

SCHEDULE OF DRAWINGS:

M1.1 SCHEDULE OF DRAWINGS & MECHANICAL SPECIFICATIONS

M1.2 MECHANICAL WORK PLAN & NOTES

M2 BASE BID TASK "A" EMERGENCY GENERATOR INSTALLATION DETAILS

M3 BASE BID TASK "B" ENGINE COOLING SYSTEM CLEAN/FLUSH/REPAIR

M4 BASE BID TASK "C" GEN #3 UPGRADES & MISCELLANEOUS DETAILS

E1 ELECTRICAL WORK PLAN, NOTES, & SPECIFICATIONS

E2 ELECTRICAL DETAILS

PROJECT OVERVIEW

1. THE EXISTING TAKOTNA POWER PLANT WAS ORIGINALLY CONSTRUCTED IN 2006. THE PLANT INCLUDES A HEAT RECOVERY SYSTEM THAT PROVIDES HEAT TO THE DIESEL FUEL STORAGE INTERMEDIATE TANK.
2. THE POWER PLANT HAS SEVERAL MAJOR MECHANICAL PROBLEMS AND IS CURRENTLY DOWN TO ONE FUNCTIONING GENERATOR CAPABLE OF POWERING THE COMMUNITY.
3. THE ENGINE COOLING SYSTEM HAS BEEN CONTAMINATED WITH LUBE OIL FROM AN UNKNOWN SOURCE. IT NOW REQUIRES CLEANING, FLUSHING AND MISCELLANEOUS REPAIRS DUE TO DAMAGE FROM THE OIL CONTAMINATION. GEN#2 AND GEN#4 ARE BOTH VERY HIGH HOUR, UNRELIABLE UNITS AND ARE BOTH SLATED FOR REPLACEMENT IN AN UPCOMING DERA PROJECT. IT IS HIGHLY LIKELY THAT ONE OR BOTH OF THESE UNITS IS CONTRIBUTING TO THE OIL CONTAMINATION OF THE ENGINE COOLING SYSTEM. BOTH OF THESE UNITS WILL BE REMOVED FROM SERVICE PRIOR TO PERFORMING THE ENGINE COOLING SYSTEM CLEAN/FLUSH TASK TO AVOID POSSIBLE RE-CONTAMINATION.
4. AN ALTERNATE, STAND-ALONE SOURCE OF POWER IS REQUIRED TO POWER THE COMMUNITY DURING THIS POWER PLANT MAINTENANCE AND IMPROVEMENT PROJECT. A PREVIOUS INCOMPLETE EMERGENCY GENERATOR INSTALLATION WILL BE COMPLETED AND INTEGRATED INTO THE POWER PLANT AS PART OF THIS PROJECT. THIS UNIT WILL RUN INDEPENDENTLY OF THE POWER PLANT ENGINE COOLING SYSTEM AND AUTOMATIC GENERATOR CONTROL SYSTEM. AFTER THE CONCLUSION OF THIS PROJECT IT WILL REMAIN IN PLACE TO PROVIDE EMERGENCY GENERATION FOR THE COMMUNITY.
5. THE MAIN PURPOSE OF THIS PROJECT IS TO PERFORM ALL OF THE BASE BID TASKS LISTED BELOW REQUIRED TO RETURN THE POWER PLANT TO OPERABLE CONDITION.
6. THE SECONDARY PURPOSE OF THIS PROJECT IS TO PERFORM AS MANY AS POSSIBLE OF THE ADDITIVE ALTERNATE TASKS LISTED BELOW WITHIN THE PROJECT BUDGET IN ORDER TO IMPROVE THE FUNCTIONALITY OF THE POWER PLANT.
7. ALL WORK IS DESIGNATED AS EITHER BASE BID OR ADDITIVE ALTERNATE. THE BASE BID WORK IS SHOWN AS INDIVIDUAL TASKS DESIGNATED WITH INDIVIDUAL LETTERS BUT IS A LUMP SUM BID. EACH ADDITIVE ALTERNATE TASK IS DESIGNATED BY A UNIQUE NUMBER FOLLOWED BY THE LETTER A AND REQUIRES A SEPARATE LINE ITEM BID. SEE BID REQUEST DOCUMENTS.

PROJECT SCOPE BASE BID TASKS:

- A** MODIFY SWITCHGEAR FOR TEMPORARY SERVICE, SEE ELECTRICAL. COMPLETE INSTALLATION OF EMERGENCY GENERATOR AND PLACE IN SERVICE.
- B** TAKE GEN#1, GEN#2, & GEN#4 OUT OF SERVICE. NOTE THAT GEN#3 & E-GEN WILL REMAIN IN SERVICE.
- C** CLEAN, FLUSH AND REPAIR THE ENGINE COOLING SYSTEM.
- D** RETURN FUNCTION TO RADIATOR VFD'S, SEE ELECTRICAL.
- E** PERFORM GENSET #3 UPGRADES.

PROJECT SCOPE ADDITIVE ALTERNATE TASKS:

- 1A** REPAIR FAILED LIGHT FIXTURES IN GENERATION ROOM, SEE ELECTRICAL.
- 2A** REPAIR AND SERVICE THE VENTILATION SYSTEM.
- 3A** REPAIR AND TEST USED OIL BLENDER SYSTEM.
- 4A** INSTALL NEW DAY TANK VENT PIPE.
- 5A** PREPARE QUOTE FOR REPAIR OF FIRE SUPPRESSION SYSTEM.
- 6A** DISPOSE OF CONTAMINATED COOLANT AND USED CLEANING SOLUTION.

**** 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, PRE-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.

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

PIPE CLAMPS - TWO-PIECE PIPE CLAMP DESIGNED TO SUPPORT PIPE TIGHT TO STRUT. B-LINE B20## OR EQUAL. ZINC-PLATED CARBON STEEL INSTALL RUBBER ISOLATION STRIP, B-LINE VIBRA CUSHION OR EQUAL, ON COPPER TUBING AND WHERE INDICATED.

FASTENERS - ALL BOLTS, NUTS, AND WASHERS ZINC-PLATED.

**** PAINTING AND MARKING ****

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.

**** EXHAUST PIPING ****

EXHAUST PIPING - ASTM A53B SCHEDULE 40 BLACK STEEL PIPE WITH BUTT WELD FITTINGS AND JOINTS. PROVIDE ANSI 150# FLAT FACED FLANGES FOR CONNECTION TO ENGINE FLEX AND MUFFLER. INSTALL HIGH TEMPERATURE FULL FACE GASKETS, FRENZELIT NOVATEC 925F OR APPROVED EQUAL. USE BLACK BOLTS AND COAT WITH HIGH TEMPERATURE ANTI-SIEZE.

**** DIESEL FUEL AND LUBE OIL PIPING, VALVES & HOSES ****

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 MIN. 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 TEFLON TAPE AND TEFLON BASED PIPE JOINT COMPOUND PRIOR TO ASSEMBLING. TEST ALL FUEL OIL PIPING JOINTS WITH MIN. 50 PSIG AIR, WITH EACH JOINT SOAKED WITH A FOAMING SOAPY WATER SOLUTION, AND VISUALLY INSPECT EACH JOINT FOR LEAKS. ISOLATE ENGINES PRIOR TO PRESSURE TESTING.

THREADED BRONZE BALL VALVES - BRONZE BODY, CHROME-PLATED BRASS BALL, TEFLON PACKING AND SEATS, THREADED ENDS, 150 PSIG MIN WORKING PRESSURE. PORT AS INDICATED. APOLLO, JOMAR, OR MILWAUKEE (DOMESTIC), NO OTHER SUBSTITUTES.

THREADED CHECK VALVES - THREADED END BRONZE BODY, SWING CHECK STYLE, 150 PSIG MIN. WORKING PRESSURE, DOMESTIC ONLY. APOLLO, HAMMOND, MILWAUKEE, NIBCO, OR APPROVED EQUAL

FUSIBLE LINK VALVES - BRASS BODY, FPT ENDS, 165F FUSIBLE HEAD. FIROMATIC OR EQUAL - 12130 (1/2").

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.

**** CRANKCASE VENTILATION PIPING & HOSE ****

CRANK VENT PIPING - TYPE "L" HARD DRAWN COPPER TUBE WITH WROUGHT COPPER FITTINGS. ALL JOINTS SOLDERED WITH 95/5 TIN/ANTIMONY SOLDER OR SILVER SOLDER.

CRANK VENT HOSE - HEAVY DUTY OIL RESISTANT PVC SUCTION HOSE. TIGERFLEX ORV OR APPROVED EQUAL. INSTALL ON BARBED HOSE (KING) NIPPLES AND FASTEN WITH LINED STAINLESS STEEL T-BOLT CLAMPS, NYCO SUPRA W2 OR APPROVED EQUAL.

**** GLYCOL VALVES, AND SPECIALTIES ****

GLYCOL THREADED CONNECTIONS - COVER MALE THREAD ENDS WITH TEFLON TAPE AND COAT FEMALE THREAD CONNECTIONS WITH TEFLON PASTE PRIOR TO ASSEMBLY.

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.

BUTTERFLY VALVES - LUG STYLE DUCTILE OR CAST IRON BODY, ANSI 150# FLANGE PATTERN ENDS, STAINLESS STEEL STEM WITH BRONZE BUSHING, BRONZE DISC, EPDM SEATS, LOCKING HANDLE. MILWAUKEE ML-233E, BRAY SERIES 31, OR APPROVED EQUAL.

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

**** INSTRUMENTATION ****

PRESSURE GAUGE - 2-1/2" DIAL SIZE, DRY TYPE, STAINLESS STEEL CASE, TUBE, AND SOCKET, 1/4" NPT BOTTOM CONNECTION. TRERICE NO. 700SS-25, NO SUBSTITUTES. 0-15 PSI 700SS-25-02-L-A-080

DIGITAL THERMOMETER - SOLAR POWERED, LCD DISPLAY, -50 TO +300 F RANGE OR DUAL F/C RANGE, 1% OF READING ACCURACY, VARIABLE ANGLE DISPLAY, 3-1/2" STEM LENGTH WEISS DUV35 OR APPROVED EQUAL, PROVIDE WITH A 3/4" NPT BRASS THERMOWELL.

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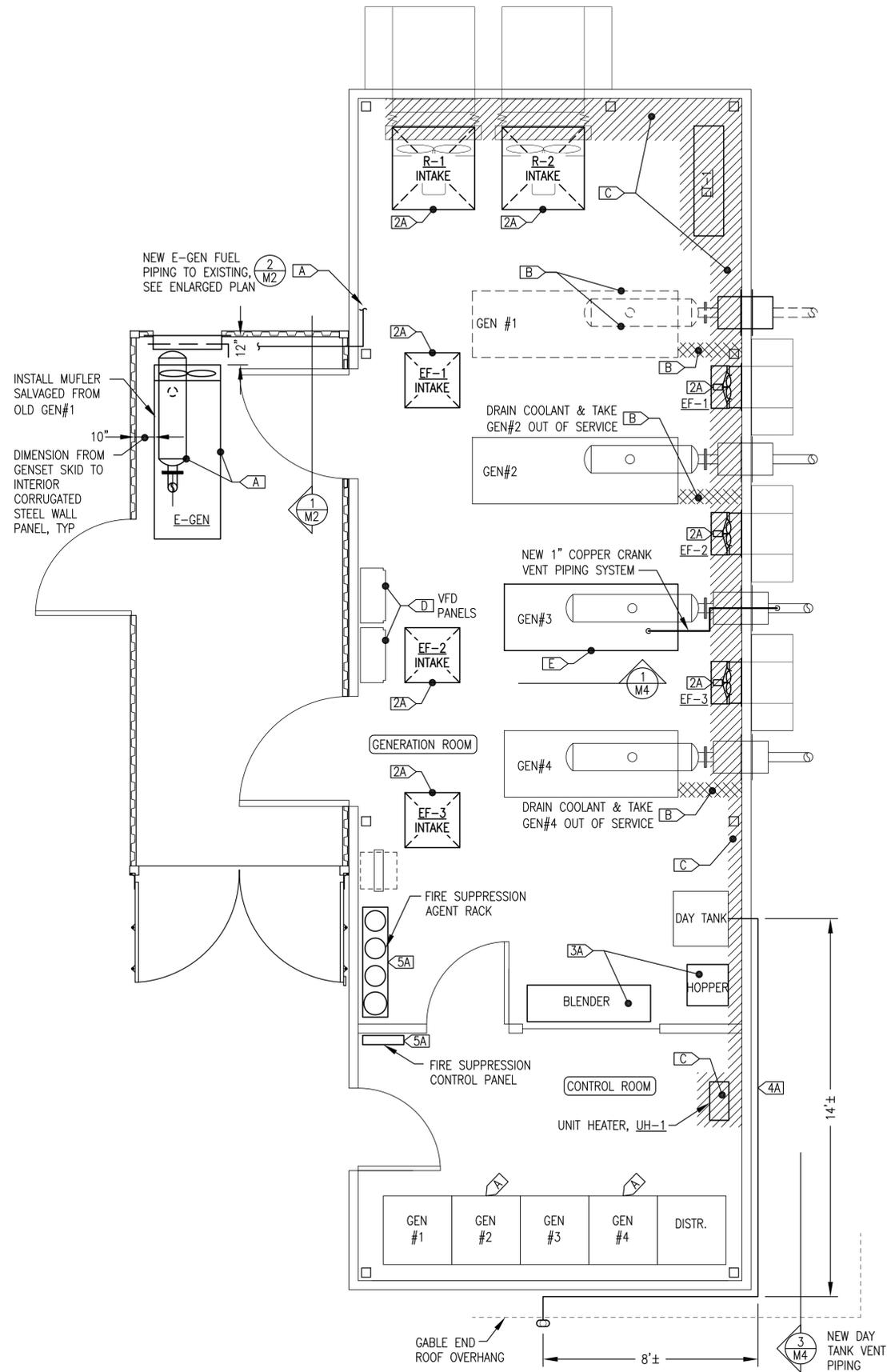
PROJECT: 2019 TAKOTNA POWER PLANT M&I PROJECT		
TITLE: SCHEDULE OF DRAWINGS & MECHANICAL SPECIFICATIONS		
	DRAWN BY: JTD	SCALE: NO SCALE
	DESIGNED BY: BCG	DATE: 7/11/19
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PROJECT NUMBER:		
P.O. 111405, Anchorage, AK 99511 (907)349-0100		

SPECIFIC NOTES (BASE BID TASKS):

- A** PLACE EMERGENCY GENSET (E-GEN) IN SERVICE:
 - MODIFY SWITCHGEAR FOR TEMPORARY SERVICE, SEE ELECTRICAL.
 - COMPLETE INSTALLATION OF EMERGENCY GENERATOR AND PLACE IN SERVICE. SEE SHEETS M2 AND E1.
- B** TAKE GEN#1, GEN#2, & GEN#4 OUT OF SERVICE. NOTE THAT GEN#3 & E-GEN WILL REMAIN IN SERVICE:
 - GENSET #1 ENGINE & GENERATOR PREVIOUSLY REMOVED FROM POWER PLANT. SALVAGE MUFFLER FOR REUSE (SEE TASK A) AND REMOVE REMAINING COMPONENTS INCLUDING SKID, VIBRATION ISOLATORS, OIL LEVEL SWITCH, POWER/CONTROL CONDUIT & CONDUCTORS, ETC.
 - CLOSE AND LOCK ENGINE COOLANT VALVES AT CONNECTIONS TO MANIFOLD.
 - DRAIN OIL-CONTAMINATED ENGINE COOLANT INTO DRUMS PROVIDED FOR ENGINE COOLANT SYSTEM CLEAN/FLUSH (SEE TASK C).
 - DEMOLISH ALL EXISTING ENGINE COOLANT HOSE.
 - DEMOLISH ALL EXISTING FUEL/OIL HOSE AND INSTALL 1/2" THREADED PLUGS IN FUEL/OIL VALVES FOR GEN #2 & #4.
 - LOCK AND TAG OUT GEN #2 & #4 BREAKERS AT SWITCHGEAR.
- C** COOLING SYSTEM CLEAN/FLUSH/REPAIR: HATCHED AREA INDICATES THE EXTENTS OF THE ENGINE COOLING SYSTEM PIPING. COOLING SYSTEM PIPING AND EQUIPMENT NOT SHOWN THIS VIEW FOR CLARITY. SEE ISOMETRIC 1/M2 FOR SCOPE AND DETAILS FOR THIS TASK.
- D** TEST AND CALIBRATE RADIATOR VFD'S, SEE ELECTRICAL.
- E** GENSET #3 UPGRADES: SEE ELEVATION 1/M4 AND SHEET E1.

