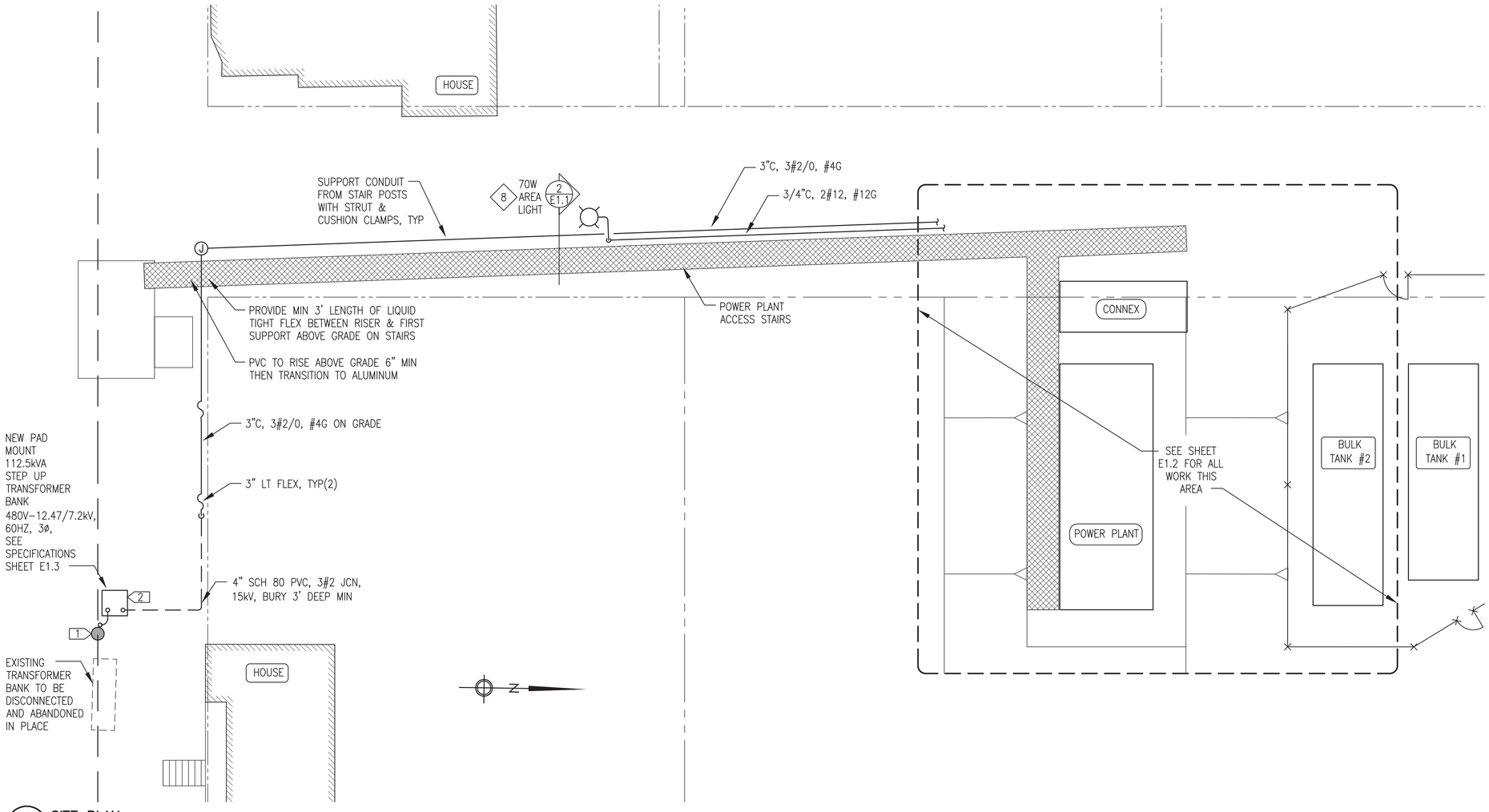
ALASKA ENERGY AUTHORITY

PROJECT:
TENAKEE SPRINGS POWER SYSTEM UPGRADE

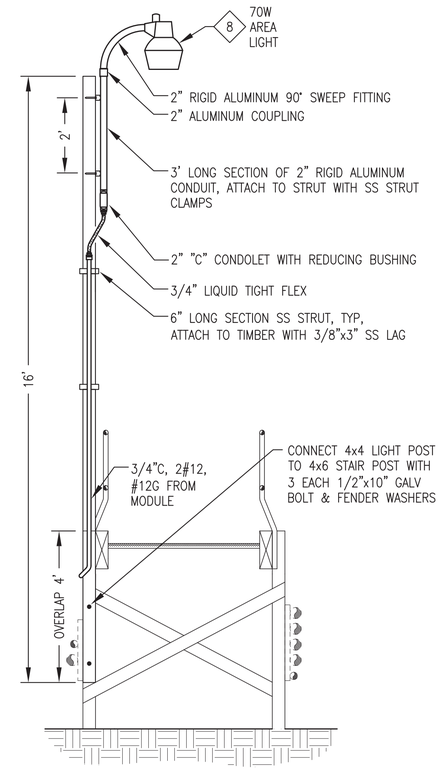
TITLE:
FIRE SUPPRESSION SYSTEM SPECIFICATIONS

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: TENAPP-FS2A	SHEET:		
DESIGNED BY: BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	FS2	OF	2



1 E1.1 SITE PLAN
1"=10'



2 E1.1 AREA LIGHT ON ACCESS STAIRS
NO SCALE

SCHEDULE OF DRAWINGS

E1.1	OVERALL SITE PLAN, DETAILS, & SCHEDULE OF DRAWINGS
E1.2	MODULE SITE PLAN & DETAILS
E1.3	POWER POLE DETAIL & TRANSFORMER SPECIFICATION
E2	EQUIPMENT LAYOUT PLAN & SWITCHGEAR DETAILS
E3	WIREWAY PLAN, ELEVATIONS, & SECTION
E4	BUILDING PLANS & STATION SERVICE PANEL
E5	CEILING PLAN & MISCELLANEOUS DETAILS
E6	SPECIFICATIONS & EQUIPMENT SCHEDULE
E7	DAY TANK CONTROL PANEL LOGIC DIAGRAM & SEQUENCE OF OPERATIONS
E8	DAY TANK CONTROL PANEL LAYOUT & INSTALLATION DETAILS
E9	RADIATOR VARIABLE FREQUENCY DRIVE PANEL
E10	USED OIL BLENDER CONTROL PANEL

SPECIFIC NOTES

1> MODIFY EXISTING STRUCTURE AS INDICATED ON DETAIL 1/E1.3. RELOCATE NEUTRAL, SECONDARY, AND STREET LIGHT AS REQUIRED TO ACCOMMODATE NEW CONSTRUCTION. AFTER INSTALLATION IS COMPLETE, REMOVE EXISTING RISER AND FUSED CUTOUTS. DELETE PRIMARY CABLES AND CONDUIT BACK TO EXISTING STEP–UP TRANSFORMER BANK.

2> INSTALL TRANSFORMER ON RUS UM1–7 CONCRETE GROUND PAD, SIZED FOR A 150 KVA TRANSFORMER. 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. ELBOWS SHALL BE ELASTIMOLD 166LR–WX, OR APPROVED EQUAL. PROVIDE MOISTURE SEALS AT BASE OF LOAD BREAK ELBOW.

RECORD DRAWING

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DATE: 9/06/07

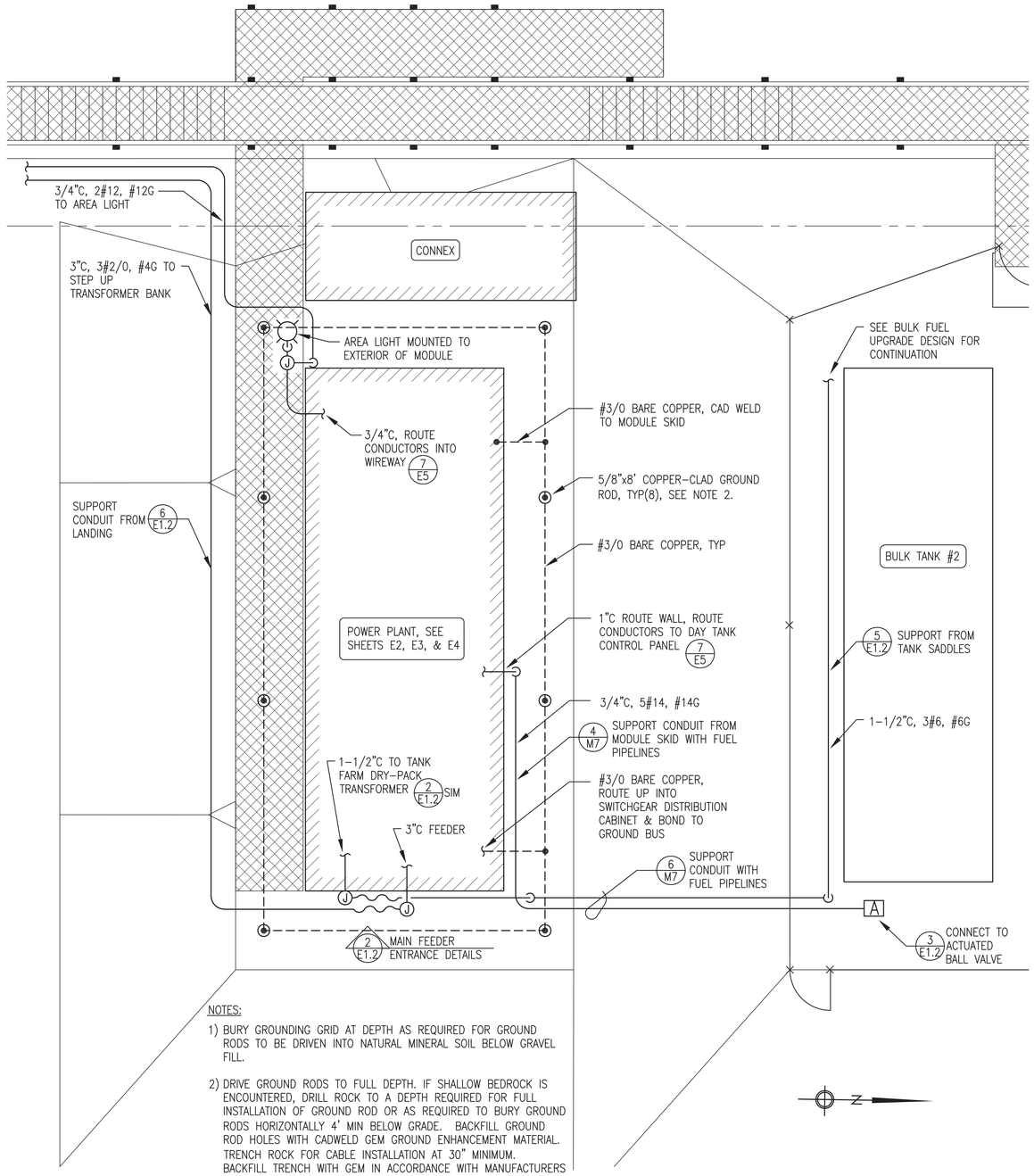
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: OVERALL SITE PLAN, DETAILS, & SCHEDULE OF DRAWINGS

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

DRAWN BY: JTD	SCALE: AS NOTED	FILE NAME: TENAPP–E1.1A	SHEET: E1.1	OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04–12–9841		



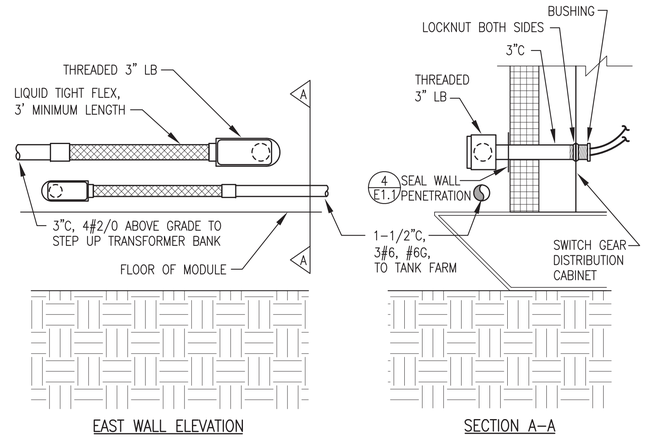
NOTES:

1) BURY GROUNDING GRID AT DEPTH AS REQUIRED FOR GROUND RODS TO BE DRIVEN INTO NATURAL MINERAL SOIL BELOW GRAVEL FILL.

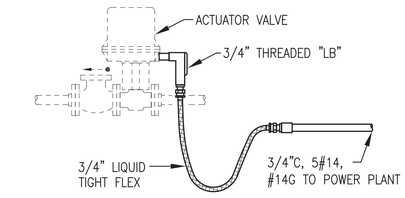
2) DRIVE GROUND RODS TO FULL DEPTH. IF SHALLOW BEDROCK IS ENCOUNTERED, DRILL ROCK TO A DEPTH REQUIRED FOR FULL INSTALLATION OF GROUND ROD OR AS REQUIRED TO BURY GROUND RODS HORIZONTALLY 4' MIN BELOW GRADE. BACKFILL GROUND ROD HOLES WITH CADWELD GEM GROUND ENHANCEMENT MATERIAL. TRENCH ROCK FOR CABLE INSTALLATION AT 30" MINIMUM. BACKFILL TRENCH WITH GEM IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

3) CAD-WELD ALL GROUNDING GRID CABLE CONNECTIONS AND GROUND ROD CONNECTIONS.

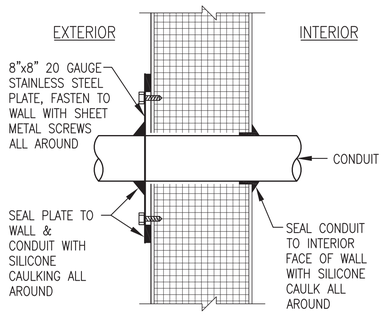
1/E1.2 MODULE PLAN
1"=5'



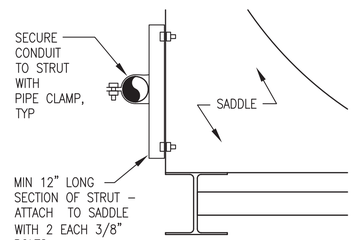
2/E1.2 MAIN FEEDER BUILDING ENTRANCE
NO SCALE



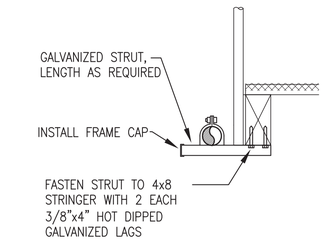
3/E1.2 ACTUATOR VALVE CONNECTION
NO SCALE



4/E1.2 MODULE WALL CONDUIT PENETRATION
NO SCALE



5/E1.2 CONDUIT SUPPORT FROM TANK SADDLE
NO SCALE



6/E1.2 CONDUIT SUPPORT FROM LANDING
NO SCALE

GENERAL NOTES

1) ALL STRUT AND FASTENERS HOT DIP GALVANIZED UNLESS SPECIFICALLY INDICATED AS STAINLESS STEEL (SS).

