

## **REQUEST FOR BID**

### **GARFIELD COUNTY COURTHOUSE / HEALTH CENTER GENERATOR INSTALLATION**

**GARFIELD COUNTY WILL BE ACCEPTING SEALED BIDS FOR INSTALLATION OF ONE 150KW PROPANE GENERATOR SYSTEM AT ONE LOCATION IN GARFIELD COUNTY. BIDS WILL BE RECEIVED BY THE GARFIELD COUNTY COMMISSIONERS, 352 LEAVITT AVE, P.O. BOX 7, JORDAN, MT 59337, UNTIL 4:00 PM MST ON MARCH 27, 2015 AND WILL BE PUBLICLY OPENED AT 10:00 AM ON MARCH 30, 2015.**

**THE BID WILL INCLUDE PROVIDING AND INSTALLING ALL MATERIALS, LABOR, PERMITS, SUPERVISION AND EQUIPMENT NEED TO COMPLETE THE PROJECT.**

**IT IS THE INTENT OF THIS SPECIFICATION TO SECURE A PROPERLY CAPABLE AND LICENSED CONTRACTOR TO PROCURE AND PERFORM THE INSTALLATION OF A 150KW PROPANE GENERATOR SYSTEM THAT HAS BEEN PROTOTYPE TESTED, FACTORY BUILT, PRODUCTION-TESTED, AND SITE-TESTED TOGETHER WITH ALL ACCESSORIES NECESSARY FOR A COMPLETE INSTALLATION AS SPECIFIED HEREIN. THIS INCLUDES INSTALLATION OF THE AUTOMATIC TRANSFER SWITCH AND DISTRIBUTION TO THE REQUIRED CIRCUITS.**

**THE COUNTY RESERVES THE RIGHT TO ACCEPT OR REJECT ANY OR ALL BIDS, OR PART THEREOF, TO WAIVE ANY INFORMALITIES OR TECHNICALITIES, OR TO AWARD CONTRACTS IN THE BEST INTEREST OF THE COUNTY. IN ALL INSTANCES, THE COUNTY'S DECISION SHALL BE FINAL.**

## **SCOPE OF WORK, SYSTEM SPECIFICATIONS AND OTHER REQUIREMENTS**

### **1. SCOPE OF WORK**

- 1.1 CONTRACTOR SHALL PROCURE, ORDER AND FURNISH ALL OF THE REQUIRED MATERIALS, LABOR AND EQUIPMENT AND SHALL CONSTRUCT, INSTALL AND COMPLETE ALL WORK NEEDED TO COMPLETE THE PROJECT.**
- 1.2 WORK PERFORMED UNDER THIS SECTION SHALL CONFORM TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.**
- 1.3 CONTRACTOR WILL OBTAIN MONTANA STATE ELECTRICAL PERMIT AND ANY OTHER REQUIRED LOCAL OR STATE PERMITS**

## **150 KW PROPANE GENERATOR SYSTEM**

### **2. GENERAL**

#### **1.1. DESCRIPTION OF SYSTEM**

**1.1.1. PROVIDE A STANDBY POWER SYSTEM FOR A HOSPITAL TO SUPPLY ELECTRICAL POWER IN EVENT OF FAILURE OF NORMAL SUPPLY, CONSISTING OF A LIQUID COOLED ENGINE, AN AC ALTERNATOR AND SYSTEM CONTROLS WITH ALL NECESSARY ACCESSORIES FOR A COMPLETE OPERATING SYSTEM, INCLUDING BUT NOT LIMITED TO THE ITEMS AS SPECIFIED HEREINAFTER.**

#### **1.2. REQUIREMENTS OF REGULATORY AGENCIES**

**1.2.1. AN ELECTRIC GENERATING SYSTEM, CONSISTING OF A PRIME MOVER, GENERATOR, GOVERNOR, COUPLING AND ALL CONTROLS, MUST HAVE BEEN TESTED, AS A COMPLETE UNIT, ON A REPRESENTATIVE ENGINEERING PROTOTYPE MODEL OF THE EQUIPMENT TO BE SOLD.**

**1.2.2. THE GENERATOR SET MUST CONFORM TO APPLICABLE NATIONAL ELECTRICAL CODE AND APPLICABLE INSPECTION AUTHORITIES.**

**1.2.3. THE GENERATOR SET MUST BE AVAILABLE WITH THE UNDERWRITERS LABORATORIES LISTING UL 2200 AS A STATIONARY ENGINE GENERATOR ASSEMBLY.**

**1.2.2. THE GENERATOR SYSTEM MUST CONFORM TO APPLICABLE NFPA 110, LEVEL 1 STANDARDS FOR HOSPITAL APPLICATION.**

#### **1.3. MANUFACTURER QUALIFICATIONS**

**1.3.1. THIS SYSTEM SHALL BE GENERAC POWER SYSTEMS® SUPPLIED BY T.W. ENTERPRISES, INC. OR AN APPROVED EQUAL WHO HAS BEEN REGULARLY ENGAGED IN THE PRODUCTION OF ENGINE-ALTERNATOR SETS, AUTOMATIC TRANSFER SWITCHES, AND ASSOCIATED CONTROLS FOR A MINIMUM OF TWENTY YEARS, THEREBY IDENTIFYING ONE SOURCE OF SUPPLY AND RESPONSIBILITY.**

**1.3.2. TO BE CLASSIFIED AS A MANUFACTURER, THE BUILDER OF THE GENERATOR SET MUST MANUFACTURE, AT MINIMUM, ENGINES OR ALTERNATORS.**

**1.3.3. THE MANUFACTURER SHALL HAVE PRINTED LITERATURE AND BROCHURES DESCRIBING THE STANDARD SERIES SPECIFIED, NOT A ONE OF A KIND FABRICATION.**

### **3. ENGINE-GENERATOR SET**

#### **3.1. ENGINE**

**3.1.1. THE PRIME MOVER SHALL BE A LIQUID COOLED, PROPANE GAS FUELED, TURBOCHARGED AFTERCOOLED ENGINE OF 4-CYCLE DESIGN. IT WILL HAVE 10 CYLINDERS WITH A MINIMUM DISPLACEMENT OF 6.8 L LITERS (415 CUBIC INCHES), WITH A MINIMUM RATING OF 224 BHP. A MINIMUM RATED OUTPUT OF 150 KW IS REQUIRED.**

**3.1.2. THE ENGINE IS TO BE COOLED WITH A UNIT MOUNTED RADIATOR, FAN, WATER PUMP, AND CLOSED COOLANT RECOVERY SYSTEM PROVIDING VISUAL DIAGNOSTIC MEANS TO DETERMINE IF THE SYSTEM IS OPERATING WITH A NORMAL ENGINE COOLANT LEVEL. THE RADIATOR SHALL BE DESIGNED FOR OPERATION IN 110 DEGREES F, 43 DEGREES C AMBIENT TEMPERATURE.**

