



**TOPEKA METRO**

**REQUEST FOR BIDS**

**Back-Up Generator**

**Ryan Administration**

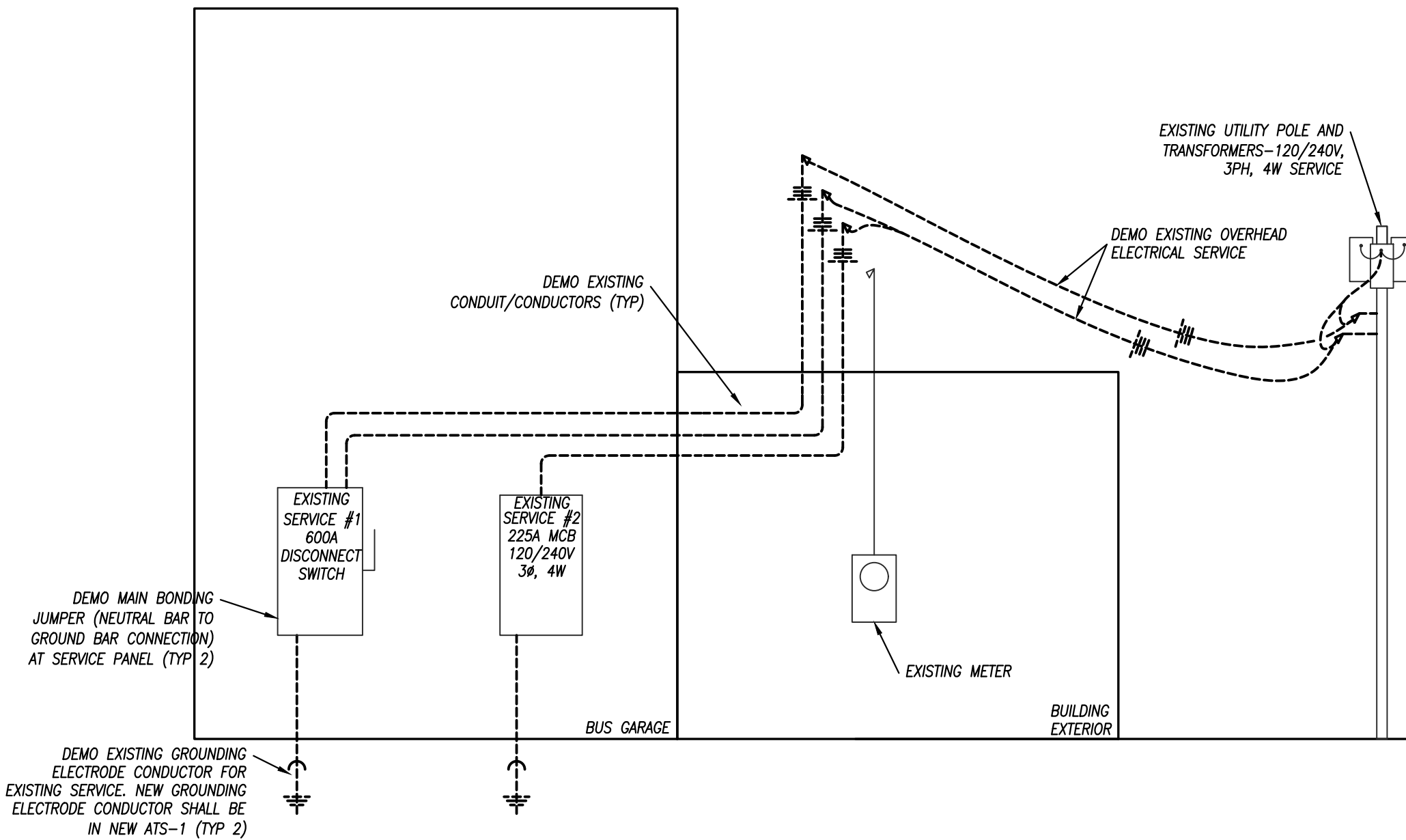
**Building TO-21-08**

**Appendix III**  
**Engineering Studies**





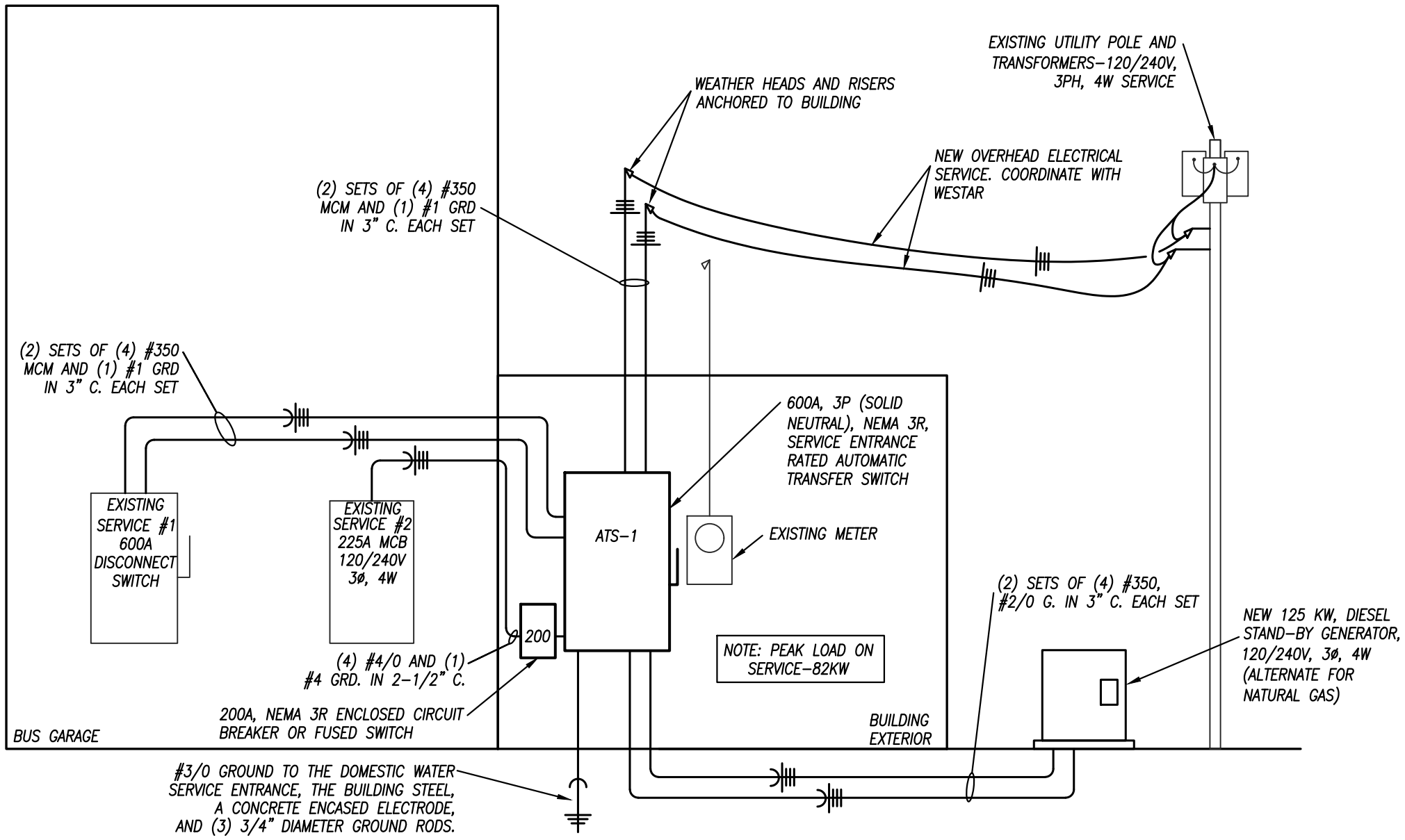
EXISTING EXTERIOR ELECTRICAL SERVICE FOR ADMINISTRATION BUILDING



ADMINISTRATION BUILDING  
EXISTING ELECTRICAL SERVICE RISER DIAGRAM - DEMO

NO SCALE

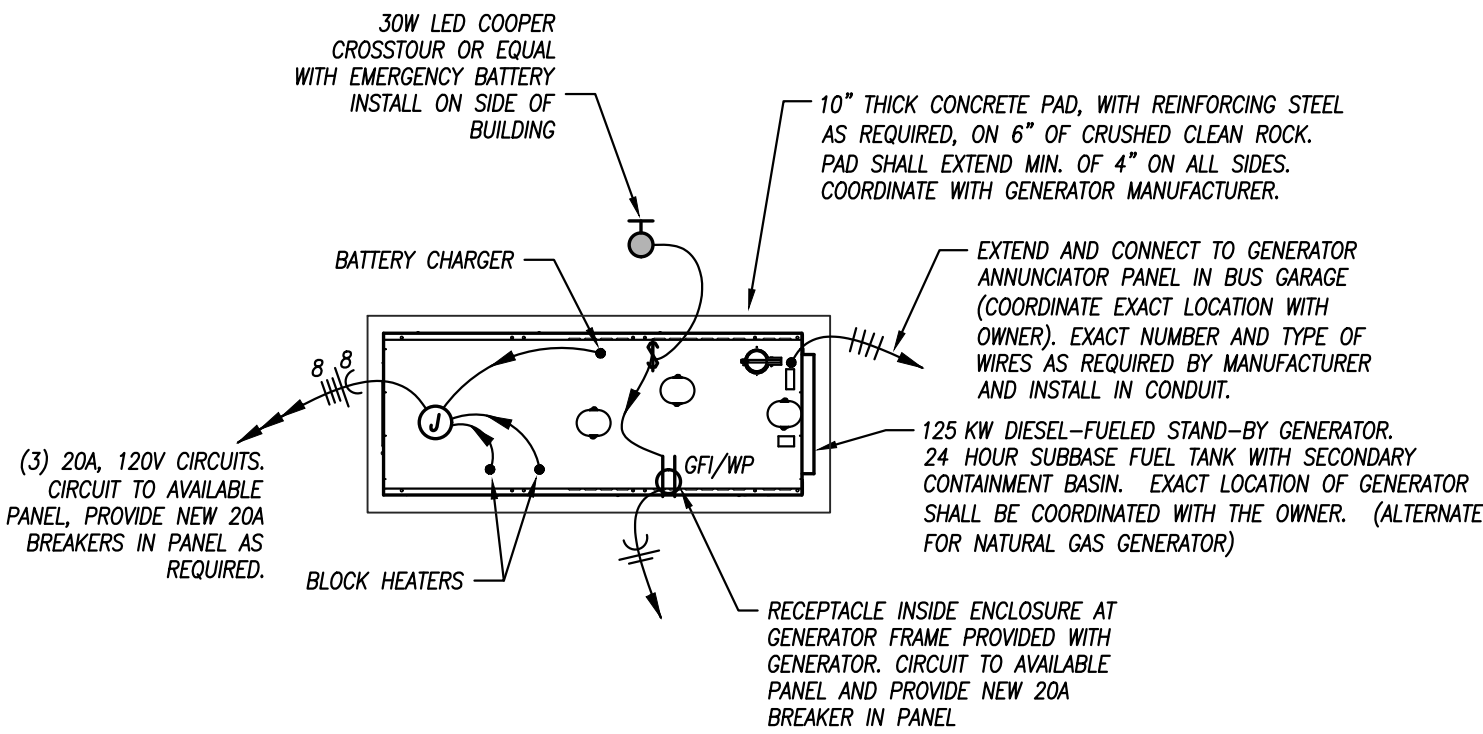
ELECTRICAL SYMBOL LIST					
SOME SYMBOLS AND ABBREVIATIONS ON THIS LEGEND MAY NOT BE USED					
	HOME RUN (2 #12, 1 #12 G UNLESS NOTED OTHERWISE)		DUPLEX RECEPTACLE		MANUAL PULL STATION