SPECIFIC NOTES (ADDITIVE ALTERNATE TASKS):

- 1A** REPAIR LIGHT FIXTURES (SEE ELECTRICAL).
- 2A** REPAIR AND SERVICE VENTILATION SYSTEM:
 - DEGREASE/CLEAN ALL EXHAUST FAN SCREENS & HOUSINGS
 - FURNISH & INSTALL NEW DAMPER ACTUATORS ON AIR INTAKES EF-1, 2, & 3. BELIMO MODEL AF-BUP OR EQUAL.
 - RECONNECT ALL DAMPER LINKAGES AND WIRING AND TEST TO CONFIRM PROPER OPERATION.
 - FURNISH 16 EACH 18"x18"x1" AND 6 EACH 24"x24"x1" FURNACE FILTERS (ONE REPLACEMENT SET PLUS ONE SET OF SPARES).
 - INSTALL 8 EACH 18"x18"x1" FILTERS IN RADIATOR INTAKES (4 FILTERS IN EACH OF 2 INTAKES).
 - INSTALL 3 EACH 24"x24"x1" FILTERS IN EXHAUST FAN INTAKES (1 FILTER IN EACH OF 3 INTAKES).
- 3A** REPAIR AND TEST USED OIL BLENDER SYSTEM.
 - FURNISH & INSTALL NEW OIL BLENDER FILTER ELEMENTS:
 - 2 EACH 10 MICRON HYDROSORB II CARTRIDGES, CIM-TEK #300342
 - 1 EACH 2 MICRON PARTICULATE CARTRIDGES, CIM-TEK #30066
 - FURNISH & INSTALL 3 EACH NEW COVER GASKETS, 13.5" O.D. FULL-FACED 1/4" BUNA-N RUBBER GASKET WITH 6" ANSI BOLT PATTERN (ALASKA RUBBER OR EQUAL). APPLY A LIGHT COAT OF GREASE OR ANTI-SIEZE PASTE TO BOTH LID FACES PRIOR TO INSTALLING GASKET.
 - TEST FUNCTION OF OIL BLENDER SYSTEM AND IF NOT FUNCTIONING TROUBLESHOOT AND PROVIDE DESCRIPTION OF PROBLEMS.
- 4A** DAY TANK VENT PIPING REPLACEMENT: SEE ELEVATION 3/M4.
- 5A** THE FIRE SUPPRESSION SYSTEM IS EQUIPPED WITH A FIKE CHEETAH MODEL 10-052 CONTROL PANEL AND MARIOFF HI-FOG MAU 150FS FLOOR RACK. THE CONTROL PANEL CURRENTLY INOPERABLE WITH DISCONNECTED BATTERIES AND MAIN FUSE. INSPECT THE FIRE SUPPRESSION SYSTEM WITH A CERTIFIED FIRE SYSTEM INSTALLER, PROVIDE A FIELD REPORT WITH ALL IDENTIFIED DEFICIENCIES, AND PROVIDE A QUOTE TO CORRECT ALL IDENTIFIED DEFICIENCIES. (QUOTE ONLY THIS TASK, ACTUAL REPAIRS AND RECERTIFICATION TO BE A SEPARATE WORK ORDER).
- 6A** REMOVE FROM SITE ALL DRUMS OF USED GLYCOL AND CLEANING SOLUTION DRAINED FROM SYSTEM UNDER BASE BID WORK AND DISPOSE OF IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

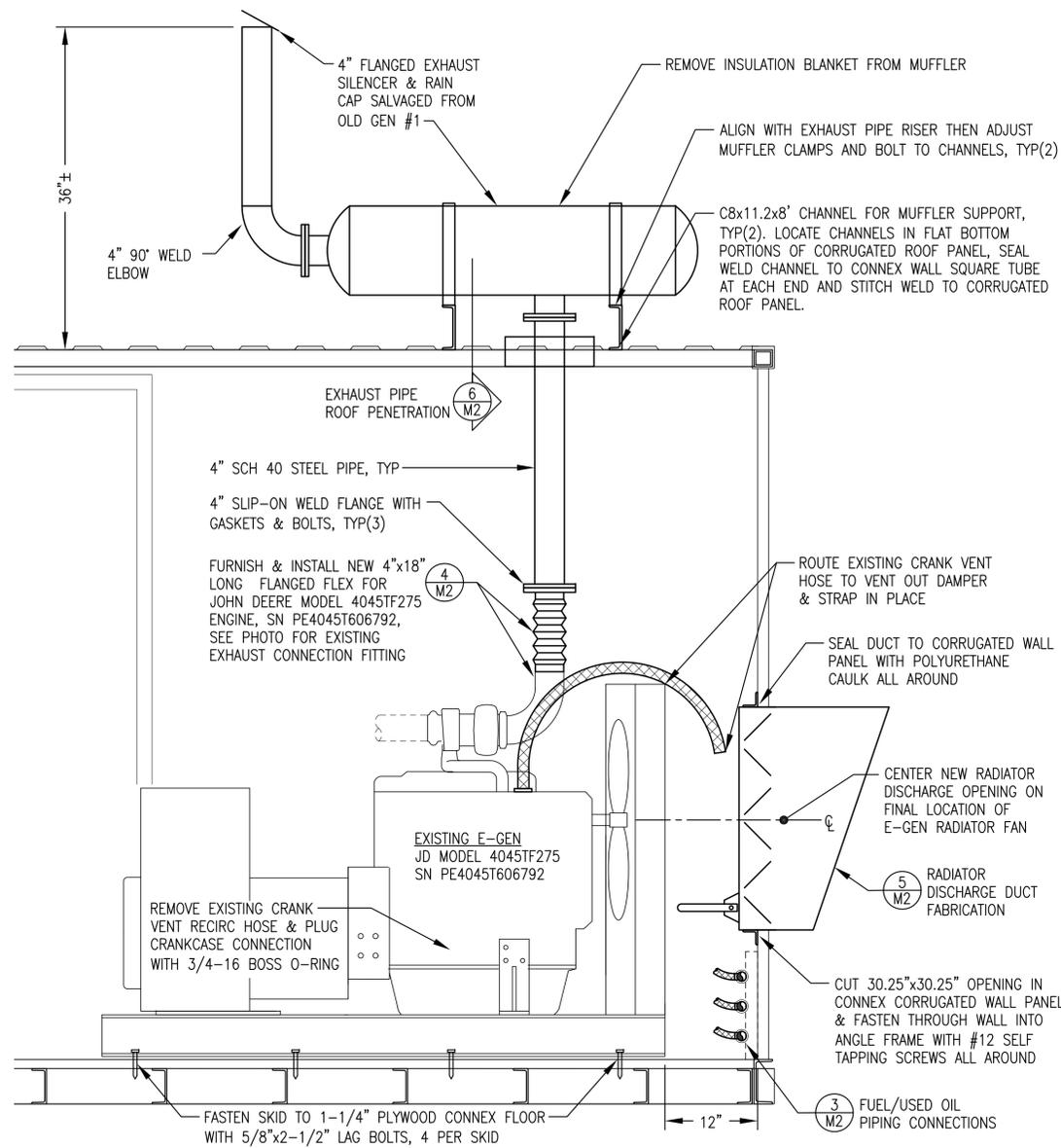


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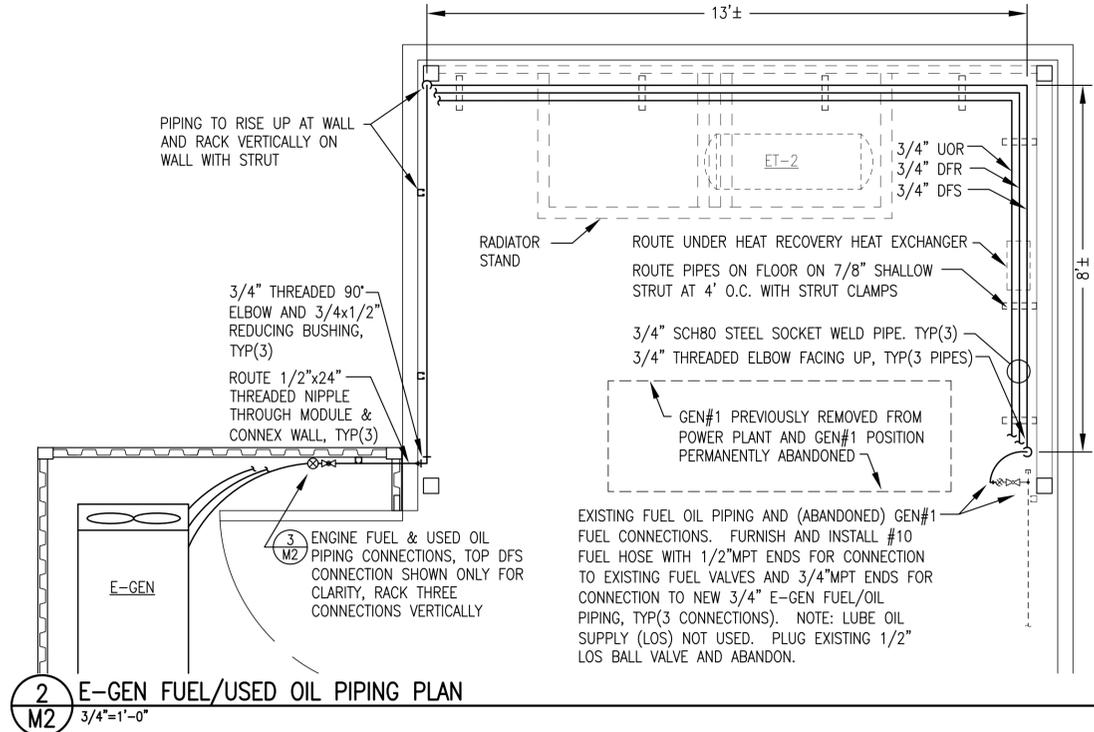


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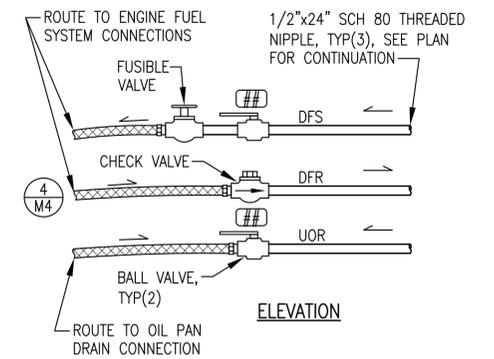




1 BASE BID TASK "A" EMERGENCY GENERATOR INSTALLATION ELEVATION
1"=1'-0"



2 E-GEN FUEL/USED OIL PIPING PLAN
3/4"=1'-0"

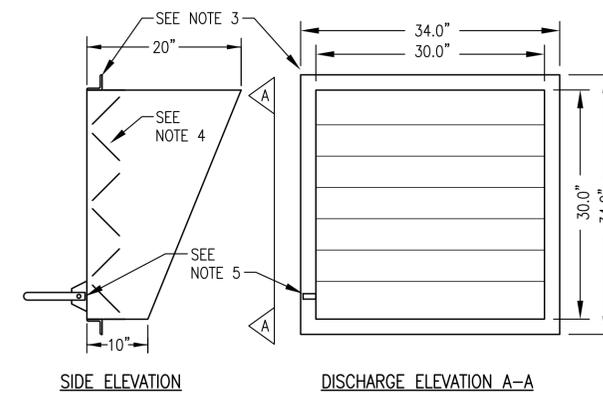


- NOTES:**
- 1) ALL NIPPLES SCH 80. ALL VALVES 1/2" THREADED BODY. SEE SPECIFICATIONS.
 - 2) FURNISH & INSTALL #8 HOSE FOR DFS/DFR & #10 HOSE FOR UOR. FURNISH WITH JIC SWIVELS & FIELD CUT TO LENGTH. PROVIDE 1/2" MPT ADAPTERS FOR VALVE CONNECTIONS. PROVIDE ADAPTERS AS REQUIRED FOR ENGINE FUEL SYSTEM & OIL PAN CONNECTIONS, SEE DETAIL.