**3.1.3. THE INTAKE AIR FILTER(S) WITH REPLACEABLE ELEMENT MUST BE MOUNTED ON THE UNIT. FULL PRESSURE LUBRICATION SHALL BE SUPPLIED BY A POSITIVE DISPLACEMENT LUBE OIL PUMP. THE ENGINE SHALL HAVE A REPLACEABLE OIL FILTER(S) WITH INTERNAL BYPASS AND REPLACEABLE ELEMENT(S). ENGINE COOLANT AND OIL DRAIN EXTENSIONS, EQUIPPED WITH PIPE PLUGS, MUST BE PROVIDED TO OUTSIDE OF THE MOUNTING BASE FOR CLEANER AND MORE CONVENIENT ENGINE SERVICING. A FAN GUARD MUST BE INSTALLED FOR PERSONNEL SAFETY.**

**3.1.4. THE ENGINE SHALL HAVE A BATTERY CHARGING DC ALTERNATOR WITH A TRANSISTORIZED VOLTAGE REGULATOR. REMOTE 2-WIRE STARTING SHALL BE BY A SOLENOID SHIFT, ELECTRIC STARTER.**

**3.1.5. ENGINE SPEED SHALL BE CONTROLLED BY ISOCHRONOUS GOVERNOR TO MAINTAIN ALTERNATOR FREQUENCY WITHIN 0.5% FROM NO LOAD TO FULL LOAD ALTERNATOR OUTPUT. STEADY STATE REGULATION IS TO BE 0.25%.**

**3.1.6. THE ENGINE FUEL SYSTEM SHALL BE DESIGNED FOR PRIMARY OPERATION ON PROPANE VAPOR GAS. A CARBURETOR, VAPORIZER, SECONDARY REGULATOR, FUEL LOCK-OFF SOLENOID AND ALL PIPING MUST BE INSTALLED AT THE POINT OF MANUFACTURING, TERMINATING AT A SINGLE PIPE OPENING EXTERNAL TO THE MOUNTING BASE. INCLUDE A FLEXIBLE CONNECTION FROM GENERATOR FRAME FOR CONNECTION TO THE PROPANE SUPPLY.**

**3.1.7. THE ENGINE SHALL HAVE (A) UNIT MOUNTED, THERMOSTATICALLY CONTROLLED WATER JACKET HEATER(S) TO AID IN QUICK STARTING. THE WATTAGE SHALL BE AS RECOMMENDED BY THE MANUFACTURER. THE CONTRACTOR SHALL PROVIDE PROPER BRANCH CIRCUIT FROM NORMAL UTILITY POWER SOURCE.**

**3.1.8. SENSING ELEMENTS TO BE LOCATED ON THE ENGINE FOR LOW OIL PRESSURE SHUTDOWN, HIGH COOLANT TEMPERATURE SHUTDOWN, LOW COOLANT LEVEL SHUTDOWN, OVERSPEED SHUTDOWN AND OVERCRANK SHUTDOWN. THESE SENSORS ARE TO BE CONNECTED TO THE CONTROL PANEL USING A WIRING HARNESS WITH THE FOLLOWING FEATURES: WIRE NUMBER LABELING ON EACH END OF THE WIRE RUN FOR EASY IDENTIFICATION, A MOLDED RUBBER BOOT TO COVER THE ELECTRICAL CONNECTION ON EACH SENSOR TO PREVENT CORROSION AND ALL WIRING TO BE RUN IN FLEXIBLE CONDUIT FOR PROTECTION FROM THE ENVIRONMENT AND ANY MOVING OBJECTS.**

**3.1.9. PROVIDE THE FOLLOWING ITEMS INSTALLED AT THE FACTORY:**

**3.1.9.1. THE MANUFACTURER SHALL SUPPLY ITS RECOMMENDED STAINLESS STEEL, FLEXIBLE CONNECTOR TO COUPLE THE ENGINE EXHAUST MANIFOLD TO THE EXHAUST SYSTEM.**

**3.1.10. THE FOLLOWING EQUIPMENT IS TO BE PROVIDED BY THE ENGINE-GENERATOR SET MANUFACTURER AND SHIPPED LOOSE WITH THE UNIT:**

## **3.2. ALTERNATOR**

**3.2.1. THE ALTERNATOR SHALL BE A 4 POLE REVOLVING FIELD TYPE, 12 LEAD, WIRED FOR 120/208 VAC 3 PHASE, 60 HZ, RATED AT 150 KW WITH A PERMANENT MAGNET DRIVEN EXCITER OPERATING AT A SPEED OF 1800 RPM. PHOTOSENSITIVE COMPONENTS WILL NOT BE PERMITTED IN THE ROTATING EXCITER. THE STATOR SHALL BE DIRECT CONNECTED TO THE ENGINE TO INSURE PERMANENT ALIGNMENT. THE GENERATOR SHALL MEET TEMPERATURE RISE STANDARDS FOR CLASS "H" INSULATION, OPERATE WITHIN CLASS "F" STANDARDS FOR EXTENDED LIFE. ALL LEADS MUST BE EXTENDED INTO AN AC CONNECTION PANEL. THE ALTERNATOR SHALL BE PROTECTED BY INTERNAL THERMAL OVERLOAD PROTECTION AND AN AUTOMATIC RESET FIELD CIRCUIT BREAKER.**

**3.2.2. ONE STEP LOAD ACCEPTANCE SHALL BE 100% OF ENGINE-GENERATOR SET NAMEPLATE RATING AND MEET THE REQUIREMENTS OF NFPA 110 PARAGRAPH 5-13.2.6. GENERATOR SHALL BE EQUIPPED WITH A PERMANENT MAGNET EXCITER.**

**3.2.3. A SOLID STATE VOLTAGE REGULATOR DESIGNED AND BUILT BY THE ALTERNATOR MANUFACTURER MUST BE USED TO CONTROL OUTPUT VOLTAGE BY VARYING THE EXCITER MAGNETIC FIELD TO PROVIDE + OR - 1% REGULATION DURING STABLE LOAD CONDITIONS. SHOULD AN EXTREMELY HEAVY LOAD DROP THE OUTPUT FREQUENCY, THE REGULATOR SHALL HAVE A VOLTAGE DROOP OF 4 VOLTS/HERTZ TO MAXIMIZE MOTOR STARTING CAPABILITY. THE FREQUENCY AT WHICH THIS DROOP OPERATION BEGINS MUST BE ADJUSTABLE, ALLOWING THE GENERATOR SET TO BE PROPERLY MATCHED TO THE LOAD CHARACTERISTICS INSURING OPTIMUM SYSTEM PERFORMANCE. ADDITIONAL RHEOSTATS FOR MATCHING GENERATOR VOLTAGE, DROOP, AND STABILITY CHARACTERISTICS TO THE SPECIFIC LOAD CONDITIONS MUST BE AVAILABLE.**

