



SAMPSON COUNTY 911 & ES FACILITIES

CLINTON,
NORTH CAROLINA

CONSTRUCTION DOCUMENTS

POWER RISER DIAGRAM

DATE 12.04.2020

PROJECT NO 20003

REVISIONS

NUM.	DATE	DESCRIPTION:
1	12-17-2020	REVISION #1

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SEAL

SHEET NUMBER

E701

BMS SYSTEM POINT LIST (TYP. 2 GENS)

DESIGNATION	DESCRIPTION	UNITS	HARDWIRED POINTS					SOFTWARE POINT	ALARM	TRENDING (Y-N)
			ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	POINT			
P-1	VOLTS A-B	VOLTS						X	X	
P-2	VOLTS B-C	VOLTS						X	X	
P-3	VOLTS C-A	VOLTS						X	X	
P-4	CURRENT A	AMPS						X	X	
P-5	CURRENT B	AMPS						X	X	
P-6	CURRENT C	AMPS						X	X	
P-7	WATTS	KW						X	X	
P-8	VOLT AMPERES REACTIVE	KVAR						X	X	
P-9	VOLT AMPERES	KVA						X	X	
P-10	POWER FACTOR	PF						X	X	
P-11	FREQUENCY	HZ						X	X	
P-12	SUMMARY ALARM									X

GENERATORS SHALL BE CAPABLE OF COMMUNICATING VIA MODBUS PROTOCOL. THE GENERATORS SHALL BE WIRED TO THE MAIN SERVICE SWITCHBOARD MSB. AT THIS POINT, THE RS-485 WIRING SHALL BE EXTENDED TO THE BMS. COORDINATE THE SPECIFIC SETUP AND DETAILS OF THESE CONNECTIONS WITH THE BMS SYSTEM CONTROLS CONTRACTOR. COORDINATE DISTANCES OF MODBUS CONNECTIONS IN ORDER TO ACHIEVE OPTIMUM TRANSFER RATES. SEE DETAIL 9 ON DRAWING E007 FOR GENERATORS CONTROL/MONITORING BLOCK DIAGRAM.

UPS SYSTEM POINT LIST

DESIGNATION	DESCRIPTION	UNITS	HARDWIRED POINTS					SOFTWARE POINT	ALARM	TRENDING (Y-N)
			ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	POINT			
P-1	VOLTS IN A-B	VOLTS						X	X	
P-2	VOLTS IN B-C	VOLTS						X	X	
P-3	VOLTS IN C-A	VOLTS						X	X	
P-4	VOLTS OUT A-B	VOLTS						X	X	
P-5	VOLTS OUT B-C	VOLTS						X	X	
P-6	VOLTS OUT C-A	VOLTS						X	X	
P-7	CURRENT IN A	AMPS						X	X	
P-8	CURRENT IN B	AMPS						X	X	
P-9	CURRENT IN C	AMPS						X	X	
P-10	CURRENT OUT A	AMPS						X	X	
P-11	CURRENT OUT B	AMPS						X	X	
P-12	CURRENT OUT C	AMPS						X	X	
P-13	WATTS IN	KW						X	X	
P-14	VOLT AMPERES IN	KVA						X	X	
P-15	WATTS OUT	KW						X	X	
P-16	VOLT AMPERES OUT	KVA						X	X	
P-17	PF OUT	PF						X	X	
P-18	FREQUENCY OUT	HZ						X	X	
P-19	SUMMARY ALARM (UPS/BATT)									X

NOTES:

- THE UPS HAS INTEGRAL MONITORING CARDS WHICH WILL COMMUNICATE TO THE BMS FOR REMOTE MONITORING PURPOSES. THE UNIT COLLECTS PERFORMANCE POINTS AND STORES THE VALUES OF THESE POINTS IN REGISTERS WHICH CAN LATER BE RETRIEVED VIA STANDARD MODBUS QUERIES. COORDINATE THE SPECIFIC SETUP AND DETAILS OF THESE CONNECTIONS WITH THE SYSTEM CONTROLS CONTRACTOR. COORDINATE DISTANCES OF CONNECTIONS IN ORDER TO ACHIEVE OPTIMUM TRANSFER RATES.
- ALL NETWORK CABLING SHALL BE CATEGORY SE CABLE. COORDINATE THE DETAILS OF THESE CONNECTIONS WITH THE SYSTEM CONTROLS CONTRACTOR.
- PROVISIONING OF THE POINTS LISTED HERE SHALL BE COORDINATED WITH OWNER.
- ALL DEVICES SHALL BE PROGRAMMED SO THAT A LOSS OF COMMUNICATION WITH THE DEVICE WILL TRIGGER AN ALARM EVENT.