3 E-GEN FUEL/USED OIL PIPING CONNECTIONS
NO SCALE

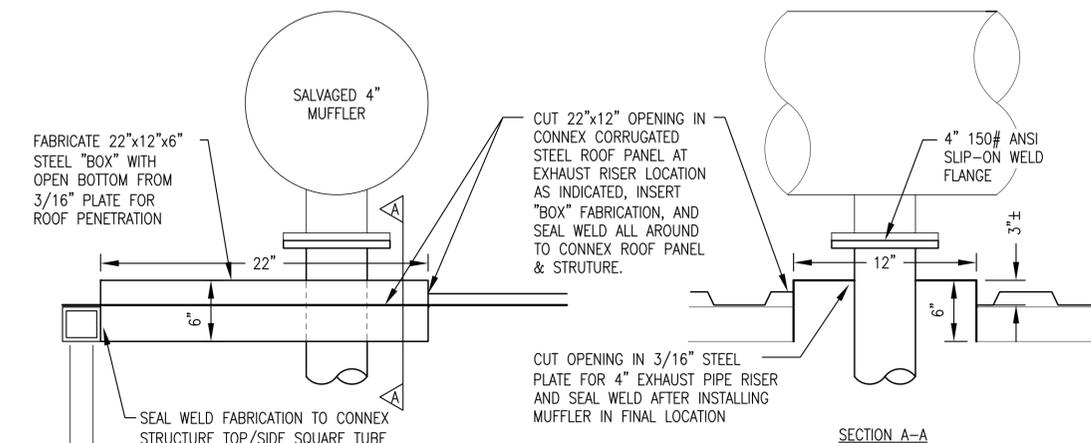


4 EXISTING E-GEN EXHAUST CONNECTION FITTING
NO SCALE



5 E-GEN RADIATOR DISCHARGE DUCT FABRICATION
1"=1'-0"

- NOTES:**
- 1) FABRICATE COMPLETE WITH DAMPER MOUNTED AND SEALED TO DUCT.
 - 2) FABRICATE FROM 18 GAUGE GALVANIZED SHEET METAL WITH STANDARD MECHANICAL OR WELDED JOINTS. WIRE BRUSH AND COLD GALV WELD AREAS.
 - 3) PROVIDE L2x2x3/16 GALV ANGLE FRAME ALL AROUND. SPOT WELD TO DUCT.
 - 4) DAMPER TO BE GREENHECK MODEL VCD OR EQUAL, FURNISH WITH FACTORY INSTALLED MANUAL QUADRANT OPERATOR.
 - 5) INSTALL QUADRANT OPERATOR ON THE LOWER LEFT SIDE.

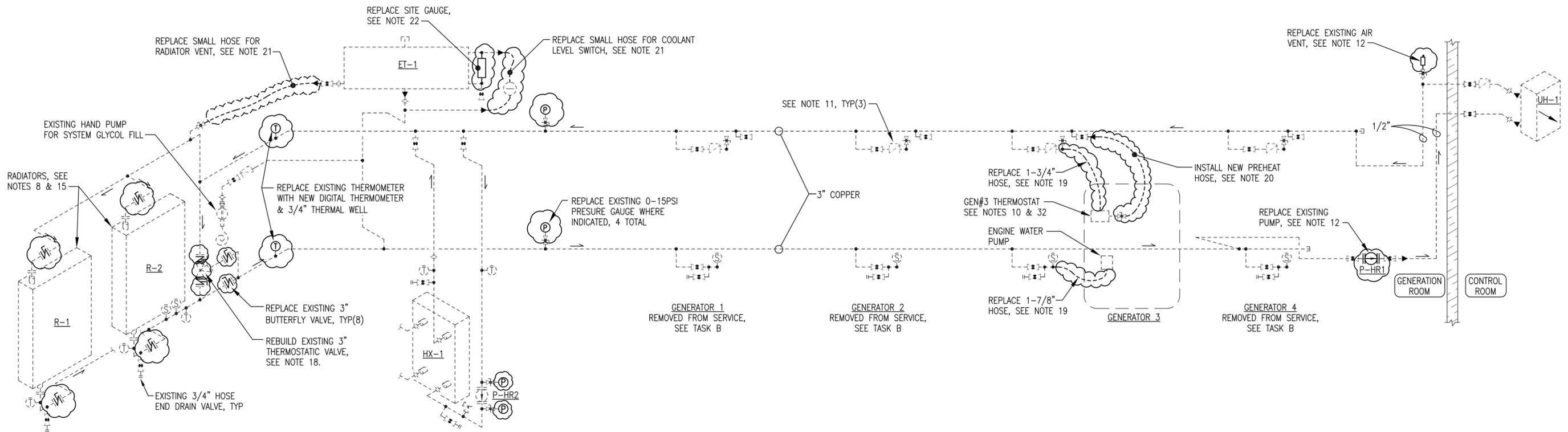


6 E-GEN EXHAUST PIPE ROOF PENETRATION
2"=1'-0"

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PROJECT: 2019 TAKOTNA POWER PLANT M&I PROJECT	
TITLE: BASE BID TASK "A" EMERGENCY GENERATOR INSTALLATION DETAILS	
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1 BASE BID TASK "C" ENGINE COOLANT SYSTEM CLEAN/FLUSH/REPAIR ISOMETRIC
M3 NO SCALE

ENGINE COOLING SYSTEM GENERAL NOTES:

- ALL WORK INDICATED THIS ISOMETRIC IS INCLUDED IN BASE BID TASK C UNLESS SPECIFICALLY INDICATED OTHERWISE.
- EXISTING ENGINE COOLING SYSTEM PIPING & DEVICES TO REMAIN UNCHANGED SHOWN WITH LIGHT DASHED LINES.
- EXISTING ENGINE COOLING SYSTEM VALVES AND DEVICES TO BE REPLACED SHOWN WITH DARK SOLID LINES AND CLOUD OUTLINE.
- ALL PIPING TYPE "L" COPPER TUBING EXCEPT WHERE SPECIFICALLY NOTE OTHERWISE. ALL COMPANION FLANGES ANSI 125# PATTERN.
- ENGINE COOLANT SYSTEM VOLUME IS APPROXIMATELY 80 GALLONS. PROVIDE A MINIMUM OF 4 EACH NEW EMPTY 55 GALLON DRUMS TO CONTAIN CONTAMINATED COOLANT AND CLEANING SOLUTION.
- PROVIDE 2 EACH 55 GALLON DRUMS NEW EXTENDED LIFE ETHYLENE GLYCOL SOLUTION, SHELL ROTELLA ELC OR APPROVED EQUAL, PRE-MIXED TO A RATIO OF 60% GLYCOL TO 40% WATER
- THIS TASK WILL NOT BEGIN UNTIL TASK A IS COMPLETE AND THE COMMUNITY IS POWERED BY THE STAND-ALONE EMERGENCY GENSET WITH THE POWER PLANT ENGINE COOLING SYSTEM OUT OF SERVICE. THE SWITCHGEAR BUS WILL BE ENERGIZED TO PROVIDE STATION SERVICE POWER. GENERATOR #3 WILL BE ABLE TO BE RUN OFF-LINE TO ALLOW THE ENGINE WATER PUMP TO CIRCULATE THE CLEANING SOLUTION DURING THE FOLLOWING CLEANING & FLUSHING PROCEDURE.

STEP 1: ENGINE COOLING SYSTEM DRAIN/CLEAN

- CLEAN AND DEGREASE RADIATOR AIR SURFACES. PRESSURE WASH TO REMOVE ALL DEBRIS.
- DRAIN THE EXISTING COOLANT INTO DRUMS AND TURN OVER TO UTILITY. SEE ADDITIVE ALTERNATE TASK 6A, SHEET M1.2 FOR OPTIONAL DISPOSAL.
- REMOVE GEN #3 THERMOSTAT TO ENSURE FULL FLOW IN PIPING FROM ENGINE WATER PUMP.
- PRIOR TO CLEANING, DRAIN DISCHARGE BRANCH CONNECTION ON GEN #1, #2, & #4 BY OPENING CHECK VALVE FLAPPER OR USING AIR TO BLOW OUT.
- PRIOR TO CLEANING, BLOW OUT 1/2" BRANCH PIPING THROUGH UNIT HEATER TO ENSURE FLOW DURING CLEANING. INSTALL NEW NEW CIRCULATING PUMP, GRUNDFOS 15-58FC OR EQUAL WITH NEW GASKETS. INSTALL NEW 1/4" AUTOMATIC AIR VENT, MAID-O-MIST #71 OR EQUAL.
- FILL SYSTEM WITH HEAVY DUTY ALKYLENE-BASED ENGINE CLEANING SOLUTION, CUMMINS FLEETGUARD RESTORE, OR EQUAL, 1 GALLON (OR 4 LITRES) PER 10 GALLONS OF FRESH WATER.
- START GEN #3. OPERATE OFF-LINE AT 1,800 RPM TO CIRCULATE THE CLEANING SOLUTION. TURN ON PUMP P-HR2 TO FORCE FLOW THROUGH THE HEAT EXCHANGER AND TURN ON P-HR1 TO FORCE FLOW THROUGH THE UNIT HEATER. OPERATE GEN #3 FOR 24 HOURS MINIMUM.
- ALLOW CIRCULATION THROUGH ONE RADIATOR AT A TIME TO MAXIMIZE CLEANING SOLUTION FLOW VELOCITY THROUGH THE RADIATOR CORES. ALTERNATE BETWEEN THE TWO RADIATORS FOR APPROXIMATELY EQUAL TIME.
- SHUT DOWN GEN #3 AND LOCK OUT. TURN OFF PUMPS P-HR1 AND P-HR2.

STEP 2: ENGINE COOLING SYSTEM DRAIN/REFURBISHMENT/FLUSH

- DRAIN THE USED CLEANING SOLUTION FROM THE SYSTEM WITHIN 1/2 HOUR OF ENGINE SHUT DOWN TO AVOID SETTLING OUT SOLIDS. TAKE CARE TO DRAIN OR BLOW OUT DISCHARGE CONNECTIONS, SEE NOTE 11. DRAIN INTO DRUMS AND TURN OVER TO UTILITY. SEE ADDITIVE ALTERNATE TASK 6A, SHEET M1.2 FOR OPTIONAL DISPOSAL.
- REBUILD EXISTING FPE MODEL A3010-180 THERMOSTATIC VALVE. PROVIDE FPE MODEL 3000 REPAIR KIT INCLUDING NEW COVER GASKET, 2 EACH NEW LIP SEALS, AND 2 EACH 180F THERMOSTATIC ELEMENTS.
- REPLACE GEN #3 SUCTION AND DISCHARGE COOLANT HOSES. PROVIDE 1-3/4"(DISCHARGE) AND 1-7/8"(SUCTION) BELLOWSFLEX HOSE AND NEW CLAMPS.
- INSTALL GEN#3 ENGINE PREHEAT HOSE. PROVIDE 1/2" SILICONE HOSE AND CLAMPS. CONNECT ONE END TO EXISTING 1/2" BALL VALVE ON COOLING MANIFOLD. CONNECT OTHER END TO EXISTING BOSS O-RING PORT ON ENGINE THERMOSTAT HOUSING WITH NEW 3/8" GAUGE COCK. PROVIDE 5/8" BARB x 3/8" (1/2") NPT BRASS KING NIPPLES FOR HOSE CONNECTION EACH END AS REQUIRED.
- REPLACE ALL OTHER SMALL DIAMETER GLYCOL HOSE AS INDICATED ON ISOMETRIC. PROVIDE 1/2" SILICONE HOSE AND NEW CLAMPS. INSTALL ON 5/8" BARB x 1/4" (3/8") (1/2") NPT BRASS KING NIPPLES AS REQUIRED.
- REMOVE EXISTING SITE GAUGE AND INSTALL NEW SITE GAUGE. BOROSILICATE GLASS TUBE, ALUMINUM BODY, BUNA N SEALS, 1/2" MPT CONNECTIONS, 9" CENTERS. LUBE DEVICES G607-09-A-1-4 OR APPROVED EQUAL.
- COMPLETE ALL OTHER COOLING SYSTEM REFURBISHMENT WORK SHOWN IN CLOUDED AREAS ON ISOMETRIC INCLUDING VALVE REPLACEMENTS AND INSTRUMENTATION REPLACEMENTS.
- PROVIDE NEW CAP SCREWS FOR LUG STYLE BUTTERFLY VALVES. PROVIDE NEW BOLT SETS AND NEW FULL FACE GASKETS FOR ALL FLANGE CONNECTIONS AS REQUIRED.
- FILL SYSTEM WITH FRESH WATER.
- START GEN #3 AND OPERATE OFF-LINE AT 1,800 RPM TO PROVIDE SYSTEM FLUSH. TURN ON PUMPS P-HR1 AND HR-2. BRING SYSTEM UP TO OPERATING TEMPERATURE. OPERATE GEN #3 FOR AN ADDITIONAL 2 HOURS MINIMUM. CAREFULLY INSPECT THE ENTIRE SYSTEM FOR ANY LEAKS WHILE FLUSHING. IF ANY LEAKS ARE DETECTED, SHUT OFF GENERATOR, REPAIR AS REQUIRED, AND BEGIN THIS STEP OVER.
- SHUT DOWN GEN #3 AND LOCK OUT. TURN OFF PUMPS P-HR1 AND P-HR2.

STEP 3: ENGINE COOLING SYSTEM DRAIN/FILL

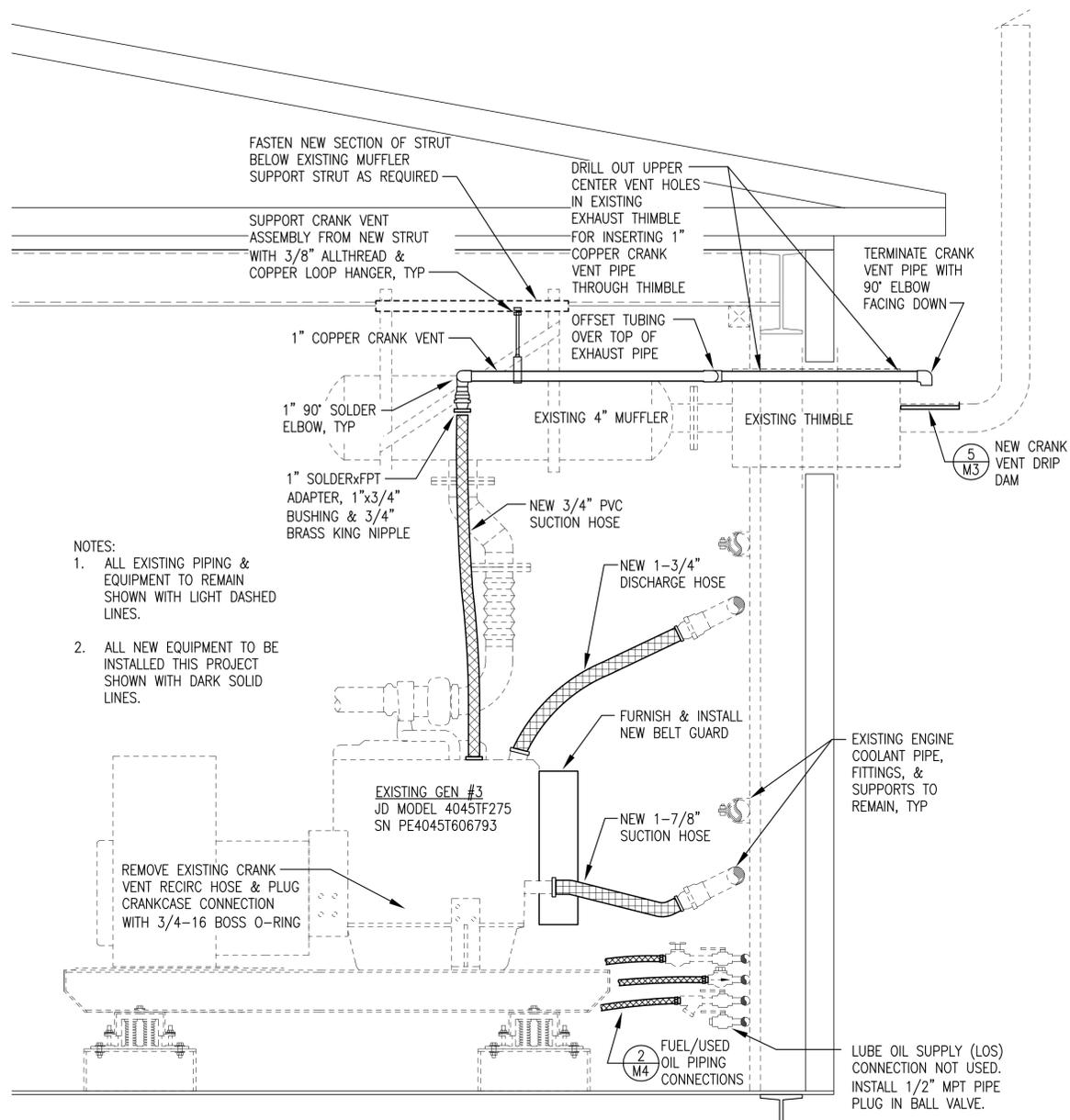
- DRAIN THE WATER AND USE LOW PRESSURE AIR TO BLOW OUT AS MUCH RESIDUAL FLUSH WATER AS POSSIBLE.
- FILL SYSTEM WITH A SOLUTION OF EXTENDED LIFE ETHYLENE GLYCOL, SHELL ROTELLA ELC OR APPROVED EQUAL, PRE-MIXED TO A RATIO OF 60% GLYCOL TO 40% WATER.
- START GEN #3 AND OPERATE OFF-LINE AT 1,800 RPM TO PROVIDE SYSTEM FINAL TEST. TURN ON PUMPS P-HR1 AND P-HR2. BRING SYSTEM UP TO OPERATING TEMPERATURE. OPERATE GEN #3 FOR AN ADDITIONAL 2 HOURS MINIMUM. CAREFULLY PURGE ALL AIR FROM SYSTEM AND INSPECT THE ENTIRE SYSTEM FOR ANY LEAKS. ENSURE THAT COOLANT LEVEL IS MID WAY ON EXPANSION TANK SITE GAUGE AT CONCLUSION OF TEST.
- SHUT DOWN GEN #3 AND LOCK OUT. TURN OFF PUMPS P-HR1 AND P-HR2.
- REINSTALL GEN #3 THERMOSTAT WITH NEW GASKETS.