	INDICATES 2 PHASE, 1 NEUTRAL, AND 1 GROUND CONDUCTOR		LINE THRU DEVICE INDICATES ABOVE COUNTER		CEILING SMOKE DETECTOR
	TELEPHONE CONDUIT		DUPLEX RECEPTACLE WITH ISOLATED GROUND (SIMPLEX AND QUADPLEX SIMILAR)		DUCT SMOKE DETECTOR
	OVERHEAD ELECTRICAL		QUADPLEX RECEPTACLE		STROBE LIGHT
	UNDERGROUND ELECTRICAL		SIMPLEX RECEPTACLE		HORN
	BATTERY OPERATED EMERGENCY LIGHT (WALL MTD)		CEILING MOUNTED RECEPTACLE		COMBINATION HORN/STROBE
	BATTERY OPERATED EMERGENCY LIGHT (CEILING MTD)		SPECIAL RECEPTACLE W/NEMA CONFIG AS NOTED		FIRE ALARM BELL
	SURFACE/RECESSED LIGHT FIXTURE		HOSPITAL GRADE NON FUSED EXISTING ISOLATED GROUND		FIRE ALARM/SPRINKLER TAMPER AND FLOW SWITCHES
	FLUORESCENT LIGHT FIXTURE		MOUNT RECEPTACLE IN TOE SPACE OF CABINET WEATHER PROOF		FIRE ALARM CONTROL PANEL
	FLUORESCENT STRIP FIXTURE		GROUND FAULT INTERRUPT EMERGENCY DISCONNECT SWITCH		ELECTRO/MAGNETIC DOOR HOLD OPEN
	EXIT LIGHT		NIGHT LIGHT RELOCATED EXISTING		TELEPHONE OUTLET - SINGLE GANG BOX WITH 3/4" C TO ABOVE ACCESSIBLE CEILING, PROVIDE CAT 6 CABLE, DEVICE PLATE, JACKS, AND TERMINATIONS AT BOTH ENDS
	FIXTURE EQUIPPED WITH BATTERY		INDICATES CONNECT TO EXISTING		LINE THRU DEVICE INDICATES ABOVE COUNTER
	LIGHT SWITCH - SINGLE POLE		CONTROL CIRCUIT		DATA OUTLETS - DOUBLE GANG BOX WITH 3/4" C TO ABOVE ACCESSIBLE CEILING, PROVIDE CAT 6 CABLE, DEVICE PLATE, JACKS, AND TERMINATIONS AT BOTH ENDS
	LIGHT SWITCH - 3-WAY		SINGLE GANG FLOOR BOX (2, 3, 4 GANG SIMILAR)		TELEPHONE/DATA OUTLETS - DOUBLE GANG BOX WITH 3/4" C TO ABOVE ACCESSIBLE CEILING, PROVIDE CAT 6 CABLE, DEVICE PLATE, JACKS, AND TERMINATIONS AT BOTH ENDS
	LIGHT SWITCH - 4-WAY		SURFACE PANELBOARD		POWER AND DATA POLE
	CEILING OCCUPANCY SENSOR FOR LIGHTING CONTROL		RECESSED PANELBOARD		
	WALL OCCUPANCY SENSOR WITH OVERRIDE SWITCH FOR LIGHTING CONTROL				
	JUNCTION BOX				