GENERATOR SYSTEM AND SWITCHBOARD MSB SEQUENCE OF OPERATION

SYSTEM DESCRIPTION:

THIS SEQUENCE OF OPERATION DESCRIBES THE FUNCTIONAL INTENT OF THE GENERATOR SYSTEM AND CONTROL FOR THE MAIN SWITCHBOARD EQUIPMENT. THE SEQUENCE OF OPERATION IS INTENDED FOR BOTH NORMAL AND FAILURE CONDITIONS AND HOW THE SYSTEM WILL REACT TO THESE EVENTS.

THE GENERATOR SYSTEM CONSISTS OF TWO (2) GENERATOR, GEN 1 AND GEN 2. EACH GENERATOR IS RATED FOR 500KW. THE GENERATORS ARE CONNECTED IN PARALLEL VIA THE PARALLELING CABINET. BOTH GENERATORS ARE INTENDED TO OPERATE AS AN 2N (REDUNDANCY) SYSTEM TO SUPPORT THE ECOM-911 AND SUPPORT SPACES AND AS AN N SYSTEM TO SUPPORT THE OVERALL FACILITY. IN ADDITION, THE GENERATOR SYSTEM IS PROVIDED WITH ISOLATED LOAD-BANK BREAKER

GENERATOR, PARALLELING CABINET AND CONTROLS SHALL BE COORDINATED AS A COMPLETE FUNCTIONING PACKAGE.

SEQUENCE OF OPERATION

- UTILITY FAILURE.
 - NORMAL POWER LOSS.
 - START SIGNAL SENT TO THE GENERATORS.
 - BOTH GENERATORS SHALL START. GENERATOR OUTPUT BREAKER SHALL CLOSE TO THE GENERATOR PARALLELING CABINET ONCE VOLTAGE/FREQUENCY IS UP TO RATED.
 - SIGNAL IS SENT FROM GENERATOR SYSTEM TO MSB PLC "BOTH GENS AVAILABLE".
 - MSB PLC SENDS START SIGNAL TO BMS TO START THE MECHANICAL LOAD PER MECHANICAL CONTROL SEQUENCE (SEE MECHANICAL DRAWING). NO LOAD SHED IS REQUIRED.
 - ONCE ALL ACTIVE LOADS ARE ONLINE AFTER 30 MINUTES, MSB PLC WILL MONITOR THE LOAD DEMAND, IF THE RUNNING LOAD IS LESS THAN 95% OF ONE GENERATOR CAPACITY, MSB PLC SHALL SEND SIGNAL TO THE GENERATOR SYSTEM, TO SHUT DOWN 1 GENERATOR.
 - IF DURING THE UTILITY FAILURE SCENARIO, A GENERATOR FAILS TO START AFTER AN ADJUSTABLE TIME DELAY (SET TO 30 SECONDS), A SIGNAL IS SENT TO MSB PLC AND BMS "ONE GEN IS AVAILABLE".
 - BMS MOMENTARILY HOLD MECHANICAL START SIGNALS.
 - MSB PLC VERIFIES LOAD DOES NOT EXCEED CAPACITY OF ONE GENERATOR. IF THE CAPACITY OF ONE GENERATOR IS EXCEEDED, THE NON-CRITICAL LOAD BREAKERS IN MSB ARE SHED (OPEN). THESE PANELS ARE NPH2 AND NPH3. IF THE CAPACITY OF ONE GENERATOR IS NOT EXCEEDED, PROCEED TO NEXT STEP.
 - BMS SENDS START SIGNALS, SEQUENTIALLY, TO THE MECHANICAL LOADS PER THE CONTROL SEQUENCE (SEE MECHANICAL DRAWING). MSB PLC VERIFIES LOAD DOES NOT EXCEED THE CAPACITY OF ONE GENERATOR AFTER EACH LOAD ADD. IF THE CAPACITY OF ONE GENERATOR IS REACHED BEFORE THE ALL MECHANICAL LOADS ARE ADDED, THE NON-CRITICAL LOAD BREAKERS IN THE MSB ARE SHED (OPEN). BMS START SIGNALS CONTINUE.
 - IF BOTH GENERATORS ARE SUPPORTING THE FACILITY AND ONE GENERATOR FAILS, A SIGNAL IS SENT TO MSB PLC & BMS - "ONE GEN AVAILABLE".
 - BMS SHUTS DOWN MECHANICAL LOADS LISTED IN THE CONTROL SEQUENCE (IN REVERSE ORDER OF STARTING, SEE MECHANICAL DRAWING). PROCEED WITH STEP 9 AND 10 ABOVE.