**3.2.4. THE VOLTAGE REGULATOR MUST CONTAIN A LIMITING CIRCUIT TO PREVENT OUTPUT VOLTAGE SURGES IN EXCESS OF 125% OF RATED VOLTAGE DURING GENERATOR SET OPERATION. ON LOSS OR NEAR LOSS OF THE VOLTAGE SENSING SIGNAL, THE VOLTAGE REGULATOR MUST BE CAPABLE OF SHUTTING DOWN TO PREVENT AN OVERVOLTAGE CONDITION FROM OCCURRING. IT MUST HAVE A SECOND MODE OF OPERATION ALLOWING 300% OF RATED CURRENT TO FLOW THROUGH THE ELECTRICAL DISTRIBUTION CIRCUIT(S) FOR TEN (10) SECONDS UNDER THE SAME CONDITIONS. VOLTAGE REGULATORS NOT CAPABLE OF SELECTING EITHER MODE OF OPERATION ARE NOT ACCEPTABLE. LED INDICATION WILL BE PROVIDED ON THE REGULATOR TO MONITOR THE SENSING (YELLOW), EXCITATION (GREEN), AND OUTPUT CIRCUIT (RED).**

**3.2.5. A NEMA 1 PANEL THAT IS AN INTEGRAL PART OF THE GENERATOR SET MUST BE PROVIDED TO ALLOW THE INSTALLER A CONVENIENT LOCATION IN WHICH TO MAKE ELECTRICAL OUTPUT CONNECTIONS. AN FULLY RATED, ISOLATED NEUTRAL MUST BE INCLUDED BY THE GENERATOR SET MANUFACTURER TO INSURE PROPER SIZING.**

**3.2.6. THE ELECTRIC PLANT SHALL BE MOUNTED WITH VIBRATION ISOLATORS ON A WELDED STEEL BASE THAT SHALL PERMIT SUITABLE MOUNTING TO ANY LEVEL SURFACE.**

**3.2.7. PROVIDE THE FOLLOWING ITEMS INSTALLED AT THE FACTORY:**

**3.2.7.1. COURT HOUSE FEED BREAKER. A MAIN LINE CIRCUIT BREAKER CARRYING THE UL MARK SHALL BE FACTORY INSTALLED. THE BREAKER SHALL BE RATED 400 AMPS, 80% THERMAL MAG PER THE MANUFACTURER'S RECOMMENDATIONS MOUNTED IN THE GENSET CONNECTION BOX . THE LINE SIDE CONNECTIONS ARE TO BE MADE AT THE FACTORY. OUTPUT LUGS SHALL BE PROVIDED FOR LOAD SIDE CONNECTIONS.**

**3.2.7.1 HOSPITAL FEED BREAKER. A MAIN LINE CIRCUIT BREAKER CARRYING THE UL MARK SHALL BE FACTORY INSTALLED. THE BREAKER SHALL BE RATED 400 AMPS, 100% ELECTRONIC FEED, LSI MOUNTED IN THE GENSET CONNECTION BOX . THE LINE SIDE CONNECTIONS ARE TO BE MADE AT THE FACTORY. OUTPUT LUGS SHALL BE PROVIDED FOR LOAD SIDE CONNECTIONS.**

### **3.3. CONTROLS**

**3.3.1. ALL ENGINE ALTERNATOR CONTROLS AND INSTRUMENTATION SHALL BE DESIGNED, BUILT, WIRED, TESTED AND SHOCK MOUNTED IN A NEMA 1 ENCLOSURE TO THE ENGINE-GENERATOR SET BY THE MANUFACTURER. IT SHALL CONTAIN PANEL LIGHTING, A FUSED DC CIRCUIT TO PROTECT THE CONTROLS AND A +/-5% VOLTAGE ADJUSTING CONTROL. THIS PANEL MUST BE ABLE TO BE ROTATED 90 DEGREES IN EITHER DIRECTION FOR CORRECT INSTALLATION.**

**3.3.2. THE ENGINE-GENERATOR SET SHALL CONTAIN A COMPLETE 2 WIRE AUTOMATIC ENGINE START-STOP CONTROL WHICH STARTS THE ENGINE ON CLOSING CONTACTS AND STOP THE ENGINE ON OPENING CONTACTS. A PROGRAMMABLE CYCLIC CRANKING LIMITER SHALL BE PROVIDED TO OPEN THE STARTING CIRCUIT AFTER EIGHT ATTEMPTS IF THE ENGINE HAS NOT STARTED WITHIN THAT TIME. ENGINE CONTROL MODULES MUST BE SOLID STATE PLUG-IN TYPE FOR HIGH RELIABILITY AND EASY SERVICE.**

**3.3.3. THE PANEL SHALL INCLUDE; ANALOG METERS TO MONITOR AC VOLTAGE, AC CURRENT AND AC FREQUENCY WITH A PHASE SELECTOR SWITCH, AN EMERGENCY STOP SWITCH, AN AUDIBLE ALARM, BATTERY CHARGER FUSE, AND A PROGRAMMABLE ENGINE CONTROL AND MONITORING MODULE.**

**3.3.4. THE PROGRAMMABLE MODULE SHALL INCLUDE: A MANUAL, OFF, AUTO SWITCH; FOUR LEDs TO INDICATE 1) NOT IN AUTO, 2) ALARM ACTIVE, 3) GENERATOR RUNNING, 4) GENERATOR READY; A DATA ENTRY KEYPAD AND A DIGITAL DISPLAY PANEL.**

**3.3.5. THE MODULE WILL DISPLAY ALL PERTINENT UNIT PARAMETERS INCLUDING:**

**1. GENERATOR STATUS**

**CURRENT UNIT STATUS IN REAL TIME**

**2. INSTRUMENTATION**

**REAL TIME READOUTS OF THE ENGINE AND ALTERNATOR ANALOG VALUES**

- \* OIL PRESSURE**
- \* COOLANT TEMPERATURE**
- \* FUEL LEVEL (WHERE APPLICABLE)**
- \* DC BATTERY VOLTAGE**
- \* RUN TIME HOURS**

**3. GENERATOR COMMANDS**

**CURRENT ENGINE START/STOP STATUS**

**4. ALARM STATUS**

**CURRENT ALARM(S) CONDITION**

- \* HIGH OR LOW AC VOLTAGE**
- \* HIGH OR LOW BATTERY VOLTAGE**
- \* HIGH OR LOW FREQUENCY**
- \* LOW OR PRE-LOW OIL PRESSURE**
- \* LOW WATER LEVEL**
- \* LOW WATER TEMPERATURE**
- \* HIGH AND PRE-HIGH ENGINE TEMPERATURE**
- \* HIGH, LOW AND CRITICAL LOW FUEL LEVELS (WHERE APPLICABLE)**
- \* OVERCRANK**
- \* OVERSPEED**
- \* UNIT NOT IN "AUTOMATIC MODE"**
- \*8 USER PROGRAMMABLE DIGITAL CHANNELS**
- \*4 USER PROGRAMMABLE ANALOG CHANNELS**