2) WRAP ALL ALUMINUM CONDUIT WITH CUSHION STRIP AT ALL LOCATIONS WHERE SUPPORTED ON GALVANIZED STRUT TO PREVENT CONTACT.

RECORD DRAWING

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DATE: 9/06/07

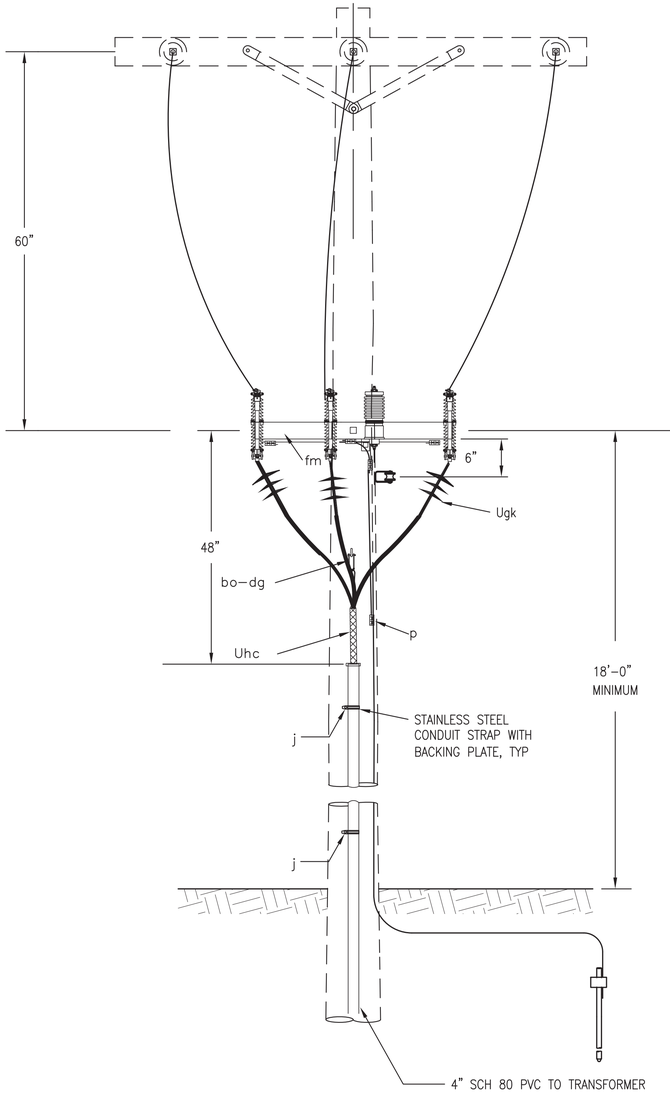
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

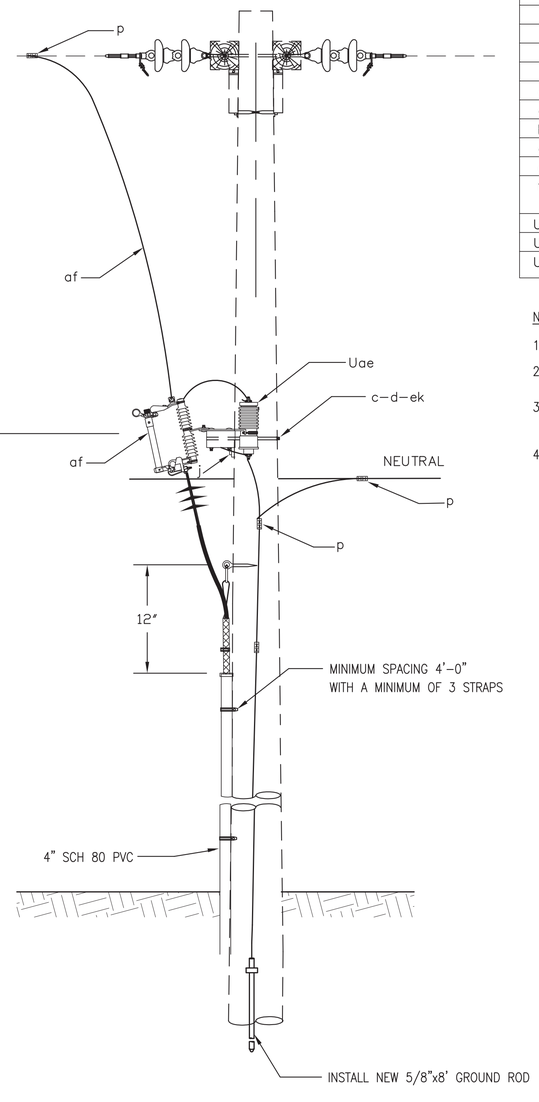
TITLE: MODULE SITE PLAN & DETAILS

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

DRAWN BY: JTD	SCALE: AS NOTED	FILE NAME: TENAPP-E1.2A	SHEET: E1.2	OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841		



FRONT ELEVATION



SIDE ELEVATION

ITEM	QTY.	MATERIAL
c	2	SS, Bolt, machine, 5/8" x required length.
d	1	SS Washer, square 2 1/4".
j		SS Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	3	Cutout (load break type).
av		Jumpers, as required.
bo	1	Anchor, shackle.
dq	1	Eye screw, elliptical or drive hook.
ek		Locknuts, as required.
fm	1	Three–Phase Mounting bracket, Hughes Brothers B2251–C, or Equal.
Uae	3	Surge arrester (9 KV DISTRIBUTION CLASS)
Ugk	3	Cable termination. (IEEE Class 1, Molded Outdoor)
Uhc	3	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH SHALL BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. ALL LIVE PARTS SHALL HAVE AN 18 FOOT CLEARANCE ABOVE GROUND AND SHALL BE INSTALLED A MINIMUM OF 6 INCHES ABOVE THE NEUTRAL CONDUCTOR.
4. ALL FASTENERS SHALL BE TYPE 316 STAINLESS STEEL

TRANSFORMER SPECIFICATION

SCOPE – THIS SPECIFICATION COVERS ELECTRICAL CHARACTERISTICS AND MECHANICAL SAFETY FEATURES OF MINERAL OIL IMMERSED, SELF–COOLED, PADMOUNTED STEP–UP TRANSFORMER WITH SEPARABLE INSULATED HIGH VOLTAGE BUSHINGS. ALL CHARACTERISTICS, VOLTAGE DESIGNATIONS AND TESTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF ANSI STANDARDS C57.12.26 AND C57.12.00, EXCEPT AS MODIFIED HEREIN. PROVIDE TRANSFORMER IN THE RATINGS AND SIZES INDICATED ELSEWHERE. TRANSFORMER SHALL BE DESIGNED IN ACCORDANCE WITH REA REQUIREMENTS.

ACCEPTABLE MANUFACTURERS – GENERAL ELECTRIC, HOWARD, AND COOPER. OTHER MANUFACTURES WILL NOT BE ACCEPTED WITHOUT PRIOR WRITTEN APPROVAL.

RATINGS – SELF–COOLED WITH KVA RATING INDICATED. KVA RATING SHALL BE BASED ON 65C RISE ABOVE A 40C AMBIENT, SELF–COOLED. PRIMARY BASIC IMPULSE INSULATION LEVEL SHALL BE 95KV. TRANSFORMER SHALL BE THREE PHASE, 7200/12470 VOLTS WYE PRIMARY WITH 480–VOLT DELTA SECONDARY.

IMPEDANCE – TRANSFOMRER IMPEDANCE SHALL BE 3.0% WITHIN STANDARD NEMA TOLERANCES.

INSULATING OIL – INHIBITED MINERAL OIL TESTED AT LESS THAN 2 PPM PCB AND ENGRAVED ON TRANSFORMER NAMEPLATE.

PROTECTION – PRIMARY DRAW OUT CURRENT LIMITING FUSE (RTE ELX OR MCGRAW EDISON NX) IN A LOADBREAK DRYWELL CANISTER WITH DEADFRONT CONSTRUCTION. APPROVED FUSES SHALL BE RATED FOR A MINIMUM OF 25,000 RMS SYMMETRICAL AMPERES INTERRUPTING WITH MINIMUM MELTING CURRENT APPROXIMATELY 200% OF TRANSFORMER NAMEPLATE RATING. PROVIDE THREE SPARE FUSES.

TERMINAL ARRANGEMENTS – PRIMARY BUSHING SHALL CONSIST OF 200 AMP LOADBREAK INSERTS (CONFORMING TO FIGURE 3 OF THE LATEST EDITION OF ANSI STD 386) IN UNIVERSAL BUSHING WELL (CONFORMING TO FIGURE 1 OF THE LATEST EDITION OF ANSI STD 386) CONNECTED FOR 200 AMP RADIAL FEED OPERATION. PARKING STANDS SHALL BE PROVIDED. PROVIDE 2 2–1/2% VOLTAGE TAPS ABOVE RATED PRIMARY VOLTAGE AND 2 2–1/2 VOLTAGE TAPS BELOW RATED PRIMARY VOLTAGE. SECONDARY SHALL CONSIST OF 4–HOLE PADS WITH NEMA 2–HOLE CONFIGURATION.

COMPARTMENT ARRANGEMENT – DUAL COMPARTMENT WITH BARRIER BETWEEN HIGH AND LOW VOLTAGE COMPARTMENTS. DOOR SWING OUTWARD.

TESTS – ELECTRICAL TESTS SHALL BE MADE IN ACCORDANCE THE LATEST EDITION OF ANSI STANDARDS C57.12.90 AND C57.12.00.

NAMEPLATE – A LASER INSCRIBED, STAINLESS STEEL NAMEPLATE, BLACK FILLED, SHALL BE AFFIXED TO THE TRANSFORMER BY THE MANUFACTURER IN ACCORDANCE WITH THE LATEST EDITION OF ANSI STANDARD C57.12.00.

ENCLOSURE SHALL MEET ANSI C56.12.28 FOR TANK COATING AND ANSI C57.12.28 FOR ENCLOSURE INTEGRITY. ALL HARDWARE AND HINGES SHALL BE STAINLESS STEEL AND DOOR SHALL BE PROVIDED WITH A CAPTIVE STAINLESS STEEL PENTAHEAD DOOR LOCKING BOLT. TRANSFORMER TANK BASE, CABINET SIDES, DOORS, AND SILL SHALL BE STAINLESS STEEL. ENCLOSURE SHALL BE PAINTED MUNSELL GREEN.

NOISE – STANDARD TRANSFORMER SOUND LEVEL SHALL NOT EXCEED THE VALUES AS CALCULATED PER THE LATEST EDITION OF NEMA PUBLICATION TRI.

SAFETY LABELS – TWO WARNING LABELS ON THE OUTSIDE FRONT AND BACK ABOVE THE DOOR, AND A DANGER LABEL INSIDE THE UNIT. SAFETY LABELS SHALL MEET THE LATEST EDITION OF NEMA STANDARD NO. 260. LABELS SHALL BE MADE OF WEATHER RESISTANT MATERIAL PER THE LATEST EDITION OF NEMA STANDARD 9.15 AND UL969. IN ADDITION TO WARNING LABELS, PROVIDE A LABEL INDICATING THE KVA RATING OF THE TRANSFORMER, IN MINIMUM 2–1/2" BLACK LETTERS, ON THE FRONT OF THE TRANSFORMER.

WARRANTY – THE FAILURE OF THE TRANSFORMER DUE TO DEFECTIVE DESIGN, MATERIAL AND/OR WORKMANSHIP WITHIN 12 MONTHS AFTER BEING ENERGIZED OR EIGHTEEN MONTHS AFTER DELIVERY SHALL BE REPAIRED OR REPLACED WITHOUT COST. ANY DEFECT IN DESIGN, MATERIAL AND/OR CONSTRUCTION DISCOVERED WITHIN THIS PERIOD SHALL BE CORRECTED AT THE MANUFACTURERS EXPENSE, EITHER BY REPAIR OR REPLACEMENT.

SUBMITTALS – SUBMIT COMPLETE ELECTRICAL DATA, MECHANICAL AND LAYOUT DRAWINGS, AND WIRING AND CONNECTION DIAGRAMS FOR EACH TYPE OF TRANSFORMER PROVIDED. PROVIDE WARRANTY AND DRAWINGS WITH THE BID. DRAWINGS SHALL INDICATE THE KVA RATING, TRANSFORMER IMPEDANCE, VOLTAGE, BOTH PRIMARY AND SECONDARY, PHASE OF THE TRANSFORMER, AND WINDING CONNECTION. MECHANICAL DRAWINGS SHALL INDICATE DIMENSIONS AND LAYOUT OF ALL COMPONENTS ON THE TRANSFORMER. PROVIDE CERTIFIED TEST REPORTS UPON SHIPMENT OF THE TRANSFORMER. TEST REPORTS SHALL INDICATE THE NO LOAD AND LOAD LOSS OF EACH TRANSFORMER, BY SERIAL NUMBER, AND SHALL CONTAIN A STATEMENT IDENTIFYING THE AMOUNT OF PCB IN THE INSULATING OIL.

1 / E1.3 POWER POLE DETAILS
NO SCALE

RECORD DRAWING
THESE DRAWINGS HAVE BEEN PREPARED FROM INFORMATION PROVIDED BY THE CONTRACTOR. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.
DATE: 9/06/07

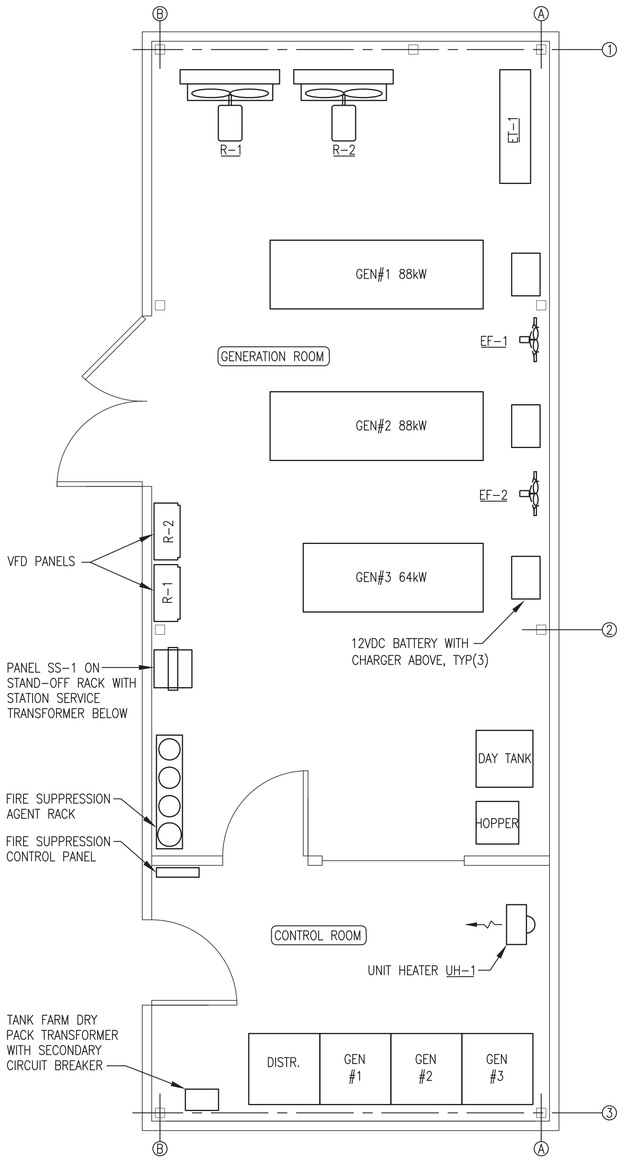
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: POWER POLE DETAIL & TRANSFORMER SPECIFICATION