NOTE: GENERATOR SYSTEM SHALL BE OPERATING FOR 30 MINUTES (ADJUSTABLE TIME DELAY) ONCE ONLINE TO AVOID RETRANSFER IN THE EVENT OF SHORT-TIME REESTABLISHMENT OF THE UTILITY POWER SOURCE.

LOAD BANK TEST MODE

THE GENERATOR SYSTEM IS PROVIDED WITH A LOAD BANK BREAKER AND QUICK CONNECTOR AT THE GENERATOR PARALLELING CABINET WHICH PERMITS LOAD BANK TESTING AND MAINTENANCE OF THE GENERATOR SYSTEM AS A SYSTEM OR SINGLE UNIT. LOAD BANK TESTING IS ACHIEVED BY CLOSING THE LOAD BANK BREAKER ON THE PARALLELING GEAR AND CONNECTING THE LOAD BANK AT THE LOAD BANK QUICK CONNECT. IF THERE IS LOST OF UTILITY DURING A LOAD BANK TESTING, THE GENERATOR LOAD BANK SHALL OPEN AND THE PLC CONTROL SHALL START THE SEQUENCE AND THE GENERATOR SYSTEM SHALL BE OPERATED PER SEQUENCE ABOVE.

NOTES:

- PROVIDE 4" HIGH FORMED CONCRETE HOUSEKEEPING PAD FOR ALL INTERIOR FLOOR MOUNTED ELECTRICAL EQUIPMENTS.
- SPD TYPES ARE TO BE MOTOROLA R56 COMPLIANT, VERIFY TYPE PRIOR TO BID.
- PROVIDE CONCRETE PAD, PER MANUFACTURERS RECOMMENDATIONS, FOR ATS, MTS, AND PARALLELING GEAR.

KEYED NOTES: ⑤

- GENERATOR SHALL BE DEFINED AS A SEPARATELY DERIVED SYSTEM AND COMPLY WITH ALL REQUIREMENTS OF NEC ARTICLE 250.30(A) AND 250.50.
- DIESEL ENGINE GENERATORS SHALL BE PROVIDED WITH FUEL TANK CAPACITY OF 72 HOURS. CONTRACTOR SHALL PROVIDE AND INSTALL REQUIRED FUEL SYSTEM AND ALL REQUIRED ASSOCIATED SUPPORT.
- FUNCTIONAL TESTING OF THE GROUND FAULT PROTECTION SYSTEM SHALL BE PROVIDED BY THE CONTRACTOR PRIOR TO ENERGIZATION. THE TESTING SHALL BE PERFORMED PER EQUIPMENT MANUFACTURER'S TESTING REQUIREMENTS. A WRITTEN TESTING REPORT SHALL BE PROVIDED AND MADE AVAILABLE TO THE ENGINEER OF RECORD.

REFERENCE LOAD BANK TEST MODE SEQUENCE FOR ADDITIONAL REQUIREMENTS

- MSB PLC SHALL BE PROVIDED BY THE SWBD MANUFACTURER. SWBD MANUFACTURER SHALL BE RESPONSIBLE FOR ALL THE TIE-INS TO/FROM GENERATORS, PARALLELING GEAR AND BMS AS REQUIRED. PROVIDE ALL INTERFACES, INTERCONNECTING CABLES, ETC... AS REQUIRED FOR A COMPLETE SYSTEM.
- GENERATOR AND PARALLELING GEAR MANUFACTURER SHALL COORDINATE WITH MSB PLC MANUFACTURER TO SEND/RECEIVE SIGNALS AS REQUIRED FOR INTENDED OPERATION.