**5. ALARM LOG**

**MEMORY OF LAST FIFTY ALARM EVENTS**

**6. OPERATING PARAMETERS**

**ACCESS TO AND MANIPULATION OF THE CURRENT OPERATING PARAMETERS AND**

**ALARM LIMITS**

**7. SOFTWARE INFORMATION**

**VERSION INFORMATION AND MODULE DISPLAY TEST FUNCTION**

**3.3.6. THE PANEL MUST BE ACCESSIBLE BY PC BASED SOFTWARE VIA EITHER STANDARD RS232, RS485 OR MODEM. THE SOFTWARE MUST DISPLAY THE MODULE FACE, BE UPDATED IN REAL TIME AND ALLOW FOR COMPLETE ACCESS TO ALL APPLICABLE MODULE FUNCTIONS. COMMUNICATION OUTPUT AND ITS SOFTWARE MUST BE FULLY COMPATIBLE AND ALLOW FOR INCORPORATION INTO AN EXISTING CONTROL PROGRAM.**

**3.3.7. THE FOLLOWING EQUIPMENT IS TO BE INSTALLED AT THE ENGINE-GENERATOR SET MANUFACTURER'S FACILITY:**

**3.3.8. THE FOLLOWING EQUIPMENT IS TO BE PROVIDED BY THE ENGINE-GENERATOR SET MANUFACTURER AND SHIPPED LOOSE WITH THE UNIT:**

**4. ADDITIONAL UNIT REQUIREMENTS**

**4.1. UNIT ACCESSORIES**

**4.1.1. THE FOLLOWING EQUIPMENT IS TO BE INSTALLED AT THE ENGINE-GENERATOR SET**

**MANUFACTURER'S FACILITY:**

**4.1.1.1. MODEL 2000 SOUND LEVEL 2 SOUND ATTENUATED WEATHER PROTECTIVE ENCLOSURE:** THE ENGINE-GENERATOR SET SHALL BE FACTORY ENCLOSED IN A 14 GAUGE STEEL ENCLOSURE CONSTRUCTED WITH CORNER POSTS, UPRIGHTS AND HEADERS. SOUND REDUCTION SHALL BE TO A 73 DB RATING AT 23 FT AVERAGE RATING FROM 4 SIDE MEASUREMENT. MEASUREMENT SHALL BE WITH THE GENERATOR ON A FLAT SURFACE. THE ROOF SHALL BE MADE OF ALUMINUM, AID IN THE RUNOFF OF WATER AND INCLUDE A DRIP EDGE. THE ENCLOSURE SHALL BE COATED WITH ELECTRO-STATICALLY APPLIED POWDER-COATED PAINT, BAKED AND FINISHED TO MANUFACTURER'S SPECIFICATIONS. THE COLOR WILL BE GRAY STANDARD. THE ENCLOSURE SHALL BE COMPLETELY LINED WITH 1" THICK, UL 94 HF-1 LISTED, SOUND DEADENING MATERIAL. THIS MATERIAL MUST BE OF A SELF EXTINGUISHING DESIGN. THE ENCLOSURE IS TO HAVE LARGE, HINGED, REMOVABLE DOORS TO ALLOW ACCESS TO THE ENGINE, ALTERNATOR AND CONTROL PANEL. THE HINGES SHALL ALLOW FOR DOOR FIT ADJUSTMENT. HINGES AND ALL EXPOSED FASTENERS WILL BE STAINLESS STEEL OR JS5000. THE USE OF POP-RIVETS WEAKENS THE PAINT SYSTEM AND SHALL NOT BE ALLOWED ON EXTERNAL PAINTED SURFACES. EACH DOOR WILL HAVE LOCKABLE HARDWARE WITH IDENTICAL KEYS. PADLOCKS DO NOT MEET THIS SPECIFICATION.

THE ENCLOSURE SHALL INCLUDE AN AIR DISCHARGE HOOD THAT PROTECTS THE RADIATOR CORE AND DIRECTS THE HOT DISCHARGE AIR UPWARD PREVENTING RE-CIRCULATING HOT AIR.

THE ENCLOSURE SHALL HAVE A MOTORIZED INTAKE AND A GRAVITY DISCHARGE DAMPER TO COMPLETELY CLOSE THE ENCLOSURE WHILE NOT RUNNING. MOTORIZED DAMPER SHALL BE SPRING OPEN AND POWER CLOSE TYPE

THE ENCLOSURE SHALL HAVE A SPACE HEATER INSTALLED TO MEET NFPA 110 LEVEL 1 HOSPITAL TEMPERATURE REQUIREMENTS FOR ENCLOSED GENERATOR SYSTEMS.

THE EXHAUST SILENCER(S) SHALL BE PROVIDED OF THE SIZE AS RECOMMENDED BY THE MANUFACTURER AND SHALL BE OF CRITICAL GRADE. THE SILENCER(S) SHALL BE MOUNTED WITHIN THE WEATHER PROTECTIVE ENCLOSURE FOR REDUCED EXHAUST NOISE AND PROVIDE A CLEAN, SMOOTH EXTERIOR DESIGN. IT SHALL BE CONNECTED TO THE ENGINE WITH A FLEXIBLE, SEAMLESS, STAINLESS STEEL EXHAUST CONNECTION. A RAIN CAP WILL TERMINATE THE EXHAUST PIPE. ALL COMPONENTS MUST BE PROPERLY SIZED TO ASSURE OPERATION WITHOUT EXCESSIVE BACK PRESSURE WHEN INSTALLED.

**4.1.1.2.** A HEAVY DUTY, LEAD ACID BATTERY, 110 AH, GROUP 31, 925 CCA, SHALL BE INSTALLED BY THE GENERATOR SET MANUFACTURER. PROVIDE ALL INTERCELL AND CONNECTING BATTERY CABLES AS REQUIRED.

**4.1.1.3.** PROVIDE AN AUTOMATIC DUAL RATE BATTERY CHARGER MANUFACTURED BY THE ENGINE-GENERATOR SET SUPPLIER. THE AUTOMATIC EQUALIZER SYSTEM SHALL MONITOR AND LIMIT THE CHARGE CURRENT TO 10 AMPS. THE OUTPUT VOLTAGE IS TO BE DETERMINED BY THE CHARGE CURRENT RATE. THE CHARGER MUST BE PROTECTED AGAINST A REVERSE POLARITY CONNECTION. THE BATTERY CHARGER IS TO BE FACTORY INSTALLED ON THE GENERATOR SET. DUE TO LINE VOLTAGE DROP CONCERNS, A BATTERY CHARGER MOUNTED IN THE TRANSFER SWITCH WILL BE UNACCEPTABLE.