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

DRAWN BY: JTD	SCALE: AS NOTED	FILE NAME: TENAPP–E1.3A	SHEET: E1.3 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04–12–9841	



1 E2 EQUIPMENT LAYOUT PLAN
3/8"=1'-0"

1	R	(+) ENGINE BATTERIES (#10 AWG)
2	BK	(−)
3	BL−BK	GOVERNOR ACTUATOR (#12 AWG)
4	BL−WH	
5		SPARE
6	Y−BK	FUEL VALVE SOLENOID, 12 VDC
7	O	STARTER RELAY, 12 VDC
8	Y−R	HIGH OIL TEMPERATURE SWITCH (24 VDC)
9	O−R	HIGH OIL TEMPERATURE SWITCH (24 VDC)
10	Y−WH	OIL LEVEL SWITCH (24 VDC)
11	O−WH	OIL LEVEL SWITCH (24 VDC)
12		MAGNETIC PICKUP
13		(#18 AWG SHIELDED/TWISTED PAIR)
14		
15		OIL PRESSURE SENSOR
16		(#18 AWG SHIELDED/TWISTED PAIR)
17		JACKET WATER TEMPERATURE SENSOR
18		(#18 AWG SHIELDED/TWISTED PAIR)
19		SEE NOTE #3, TYP
20		COOLANT RETURN TEMPERATURE RTD
21		(#18 AWG SHIELDED/TWISTED TRIAD)
22		
23		SPARE
24		
25	A	VOLTAGE REGULATOR AUXILIARY BIAS INPUT
26	B	(#18 AWG SHIELDED/TWISTED PAIR)
27		SPARE
28		SPARE
29	GRY	CLOGGED AIR FILTER SWITCH
30	WH	(#12AWG)
TC−1		EXHAUST TEMPERATURE TYPE "K"
TC−2		THERMOCOUPLE, SEE NOTE #2
BC−1		#14 AWG TO BATTERY CHARGER ALARM, INSTALL
BC−2		AT SWITCHGEAR ONLY (NOT ON GENERATOR)

#14 AWG

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 ON GROUND LUGS AT GENERATOR END ONLY.

2 E2 TYPICAL GENERATOR CONNECTION DETAILS
NO SCALE

NOTES:

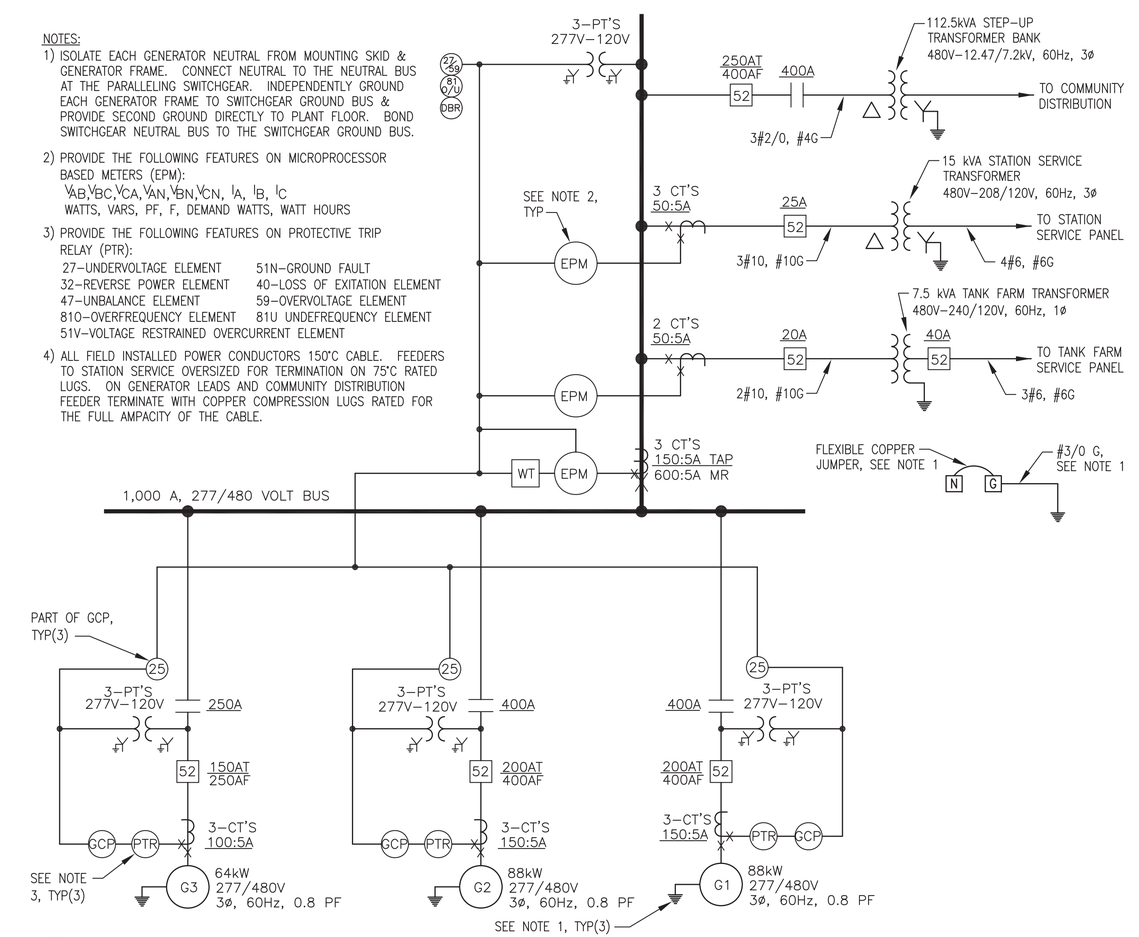
1) ISOLATE EACH GENERATOR NEUTRAL FROM MOUNTING SKID & GENERATOR FRAME. CONNECT NEUTRAL TO THE NEUTRAL BUS AT THE PARALLELING SWITCHGEAR. INDEPENDENTLY GROUND EACH GENERATOR FRAME TO SWITCHGEAR GROUND BUS & PROVIDE SECOND GROUND DIRECTLY TO PLANT FLOOR. BOND SWITCHGEAR NEUTRAL BUS TO THE SWITCHGEAR GROUND BUS.

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

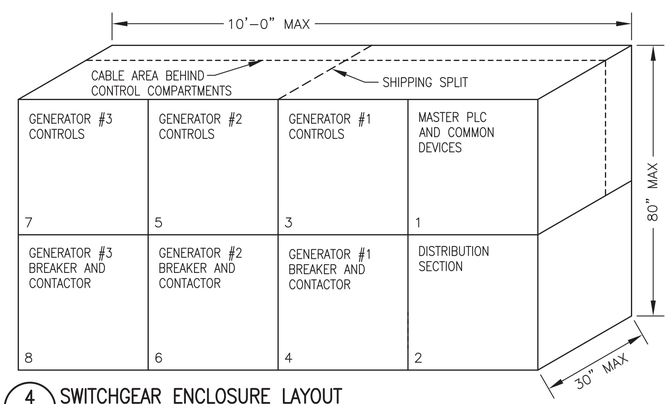
3) PROVIDE THE FOLLOWING FEATURES ON PROTECTIVE TRIP RELAY (PTR):

27−UNDERVOLTAGE ELEMENT	51N−GROUND FAULT
32−REVERSE POWER ELEMENT	40−LOSS OF EXITATION ELEMENT
47−UNBALANCE ELEMENT	59−OVERVOLTAGE ELEMENT
81O−OVERFREQUENCY ELEMENT	81U UNDEFREQUENCY ELEMENT
51V−VOLTAGE RESTRAINED OVERCURRENT ELEMENT	

4) ALL FIELD INSTALLED POWER CONDUCTORS 150°C CABLE. FEEDERS TO STATION SERVICE OVERSIZED FOR TERMINATION ON 75°C RATED LUGS. ON GENERATOR LEADS AND COMMUNITY DISTRIBUTION FEEDER TERMINATE WITH COPPER COMPRESSION LUGS RATED FOR THE FULL AMPACITY OF THE CABLE.



3 E2 SWITCHGEAR ONE−LINE DIAGRAM
NO SCALE



4 E2 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 CT'S RATING FACTOR RF=2.0
- POTENTIAL TRANSFORMER
- WT — WATT TRANSDUCER
- 25 — SYNCHRONIZING EQUIPMENT
- PTR — MICROPROCESSOR−BASED PROTECTIVE TRIP RELAY
- 27/59 — VOLTAGE RELAY OVER/UNDER
- 81 O/U — FREQUENCY RELAY OVER/UNDER
- WYE CONNECTION
- DELTA CONNECTION
- EPM — MICROPROCESSOR−BASED METERING UNIT
- DBR — DEAD BUS RELAY
- GCP — GENSET CONTROL PACKAGE WOODWARD GCP−31

RECORD DRAWING

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

DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	MOVE BATTERY CHARGERS, INCREASE TANK FARM PRIMARY TO #10	1/10/06	BCG

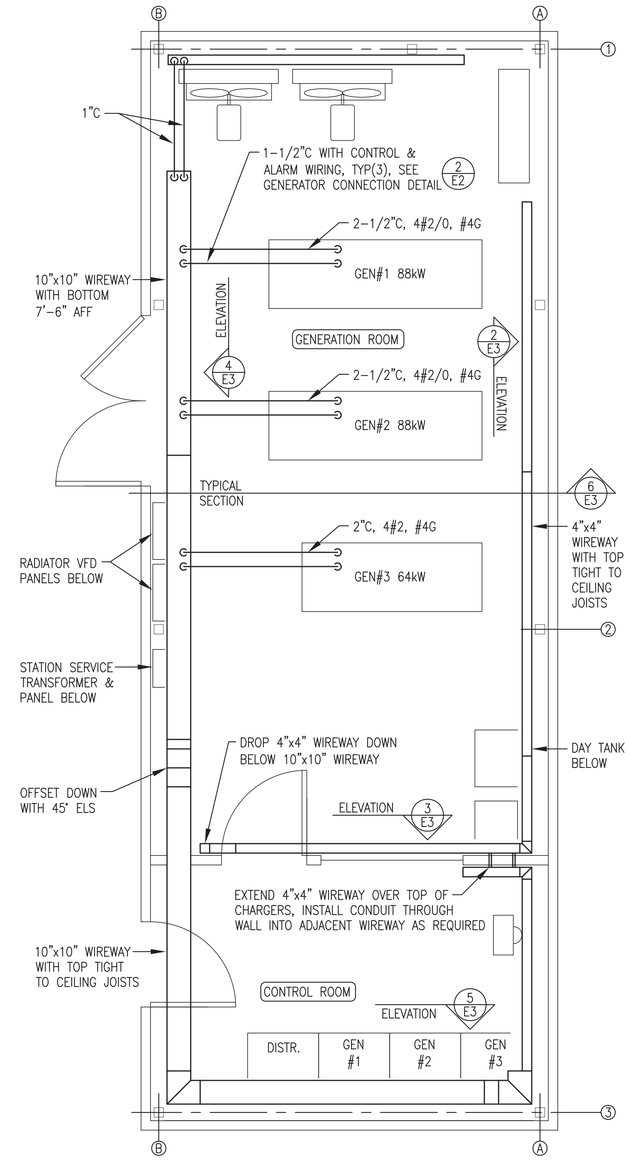
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

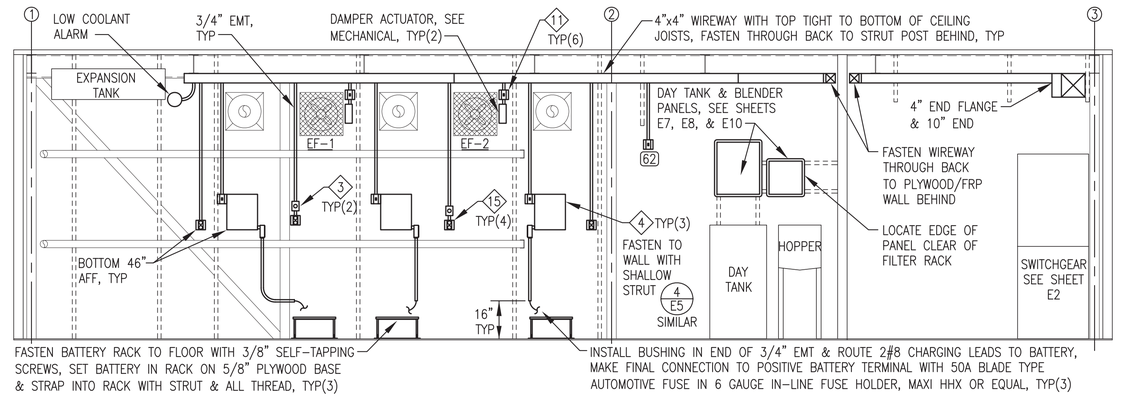
TITLE: EQUIPMENT LAYOUT PLAN & SWITCHGEAR DETAILS

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

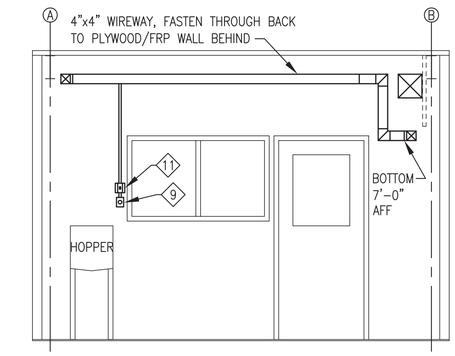
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: TENAPP−E2A	SHEET: E2	OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04−12−9841		



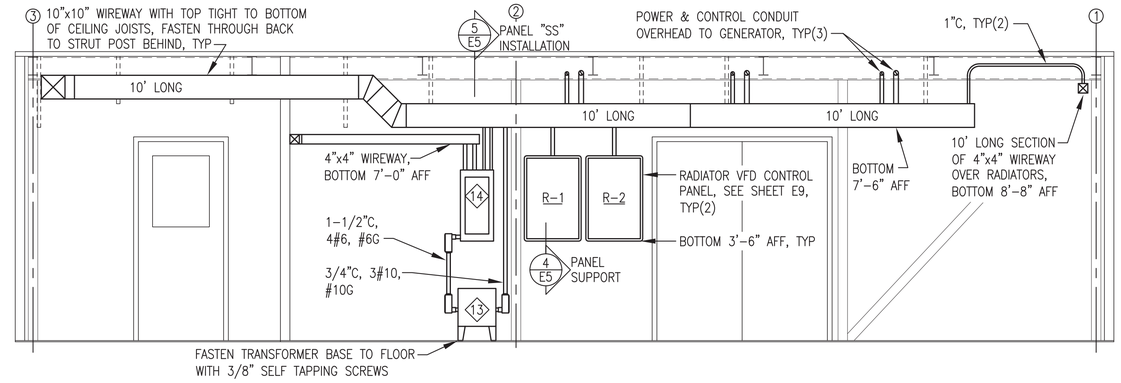
1 E3 WIREWAY PLAN
3/8"=1'-0"