ADMINISTRATION BUILDING  
ELECTRICAL SERVICE RISER DIAGRAM

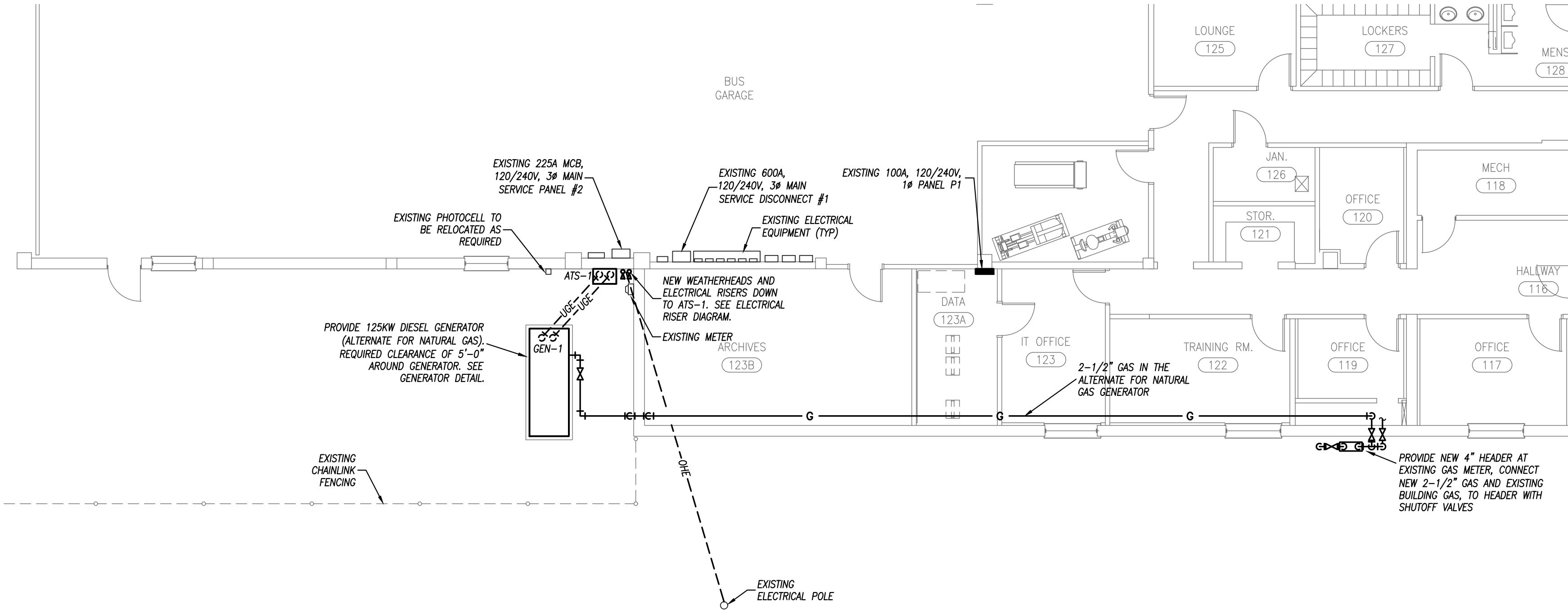
NO SCALE

EQUIPMENT FAULT CURRENT RATING SCHEDULE-ADMIN BLDG			
EQUIPMENT	SCA **	SCCR	NOTES
MTS-1 (ADMIN. BUILDING)	14,398	35,000	1,2
NOTES:			
1. RATING BASED ON AN ASSUMED FAULT AT UTILITY CO. TRANSFORMER OF 16,255 AIC.			
2. EQUIPMENT MAY BE SERIES RATED.			
** CALCULATIONS PERFORMED USING BUSSMANN POINT-TO-POINT METHOD.			