**4.1.1.4.** PROVIDE AN ALARM ANNUNCIATOR PANEL FOR REMOTE SURFACE MOUNTING WITH THE FOLLOWING SIGNALS INDICATING STATUS AND POSSIBLE MALFUNCTION. THE ANNUNCIATOR MUST HAVE THE CAPABILITY OF PROGRAMMING THE AUDIBLE ALARMS AS FOLLOWS:

<b>LAMP LEGEND</b>	<b>LIGHT</b>	<b>AUDIBLE</b>
PRE-ALARM HIGH WATER TEMPERATURE	YELLOW	SELECTABLE
PRE-ALARM LOW OIL PRESSURE	YELLOW	SELECTABLE
HIGH COOLANT TEMP/LOW COOLANT LEVEL	RED	YES
LOW OIL PRESSURE	RED	YES
LOW COOLANT TEMPERATURE	YELLOW	SELECTABLE
LOW FUEL	YELLOW	SELECTABLE
HIGH BATTERY VOLTAGE	YELLOW	No
NOT IN AUTO	RED	YES
RPM SENSOR LOSS	RED	YES

OVER SPEED	RED	YES
LOW BATTERY VOLTAGE	YELLOW	YES
OVERCRANK	RED	YES
GENERATOR POWER	YELLOW	No
NORMAL UTILITY POWER	GREEN	No
SYSTEM READY	GREEN	No
ALARM SWITCH OFF	RED	No
GENERATOR RUNNING	YELLOW	No
BATTERY CHARGER FAILURE	YELLOW	SELECTABLE
EMERGENCY STOP	RED	YES
COMMUNICATIONS OK	GREEN	YES

THE PANEL SHALL HAVE AN **ALARM** SWITCH THAT WHEN MOVED TO THE **OFF** POSITION SILENCES THE AUDIBLE ALARM. A **TEST/RESET** SWITCH MUST BE INCLUDED TO VERIFY THE LIGHTS ARE FUNCTIONAL AND RESET ANY CONDITION AFTER IT HAS CLEARED. THE REMOTE ANNUNCIATOR SHALL HAVE A FACTORY INSTALLED SWITCH WITH THE CAPABILITY OF STARTING, AND STOPPING THE STANDBY GENERATOR SET FROM THE ANNUNCIATOR PANEL.

## 5. AUTOMATIC TRANSFER SWITCHES

- (1) COURTHOUSE TRANSFER SWITCH. 400 AMPS
- (1) HOSPITAL TRANSFER SWITCH. 400 AMPS

### 5.1. GENERAL

5.1.1. THE AUTOMATIC TRANSFER SWITCH SHALL BE FURNISHED BY THE MANUFACTURER OF THE ENGINE-GENERATOR SET SO AS TO MAINTAIN SYSTEM COMPATIBILITY AND LOCAL SERVICE AND WARRANTY RESPONSIBILITY FOR THE COMPLETE EMERGENCY POWER SYSTEM. THE TRANSFER SWITCH SHALL INCLUDE A SERVICE DISCONNECT AS PART OF THE DESIGN TO BREAK UTILITY SERVICE INTO THE BUILDING. IT SHALL BE LISTED BY UNDERWRITER'S LABORATORY, STANDARD 1008 WITH CIRCUIT BREAKER PROTECTION. REPRESENTATIVE PRODUCTION SAMPLES OF THE TRANSFER SWITCH SUPPLIED SHALL HAVE DEMONSTRATED THROUGH TESTS THE ABILITY TO WITHSTAND AT LEAST 10,000 MECHANICAL OPERATION CYCLES. ONE OPERATION CYCLE IS THE ELECTRICALLY OPERATED TRANSFER FROM NORMAL TO EMERGENCY AND BACK TO NORMAL. WIRING MUST COMPLY WITH NEC TABLE 373-6(B). THE MANUFACTURER SHALL FURNISH SCHEMATIC AND WIRING DIAGRAMS FOR THE PARTICULAR AUTOMATIC TRANSFER SWITCH AND A TYPICAL WIRING DIAGRAM FOR THE ENTIRE SYSTEM.

### 5.2. RATINGS & PERFORMANCE

5.2.1. THE AUTOMATIC TRANSFER SWITCH SHALL BE A 3 POLE DESIGN RATED FOR 400 AMPS CONTINUOUS OPERATION IN AMBIENT TEMPERATURES OF -20 DEGREES FAHRENHEIT (-30 DEGREES CELSIUS) TO +140 DEGREES FAHRENHEIT (+60 DEGREES CELSIUS). MAIN POWER SWITCH CONTACTS SHALL BE RATED FOR 600 V AC MINIMUM. THE TRANSFER SWITCH SUPPLIED SHALL HAVE A MINIMUM WITHSTAND AND CLOSING RATING WHEN FUSE PROTECTED OF 200,000 AMPERES. WHERE THE LINE SIDE OVERCURRENT PROTECTION IS PROVIDED BY CIRCUIT BREAKERS, THE SHORT CIRCUIT WITHSTAND AND CLOSING RATINGS SHALL BE 65,000 AMPERES RMS. THESE RMS SYMMETRICAL FAULT CURRENT RATINGS SHALL BE THE RATING LISTED IN THE UL LISTING OR COMPONENT RECOGNITION PROCEDURES FOR THE TRANSFER SWITCH. ALL WITHSTAND TESTS SHALL BE PERFORMED WITH THE OVERCURRENT PROTECTIVE DEVICES LOCATED EXTERNAL TO THE TRANSFER SWITCH.

### 5.3. CONSTRUCTION

5.3.1. THE TRANSFER SWITCH SHALL BE DOUBLE THROW CONSTRUCTION, POSITIVELY ELECTRICALLY AND MECHANICALLY INTERLOCKED TO PREVENT SIMULTANEOUS CLOSING AND MECHANICALLY HELD IN BOTH NORMAL AND EMERGENCY POSITIONS. INDEPENDENT BREAK BEFORE MAKE ACTION SHALL BE USED TO POSITIVELY PREVENT DANGEROUS SOURCE TO SOURCE CONNECTIONS. WHEN SWITCHING THE NEUTRAL, THIS ACTION PREVENTS THE OBJECTIONABLE GROUND CURRENTS AND NUISANCE GROUND FAULT TRIPPING THAT CAN

RESULT FROM OVERLAPPING DESIGNS. THE TRANSFER SWITCH SHALL BE APPROVED FOR MANUAL OPERATION. THE ELECTRICAL OPERATING MEANS SHALL BE BY ELECTRIC SOLENOID. EVERY PORTION OF THE CONTACTOR IS TO BE POSITIVELY MECHANICALLY CONNECTED. NO CLUTCH OR FRICTION DRIVE MECHANISM IS ALLOWED, AND PARTS ARE TO BE KEPT TO A MINIMUM. THIS TRANSFER SWITCH SHALL NOT CONTAIN INTEGRAL OVERCURRENT DEVICES IN THE MAIN POWER CIRCUIT, INCLUDING MOLDED CASE CIRCUIT BREAKERS OR FUSES.