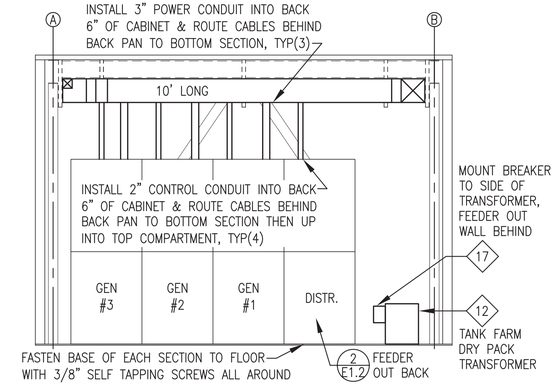
2 E3 WALL ELEVATION AT GRID A
3/8"=1'-0"



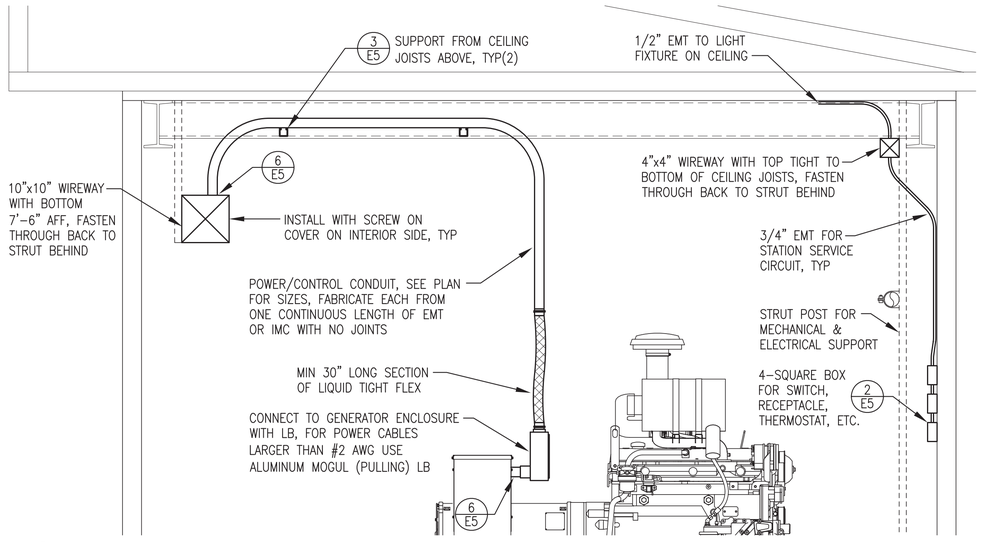
3 E3 INTERIOR WALL ELEVATION
3/8"=1'-0"



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



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



6 E3 TYPICAL SECTION AT GENERATOR
3/4"=1'-0"

REV.	DESCRIPTION	DATE	BY
1	ADD 2 EA. 1"C FROM 10"x10" WIREWAY TO 4"x4" WIREWAY OVER RADIATORS	1/10/06	BCG

RECORD DRAWING

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DATE: 9/06/07

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

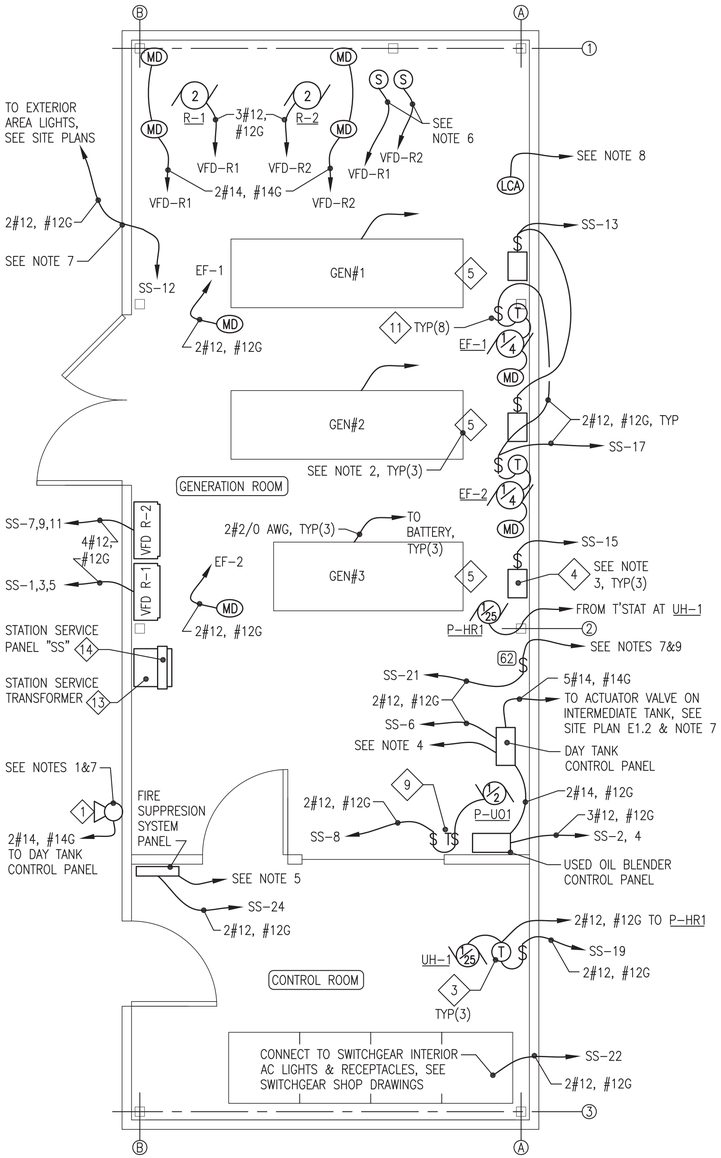
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

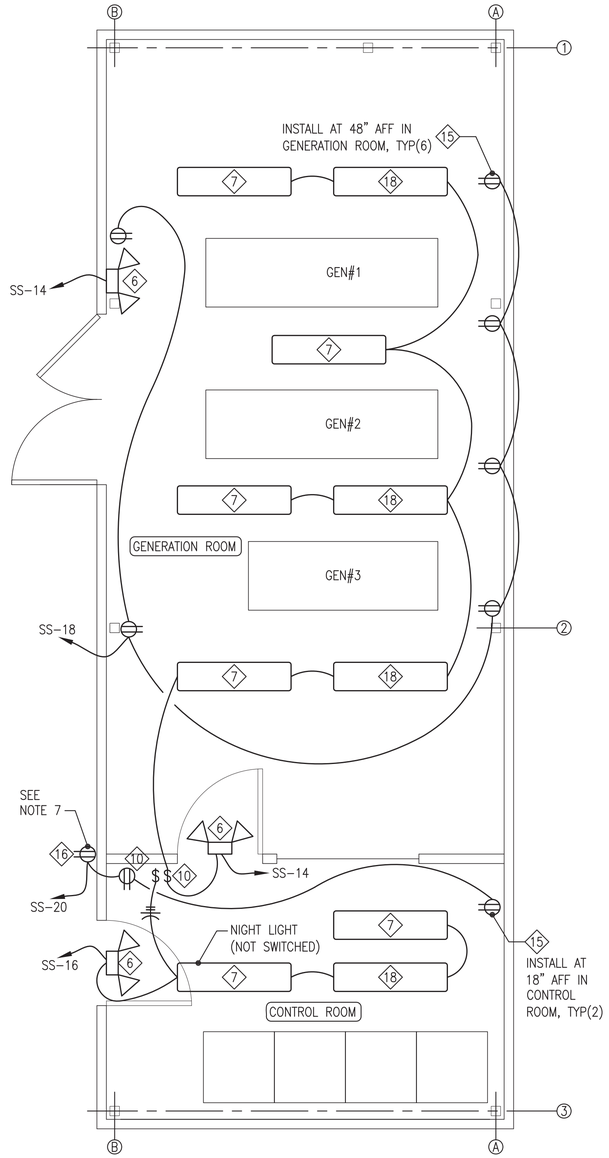
TITLE: WIREWAY PLAN, ELEVATIONS, & SECTION

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

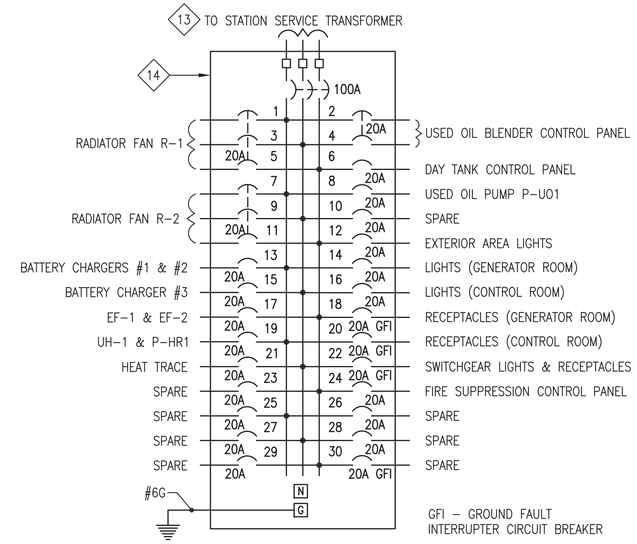
DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: TENAPP-E3A	SHEET: E3 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



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



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



3 E3 STATION SERVICE PANEL "SS"
NO SCALE

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 ON SHEET E6
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

NOTES:

1) INSTALL PLACARD, SEE SHEET M2.

2) INSTALL RTD TEMPERATURE SENSOR IN COOLANT RETURN PIPE AND ROUTE SHIELDED TRIAD TO GENERATOR TERMINAL STRIP, SEE 2/E2.

3) MOUNT BATTERY CHARGER TO WALL AND INSTALL BATTERY ON FLOOR BELOW, SEE ELEVATION 2/E3. ROUTE 2#14 FROM CHARGER ALARM CONTACTS TO ASSOCIATED SWITCHGEAR GENERATOR SECTION, SEE TERMINAL STRIP DRAWING 2/E2.

4) ROUTE 2#14 FOR ENGINE RUN-DRY PREVENTION AND #18 SHIELDED/TWISTED PAIR FOR DAY TANK METER PULSER TO SWITCHGEAR MASTER SECTION.

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

6) INSTALL TEMPERATURE SENSORS PROVIDED WITH RADIATOR VFD CONTROLS WHERE SHOWN ON COOLING PIPING ISOMETRIC. ROUTE #18 SHIELDED/TWISTED PAIR FROM EACH SENSOR TO ASSOCIATED VFD PANEL.

7) SEE DETAIL 7/E5 FOR TYPICAL EXTERIOR WALL PENETRATION.

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

9) INSTALL HEAT TRACE ON DAY TANK SUPPLY PIPING, SEE SHEET M7 FOR LOCATION, INSTALLATION, AND SPECIFICATION. SEE DETAIL 8/E5 FOR TERMINATION AT TEMPERATURE CONTROLLER. INSTALL TAG 62 NEXT TO SWITCH, SEE SHEET M5.

RECORD DRAWING
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DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	ADD EMERGENCY LIGHT FIXTURE #18, ADD REFERENCE TO HEAT TRACE CONTROLLER	1/10/06	BCG

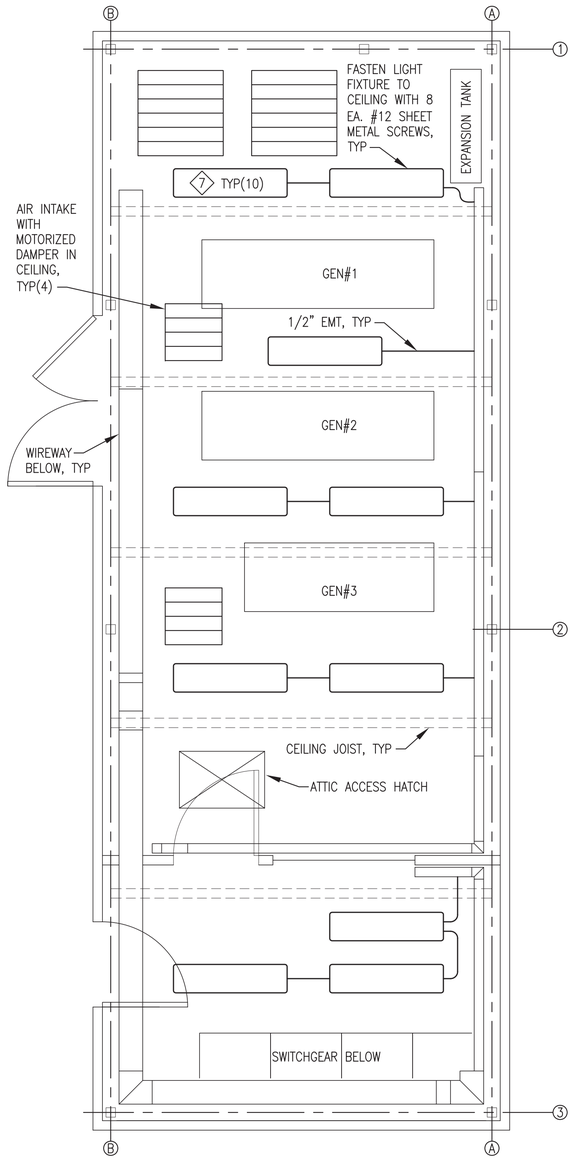
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

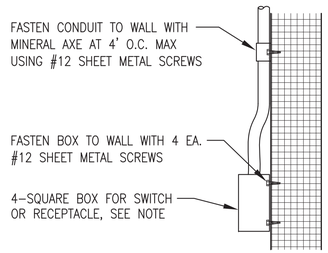
TITLE: BUILDING PLANS & STATION SERVICE PANEL

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: TENAPP-E4A	SHEET: E4 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	

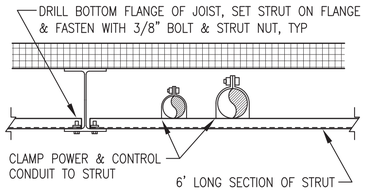


1 E5 CEILING PLAN
3/8"=1'-0"

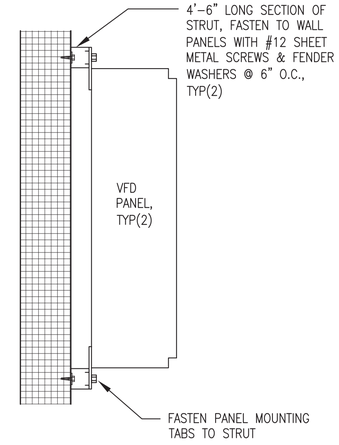


NOTE: INSTALL THERMOSTATS & TIMER SWITCHES IN DEEP SINGLE GANG BELL BOX INSTEAD OF 4-SQUARE BOX.