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JULY 2019



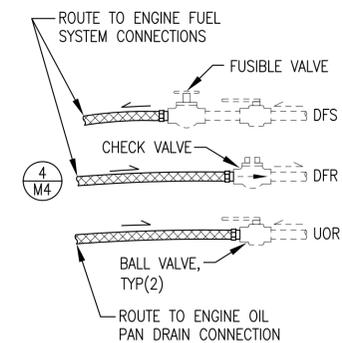
PROJECT: 2019 TAKOTNA POWER PLANT M&I PROJECT		
TITLE: BASE BID TASK "C" ENGINE COOLING SYSTEM CLEAN/FLUSH/REPAIR		
DRAWN BY: JTD	SCALE: NO SCALE	
DESIGNED BY: BCG	DATE: 7/11/19	
FILE NAME: TAKOM&I M1-4	SHEET: M3	OF 4
PROJECT NUMBER:		

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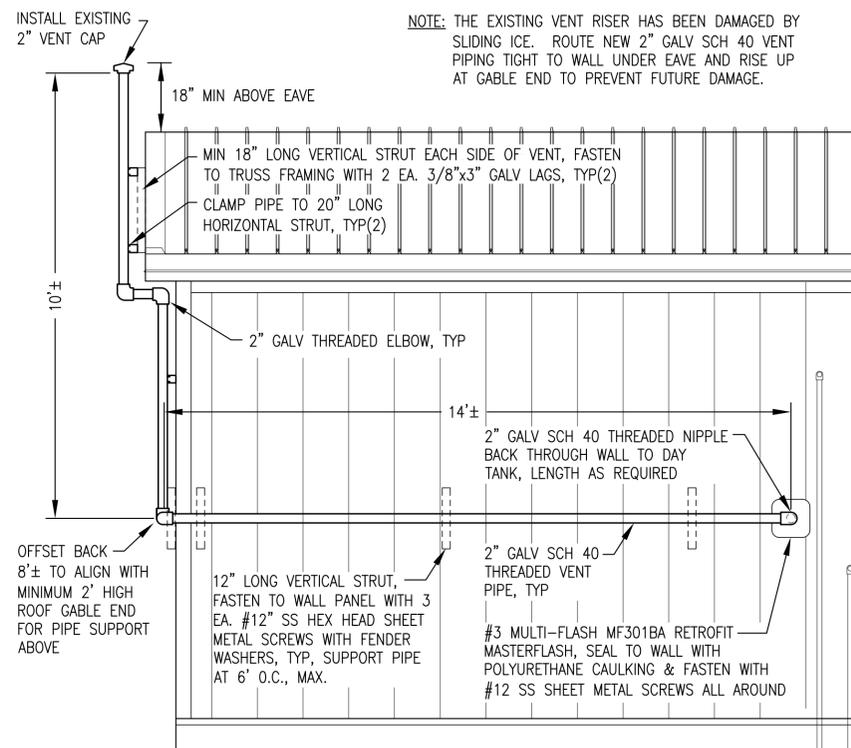
- NOTES:
1. ALL EXISTING PIPING & EQUIPMENT TO REMAIN SHOWN WITH LIGHT DASHED LINES.
 2. ALL NEW EQUIPMENT TO BE INSTALLED THIS PROJECT SHOWN WITH DARK SOLID LINES.

1 BASE BID TASK "D" GEN #3 UPGRADE ELEVATION
M4 1"=1'-0"



- NOTES:
- 1) EXISTING PIPING & VALVES 1/2".
 - 2) FURNISH & INSTALL #8 HOSE FOR DFS/DFR & #10 HOSE FOR UOR. FURNISH WITH JIC SWIVELS & FIELD CUT TO LENGTH. PROVIDE 1/2" MPT ADAPTERS FOR VALVE CONNECTIONS. PROVIDE ADAPTERS AS REQUIRED FOR ENGINE FUEL SYSTEM & OIL PAN CONNECTIONS, SEE DETAIL.

2 GEN#3 FUEL/USED OIL PIPING CONNECTIONS
M4 NO SCALE



NOTE: THE EXISTING VENT RISER HAS BEEN DAMAGED BY SLIDING ICE. ROUTE NEW 2" GALV SCH 40 VENT PIPING TIGHT TO WALL UNDER EAVE AND RISE UP AT GABLE END TO PREVENT FUTURE DAMAGE.

3 NEW DAY TANK VENT INSTALLATION
M4 NO SCALE



DIESEL FUEL RETURN (DFR) CONNECTION DIESEL FUEL SUPPLY (DFS) CONNECTION

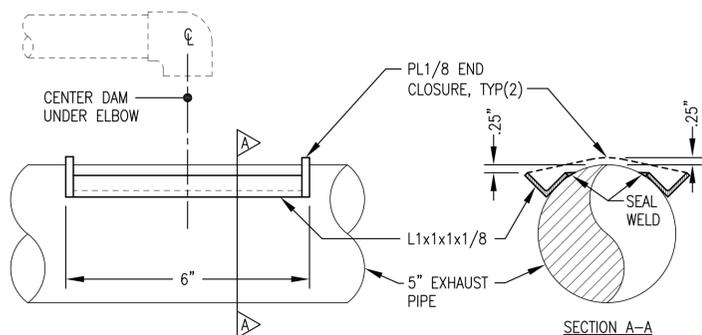


USED OIL RETURN (UOR) CONNECTION

NOTE: BOTH EXISTING GENSETS HAVE IDENTICAL JOHN DEERE MODEL 4045TF275 ENGINES, SN PE4045T606792 (E-GEN) SN PE4045T606793 (GEN#3).

REMOVE OIL PAN DRAIN PLUG & INSTALL FITTING ADAPTER AS REQUIRED FOR #10 OIL DRAIN HOSE

4 TYPICAL ENGINE FUEL/OIL HOSE CONNECTIONS
M4 NO SCALE



5 CRANKCASE DRIP DAM FABRICATION DETAIL
M4 NO SCALE

ISSUED FOR CONSTRUCTION JULY 2019



PROJECT:	2019 TAKOTNA POWER PLANT M&I PROJECT		
TITLE:	BASE BID TASK "D" GENSET #3 UPGRADES & MISCELLANEOUS DETAILS		
DRAWN BY: JTD	SCALE: AS NOTED	DESIGNED BY: BCG	DATE: 7/11/19
FILE NAME: TAKOM&I M1-4	SHEET: M4	PROJECT NUMBER:	OF 4



GENERAL NOTES:

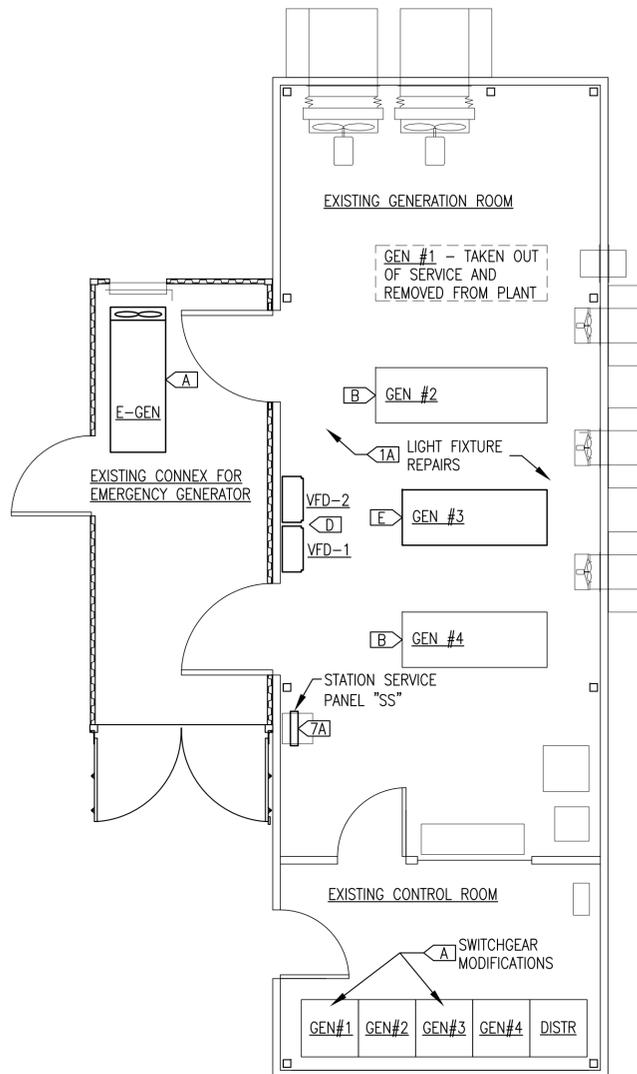
- 1) A PREVIOUS INCOMPLETE EMERGENCY GENERATOR INSTALLATION WILL BE COMPLETED AND INTEGRATED INTO THE POWER PLANT AS PART OF THIS PROJECT. THE EMERGENCY GENERATOR WILL PROVIDE TEMPORARY COMMUNITY AND STATION SERVICE POWER DURING THIS PROJECT AND STANDBY POWER AFTER COMPLETION. SEE MECHANICAL FOR ADDITIONAL DESCRIPTION.
- 2) THIS PLANT PROVIDES PRIME POWER TO THE COMMUNITY OF TAKOTNA. KEEP OUTAGES TO A MINIMUM AND COORDINATE ALL REQUIRED OUTAGES WITH THE UTILITY.
- 3) ALL ITEMS TO REMAIN UNLESS SPECIFICALLY INDICATED FOR REMOVAL.
- 4) ENSURE ALL EQUIPMENT AND CIRCUITS TO BE REMOVED ARE DE-ENERGIZED PRIOR TO BEGINNING DEMOLITION. LOCK AND TAG OUT ALL AFFECTED CIRCUIT BREAKERS AND DISCONNECTS.
- 5) 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.

SPECIFIC NOTES (BASE BID TASKS):

- A** MODIFY SWITCHGEAR FOR TEMPORARY SERVICE. COMPLETE INSTALLATION OF EMERGENCY GENERATOR AND PLACE IN SERVICE:
 - SEE ATTACHED MARKED UP SHOP DRAWINGS FOR ALL SWITCHGEAR MODIFICATIONS & TERMINATIONS.
 - SEE SHEET E2 FOR EMERGENCY GENERATOR PLAN, NOTES, & DETAILS. SEE MECHANICAL FOR ADDITIONAL DETAIL.
- B** TAKE GEN#1, GEN#2, & GEN#4 OUT OF SERVICE. NOTE THAT GEN#3 & E-GEN WILL REMAIN IN SERVICE:
 - LOCK AND TAG OUT GEN #2 & #4 BREAKERS AT SWITCHGEAR.
 - SEE DETAIL 1/E2 NOTE 2 FOR CONDUCTORS AT GEN #1. CONDUCTORS AT GEN #2 & GEN #4 TO REMAIN.
 - SEE MECHANICAL FOR ADDITIONAL DETAILS.
- C** CLEAN, FLUSH AND REPAIR THE ENGINE COOLING SYSTEM, SEE MECHANICAL.
- D** RETURN FUNCTION TO RADIATOR VFD'S:
 - THE VFD'S ARE FUNCTIONAL BUT HAVE RECENTLY BEEN OPERATED IN "OFF" OR BYPASS MODE.
 - TEST AND CALIBRATE BOTH RADIATOR VFD CONTROLS AND CONFIRM PROPER RADIATOR FUNCTION. VFD CONTROL FOR EACH RADIATOR IS PROVIDED BY AN ALTIVAR DRIVE MODEL ATV58HU72M2ZU WITH REMOTE DISPLAY MOUNTED IN FACE OF DEDICATED CONTROL PANEL.
- E** PERFORM GENSET #3 UPGRADES:
 - SEE SHEET E2 FOR PLAN, NOTES, & DETAILS
 - SEE MECHANICAL FOR ADDITIONAL DETAILS.