**4.3.2.** THE TRANSFER SWITCH ELECTRICAL ACTUATOR SHALL HAVE AN INDEPENDENT DISCONNECT MEANS TO DISABLE THE ELECTRICAL OPERATION DURING MANUAL SWITCHING. MAXIMUM ELECTRICAL TRANSFER TIME IN EITHER DIRECTION SHALL BE 160 MILLISECONDS, EXCLUSIVE OF TIME DELAYS. MAIN SWITCH CONTACTS SHALL BE HIGH PRESSURE SILVER ALLOY WITH ARC CHUTES AND SEPARATE ARCING CONTACTS TO RESIST BURNING AND PITTING FOR LONG LIFE OPERATION.

## **5.4. CONTROLS**

**5.4.1.** ALL CONTROL EQUIPMENT SHALL BE MOUNTED ON THE INSIDE OF THE CABINET DOOR IN A METAL LOCKABLE ENCLOSURE WITH TRANSPARENT SAFETY SHIELD TO PROTECT ALL SOLID STATE CIRCUIT BOARDS. THIS WILL ALLOW FOR EASE OF SERVICE ACCESS WHEN MAIN CABINET LOCKABLE DOOR IS OPEN, BUT TO PREVENT ACCESS BY UNAUTHORIZED PERSONNEL. CONTROL BOARDS SHALL HAVE INSTALLED COVER PLATES TO AVOID SHOCK HAZARD WHILE MAKING CONTROL ADJUSTMENTS. THE SOLID STATE VOLTAGE SENSORS AND TIME DELAY MODULES SHALL BE PLUG-IN CIRCUIT BOARDS WITH SILVER OR GOLD CONTACTS FOR EASE OF SERVICE.

**5.4.2.** A SOLID STATE UNDERVOLTAGE SENSOR SHALL MONITOR ALL PHASES OF THE NORMAL SOURCE AND PROVIDE ADJUSTABLE RANGES FOR FIELD ADJUSTMENTS FOR SPECIFIC APPLICATION NEEDS. PICK-UP AND DROP-OUT SETTINGS SHALL BE ADJUSTABLE FROM A MINIMUM OF 70% TO A MAXIMUM OF 95% OF NOMINAL VOLTAGE. A UTILITY SENSING INTERFACE SHALL BE USED, STEPPING DOWN SYSTEM VOLTAGE OF 120/208 VAC 3 PHASE TO 24VAC, HELPING TO PROTECT THE PRINTED CIRCUIT BOARD FROM VOLTAGE SPIKES AND INCREASING PERSONNEL SAFETY WHEN TROUBLESHOOTING.

**5.4.3.** SIGNAL THE ENGINE-GENERATOR SET TO START IN THE EVENT OF A POWER INTERRUPTION. A SET OF CONTACTS SHALL CLOSE TO START THE ENGINE AND OPEN FOR ENGINE SHUTDOWN. A SOLID STATE TIME DELAY START, ADJUSTABLE, .1 TO 10 SECONDS, SHALL DELAY THIS SIGNAL TO AVOID NUISANCE START-UPS ON MOMENTARY VOLTAGE DIPS OR POWER OUTAGES.

**5.4.4.** TRANSFER THE LOAD TO THE ENGINE-GENERATOR SET AFTER IT REACHED PROPER VOLTAGE, ADJUSTABLE FROM 70-90% OF SYSTEM VOLTAGE, AND FREQUENCY, ADJUSTABLE FROM 80-90% OF SYSTEM FREQUENCY. A SOLID STATE TIME DELAY, ADJUSTABLE FROM 5 SECONDS TO 3 MINUTES, SHALL DELAY THIS TRANSFER TO ALLOW THE ENGINE-GENERATOR TO WARM-UP BEFORE APPLICATION OF LOAD. THERE SHALL BE A SWITCH TO BYPASS THIS WARM-UP TIMER WHEN IMMEDIATE TRANSFER IS REQUIRED.

**5.4.5.** RETRANSFER THE LOAD TO THE LINE AFTER NORMAL POWER RESTORATION. A RETURN TO UTILITY TIMER, ADJUSTABLE FROM 1-30 MINUTES, SHALL DELAY THIS TRANSFER TO AVOID SHORT TERM NORMAL POWER RESTORATION.

**5.4.6.** THE OPERATING POWER FOR TRANSFER AND RETRANSFER SHALL BE OBTAINED FROM THE SOURCE TO WHICH THE LOAD IS BEING TRANSFERRED. CONTROLS SHALL PROVIDE AN AUTOMATIC RETRANSFER OF THE LOAD FROM EMERGENCY TO NORMAL IF THE EMERGENCY SOURCE FAILS WITH THE NORMAL SOURCE AVAILABLE.

**5.4.7.** SIGNAL THE ENGINE-GENERATOR TO STOP AFTER THE LOAD RETRANSFERS TO NORMAL. A SOLID STATE ENGINE COOLDOWN TIMER, ADJUSTABLE FROM 1-30 MINUTES, SHALL PERMIT THE ENGINE TO RUN UNLOADED TO COOLDOWN BEFORE SHUTDOWN. SHOULD THE UTILITY POWER FAIL DURING THIS TIME, THE SWITCH WILL IMMEDIATELY TRANSFER BACK TO THE GENERATOR.

**5.4.8.** PROVIDE AN ENGINE MINIMUM RUN TIMER, ADJUSTABLE FROM 5-30 MINUTES, TO ENSURE AN ADEQUATE ENGINE RUN PERIOD.

**5.4.9. PROVIDE A SOLID STATE PLANT EXERCISE CLOCK. IT MUST ALLOW SELECTION OF ANY COMBINATION OF DAYS OF THE WEEK AND THE TIME OF DAY FOR THE GENERATOR SET EXERCISE PERIOD. CLOCK SHALL HAVE A ONE WEEK CYCLE AND BE POWERED BY THE LOAD SIDE OF THE TRANSFER SWITCH. A BATTERY MUST BE SUPPLIED TO MAINTAIN THE CIRCUIT BOARD CLOCK OPERATION WHEN THE LOAD SIDE OF THE TRANSFER SWITCH IS DE-ENERGIZED. INCLUDE A SWITCH TO SELECT IF THE LOAD WILL TRANSFER TO THE ENGINE-GENERATOR SET DURING THE EXERCISE PERIOD.**