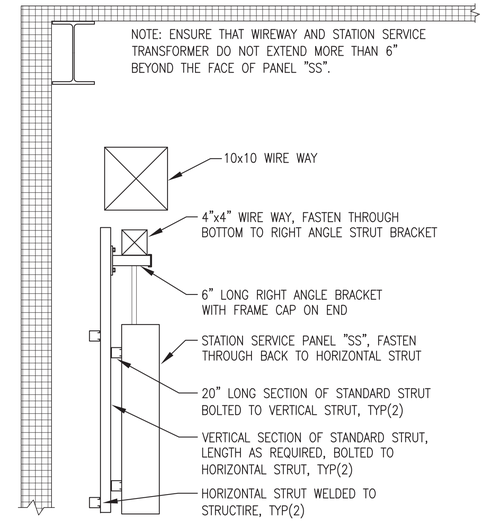
2 E5 TYPICAL DEVICE MOUNTING
NO SCALE



3 E5 CONDUIT SUPPORT FROM CEILING
NO SCALE



4 E5 VFD PANEL SUPPORT
NO SCALE

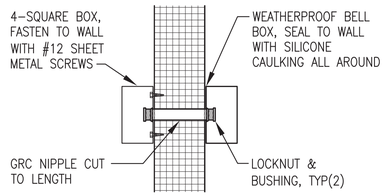


5 E5 STATION SERVICE PANEL SUPPORT
NO SCALE

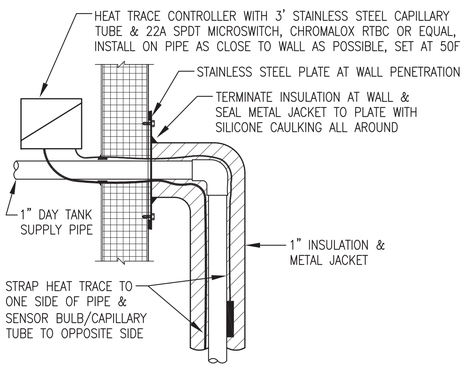
NOTES:
1) THIS DETAIL APPLIES TO ALL CONNECTIONS TO WIREWAY, GENERATOR ENCLOSURES, SWITCHGEAR, AND PANELS.

2) ON GENERATOR ENCLOSURES MAKE ALL CONNECTIONS AS TIGHT AS POSSIBLE TO WITHSTAND VIBRATION & INSTALL ADDITIONAL LOCKNUT AGAINST LB.

6 E5 CONDUIT CONNECTION TO ENCLOSURE
NO SCALE



7 E5 TYPICAL EXTERIOR WALL PENETRATION
NO SCALE



8 E5 HEAT TRACE TERMINATION AT MODULE
NO SCALE

REV.	DESCRIPTION	DATE	BY
1	ADD HEAT TRACE TERMINATION DETAIL	1/10/06	BCG

RECORD DRAWING
THESE DRAWINGS HAVE BEEN PREPARED FROM INFORMATION PROVIDED BY THE CONTRACTOR. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.
DATE: 9/06/07

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: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: CEILING PLAN & MISCELLANEOUS 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: TENAPP-E5A	SHEET: E5 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	

** 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 ON EXTERIOR INSTALLATIONS ALL TYPE 316 STAINLESS STEEL.

** ENGINE GENERATORS **

PROVIDE COMPLETE DIESEL ENGINE GENERATOR SETS OF THE PRIME POWER kW CAPACITY INDICATED ON THE DRAWINGS. PROVIDE JOHN DEERE ENGINES WITH MARATHON/LIMA GENERATORS, 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 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.

** RACEWAYS **

INTERIOR – ALL INTERIOR LOCATIONS SHALL BE ELECTRICAL METALLIC TUBING (EMT) EXCEPT WHERE SPECIFICALLY INDICATED AS WIREWAY OR GALVANIZED RIGID CONDUIT (GRC). WIREWAY SHALL BE NEMA 1 WITH SCREW COVER AND MANUFACTURER PROVIDED CONNECTORS AND FITTINGS.

EXTERIOR – ALL EXTERIOR ABOVE GRADE LOCATIONS RIGID ALUMINUM CONDUIT. ALL FITTINGS ALUMINUM BODY WITH BAKED ALUMINUM LACQUER OR EPOXY POWDER COATING. ALL BELOW GRADE LOCATIONS SCHEDULE 80 PVC CONDUIT.

FLEX – FINAL CONNECTIONS TO DEVICES MAY BE WITH LIQUID TIGHT OIL RESISTANT FLEXIBLE CONDUIT. IN ADDITION PROVIDE LIQUID TIGHT OIL RESISTANT FLEXIBLE CONDUIT WHERE INDICATED AND AS REQUIRED TO ACCOMMODATE MOVEMENT. ON ALL EXTERIOR LOCATIONS USE ALUMINUM CONNECTORS ONLY, T&B OR EQUAL, AND PAINT CUT ENDS OF FLEX WITH COLD GALVANIZING COMPOUND.

TERMINATION – 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. ALL STRUT, BRACKETS, HANGERS, AND FASTENERS SHALL BE GALVANIZED OR ZINC PLATED EXCEPT ON EXTERIOR INSTALLATIONS WHERE INDICATED AS TYPE 304 STAINLESS STEEL.

** CONDUCTORS **

GENERATOR LEADS, FEEDERS (480V), BATTERY CABLES, AND CONDUCTORS INSTALLED IN EXTERIOR LOCATIONS – TYPE VW-1, UL LISTED HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE. 1000V, 150°C THERMOSET EPDM INSULATION WITH TIN COATED COPPER CONDUCTOR. COBRA WIRE AND CABLE, POLAR WIRE, 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.

COLOR CODING – COLOR CODING OF CONDUCTORS SHALL BE AS INDICATED ON THE DRAWINGS. IF NO COLOR CODING IS INDICATED, THE FOLLOWING COLOR CODES SHALL BE FOLLOWED:

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.

HIGH VOLTAGE CONDUCTORS – CONDUCTORS USED TO CONNECT THE STEP-UP TRANSFORMER TO THE OVERHEAD DISTRIBUTION LINE SHALL BE OF THE SIZE INDICATED ON THE DRAWINGS AND SHALL BE RATED 15 KV, 133% ETHYLENE PROPYLENE INSULATION, PVC JACKETED, FULL CONCENTRIC NEUTRAL, STRAND-FILLED ALUMINUM. OUTDOOR TERMINATIONS SHALL BE RAYCHEM HVT TYPE HEAT SHRINK OR SCOTCH 3M QT-III COLD SHRINK WITH TOP INSULATOR, IEEE-48, CLASS 1, MOLDED.

GENERATOR CONTROL CONDUCTORS – TYPE VW-1, UL LISTED HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE. 1000V, 150°C THERMOSET EPDM INSULATION WITH TIN COATED COPPER CONDUCTOR. COBRA WIRE AND CABLE, POLAR WIRE, OR EQUAL EXCEPT WHERE SPECIFICALLY INDICATED OTHERWISE. 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.

THERMOCOUPLE EXTENSION CABLE – SINGLE PAIR TWISTED #16 AWG SOLID ALLOY PER ANSI MC96.1 FOR TYPE K THERMOCOUPLES, 600V FLAME RETARDANT EPR INSULATION, 100% COVERAGE ALUMINUM FOIL-POLYESTER TAPE SHIELD WITH A STRANDED TINNED COPPER DRAIN WIRE, AND FLAME RETARDANT CPE OUTER JACKET. GENERAL CABLE 33668KX, OR EQUAL. TERMINATE ON TYPE K THERMOCOUPLE TERMINAL BLOCKS.

** 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 1000-AMPERE COPPER, 3-PHASE, 4-WIRE WITH NEUTRAL AND GROUND BUSES. COMPLETE WITH PROVISIONS FOR 3 OR 4 GENERATORS AS INDICATED AND A MASTER/DISTRIBUTION SECTION. EQUIPMENT ARRANGEMENT AND SIZES SHALL CONFORM TO THE ONE-LINE DIAGRAM. PANEL SHALL BE PAINTED ANSI 61 GRAY.

PROVIDE THE FOLLOWING FEATURES FOR EACH GENERATING UNIT – (A) GENSET CONTROL PACKAGE (GCP) THAT PROVIDES AUTOMATIC PARALLELING AND SYNCHRONIZATION PLUS COMMUNICATION WITH THE PLC, (B) ENGINE SPEED CONTROL, (C) LOAD SENSOR; (D) AUTOMATIC SYNCHRONIZER, (E) FREQUENCY METER, (F) POWER MONITOR WITH VOLTS, AMPS FREQUENCY, KW, PF, AND TOTAL KWH; (G) IDLE SPEED POTENTIOMETER AND RATED/IDLE SELECTOR SWITCH; (H) MOLDED CASE CIRCUIT BREAKER (I) GENERATOR CONTROL CONTACTOR.

PROVIDE THE FOLLOWING PROTECTION FOR EACH GENERATING UNIT – (A) OVERCRANK, (B) OVER/UNDERVOLTAGE, (C) OVER/UNDER FREQUENCY, (D) REVERSE POWER, (E) OVERCURRENT, (F) DEAD BUS RELAY, (G) SYNC CHECK RELAY, (H) HIGH JACKET WATER TEMPERATURE, (I) HIGH LUBE OIL TEMPERATURE, (J) LOW LUBE OIL PRESSURE, (K) LOW LUBE OIL LEVEL, (L) OVERSPEED, (M) ANNUNCIATION PANEL WITH COMPLETE ANNUNCIATION OF FAILURE AND STATUS OF THE GENERATOR DEVICES.

PROVIDE THE FOLLOWING FEATURES IN THE MASTER CONTROL SECTION TO SERVE ALL GENERATING UNITS – (A) PRIMARY PROGRAMMABLE LOGIC CONTROLLER (PLC) FOR AUTOMATIC LOAD CONTROL AND SENSING, (B) BACKUP PROGRAMMABLE LOGIC CONTROLLER, (C) OPERATOR INTERFACE UNIT FOR OPERATOR CHANGES TO THE LOAD CONTROL SET POINTS IN THE PLC, (D) ANNUNCIATION PANEL WITH COMPLETE ANNUNCIATION OF FAILURE AND STATUS OF THE SWITCHGEAR DEVICES.

PROVIDE A DISTRIBUTION SECTION COMPLETE WITH – (A) MICROPROCESSOR BASED KILOWATT-HOUR METERS FOR THE BUS AND FOR THE STATION SERVICE; (B) MOLDED CASE CIRCUIT BREAKER FOR THE STATION SERVICE; (C) MOLDED CASE CIRCUIT BREAKER AND CONTACTOR FOR THE COMMUNITY FEEDER. CIRCUIT BREAKER SIZES 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 AUTOMATICALLY START THE ENGINE/GENERATOR UNITS, BRING THEM TO THE PROPER SPEED, SYNCHRONIZE THE UNITS, AND CLOSE THE GENERATOR CONTACTOR. WHEN THE PLC REMOVES AN ENGINE/GENERATOR FROM THE BUS, THE PLC 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 THROUGH 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. INSTALL IN SINGLE GANG BELL BOX.	HONEYWELL T651A3000
4	12-VOLT 20-AMP AUTO-EQUALIZING BATTERY CHARGER FOR 120 VOLT AC INPUT POWER. PROVIDE WITH OPTIONAL HIGH/LOW VOLTAGE, AC POWER FAILURE, & REMOTE SUMMARY ALARM RELAYS.	CHARLES INDUSTRIES MODEL AA1220-HLPR
5	MODERATE TEMPERATURE RANGE, 3 WIRE, PLATINUM RTD, 100 OHMS +/- 0.12%, 0.00385 TEMPERATURE COEFFICIENT, TYPE 316 STAINLESS STEEL CONSTRUCTION, 1/2" NPT REDUCED TIP TYPE 316 SS THERMOWELL, 1-1/2" IMMERSION LENGTH, NO LAG.	R.T.D. COMPANY CLASS 130 M-P2B-3S-A-B-010-TR2-015-B-00-N
6	EMERGENCY FIXTURE WITH EXIT SIGN, WALL MOUNT, 20 GAUGE 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 FLOURESCENT FIXTURE, WET LOCATION RATED. 2 TUBE F32WT8 LAMP, ENERGY SAVING BALLAST, 120V COMPLETE WITH LAMPS.	LITHONIA DMW232120
8	70W HIGH PRESSURE SODIUM AREA LIGHT, 120V HPF BALLAST. PROVIDE WITH 120V PHOTO CELL CONTROL. PROVIDE FIXTURE WITHOUT MOUNTING ARM.	GENERAL ELECTRIC FIXTURE SAM-07S1N54N-V5AS-C
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	TANK FARM TRANSFORMER – ENCLOSURE TYPE 1, 7.5kVA, 1ø, HV 480, LV 240/120	EGS ELECTRICAL GROUP CAT. NO. HS5F7.5AS
13	STATION SERVICE TRANSFORMER – ENCLOSURE TYPE 1, 15kVA, 3ø, HV 480 DELTA, LV 208Y/120, ENERGY STAR COMPLIANT	EGS ELECTRICAL GROUP CAT. NO. ET2H15S
14	STATION SERVICE PANELBOARD, 3-PHASE MAIN BREAKER WITH COPPER BUS, 4 WIRE, 120/208V, 100A, 30 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	ENCLOSED CIRCUIT BREAKER WITH NEUTRAL, SERVICE ENTRANCE RATED, NEMA 1, 40A, 2P	SIEMENS E0204ML1060S WITH 40A, 2P, QP BREAKER
18	SURFACE MOUNTED FLUORESCENT FIXTURE, WET LOCATION RATED. 2 TUBE F32WT8 LAMP, ENERGY SAVING BALLAST, FIELD INSTALL BATTERY BACKUP EMERGENCY BALLAST KIT & TOGGLE SWITCH	LITHONIA DMW232120 LIGHT & LITHONIA PS1400QD-DW BATTERY

REV.	DESCRIPTION	DATE	BY
1	ADD EMERGENCY LIGHT FIXTURE #18	1/10/06	BCG

RECORD DRAWING

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

DATE: 9/06/07

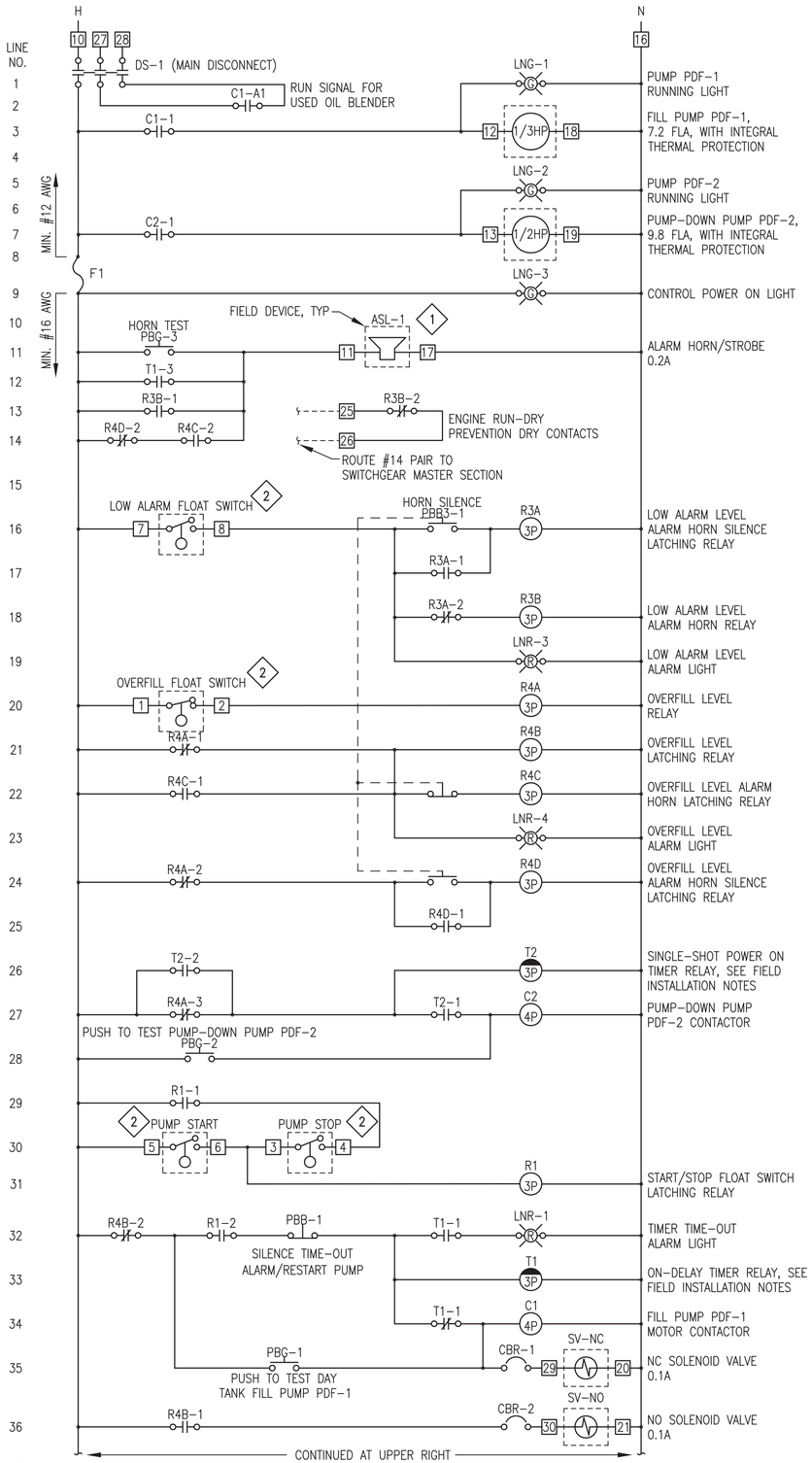
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT:
TENAKEE SPRINGS POWER SYSTEM UPGRADE