SPECIFIC NOTES (ADDITIVE ALTERNATE TASKS):

- 1A** REPAIR LIGHT FIXTURES: THE MODULE HAS A TOTAL OF 11 EACH CEILING-MOUNTED LITHONIA MODEL DMW232120 FLOURESCENT LIGHT FIXTURES WITH TWO EACH 32W T8 LAMPS PER FIXTURE. MOST OF THE BALLASTS AND LAMPS ARE FAILED AND IN NEED OF REPLACEMENT. REMOVE ALL FLUORESCENT LAMPS, REMOVE ALL BALLASTS, AND REWIRE FIXTURES WITH HOT TO PIN BASE ONE END, NEUTRAL TO PIN BASE THE OTHER END. INSTALL LED RETROFIT T8 LAMPS IN EXISTING RE-WIRED FIXTURE, TOPAZ MODEL L4T8B/850/14F/DE-39C OR EQUAL. PROVIDE 24 LAMPS TOTAL, 22 INSTALLED PLUS 2 SPARES.
- 2A** REPAIR AND SERVICE THE VENTILATION SYSTEM, SEE MECHANICAL.
- 3A** REPAIR AND TEST USED OIL BLENDER SYSTEM, SEE MECHANICAL.
- 4A** INSTALL NEW DAY TANK VENT PIPE, SEE MECHANICAL.
- 5A** PREPARE QUOTE FOR REPAIR OF FIRE SUPPRESSION SYSTEM, SEE MECHANICAL.
- 6A** DISPOSE OF CONTAMINATED COOLANT AND USED CLEANING SOLUTION, SEE MECHANICAL.
- 7A** LABEL CIRCUITS IN STATION SERVICE PANEL "SS": SEE DESIGN CIRCUIT LAYOUT 5/E2. TEST CIRCUITS AND COMPARE AS-BUILT CONDITION WITH DESIGN LAYOUT. LABEL PANEL TO MATCH AS-BUILT CIRCUIT ARRANGEMENT. MARK UP CIRCUIT LAYOUT AND PROVIDE TO ENGINEER.



1
E1 ELECTRICAL WORK PLAN
1/4"=1'-0"

ELECTRICAL SPECIFICATIONS:

**** 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. INSTALL ALL MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS, UNLESS INDICATED OTHERWISE.

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.

**** 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.

**** DEVICES AND EQUIPMENT ****

DEVICES - LISTED FOR INTENDED SERVICE. INSTALL ALL DEVICES SUCH THAT MINIMUM REQUIRED ACCESS CLEARANCE IS MAINTAINED.

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.

**** CONDUCTORS ****

COLOR CODING - UNLESS SPECIFICALLY INDICATED OTHERWISE CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS:

- 480-VOLT POWER CONDUCTORS (FOR GEN #4 ONLY IF THREE-PHASE CONVERSION COMPLETE)
 - 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.

GENERATOR POWER CONDUCTORS - HIGH TEMPERATURE, EXTRA FLEXIBLE CABLE. 1000V, 150°C THERMOSET EPDM INSULATION WITH TIN COATED COPPER CONDUCTOR. COBRA CABLE, HOUSTON WIRE & CABLE, OR APPROVED EQUAL. TERMINATE WITH COPPER COMPRESSION LUGS RATED FOR THE FULL AMPACITY OF THE CABLE AT 150°C.

ELECTRICAL EQUIPMENT/DEVICE SCHEDULE

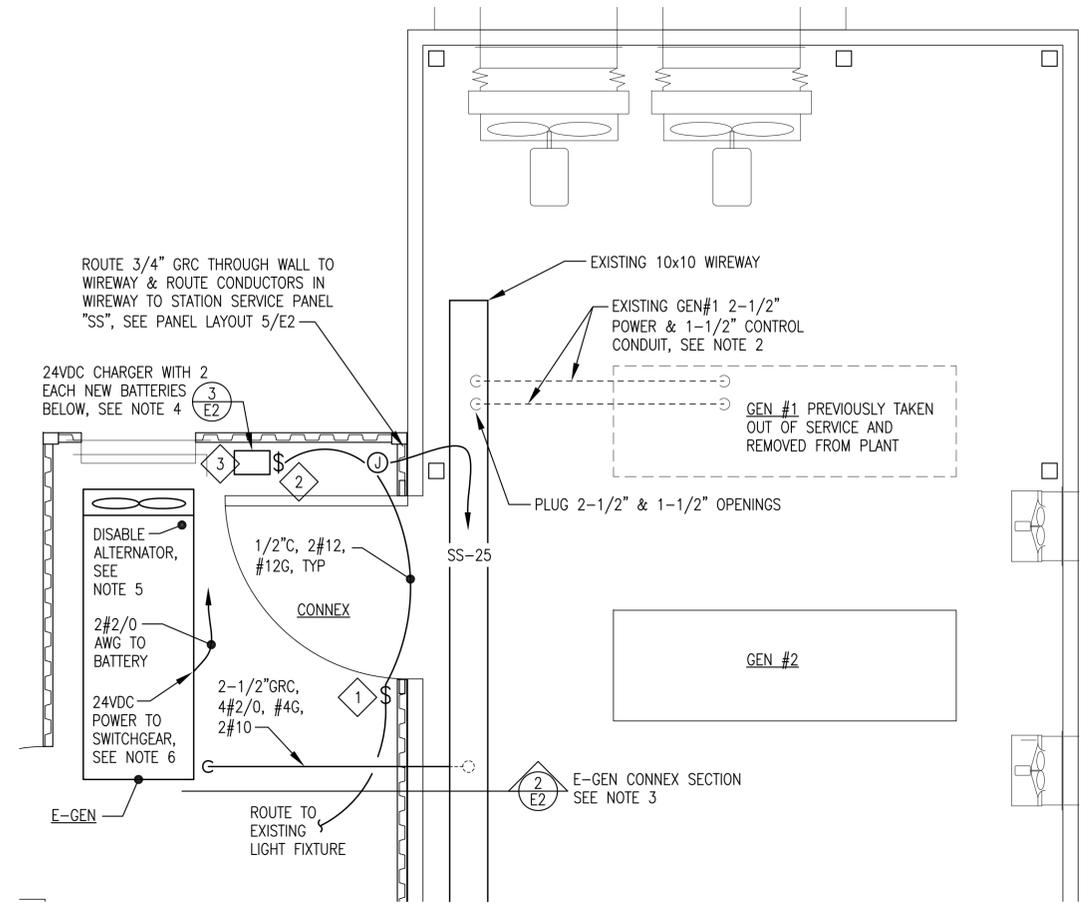
SYMBOL	SERVICE	DESCRIPTION	MANUFACTURER/MODEL
1	LIGHT SWITCH	SINGLE POLE SNAP SWITCH, 120V, 20A, METAL, 1-1/2HP RATED, INSTALL IN 4"x4" STEEL BOX WITH METAL COVER, IVORY.	HUBBELL 1221-I OR EQUAL
2	1Ø SMALL MOTOR DISCONNECT	SINGLE POLE SNAP SWITCH WITH RED PILOT LIGHT, 120V, 20A, 1-1/2HP RATED, INSTALL IN 4"x4" STEEL BOX WITH METAL COVER	HUBBELL 1221-PL OR EQUAL
3	BATTERY CHARGER	12/24-VOLT SOLID STATE 20-AMP AUTO-EQUALIZING BATTERY CHARGER FOR 120 VAC INPUT, WITH OPTIONAL HIGH/LOW VOLTAGE, AC POWER FAILURE, & REMOTE SUMMARY ALARM RELAYS	SENS NRG22-20-RCLS OR EQUAL

ISSUED FOR
CONSTRUCTION
JULY 2019



PROJECT: 2019 TAKOTNA POWER PLANT M&I PROJECT		
TITLE: ELECTRICAL WORK PLAN, NOTES, & SPECIFICATIONS		
DRAWN BY: JTD	SCALE: NO SCALE	
DESIGNED BY: CWV/BCG	DATE: 7/11/19	
FILE NAME: TAKOM&I E1-E2	SHEET: E1	OF 2
PROJECT NUMBER:		

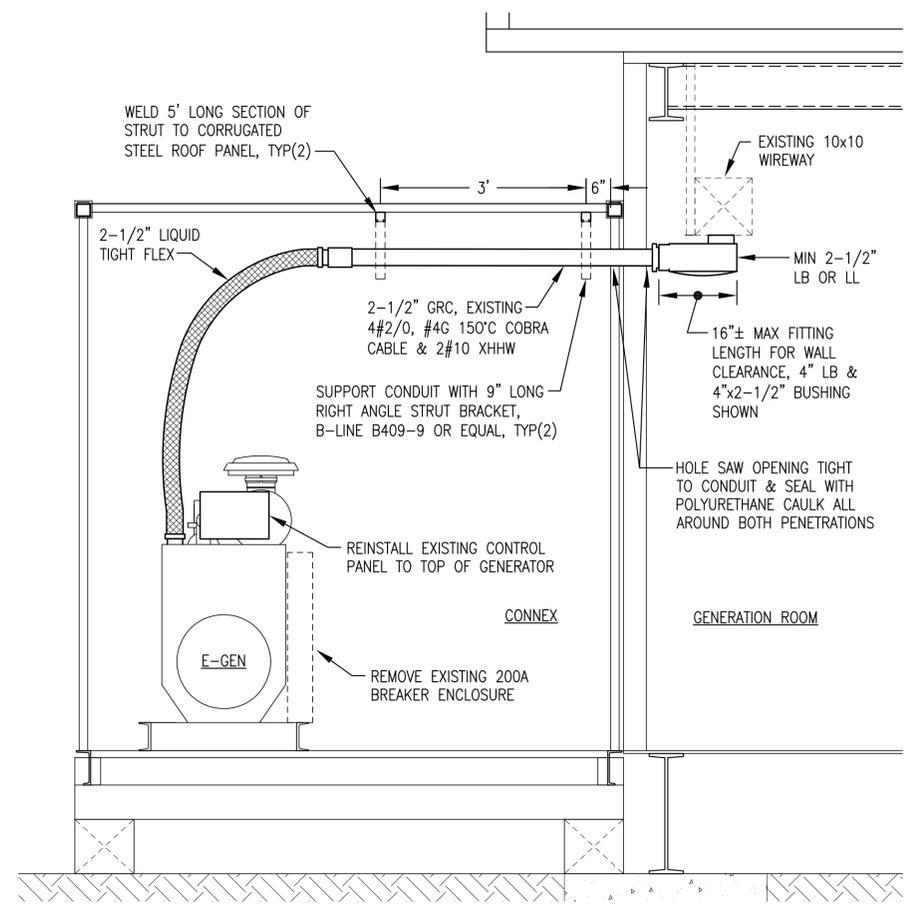




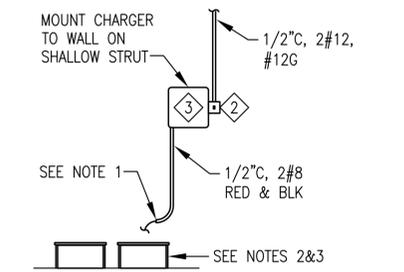
1 BASE BID TASK "A" EMERGENCY GENERATOR (E-GEN) INSTALLATION PLAN
1/2"=1'-0"

E-GEN INSTALLATION NOTES:

1. ALL WORK INDICATED THIS PLAN IS INCLUDED IN BASE BID TASK "A" UNLESS SPECIFICALLY INDICATED OTHERWISE.
2. PULL EXISTING GEN #1 4#2/0, #4G POWER AND 2#10 24VDC CONDUCTORS BACK INTO WIREWAY FOR RECONNECTION TO E-GEN. SEE NOTE 3 FOR NEW TERMINATION. PULL ALL OTHER GEN#1 CONTROL CONDUCTORS INTO 10x10 WIREWAY, NEATLY COIL, AND TAPE ENDS FOR STORAGE. REMOVE EXISTING 2-1/2" AND 1-1/2" EMT POWER/CONTROL CONDUITS. SAVE LT FLEX AND MOGULS FOR RE-USE ON E-GEN INSTALLATION AS NEEDED.
3. INSTALL NEW CONDUIT, RE-ROUTE OLD GEN#1 4#2/0, #4G POWER AND 2#10 24VDC CONDUCTORS TO E-GEN. SEE ELEVATION FOR DETAILS.
4. INSTALL NEW BATTERY CHARGER AND BATTERIES PER DETAIL 3/E2.
5. TAKE EXISTING ALTERNATOR OUT OF SERVICE AND RECONNECT WIRING HARNESS AS REQUIRED TO DISPLAY VOLTAGE AND ALARM STATUS CORRECTLY ON ENGINE CONTROLLER.
6. PROVIDE 24VDC POWER CONNECTION FROM BATTERY CABLES. MOUNT 30A CIRCUIT BREAKER WITH SWITCH NEAR STARTER, COOPER 187-030-F-00 OR APPROVED EQUAL. CONNECT 2#10 24VDC CONDUCTORS AND ROUTE IN LOOM TO GENERATOR ENCLOSURE. SEE NOTE 3 FOR CONTINUATION TO SWITCHGEAR.

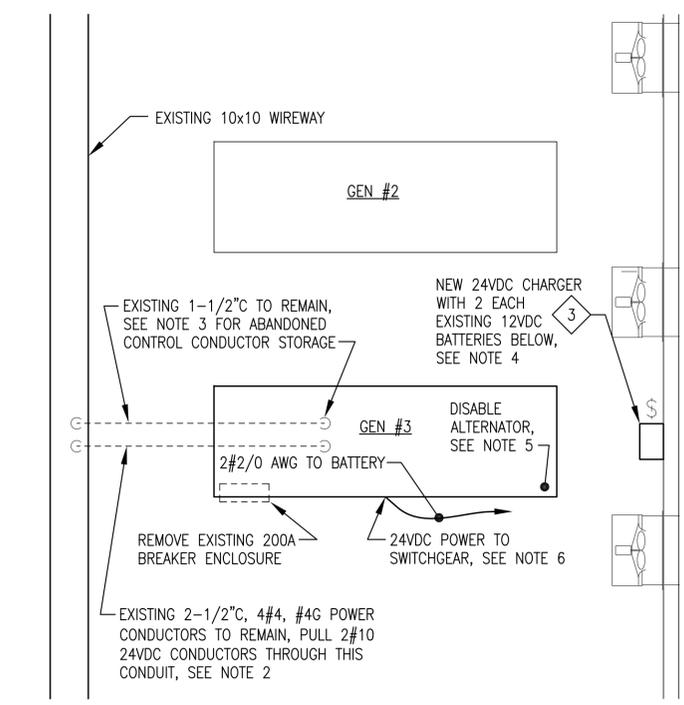


2 E-GEN CONNEX SECTION
3/4"=1'-0"



- NOTES:
1. INSTALL BUSHING IN END OF EMT & ROUTE 2#8 CHARGING LEADS TO BATTERY, MAKE FINAL CONNECTION TO POSITIVE BATTERY TERMINAL WITH IN-LINE 50A CIRCUIT BREAKER, COOPER BP/CB185-50 OR EQUAL
 2. INSTALL EACH BATTERY IN A RACK SIZED TO SECURELY HOLD THE BATTERY WITH A MINIMUM 5/8" PLYWOOD BASE.
 3. FOR E-GEN PROVIDE TWO EACH MINIMUM 800 COLD CRANK AMP 12-VOLT STARTING BATTERIES. BATTERIES SHALL BE SEALED MAINTENANCE FREE, OPTIMA RED TOP NAPA PART# BAT N993478RD OR EQUAL.