**5.4.10. THE TRANSFER SWITCH SHALL HAVE A TIME DELAY NEUTRAL FEATURE TO PROVIDE A TIME DELAY, ADJUSTABLE FROM .1-10 SECONDS, DURING THE TRANSFER IN EITHER DIRECTION, DURING WHICH TIME THE LOAD IS ISOLATED FROM BOTH POWER SOURCES. THIS ALLOWS RESIDUAL VOLTAGE COMPONENTS OF MOTORS OR OTHER INDUCTIVE LOADS (SUCH AS TRANSFORMERS) TO DECAY BEFORE COMPLETING THE SWITCHING CYCLE. A SWITCH WILL BE PROVIDED TO BYPASS ALL TRANSITION FEATURES WHEN IMMEDIATE TRANSFER IS REQUIRED.**

**5.4.11. THE TRANSFER SWITCH SHALL HAVE AN INPHASE MONITOR WHICH ALLOWS THE SWITCH TO TRANSFER BETWEEN LIVE SOURCES IF THEIR VOLTAGE WAVEFORMS BECOME SYNCHRONOUS WITHIN 20 ELECTRICAL DEGREES WITHIN 10 SECONDS OF TRANSFER INITIATION SIGNAL. A SWITCH MUST BE PROVIDED TO BYPASS THIS FEATURE IF NOT REQUIRED.**

**5.4.12. IF THE INPHASE MONITOR WILL NOT ALLOW SUCH A TRANSFER, THE CONTROL MUST DEFAULT TO TIME DELAY NEUTRAL OPERATION. SWITCHES WITH INPHASE MONITORS WHICH DO NOT DEFAULT TO TIME DELAY NEUTRAL OPERATION ARE NOT ACCEPTABLE.**

**5.4.13. FRONT MOUNTED CONTROLS SHALL INCLUDE A SELECTOR SWITCH TO PROVIDE FOR A TEST MODE WITH FULL USE OF TIME DELAYS, AND AUTOMATIC MODE TO SET THE SYSTEM FOR NORMAL OPERATION.**

**5.4.14. PROVIDE BRIGHT LAMPS TO INDICATE THE TRANSFER SWITCH POSITION IN EITHER UTILITY (WHITE) OR EMERGENCY (RED). A THIRD LAMP IS NEEDED TO INDICATE STANDBY OPERATING (AMBER). THESE LIGHTS MUST BE ENERGIZED FROM UTILITY OR THE ENGINE-GENERATOR SET.**

**5.4.15. PROVIDE MANUAL OPERATING HANDLE TO ALLOW FOR MANUAL TRANSFER. THIS HANDLE MUST BE MOUNTED INSIDE THE LOCKABLE ENCLOSURE SO ACCESSIBLE ONLY BY AUTHORIZED PERSONNEL.**

**5.4.16. PROVIDE A SAFETY DISCONNECT SWITCH TO PREVENT LOAD TRANSFER AND AUTOMATIC ENGINE START WHILE PERFORMING MAINTENANCE. THIS SWITCH WILL ALSO BE USED FOR MANUAL TRANSFER SWITCH OPERATION.**

**5.4.17. PROVIDE LED STATUS LIGHTS TO GIVE A VISUAL READOUT OF THE OPERATING SEQUENCE. THIS SHALL INCLUDE UTILITY ON, ENGINE WARM-UP, STANDBY READY, TRANSFER TO STANDBY, INPHASE MONITOR, TIME DELAY NEUTRAL, RETURN TO UTILITY, ENGINE COOLDOWN AND ENGINE MINIMUM RUN. A "SIGNAL BEFORE TRANSFER" LAMP SHALL BE SUPPLIED TO OPERATE FROM OPTIONAL CIRCUITRY.**

**5.4.18.**

## **5.5. MISCELLANEOUS TRANSFER SWITCH EQUIPMENT**

**5.5.1. THE TRANSFER SWITCH MECHANISM AND CONTROLS ARE TO BE MOUNTED IN A NEMA 3R ENCLOSURE.**

**5.5.2. PROVIDE AN ENCLOSURE HEATER, 100 WATTS, WITH THERMOSTAT.**

## **6. ADDITIONAL PROJECT REQUIREMENTS**

### **6.1. APPLIED STANDARDS**

**6.1.1. THE GENERATOR SET(S) MUST BE MANUFACTURED TO THE APPLICABLE SPECIFICATIONS**

ON FILE WITH UNDERWRITERS LABORATORIES AND THE UL 2200 MARK MUST BE AFFIXED.

## **6.2. FACTORY TESTING**

**6.2.1. BEFORE SHIPMENT OF THE EQUIPMENT, THE ENGINE-GENERATOR SET SHALL BE TESTED UNDER RATED LOAD FOR PERFORMANCE AND PROPER FUNCTIONING OF CONTROL AND INTERFACING CIRCUITS. TESTS SHALL INCLUDE:**

**6.2.1.1. VERIFYING ALL SAFETY SHUTDOWNS ARE FUNCTIONING PROPERLY.**

**6.2.1.2. VERIFY SINGLE STEP LOAD PICK-UP PER NFPA 110-1996, PARAGRAPH 5-13.2.6.**

**6.2.1.3. VERIFY TRANSIENT AND VOLTAGE DIP RESPONSES AND STEADY STATE VOLTAGE AND SPEED (FREQUENCY) CHECKS.**

**6.2.1.4. REACTIVE 100% LOAD BANK TEST PER REQUIREMENTS FOR NFPA 110 HOSPITAL REQUIREMENTS.**

## **6.3. OWNER'S MANUALS**

**5.3.1. THREE (3) SETS OF OWNER'S MANUALS SPECIFIC TO THE PRODUCT SUPPLIED MUST ACCOMPANY DELIVERY OF THE EQUIPMENT. GENERAL OPERATING INSTRUCTION, PREVENTIVE MAINTENANCE, WIRING DIAGRAMS, SCHEMATICS AND PARTS EXPLODED VIEWS SPECIFIC TO THIS MODEL MUST BE INCLUDED.**

## **6.4. DELIVERY AND INSTALLATION**

**6.4.1. GENERATOR SYSTEM SUPPLIER SHALL DELIVER THE SYSTEM TO THE JOBSITE AND PLACE THE GENERATOR ON AN OWNER'S SUPPLIED CONCRETE PAD.**

**6.4.2. CONTRACTOR SHALL INSTALL THE COMPLETE ELECTRICAL GENERATING SYSTEM INCLUDING ALL FUEL CONNECTIONS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.**