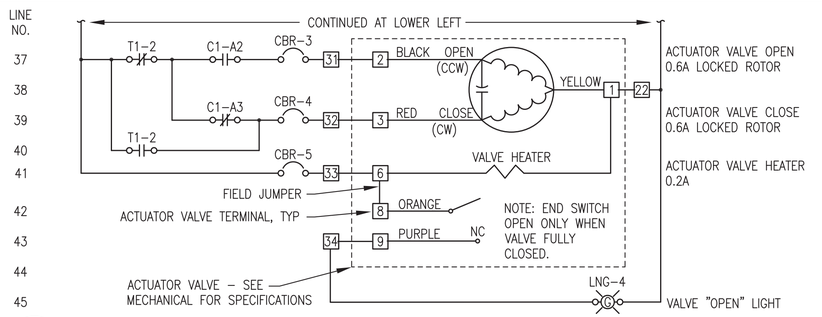
TITLE:
SPECIFICATIONS & EQUIPMENT SCHEDULE

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

DRAWN BY: BCG	SCALE: AS NOTED	FILE NAME: TENAPP-E6A	SHEET: E6 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



1 / E7 LOGIC DIAGRAM
NO SCALE



1 / E7 LOGIC DIAGRAM (CONTINUED)
NO SCALE

SEQUENCE OF OPERATIONS:

1. WHEN THE DAY TANK CIRCUIT BREAKER AND 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.

LEGEND

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

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

TAG	QTY	MANUFACTURER	MODEL	DESCRIPTION
C	2	ALLEN–BRADLEY	100C23D10	CONTACTOR, 120V COIL, 23A, 3 POLE WITH 1 NO AUX
	1	ALLEN–BRADLEY	100SA11	AUXILIARY CONTACT FOR CONTACTOR, 2 POLE, NO, NC
CBR	5	ALLEN–BRADLEY	1492GH010	CIRCUIT BREAKER, RAIL STYLE, 1 POLE, 1A
DS	1	ALLEN–BRADLEY	194LE201753	DISCONNECT, 2 POSITION, 3 N.O., 20A, FACE MOUNT
	1	ALLEN–BRADLEY	194LHC4E1751	KNOB ACTUATOR FOR LOAD SWITCH, ON/OFF, LOCKABLE
F	1	BUSS	FNQR5	5A FUSE IN 3 FUSE HOLDER WITH 2 EACH SPARE FUSES
LNG	4	ALLEN–BRADLEY	800HQRH10G	GREEN LED PILOT LIGHT, 120V, NEMA 4X
LNR	3	ALLEN–BRADLEY	800HQRH10R	RED LED PILOT LIGHT, 120V, NEMA 4X
PBB	1	ALLEN–BRADLEY	800HAR2D2	MOMENTARY PUSH BUTTON, 1 NC, NEMA 4X, BLACK
PBB3	1	ALLEN–BRADLEY	800HAR2	MOMENTARY PUSH BUTTON, NEMA 4X, BLACK
	2	ALLEN–BRADLEY	800T–XD1	NO CONTACT BLOCK
	1	ALLEN–BRADLEY	800T–XD2	NC CONTACT BLOCK
PBG	3	ALLEN–BRADLEY	800HAR1D1	MOMENTARY PUSH BUTTON, 1 NO, NEMA 4X, GREEN
R	7	ALLEN–BRADLEY	700HA33A1	3PDT RELAY
	7	ALLEN–BRADLEY	700HN101	11 PIN SOCKET BASE
T	2	ALLEN–BRADLEY	700HA33A1	3PDT RELAY
	2	ALLEN–BRADLEY	700HN205	11 PIN RELAY SOCKET BASE FOR TIMER
	2	ALLEN–BRADLEY	700HT3	SERIES B TIMING MODULE
TB–1	35	ALLEN–BRADLEY	1492CAM1	35A, 600V SCREW TERMINALS

PANEL NOTES:

1. PROVIDE COMPLETE UL LISTED PANEL ASSEMBLY WITH ALL DEVICES INDICATED IN LOGIC DIAGRAM EXCEPT FOR FIELD DEVICES. FIELD DEVICES ARE INDICATED WITH DASHED OUTLINE. INSTALL IN A 24"x20"x8" NEMA 12 ENCLOSURE WITH 4 EACH INTEGRAL MOUNTING LUGS AT BACK.
2. USE MIN #16 AWG ON ALL 5 AMP FUSED CIRCUITS AND MIN #12 AWG WIRE ON ALL OTHER CIRCUITS. TAG EACH END OF ALL JUMPERS WITH DEVICE OR TERMINATION DESIGNATOR OF LANDING OF OPPOSITE END OF JUMPER (REVERSE ADDRESS).
3. LABEL ALL PANEL DEVICES AND REMOTE EQUIPMENT CONNECTIONS AT THE TERMINAL BLOCK BY THE ITEM TITLE AS SHOWN ON THE TERMINAL STRIP DRAWING.
4. BENCH TEST COMPLETED UNIT. PROVIDE MIN 48 HOURS NOTICE TO ENGINEER TO SCHEDULE OBSERVATION OF BENCH TEST. PROVIDE SWITCHES AND LAMPS TO SIMULATE OPERATION OF ALL FIELD DEVICES.
5. FIELD WIRING AND FIELD INSTALLED DEVICES PROVIDED BY OTHERS ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT PART OF THE PANEL BID.
6. POWER TO PANEL PROVIDED FROM DEDICATED 20A CIRCUIT BREAKER IN LISTED LOAD CENTER. SEE FIELD INSTALLATION NOTE #3.

FIELD INSTALLATION NOTES:

1. SEE MECHANICAL FOR DAY TANK INSTALLATION & PIPING. INSTALL CONTROL PANEL & FIELD DEVICES AS INDICATED TO PROVIDE REDUNDANT HIGH & LOW LIMIT CONTROLS & OVERFILL PROTECTION.
2. FIELD WIRING TO FLOAT SWITCHES, SOLENOID VALVES, AND ACTUATOR VALVES #14 AWG. ALL OTHER FIELD WIRING #12 AWG. LABEL BOTH ENDS OF ALL CONDUCTORS WITH CONTROL PANEL TERMINAL BLOCK TERMINATION NUMBERS.
3. PERFORM ALL FIELD WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS ON SHEET E6. PROVIDE POWER TO DAY TANK PANEL FROM DEDICATED 20A SINGLE POLE CIRCUIT BREAKER IN STATION SERVICE LOAD CENTER.
4. VERIFY THAT ALL FLOAT SWITCHES ARE ORIENTED FOR N.C. (OPEN ON RISE) OPERATION PRIOR TO INSTALLATION. ALL FLOATS SHOWN ON LOGIC DIAGRAM WITH TANK AT FULL (PUMP STOP) LEVEL.
5. VERIFY PROPER ROTATION OF ALL PUMPS. FILL PUMP CAVITY WITH LUBE OIL PRIOR TO INITIAL OPERATION.
6. FIELD TEST COMPLETED UNIT TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. MANIPULATE FLOAT SWITCHES BY REACHING IN THROUGH ADJACENT 4" BUNG. TEMPORARILY SET TIMING RELAYS TO 30 SECONDS TO VERIFY TIME–OUT AND RESET FUNCTIONS.
7. SET FILL PUMP PDF–1 TIMING RELAY T1 TIME DELAY TO 30 MINUTES (APPROX. 35 GALS. REQUIRED FROM PUMP START TO PUMP STOP LEVEL @ APPROX. 2 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". PRIME SYSTEM WITH HAND PRIMING PUMP PRIOR TO OPERATING DAY TANK PUMP.
8. SET PUMP–DOWN PUMP T2 TIMING RELAY TIME DELAY TO 4 MINUTES (24 GALS. REQUIRED TO DROP LEVEL INTO NORMAL OPERATING RANGE @ APPROX. 6 GPM).

RECORD DRAWING
THESE DRAWINGS HAVE BEEN PREPARED FROM INFORMATION PROVIDED BY THE CONTRACTOR. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.
DATE: 9/06/07

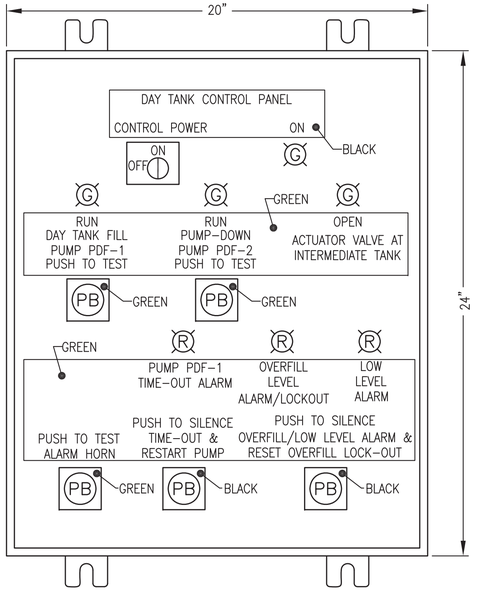
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

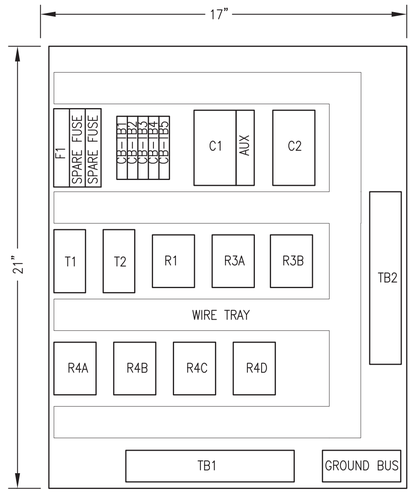
TITLE: DAY TANK CONTROL PANEL
LOGIC DIAGRAM & SEQUENCE OF OPERATIONS

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: TENAPP–E7A	SHEET: E7	OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04–12–9841		

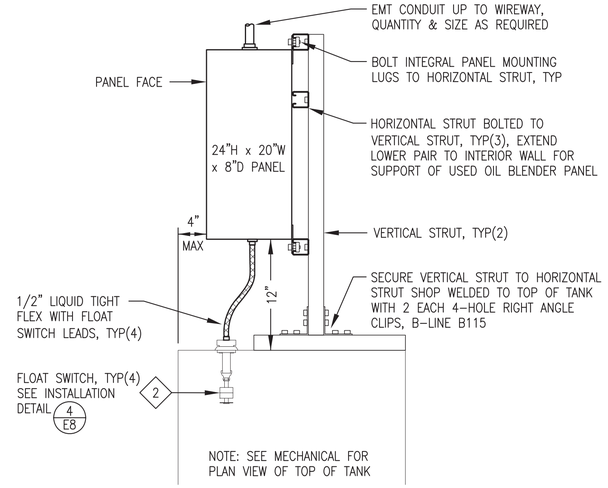


1 E8 FRONT PANEL LAYOUT
NO SCALE



2 E8 SUB PANEL LAYOUT
NO SCALE

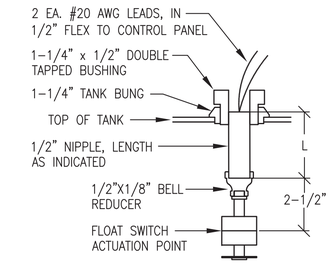
NOTE: THIS DETAIL IS FOR FIELD INSTALLATION ONLY AND IS NOT PART OF THE PANEL BID.



3 E8 DAY TANK CONTROL PANEL INSTALLATION
NO SCALE

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

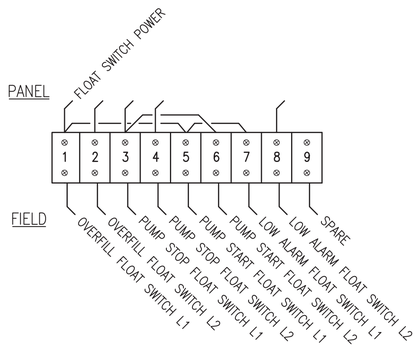
2) PRIOR TO INSTALLATION CHASE THREADS ON FLOAT SWITCH WITH 1/8" PIPE DIE TO CLEAN OFF ANY EXCESS EPOXY, USE CARE TO AVOID DAMAGING WIRES.



L = OVERALL LENGTH OF 1/2" NIPPLE

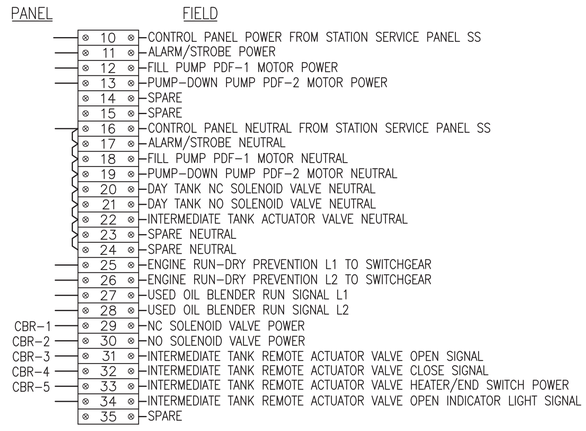
1. OVERFILL FLOAT L=2"
2. PUMP STOP FLOAT L=4"
3. PUMP START FLOAT L=18"
4. LOW ALARM FLOAT L=20"

4 E8 FLOAT SWITCH DETAIL
NO SCALE



NOTES:
1) INSTALL TERMINAL STRIP TB-1 HORIZONTALLY AS SHOWN. LOCATE TERMINAL STRIP BELOW PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO BOTTOM OF PANEL – SEE SUBPANEL LAYOUT.