ENLARGED GENERATOR PLAN

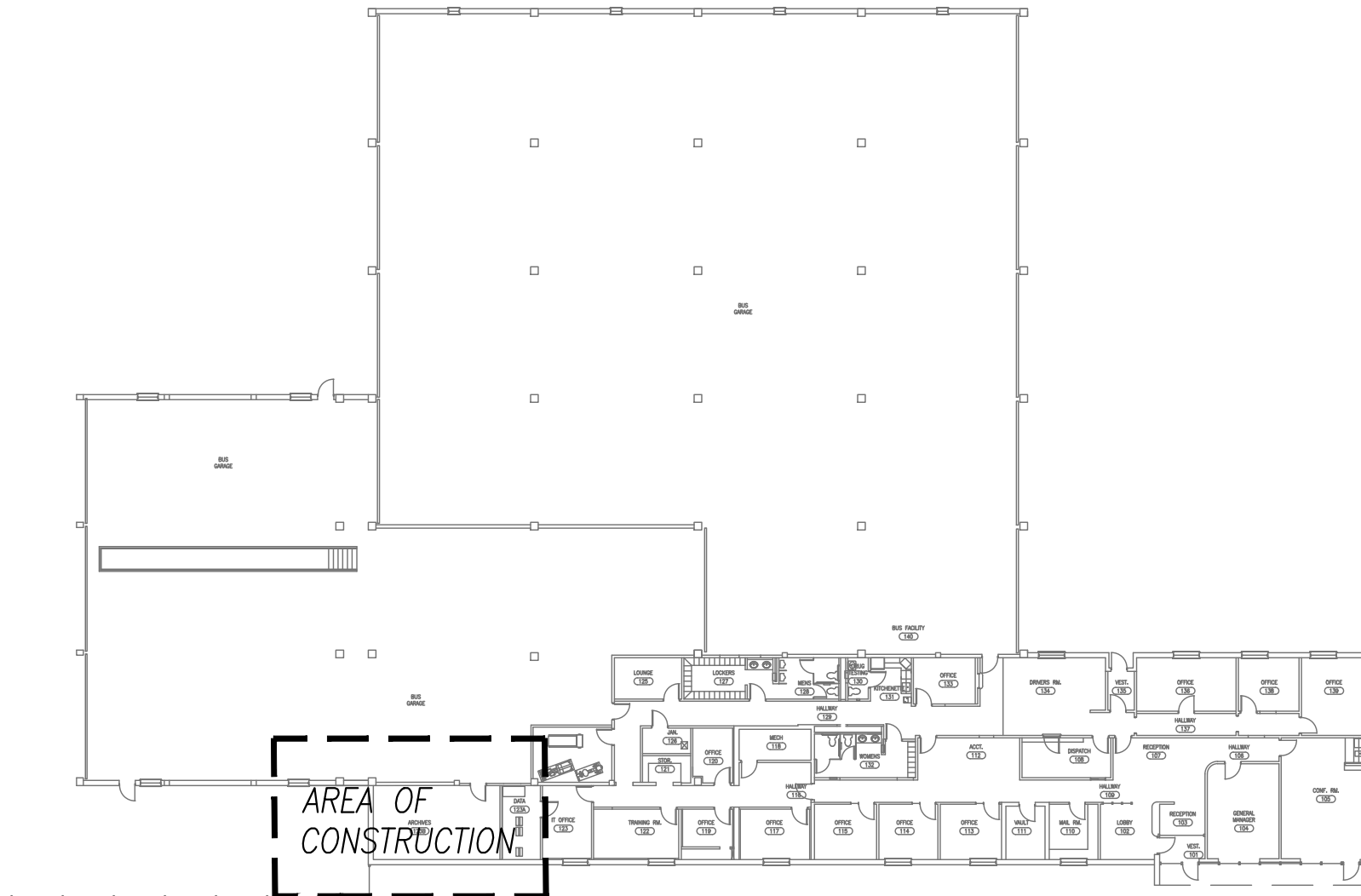
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ADMINISTRATION BUILDING FLOOR PLAN - POWER

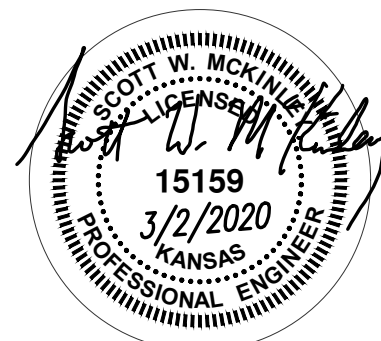
1/8"=1'

GENERATOR SCHEDULE						
GENERATOR NUMBER	MANUFACTURER	SIZE	VOLTAGE	FUEL	FUEL TANK	NOTES
GEN-1 BASE BID	CATERPILLAR	125 KW	120/240V, 3PH, 4W	DIESEL	24HR SUB-BASE	1,2,3
GEN-1 ALTERNATE	CATERPILLAR	125 KW	120/240V, 3PH, 4W	NATURAL GAS	NONE	1,2,3
REMARKS:						
1. LOCKABLE NEMA 3R WEATHERPROOF SOUND ENCLOSURE						
2. FACTORY APPROVED START-UP AND BUILDING LOAD TEST						
3. 5 YEAR EXTENDED WARRANTY						



KEY PLAN - ADMINISTRATION BUILDING

1/32"=1'