3 BATTERY CHARGER INSTALLATION
NO SCALE

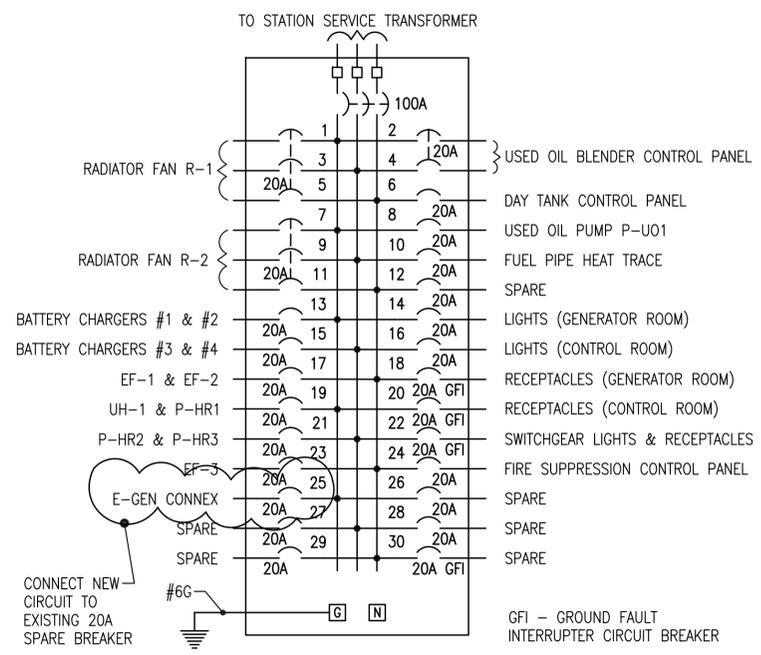


4 BASE BID TASK "E" GENSET #3 UPGRADE DETAILS
1/2"=1'-0"

GEN#3 UPGRADE NOTES:

1. ALL WORK INDICATED THIS PLAN IS INCLUDED IN BASE BID TASK "E" UNLESS SPECIFICALLY INDICATED OTHERWISE.
2. THIS GENERATOR IS NOW CONTROLLED BY AN ON-BOARD SOLID STATE CONTROL PACKAGE AND NO LONGER COMMUNICATES WITH THE SWITCHGEAR. THE ORIGINAL CONTROL CONDUCTORS AND 1-1/2" LT FLEX RISER ARE STILL IN PLACE BUT ARE NOT CONNECTED. PULL EXISTING 2#10 24VDC CONDUCTORS BACK INTO WIREWAY FOR RECONNECTION, SEE NOTE 3 FOR NEW TERMINATION. PULL ALL OTHER GEN#3 CONTROL CONDUCTORS INTO 10x10 WIREWAY, NEATLY COIL, AND TAPE ENDS FOR STORAGE. REMOVE 1-1/2" CONDUIT RISER UP TO CEILING AND CAP OR PLUG END.
3. PULL 2#10 24VDC SWITCHGEAR POWER CONDUCTORS INTO EXISTING 2-1/2" CONDUIT WITH EXISTING GENERATOR CONDUCTORS.
4. REPLACE EXISTING BATTERY CHARGER WITH NEW BATTERY CHARGER AND CONNECT TO EXISTING 20A CIRCUIT THROUGH EXISTING SWITCH. RELOCATE EXISTING BATTERIES FROM SIDE OF ENGINE TO ORIGINAL LOCATION AT FRONT OF ENGINE. INSTALL AND CONNECT PER DETAIL 3/E2. INSTALL NEW BATTERY CABLES TO STARTER.
5. TAKE EXISTING ALTERNATOR OUT OF SERVICE AND RECONNECT WIRING HARNESS AS REQUIRED TO DISPLAY VOLTAGE AND ALARM STATUS CORRECTLY ON ENGINE CONTROLLER.
6. PROVIDE 24VDC POWER CONNECTION, MOUNT 30A CIRCUIT BREAKER WITH SWITCH NEAR STARTER, COOPER 187-030-F-00 OR APPROVED EQUAL. CONNECT #10 CONDUCTORS AND ROUTE IN LOOM TO GENERATOR ENCLOSURE. SEE NOTE 3 FOR CONTINUATION TO SWITCHGEAR.

5 TAKOTNA STATION SERVICE PANEL "SS" (FIELD VERIFY CIRCUITS)
NO SCALE



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JULY 2019

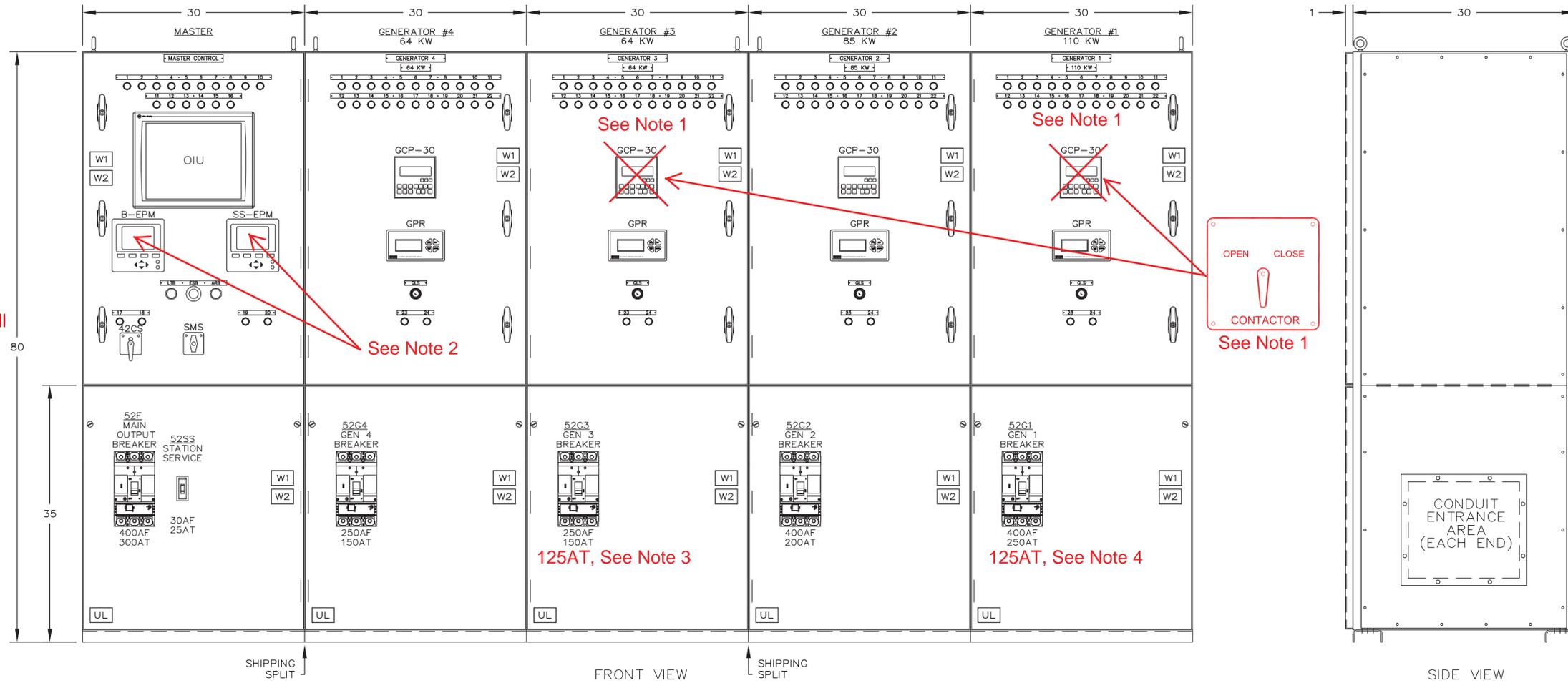


PROJECT: 2019 TAKOTNA POWER PLANT M&I PROJECT		
TITLE: ELECTRICAL PLANS & DETAILS		
DRAWN BY: JTD	SCALE: NO SCALE	DESIGNED BY: CWV/BCG
FILE NAME: TAKOM&I E1-E2	PROJECT NUMBER:	DATE: 7/11/19
SHEET: E2		OF 2

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

Switchgear Modification Specific Notes:

- 1) Remove existing GCP and install cover plate with face mounted Contactor Close / Contactor Open switch and back mounted Lock Out Relay. See Sheets 4A, 4C, 6A, and 6C for connection to existing.
- 2) Remove existing Bus and Station Service meters and install new meters. See Sheet 5.
- 3) Remove existing Gen #3 trip plug and install new 125A trip plug. See Sheet 4C.
- 4) Remove existing Gen #1 trip plug and install new 125A trip plug. See Sheet 4A.



DEVICE LEGEND	
ARB	ALARM RESET BUTTON
B-EPM	BUS ELECTRONIC POWER METER - 7650ION
ESB	EMERGENCY STOP BUTTON
GCP	GENERATOR CONTROL PACKAGE
GLS	GENERATOR LOCKOUT SWITCH
GPR	GENERATOR PROTECTIVE RELAY
OIU	OPERATOR INTERFACE UNIT
LTB	LAMP TEST BUTTON
SMS	MASTER CONTROL SWITCH (AUTO-MANUAL)
SS-EPM	STATION SERVICE POWER METER - 7550ION
42xx	CONTACTOR
42CS	CONTACTOR CONTROL SWITCH
52xx	CIRCUIT BREAKER

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

MASTER ANNUNCIATOR LEGEND:			
1	FIRE ALARM LIGHT	11	HEAT RECOVERY NO LOAD
2	EMERGENCY STOP LIGHT	12	HEAT RECOVERY LOSS OF PRESSURE
3	SYSTEM LOW WATER LEVEL LIGHT	13	HEAT RECOVERY LOSS OF FLOW
4	LOW FUEL LEVEL LIGHT	14	SPARE 1
5	BUS UNDER/OVER VOLTAGE LIGHT	15	SPARE 2
6	BUS UNDER/OVER FREQUENCY LIGHT	16	SPARE 3
7	FEEDER BREAKER OVERCURRENT LIGHT	17	FEEDER BREAKER OPEN
8	PRIMARY PLC FAILURE	18	FEEDER BREAKER CLOSED
9	OPERATING ON BACKUP PLC	19	STATION SERVICE BREAKER OPEN
10	BACKUP PLC FAILURE	20	STATION SERVICE BREAKER CLOSED

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
4D	GENERATOR 4 AC SCHEMATIC
5	MASTER AC & DISTRIBUTION SCHEMATIC
6A	GENERATOR 1 DC CONTROL SCHEMATIC
6B	GENERATOR 2 DC CONTROL SCHEMATIC
6C	GENERATOR 3 DC CONTROL SCHEMATIC
6D	GENERATOR 4 DC CONTROL SCHEMATIC
7A	GENERATOR 1 DC CONTROL SCHEMATIC
7B	GENERATOR 2 DC CONTROL SCHEMATIC
7C	GENERATOR 3 DC CONTROL SCHEMATIC
7D	GENERATOR 4 DC CONTROL SCHEMATIC
8A	GENERATOR 1 DC CONTROL SCHEMATIC
8B	GENERATOR 2 DC CONTROL SCHEMATIC
8C	GENERATOR 3 DC CONTROL SCHEMATIC
8D	GENERATOR 4 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	EPM MONITORING & SYSTEM COMMUNICATION DIAGRAM
17	HEATER & LIGHTING CONTROL SCHEMATIC
18	CONTROL SWITCH TARGET DIAGRAM
19	NAMEPLATE DETAILS
20	INTERCONNECTION DIAGRAM

Switchgear Modification General Notes:

- A) The existing switchgear is not functioning due to age and neglect. The purpose of the M&I project switchgear modifications is to restore limited function to allow operation of Gen #1 and Gen #3 sections. A more extensive upgrade is scheduled in the near future under a separate project.
- B) The new generators operating in positions #1 and #3 are equipped with unit mounted control panels. All start/stop, speed control, and unit protection will be performed from the control panels and not from the switchgear.
- C) The new generators operating in positions #1 and #3 are 24VDC and the associated starter batteries will provide 24VDC power to the switchgear. The failed 12-24VDC converters will be taken out of service.
- D) The existing generators in positions #2 and #4 will be locked out of service.
- E) The switchgear will temporarily serve as a manual transfer switch allowing operation of Gen #1 or Gen #3 individually. The new controls will allow either generator to close into a dead bus and will prevent the two generators from operating simultaneously.

REFER TO SHEET #

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

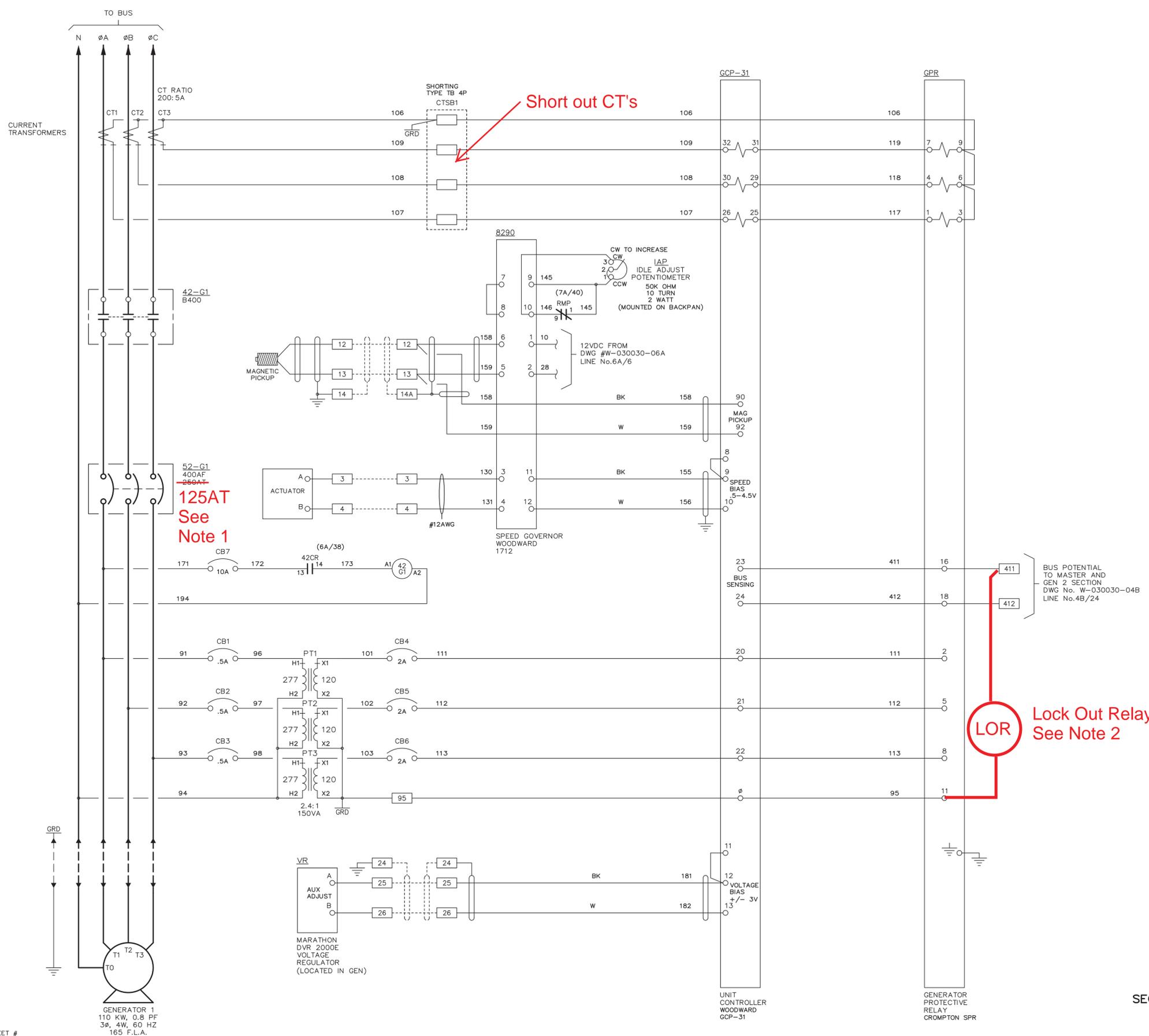
DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
2	AS BUILT			BM	RH	05-05-02
1	APPROVAL MOD'S			BM	RH	05-03-16