5 E8 TERMINAL STRIP TB-1
NO SCALE



NOTES:
1. INSTALL TERMINAL STRIP TB-2 VERTICALLY AS SHOWN. LOCATE TERMINAL STRIP TO THE RIGHT OF PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO RIGHT SIDE (FACING) OF PANEL – SEE SUBPANEL LAYOUT.

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

6 E8 TERMINAL STRIP TB-2
NO SCALE

RECORD DRAWING
THESE DRAWINGS HAVE BEEN PREPARED FROM INFORMATION PROVIDED BY THE CONTRACTOR. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.
DATE: 9/06/07

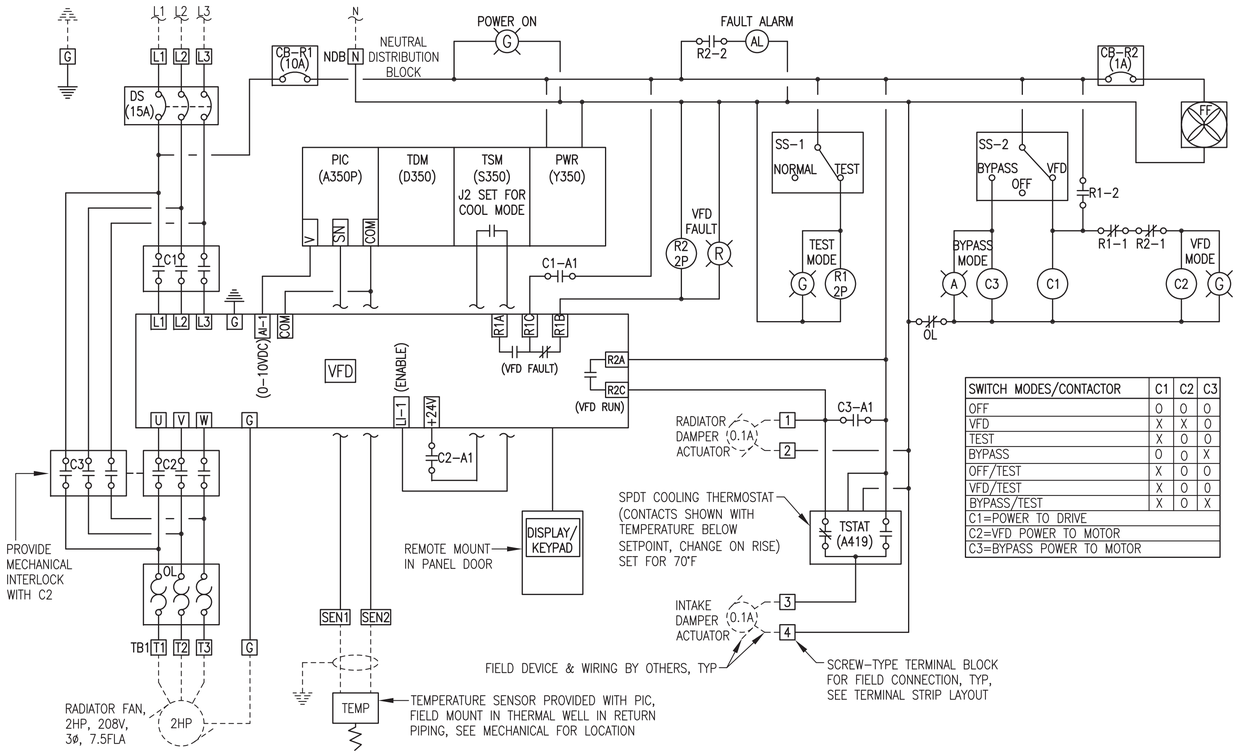
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: DAY TANK CONTROL PANEL LAYOUT & INSTALLATION 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: TENAPP-E8A	SHEET: E8 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	



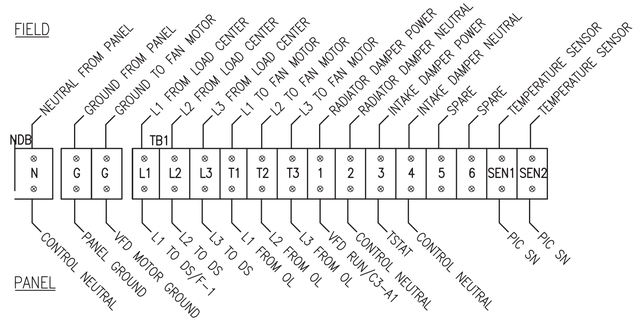
SWITCH MODES/CONTACTOR	C1	C2	C3
OFF	0	0	0
VFD	X	X	0
TEST	X	0	0
BYPASS	0	0	X
OFF/TEST	X	0	0
VFD/TEST	X	0	0
BYPASS/TEST	X	0	X
C1=POWER TO DRIVE			
C2=VFD POWER TO MOTOR			
C3=BYPASS POWER TO MOTOR			

1 E9 VFD PANEL LOGIC DIAGRAM

NO SCALE

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

TAG	QTY	MANUFACTURER	MODEL	DESCRIPTION
C	3	ALLEN BRADLEY	100-C16D10	2HP, 208V, 16A, 3ø, MOTOR CONTACTOR W/ 1 N.O. AUX CONTACT
	1	ALLEN BRADLEY	100-MCA00	CONTACTOR MECHANICAL INTERLOCK
OL	1	ALLEN BRADLEY	193-TAC10	208V, 3ø OVERLOAD, ADJUSTABLE 6A-10A RANGE
	1	ALLEN BRADLEY	193-TAPM	OVERLOAD BASE
CB-R1	1	SQUARE D	QOU110	10A, 1P, CIRCUIT BREAKER
CB-R2	1	ALLEN BRADLEY	1492-CB1G010	RAIL-MOUNT CIRCUIT BREAKER, 1A
DS	1	SQUARE D	9421-LN4	CIRCUIT BREAKER OPERATOR/DISCONNECT WITH THRU DOOR HANDLE
	1	SQUARE D	FAL36015	15A, 3P, CIRCUIT BREAKER
TB1	14	ALLEN-BRADLEY	1492-W10	50A, 600V, TERMINAL BLOCK
NDB	1	MARATHON	1411400	DISTRIBUTION BLOCK
G	2	BLACKBURN	ADR2	SCREW TERMINAL GROUND LUG FOR UP TO #2AWG
R	2	ALLEN-BRADLEY	700HA32A1	DPDT RELAY WITH 8 PIN SOCKET BASE 700HN100
LNA	1	ALLEN-BRADLEY	800T-QH10A	AMBER LED PILOT LIGHT, 120V, NEMA 4, 13
LNG	3	ALLEN-BRADLEY	800T-QH10G	GREEN LED PILOT LIGHT, 120V, NEMA 4, 13
LNR	1	ALLEN-BRADLEY	800T-QH10R	RED LED PILOT LIGHT, 120V, NEMA 4, 13
SS-1	1	ALLEN-BRADLEY	800T-H2D1	2 POSITION MAINTAINED CONTACT SELECTOR SWITCH, 1 N.O.
SS-2	1	ALLEN-BRADLEY	800T-J2A	3 POSITION MAINTAINED CONTACT SELECTOR SWITCH, 1 N.O., 1 N.C.
PIC	1	JOHNSON	A350PS-2C	PROPORTIONAL INTEGRAL CONTROLLER, 90°F TO 250°F RANGE
TEMP	1	JOHNSON	A99BC-25C	TEMPERATURE SENSOR FOR WITH PI CONTROLLER
	1	JOHNSON	WELL 11A-601R	BULB WELL ASSEMBLY FOR TEMPERATURE SENSOR
	1	JOHNSON	TE-6001-3	MOUNTING ASSEMBLY FOR TEMPERATURE SENSOR
TSM	1	JOHNSON	S350AA-1C	TEMPERATURE STAGE MODULE
PWR	1	JOHNSON	Y350	CLASS 2, 24VDC POWER SUPPLY FOR SYSTEM 350 COMPONENTS
TDM	1	JOHNSON	D350AA-1C	TEMPERATURE DISPLAY MODULE, -30°F TO 250°F RANGE
TSTAT	1	JOHNSON	A419ABC-1C	SPDT TEMP CONTROL, -30F TO 212°F, 16A/120V CONTACTS
VFD	1	SQUARE D	ATV58HU29M2ZU	2 HP, 208V, 3ø VARIABLE FREQUENCY DRIVE
	1	SQUARE D	VW3A58101U	REMOTE MOUNT KEYPAD/DISPLAY
	1	SQUARE D	VW3A58103	MOUNTING KIT FOR REMOTE KEYPAD
FF	1	HAMMOND	PF2000	FILTER FAN (INTAKE AIR) WITH FILTER AND GRILLE
	1	HAMMOND	PFA2000	EXHAUST AIR FILTER GRILLE
AL	1	INGRAM	AH115A8G	PANEL FACE MOUNTED ALARM HORN, GRAY



NOTE: INSTALL TERMINAL STRIP HORIZONTALLY AS SHOWN. LOCATE TERMINAL STRIP ABOVE PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO TOP OF PANEL.

2 E9 TERMINAL STRIP LAYOUT

NO SCALE

SYMBOL LEGEND

CIRCUIT BREAKER — PANEL WIRING - - - - - FIELD WIRING

NORMALLY OPEN CONTACT — NORMALLY CLOSED CONTACT

R2 2P 2 POLE RELAY — C3 CONTACTOR — OVERLOAD

A PILOT LAMP (COLOR INDICATED) — # TERMINAL BLOCK

SEQUENCE OF OPERATION:

WHEN THE CIRCUIT BREAKER IN THE BUILDING LOAD CENTER AND THE PANEL FACE DISCONNECT SWITCH/CIRCUIT BREAKER ARE CLOSED POWER IS PROVIDED TO ALL CONTROL DEVICES AND THE "POWER ON" LIGHT IS ON. WHEN THE DRIVE IS INITIALLY POWERED UP THE VFD FAULT LIGHT MAY ILLUMINATE AND THE ALARM HORN MAY SOUND MOMENTARILY.

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

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.

WHEN THE 2-POSITION SELECTOR SWITCH IS IN THE "TEST" MODE, POWER WILL BE PROVIDED TO THE VFD FOR PROGRAMMING BUT THE FAN WILL NOT OPERATE UNDER CONTROL OF THE VFD. THE FAN MAY BE OPERATED IN BYPASS MODE WHILE UTILIZING THE TEST FEATURE.

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 ENGINE COOLANT RETURN TEMPERATURE AND SEND A PROPORTIONAL SIGNAL TO THE ELECTRONIC PROPORTIONAL INTEGRAL CONTROLLER. THE CONTROLLER WILL LINEARIZE THE OUTPUT OF THE TEMPERATURE SENSOR AND SEND A 0-10 VDC SIGNAL TO THE VFD THAT IS LINEARLY PROPORTIONAL TO THE TEMPERATURE OF THE ENGINE COOLANT. THE VFD WILL MODULATE THE FAN SPEED AS REQUIRED TO MAINTAIN TEMPERATURE IN THE ENGINE COOLANT LINE, SETPOINT ADJUSTABLE. IF THE TEMPERATURE OF THE ENGINE COOLANT IS ABOVE THE SETPOINT, THE VFD WILL INCREASE THE SPEED OF THE FAN. IF THE TEMPERATURE OF THE ENGINE COOLANT IS BELOW THE SETPOINT THE VFD WILL REDUCE THE SPEED OF THE FAN. ONCE THE FAN SPEED REACHES A MINIMUM SPEED OF 25% (FIELD ADJUSTABLE), THE VFD WILL SHUT THE FAN OFF. AS THE ENGINE COOLANT TEMPERATURE RISES THE VFD WILL RESTART THE FAN.

WHEN THE COOLANT TEMPERATURE DROPS TO MORE THAN 10°F (ADJUSTABLE) BELOW THE SETPOINT, THE TEMPERATURE STAGE MODULE WILL DISABLE THE VFD. WHEN THE TEMPERATURE RISES TO LESS THAN 10°F (ADJUSTABLE) BELOW THE SETPOINT, THE TEMPERATURE STAGE MODULE WILL ENABLE THE VFD TO OPERATE.

THE RADIATOR DAMPER WILL BE OPEN ANY TIME THE RADIATOR FAN RUNS (BOTH VFD AND BYPASS MODES). THE INTAKE AIR DAMPER WILL BE OPEN ANY TIME THE RADIATOR FAN RUNS AND ANY TIME THE TEMPERATURE IN THE SPACE IS ABOVE 70F (ADJUSTABLE).

TEMPERATURE DISPLAY – THE TEMPERATURE OF THE ENGINE COOLANT AND THE SETPOINT WILL BE DISPLAYED ON THE TEMPERATURE DISPLAY MODULE LOCATED INSIDE THE PANEL.

MOTOR SPEED DISPLAY – THE SPEED OF THE FAN MOTOR WILL BE DISPLAYED ON A REMOTE ELECTRONIC DISPLAY/KEYPAD MODULE MOUNTED ON THE FRONT DOOR OF THE PANEL.

SHOP FABRICATION NOTES:

1) PROVIDE COMPLETE UL LISTED PANEL ASSEMBLY WITH ALL DEVICES INDICATED IN LOGIC DIAGRAM 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 36"x24"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, BLACK OR RED FACE AS INDICATED, AND SECURE TO PANEL FACE WITH A MINIMUM OF TWO MOUNTING SCREWS.

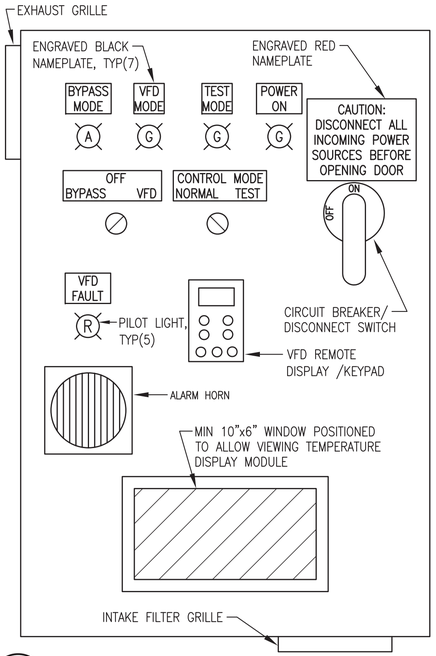
6) BENCH TEST COMPLETED UNIT. PROVIDE A SIGNED AND DATED BENCH TEST REPORT VERIFYING ALL FUNCTIONS. THIS DRAWING WILL BE PROVIDED IN AUTOCAD FORMAT TO THE PANEL MANUFACTURER UPON AWARD OF ORDER. MODIFY THIS DRAWING AS REQUIRED TO INDICATE AS-BUILT CONSTRUCTION. PACKAGE THREE COPIES OF AS-BUILT DRAWING IN PANEL PRIOR TO SHIPPING AND PROVIDE IN AUTOCAD FORMAT TO ENGINEER.

FIELD INSTALLATION NOTES:

1) PERFORM ALL FIELD WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS ON SHEET E6. FIELD WIRING TO RADIATOR FAN MOTOR MIN #12 AWG. FIELD WIRING TO DAMPERS MIN #14 AWG. FIELD WIRING TO TEMPERATURE SENSOR MIN #16AWG SHIELDED/TWISTED PAIR. LABEL BOTH ENDS OF ALL CONDUCTORS WITH VFD PANEL TERMINAL BLOCK TERMINATION NUMBERS.