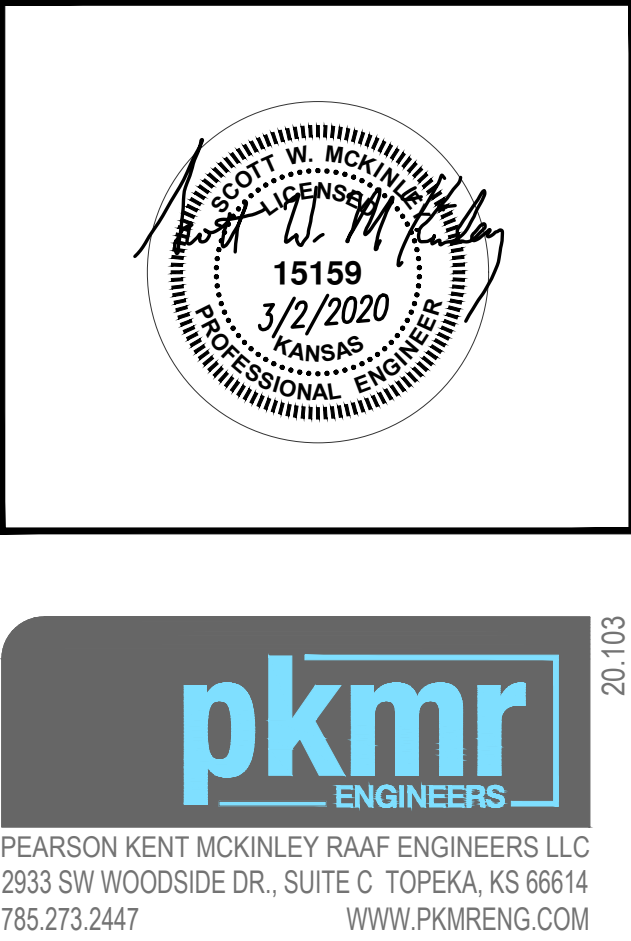
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2933 SW WOODSIDE DR., SUITE C TOPEKA, KS 66614  
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TOPEKA METRO  
ELECTRICAL GENERATOR  
ADMINISTRATION BUILDING  
201 N. KANSAS AVE  
TOPEKA, KS  
66603

ISSUED FOR:		
DESCRIPTION	DATE	
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© PEARSON KENT MCKINLEY RAAF ENGINEERS, LLC		
DRAWN BY:	KAH	
CHECKED BY:	SWM	
SHEET TITLE:		
ADMINISTRATION BUILDING		
DATE:	PKMR PROJECT:	
3/2/2020	rs/lsc	
SHEET NUMBER:		

E-1





PEARSON KENT MCKINLEY RAAF ENGINEERS, LLC  
2933 SW WOODSIDE DR., SUITE C TOPEKA, KS 66614  
785.273.2447 WWW.PKMR.ENG.COM

# TOPEKA METRO ELECTRICAL GENERATOR

ADMINISTRATION BUILDING  
201 N. KANSAS AVE  
TOPEKA, KS 66603

TOPEK  
ELECTRICAL  
ADMINISTRATOR  
201 N. K  
TOP  
6

ISSUED FOR:	
DESCRIPTION	DATE
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© PEARSON KENT MCKINLEY RAAF ENGINEERS, LLC	
DRAWN BY:	KAH
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ELECTRICAL SPECIFICATIONS	
DATE:	PKMR PROJECT:
3/2/2020	20.103
SHEET NUMBER:	
E-2	

## 16000 - ELECTRICAL SPECIFICATIONS

SECTION 16000 - ELECTRICAL REQUIREMENTS

GENERAL REQUIREMENTS

A. ALL WORK SHALL BE IN ACCORDANCE W/ LATEST EDITION OF INTERNATIONAL BUILDING CODE, NATIONAL ELECTRICAL CODE, NFPA CODES AS ADOPTED BY CITY, COUNTY, STATE & ALL OTHER APPLICABLE CODES.

B. ALL MATERIALS & EQUIPMENT SHALL BE NEW & SHALL BEAR U.L. LABEL WHERE APPLICABLE. PROVIDE WATERPROOF EQUIPMENT ENCLOSURES WHERE REQUIRED.

C. OBTAIN A PAY FOR ALL PERMITS REQUIRED FOR EXECUTION OF THIS WORK & SHALL MAKE ARRANGEMENTS FOR MODIFICATIONS TO ELECTRICAL CONNECTIONS TO BUILDING AS REQUIRED.