GENERATOR CONTROL PANEL
 MODEL GCS 2200
 PHYSICAL LAYOUT
 MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

AS BUILT			
DRAWINGS AND/OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.			
CUSTOMER ALASKA ENERGY AUTHORITY		WORK ORDER No. W-030030	
CUSTOMER ORDER No. C-022623	AUTH BY RH	DATE 05-02-14	REV 2
DRAWN BY LR	DRAWING/FILE No. W-030030-01		SHEET 1

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4A/40
4A/41



Notes:
 1) Existing Gen #1 breaker is a G.E. Spectra RMS Cat. # SGHA36AT0400. Remove existing trip plug and install new 125A trip plug.
 2) Furnish and install new Lock Out Relay to prevent closing contactor when bus is hot. Min 2 pole relay with 120VAC coil.

125AT
See Note 1

LOR
Lock Out Relay
See Note 2

SECTION #5

AS BUILT

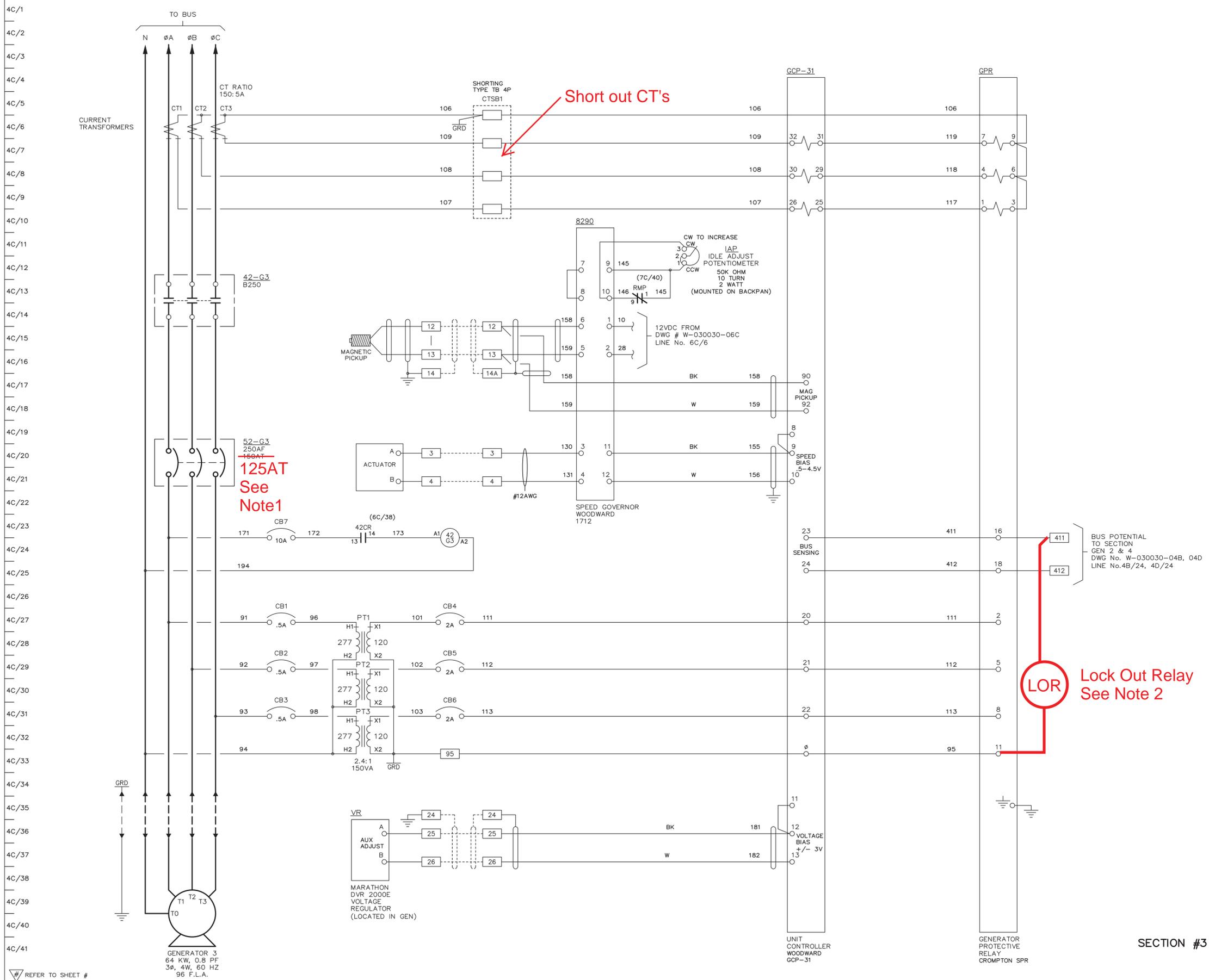
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 RELEASED FOR INFORMATION
 AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT			BM	RH	05-05-02



GENERATOR CONTROL PANEL
 MODEL GCS 2200
 GENERATOR #1 AC SCHEMATIC
 MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

DRAWINGS AND/OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.			
CUSTOMER ALASKA ENERGY AUTHORITY		WORK ORDER No. W-030030	
CUSTOMER ORDER No. C-022623	AUTH BY RH	DATE 05-02-14	REV 1
DRAWN BY LR	DRAWING/FILE No. W-030030-04A		SHEET 4A



Notes:
 1) Existing Gen #3 breaker is a G.E. Spectra RMS Cat. # SFHA36AT0250. Remove existing trip plug and install new 125A trip plug.
 2) Furnish and install new Lock Out Relay to prevent closing contactor when bus is hot. Min 2 pole relay with 120VAC coil.

LOR Lock Out Relay See Note 2

SECTION #3

AS BUILT

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

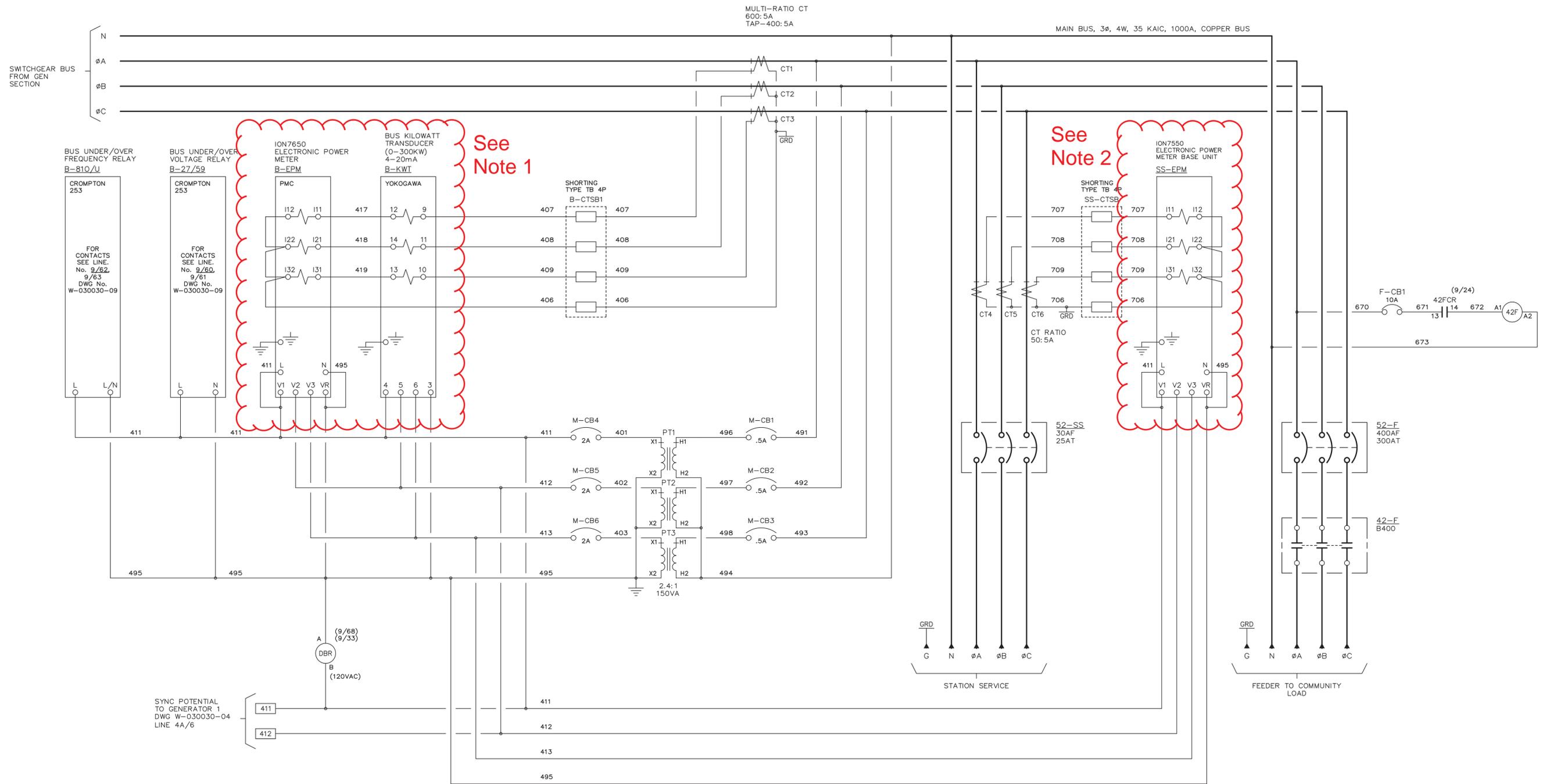
DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT			BM	RH	05-05-02



GENERATOR CONTROL PANEL
 MODEL GCS 2200
 GENERATOR #3 AC SCHEMATIC
 MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

DRAWINGS AND/OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.			
CUSTOMER ALASKA ENERGY AUTHORITY		WORK ORDER No. W-030030	
CUSTOMER ORDER No. C-022623	AUTH BY RH	DATE 05-02-14	REV 1
DRAWN BY LR	DRAWING/FILE No. W-030030-04C		SHEET 4C

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- Notes:**
- 1) Remove existing Totalizing (Bus) Meter and provide new meter: Class 10 current inputs, 120V AC input, 18-60V DC power supply. Provide with 4-20 mA I/O card, Ethernet communications port, panel mount remote display module, and cable. SHARK 200-60-10-V2-D-INP100S-20mAOS, or approved equal.
 - 2) Remove existing Station Service Meter and provide new meter: Class 10 current inputs, 120V AC input, 18-60V DC power supply. Provide with 4-20 mA I/O card, Ethernet communications port, panel mount remote display module, and cable. SHARK 200-60-10-V2-D-INP100S-X, or approved equal.