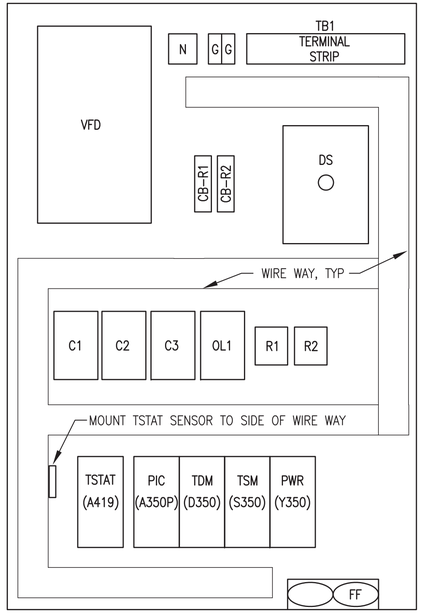
2) ADJUST OVERLOAD TO 115% OF ACTUAL FAN MOTOR NAMEPLATE FLA RATING. WITH FAN RUNNING IN BYPASS MODE CHECK CURRENT IN ALL THREE PHASES AND VERIFY THAT MOTOR IS OPERATING WITHIN NAMEPLATE RATING.

3) SET THROTTLING RANGE ON PIC (A350P) TO 30° AND SET TEMPERATURE TO SETPOINTS INDICATED IN MECHANICAL SPECIFICATIONS SEQUENCE OF OPERATION. SET BOTH OFFSET AND DIFFERENTIAL ON TSM (S350) TO 1°. VERIFY THAT VFD IS IN STANDARD (MATERIAL HANDLING) MODE. SET MINIMUM SPEED TO 6HZ (10%). FIELD TEST SYSTEM TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. VERIFY TEMPERATURE SETPOINTS WITH PIPING THERMOMETERS.



3 E9 PANEL FACE LAYOUT

NO SCALE



4 E9 PANEL INTERIOR LAYOUT

NO SCALE

RECORD DRAWING

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

DATE: 9/06/07

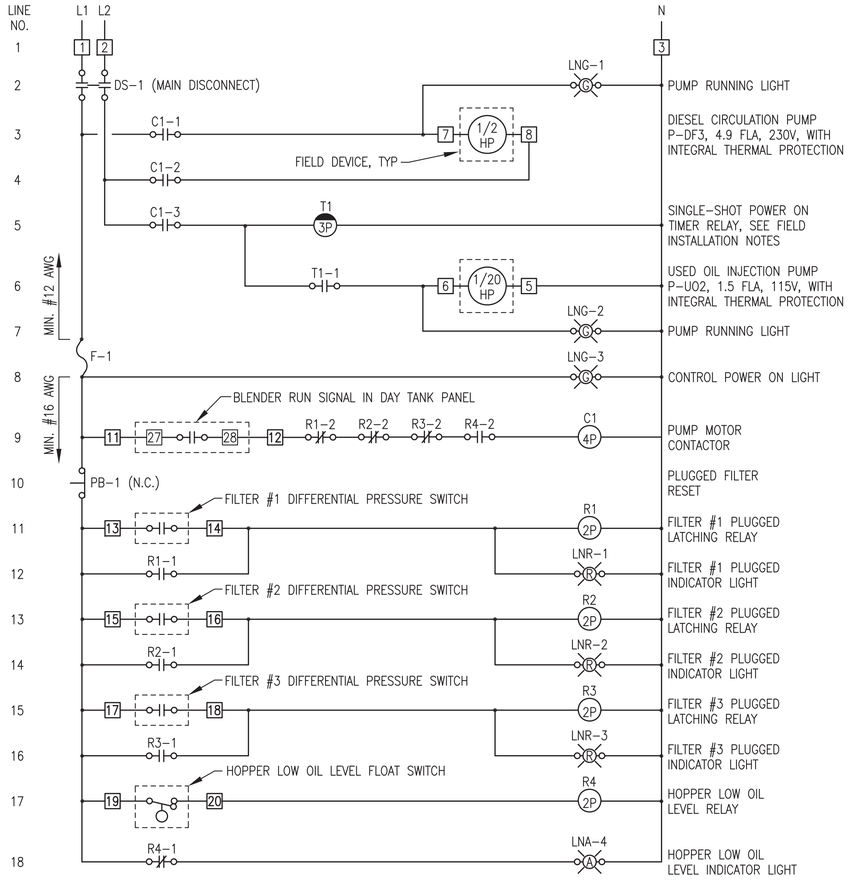
State of Alaska
Department of Community and Economic Development
AIDEA/AEA
Rural Energy Group
813 West Northern Lights Blvd.
Anchorage, Alaska 99503
ALASKA ENERGY AUTHORITY

PROJECT: TENAKEE SPRINGS POWER SYSTEM UPGRADE

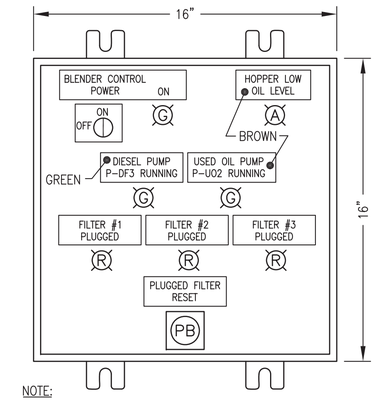
TITLE: RADIATOR VARIABLE FREQUENCY DRIVE PANEL

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: TENAPP-E9	SHEET: E9 OF 12
DESIGNED BY: CWV/BCG	DATE: 4/05/05	PROJECT NUMBER: 04-12-9841	

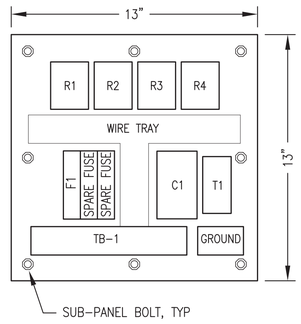


1 E10 LOGIC DIAGRAM
NO SCALE

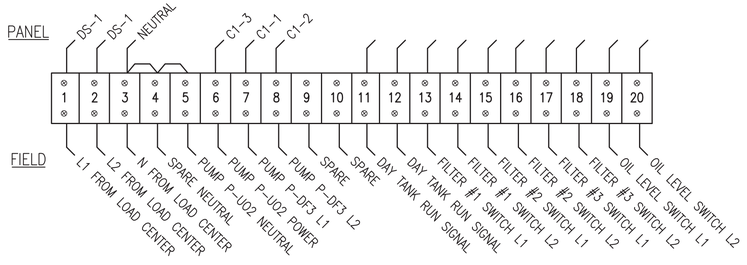


NOTE:
ALL NAMEPLATES BLACK UNLESS SPECIFICALY NOTED OTHERWISE.

2 E10 PANEL FACE LAYOUT
NO SCALE



3 E10 SUB-PANEL LAYOUT
NO SCALE



NOTES:
1) INSTALL TERMINAL STRIP TB-1 HORIZONTALLY AS SHOWN. LOCATE TERMINAL STRIP BELOW PANEL DEVICES TO ACCOMMODATE CONDUCTOR ROUTING FROM CONDUITS CONNECTING TO BOTTOM OF PANEL, SEE SUB-PANEL LAYOUT.

2) IN ADDITION TO THE TERMINAL STRIPS SHOWN, PROVIDE 3 EACH 35A SCREW TERMINAL GROUNDING BUS.

4 E10 TERMINAL STRIP LAYOUT
NO SCALE

LEGEND

R#	CONTROL RELAY		2-POSITION SELECTOR/ DISCONNECT SWITCH	PB-#	NORMALLY CLOSED MOMENTARY PUSH BUTTON
T#	TIME DELAY RELAY	R#-#	NORMALLY OPEN CONTACT	SW-#	NORMALLY OPEN FLOAT SWITCH
C#	CONTACTOR	R#-#	NORMALLY CLOSED CONTACT	[#]	TERMINAL BLOCK

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

TAG	QTY	MANUFACTURER	MODEL	DESCRIPTION
C	1	ALLEN-BRADLEY	100C23D10	CONTACTOR, 120V COIL, 23A, 3 POLE WITH 1 NO AUX
DS	1	ALLEN-BRADLEY	194LE201752	DISCONNECT, 2 POSITION, 2 N.O., 20A, FACE MOUNT
	1	ALLEN-BRADLEY	194LHC4E1751	KNOB ACTUATOR FOR LOAD SWITCH, ON/OFF, LOCKABLE
F	1	BUSS	FNQR5	5A FUSE IN 3 FUSE HOLDER WITH 2 EACH SPARE FUSES
LNA	1	ALLEN-BRADLEY	800HQRH10A	AMBER LED PILOT LIGHT, 120V, NEMA 4X
LNG	3	ALLEN-BRADLEY	800HQRH10G	GREEN LED PILOT LIGHT, 120V, NEMA 4X
LNR	3	ALLEN-BRADLEY	800HQRH10R	RED LED PILOT LIGHT, 120V, NEMA 4X
PBB	1	ALLEN-BRADLEY	800HAR2D2	MOMENTARY PUSH BUTTON, 1 NC, NEMA 4X, BLACK
R	4	ALLEN-BRADLEY	700HA32A1	DPDT RELAY
	4	ALLEN-BRADLEY	700HN100	8 PIN SOCKET BASE
T	1	ALLEN-BRADLEY	700HA33A1	3PDT RELAY
	1	ALLEN-BRADLEY	700HN205	11 PIN RELAY SOCKET BASE FOR TIMER
	1	ALLEN-BRADLEY	700HT3	SERIES B TIMING MODULE
TB-1	20	ALLEN-BRADLEY	1492CAM1L	LARGE-HEAD SCREW TERMINALS, 35A, 600V

PANEL NOTES:

1. PROVIDE COMPLETE UL LISTED PANEL ASSEMBLY WITH ALL DEVICES INDICATED IN LOGIC DIAGRAM EXCEPT FOR FIELD DEVICES. FIELD DEVICES ARE INDICATED WITH DASHED OUTLINE. INSTALL IN A 16"x16"x8" NEMA 12 ENCLOSURE WITH 4 EACH INTEGRAL MOUNTING LUGS AT BACK.
2. USE MIN #16 AWG ON ALL 5 AMP FUSED CIRCUITS AND MIN #12 AWG WIRE ON ALL OTHER CIRCUITS. TAG EACH END OF ALL JUMPERS WITH DEVICE OR TERMINATION DESIGNATOR OF LANDING OF OPPOSITE END OF JUMPER (REVERSE ADDRESS).
3. LABEL ALL PANEL DEVICES ON BASE OR BACK PANEL ADJACENT TO ITEM. LABEL REMOTE EQUIPMENT CONNECTIONS AT EACH TERMINAL BLOCK BY THE ITEM TITLE AS SHOWN ON THE FIELD SIDE OF THE TERMINAL STRIP DRAWING.
4. PROVIDE BEVELED EDGE WHITE CORE NAMEPLATES, FACE COLOR AS INDICATED, AND SECURE TO PANEL FACE WITH A MINIMUM OF TWO STAINLESS STEEL MOUNTING SCREWS.
5. BENCH TEST COMPLETED UNIT. PROVIDE MIN 48 HOURS NOTICE TO ENGINEER TO SCHEDULE OBSERVATION OF BENCH TEST. PROVIDE SWITCHES AND LAMPS TO SIMULATE OPERATION OF ALL FIELD DEVICES.
6. FIELD WIRING AND FIELD INSTALLED DEVICES PROVIDED BY OTHERS ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT PART OF THE PANEL BID.
7. POWER TO PANEL PROVIDED FROM DEDICATED 20A CIRCUIT BREAKER IN LISTED LOAD CENTER. SEE FIELD INSTALLATION NOTE #3.

FIELD INSTALLATION NOTES:

1. SEE MECHANICAL FOR BLENDER INSTALLATION & PIPING. INSTALL PANEL & FIELD DEVICES AS INDICATED.
2. FIELD WIRING TO SWITCHES #14 AWG. ALL OTHER FIELD WIRING #12 AWG. LABEL BOTH ENDS OF ALL CONDUCTORS WITH CONTROL PANEL TERMINAL BLOCK TERMINATION NUMBERS.
3. PERFORM ALL FIELD WIRING IN ACCORDANCE WITH ELECTRICAL SPECIFICATIONS ON SHEET E6. PROVIDE POWER TO PANEL FROM DEDICATED 20A TWO POLE CIRCUIT BREAKER IN STATION SERVICE LOAD CENTER.
4. VERIFY THAT FLOAT SWITCH IS ORIENTED FOR N.O. (CLOSE ON RISE) OPERATION PRIOR TO INSTALLATION. FLOAT SHOWN ON LOGIC DIAGRAM WITH TANK ABOVE LOW LEVEL (NORMAL OPERATION).
5. VERIFY PROPER ROTATION OF ALL PUMPS. FILL PUMP CAVITIES WITH LUBE OIL PRIOR TO INITIAL OPERATION.
6. FIELD TEST COMPLETED UNIT TO VERIFY ALL CONTROL AND ALARM FUNCTIONS. MANIPULATE FLOAT SWITCH TO VERIFY LOW OIL LEVEL SHUT OFF. THROTTLE ISOLATION VALVE ON DOWNSTREAM SIDE OF EACH FILTER TO VERIFY DIFFERENTIAL PRESSURE SHUTOFF AND ADJUST AS REQUIRED TO OPERATE AT 7 PSID.
7. CONFIGURE TIMER RELAY T-1 FOR SINGLE-SHOT POWER ON MODE AND SET TO 10 MINUTES INITIALLY. IF THE FUEL APPEARS TO BE TOO RICH (BLACK EXHAUST SMOKE) REDUCE THE TIME INTERVAL AS REQUIRED.

SEQUENCE OF OPERATIONS:

1. WHEN THE BLENDER CIRCUIT BREAKER AND MAIN DISCONNECT 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 THE DIESEL CIRCULATING PUMP P-DF3 RUNS, THE TIMER RELAY T-1 STARTS, AND THE USED OIL INJECTION PUMP P-UO2 RUNS UNTIL THE TIMER INTERVAL EXPIRES. WHENEVER THE PUMPS ARE RUNNING THE ASSOCIATED GREEN PUMP RUNNING LIGHTS ARE ON. NOTE THAT THE DIESEL PUMP RUNS FOR THE ENTIRE DAY TANK FILL CYCLE TO FILTER AND BLEND THE FUEL BUT THE USED OIL PUMP ONLY RUNS FOR THE PRE-SET TIMED INTERVAL TO CONTROL THE BLEND RATIO. SEE FIELD INSTALLATION NOTES FOR TIMER SETTING.
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.

RECORD DRAWING
THESE DRAWINGS HAVE BEEN PREPARED FROM INFORMATION PROVIDED BY THE CONTRACTOR. THERE IS NO GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION CONTAINED HEREIN.
DATE: 9/06/07

REV.	DESCRIPTION	DATE	BY
1	ADD TIMER RELAY ON PUO-2, CHANGE NAMEPLATES TO BROWN	7/14/06	BCG

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: TENAKEE SPRINGS POWER SYSTEM UPGRADE

TITLE: USED OIL BLENDER CONTROL PANEL

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