## **6.5. SERVICE**

**5.5.1. SUPPLIER OF THE ELECTRIC PLANT AND ASSOCIATED ITEMS SHALL HAVE PERMANENT SERVICE FACILITIES IN THIS TRADE AREA. THESE FACILITIES SHALL COMPRISE A PERMANENT FORCE OF FACTORY TRAINED SERVICE PERSONNEL ON 24 HOUR CALL, EXPERIENCED IN SERVICING THIS TYPE OF EQUIPMENT, PROVIDING WARRANTY AND ROUTINE MAINTENANCE SERVICE TO AFFORD THE OWNER MAXIMUM PROTECTION. DELEGATION OF THIS SERVICE RESPONSIBILITY FOR ANY OF THE EQUIPMENT LISTED HEREIN WILL NOT BE CONSIDERED FULFILLMENT OF THESE SPECIFICATIONS. SERVICE CONTRACTS SHALL ALSO BE AVAILABLE.**

## **6.6. WARRANTY**

**5.6.1. THE STANDBY ELECTRIC GENERATING SYSTEM COMPONENTS, COMPLETE ENGINE-GENERATOR AND INSTRUMENTATION PANEL SHALL BE WARRANTED BY THE MANUFACTURER AGAINST DEFECTIVE MATERIALS AND FACTORY WORKMANSHIP FOR A PERIOD OF 60 MONTHS. SUCH DEFECTIVE PARTS SHALL BE REPAIRED OR REPLACED AT THE MANUFACTURER'S OPTION, FREE OF CHARGE. TRAVEL AND LABOR SHALL BE INCLUDED.**

**THE WARRANTY PERIOD SHALL COMMENCE WHEN THE STANDBY POWER SYSTEM IS FIRST PLACED INTO SERVICE. MULTIPLE WARRANTIES FOR INDIVIDUAL COMPONENTS (ENGINE, ALTERNATOR, CONTROLS, ETC.) WILL NOT BE ACCEPTABLE. SATISFACTORY WARRANTY DOCUMENTS MUST BE PROVIDED. ALSO, IN THE JUDGMENT OF THE SPECIFYING AUTHORITY, THE MANUFACTURER SUPPLYING THE WARRANTY FOR THE COMPLETE SYSTEM MUST HAVE THE NECESSARY FINANCIAL STRENGTH AND TECHNICAL EXPERTISE WITH ALL COMPONENTS SUPPLIED TO PROVIDE ADEQUATE WARRANTY SUPPORT. TRANSFER SWITCHES SHALL BE INCLUDED IN THIS WARRANTY**

## **6.7. STARTUP AND CHECKOUT**

**5.7.1. THE SUPPLIER OF THE ELECTRIC GENERATING PLANT AND ASSOCIATED ITEMS COVERED**

HEREIN SHALL PROVIDE FACTORY TRAINED TECHNICIANS TO CHECK OUT THE COMPLETED INSTALLATION AND TO PERFORM AN INITIAL STARTUP INSPECTION TO INCLUDE:

**6.7.1.1. ENSURING THE ENGINE STARTS (BOTH HOT AND COLD) WITHIN THE SPECIFIED TIME.**

**6.7.1.2. VERIFICATION OF ENGINE PARAMETERS WITHIN SPECIFICATION.**

**6.7.1.3. VERIFY NO LOAD FREQUENCY AND VOLTAGE, ADJUSTING IF REQUIRED.**

**6.7.1.4. TEST ALL AUTOMATIC SHUTDOWNS OF THE ENGINE-GENERATOR.**

**6.7.1.5. PERFORM A LOAD TEST PER REQUIREMENTS OF NFPA 110, LEVEL 1 FOR HOSPITAL APPLICATIONS. ENSURE FULL LOAD FREQUENCY AND VOLTAGE ARE WITHIN SPECIFICATION BY USING A PORTABLE LOAD BANK. SYSTEM WILL BE TESTED FOR 1 HOUR AT 50% LOAD, 1 HOUR AT 75% LOAD AND 2 HOURS AT 100% LOAD. SYSTEM DATA WILL BE RECORDED AT 15 SECOND INTERVALS. TEST RESULTS WILL BE SUBMITTED TO OWNER AND A PERMANENT COPY SHALL BE PLACED IN PROJECT FILE.**

## **6.8. SUBMITTALS**

**6.8.1. PROVIDE THREE COMPLETE SETS OF ENGINEERING SUBMITTAL FOR APPROVAL, PRIOR TO PRODUCTION RELEASE, SHOWING ALL COMPONENTS, IN ADDITION TO THE ENGINE AND GENERATOR. SUBMITTALS SHALL INCLUDE COMPLIANCE WITH THESE SPECIFICATIONS.**

## **6.9. SUBSTITUTIONS**

**5.9.1. THE EMERGENCY POWER SYSTEM HAS BEEN DESIGNED TO THE SPECIFIED MANUFACTURER'S ELECTRICAL AND PHYSICAL CHARACTERISTICS. THE EQUIPMENT SIZING, SPACING, AMOUNTS, ELECTRICAL WIRING, VENTILATION EQUIPMENT, FUEL AND EXHAUST COMPONENTS HAVE ALL BEEN SIZED AND DESIGNED AROUND GENERAC POWER SYSTEM'S EQUIPMENT. SHOULD ANY SUBSTITUTIONS BE MADE, THE CONTRACTOR SHALL BEAR RESPONSIBILITY FOR THE INSTALLATION, COORDINATION AND OPERATION OF THE SYSTEM AS WELL AS ANY ENGINEERING AND REDESIGN COSTS WHICH MAY RESULT FROM SUCH SUBSTITUTIONS. ALTERNATE EQUIPMENT SUPPLIERS SHALL FURNISH EQUIPMENT SUBMITTALS 14 DAYS PRIOR TO BID DATE FOR APPROVAL TO BID. AS PART OF THE SUBMITTALS, THE SUBSTITUTE MANUFACTURER SHALL SUPPLY AS A MINIMUM ENGINE, ALTERNATOR AND CONTROL PANEL WIRING DIAGRAMS AND SCHEMATICS. A SEPARATE LIST OF ALL PRINTED CIRCUIT BOARDS WITH PART NUMBERS AND CURRENT PRICING MUST ALSO BE INCLUDED.**

**1-1000 GALLON PROPANE TANK – INSTALLED UNDERGROUND. THE CONTRACTOR IS RESPONSIBLE FOR ABIDING BY ALL STATE AND LOCAL REQUIREMENTS FOR LOCATION AND CONNECTION OF THE PROPANE TANK, INCLUDING A 10 FOOT MINIMUM DISTANCE BETWEEN THE PROPANE TANK AND ALL BUILDINGS AND PROPERTY BOUNDARIES PER STATE REQUIREMENTS.**

**1-CONCRETE PAD FORMED AND POURED IN PLACE WITH #4 REINFORCING BARS ON 16 INCH CENTERS IN BOTH DIRECTIONS NOT LESS THAN 36 INCHES LARGER THAN THE GENERATOR BASE IN EACH DIRECTION. ALL EXCAVATING, BACKFILLING AND SITE CLEANUP INCLUDED.**