SECTION #1

AS BUILT

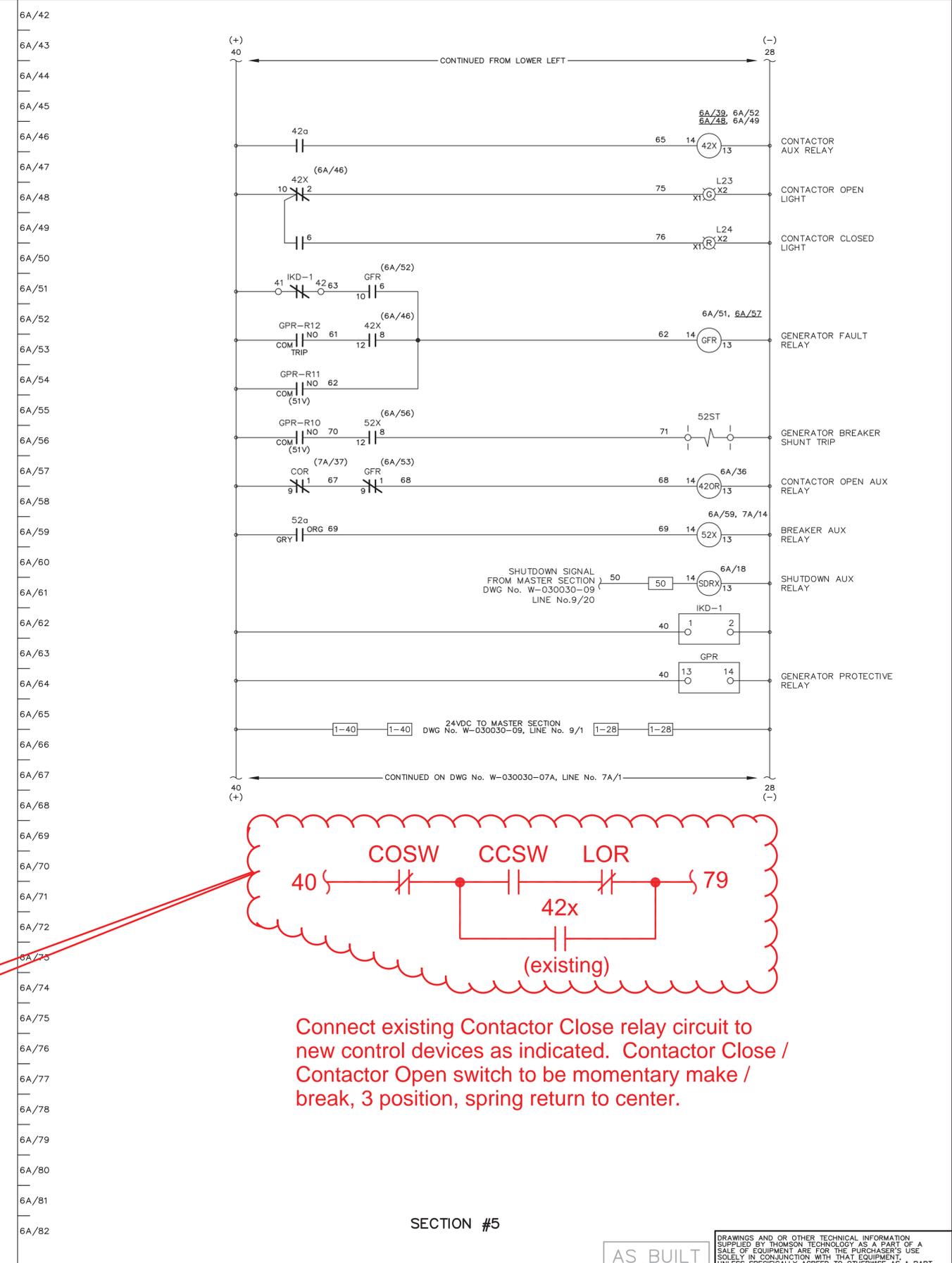
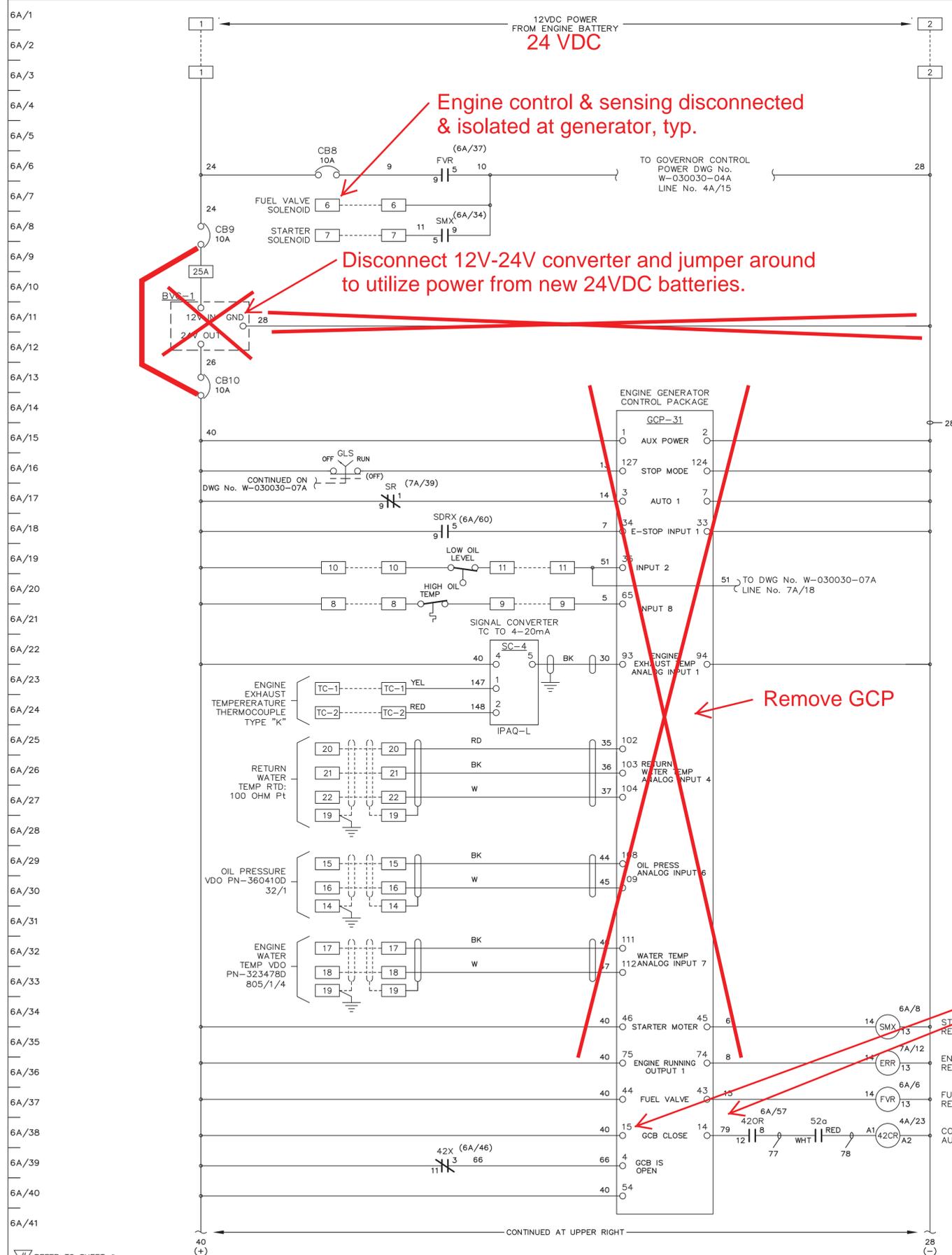
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 AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT			BM	RH	05-05-02



GENERATOR CONTROL PANEL
 MODEL GCS 2200
 MASTER AC & DISTRIBUTION SCHEMATIC
 MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

DRAWINGS AND/OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.			
CUSTOMER ALASKA ENERGY AUTHORITY		WORK ORDER No. W-030030	
CUSTOMER ORDER No. C-022623	AUTH BY RH	DATE 05-02-14	REV 1
DRAWN BY LR	DRAWING/FILE No. W-030030-05	SHEET 5	



REFER TO SHEET #

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MULTIPLE UNIT WORK ORDER

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AUTH. BY: DATE:

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
1	AS BUILT			BM	RH	05-05-02

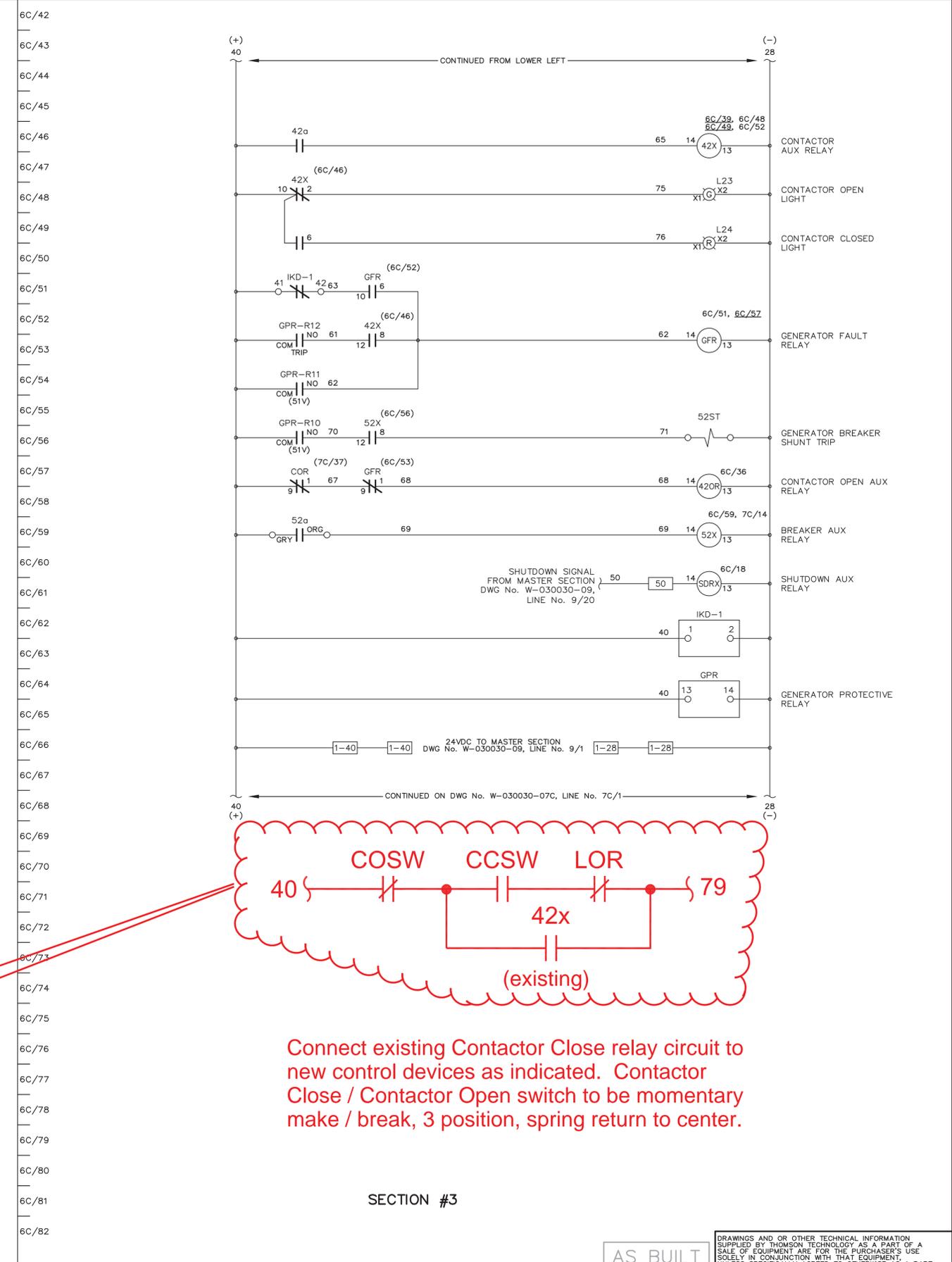
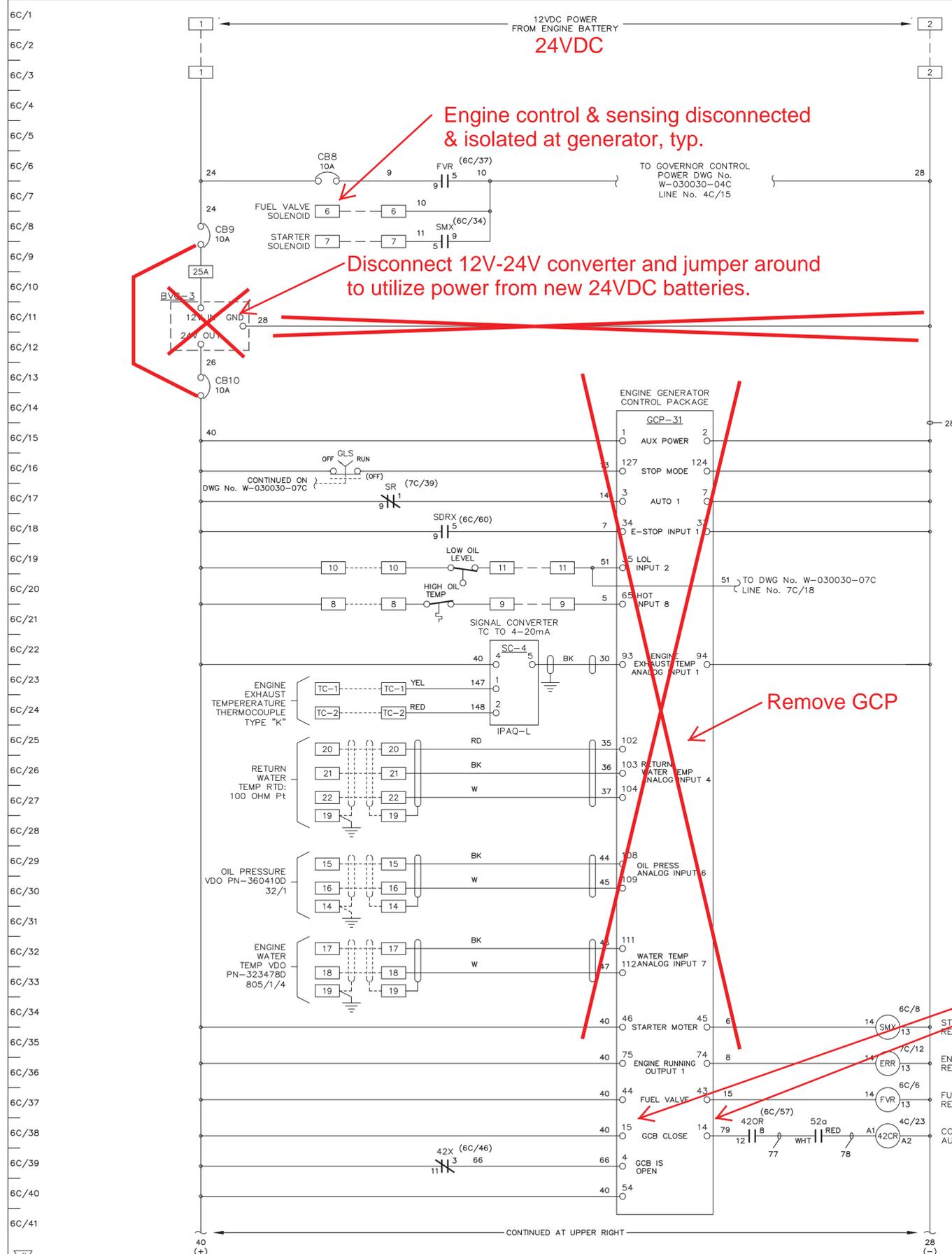


GENERATOR CONTROL PANEL
MODEL GCS 2200
GENERATOR 1 DC CONTROL SCHEMATIC
MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

AS BUILT

DRAWINGS AND/OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.

CUSTOMER ALASKA ENERGY AUTHORITY			
CUSTOMER ORDER No. C- 022623	WORK ORDER No. W- 030030		
DRAWN BY LR	AUTH BY RH	DATE 05-02-14	REV 1
DRAWING/FILE No. W-030030-06A			SHEET 6A



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 AUTH. BY: _____ DATE: _____

DRAWING No.	REFERENCE DRAWINGS	No.	REVISIONS	BY	AUTH	DATE
2	AS BUILT			BM	RH	05-05-02
1	APPROVAL MOD'S			BM	RH	05-03-16



GENERATOR CONTROL PANEL
 MODEL GCS 2200
 GENERATOR 3 DC CONTROL SCHEMATIC
 MIDDLE KUSKOKWIM REGIONAL ENERGY - SLEETMUTE

DRAWINGS AND OR OTHER TECHNICAL INFORMATION SUPPLIED BY THOMSON TECHNOLOGY AS A PART OF A SALE OF EQUIPMENT ARE FOR THE PURCHASER'S USE SOLELY IN CONJUNCTION WITH THAT EQUIPMENT, UNLESS SPECIFICALLY AGREED TO OTHERWISE AS A PART OF THE TERMS OF SALE.			
CUSTOMER ALASKA ENERGY AUTHORITY		WORK ORDER No. W-030030	
CUSTOMER ORDER No. C- 022623	DRAWN BY LR	AUTH BY RH	DATE 05-02-14
			REV 2
DRAWING/FILE No. W-030030-06C	SHEET 6C		