D. CONTRACTOR SHALL PROVIDE ALL LABOR & MATERIALS REQUIRED TO HAVE COMPLETE FUNCTIONING ELECTRICAL LIGHTING & POWER SYSTEMS TOGETHER W/ ALL ASSOCIATED EQUIPMENT & APPARATUS AS SHOWN ON PLANS.

E. WHERE AN ELECTRICAL DEVICE IS REQUIRED BY CODE BUT NOT SHOWN, IT SHALL BE PROVIDED AS THOUGH FULLY SHOWN & SPECIFIED.

F. CONTRACTOR SHALL VISIT SITE & OBSERVE CONDITIONS UNDER WHICH WORK WILL BE DONE. ANY DISCREPANCIES SHALL BE CALLED TO ARCHITECT'S ATTENTION. NO SUBSEQUENT ACTION WILL BE MADE IN THIS CONNECTION FOR ANY ERROR OR NEGLIGENCE ON CONTRACTOR'S PART.

G. FINAL ACCEPTANCE OF WORK SHALL BE SUBJECT TO CONDITION THAT ALL SYSTEMS, EQUIPMENT, APPARATUS & APPLIANCES OPERATE SATISFACTORILY AS DESIGNED & INTENDED. WORK SHALL INCLUDE REQUIRED ADJUSTMENT OF SYSTEMS & CONTROL EQUIPMENT INSTALLED UNDER THESE SPECIFICATIONS.

H. WARRANTY TO OWNER QUALITY OF MATERIALS, EQUIPMENT, WORKMANSHIP & OPERATION OF EQUIPMENT PROVIDED UNDER THESE SPECIFICATIONS FOR ONE YEAR FROM & AFTER COMPLETION OF BUILDING & ACCEPTANCE OF MECHANICAL SYSTEMS BY OWNER.

I. ALL MATERIALS INSTALLED IN PLenums SHALL BE NONCOMBUSTIBLE OR HAVE FLAME/SMOKE INDEX OF NO MORE THAN 25.00 IN ACCORDANCE W/ ASTM E 84.

SECTION 16100 - CONDUIT & CONDUCTORS

A. FOLLOW CIRCUITING SHOWN ON PLANS. USE NO CONDUIT SMALLER THAN 1/2" & NO CONDUCTORS SMALLER THAN #12 GA. UNLESS NOTED OTHERWISE.

B. WIRE SHALL BE IN NON-FLEXIBLE METALLIC CONDUIT (EMT, IMC OR RMC) FOR ALL CIRCUITS AND FEEDERS GREATER THAN 30K. LIGHT SWITCH RECES. KITCHEN CIRCUITS & HOME RUNS C/W CABLE ACCEPTABLE FOR BRANCH CONVENIENCE CIRCUITS AND LIGHTING CIRCUITS. DO NOT DASH CHAIN LIGHT FIXTURES. PROVIDE HEALTH CARE RATED MC FOR MEDICAL TREATMENT AREAS WHEN NOT IN CONDUIT.

C. CONDUIT INSTALLED BELOW GRADE SHALL BE SCHEDULE 80 PVC HEAVY WALL PLASTIC CONDUIT MEETING NEMA STANDARDS & U.L. LISTED FOR UNDERGROUND & EXPOSED USE. PROVIDE GRS RINGS, RINGS & ROSES AS CONDUITS PASS ABOVE FLOOR SLABS.

D. PROVIDE INTERLOCKING SPACERS FOR MULT RUNS OF UG CONDUITS IN SAME TRENCH.

E. FIGHTING & RECEPTACLE CIRCUIT CONDUITS SHALL BE COPPER THINWALL 600 VOLT, 75 DEG C, COLOR CODE AS DESCRIBED UNDER APPLICABLE CODES. NO ROMEY, PLASTIC FLEX TUBING ETC PERMITTED. LIGHT FIXTURE WIRE INSULATION SHALL HAVE TEMP RATING NOT LESS THAN INDIVIDUAL EXISTING MANUF. RECOMMENDED RATING.

F. G. CIRCUITS W/ NO. 8 OR LARGER CONDUCTORS, MOTOR CIRCUITS, PUMP & FEEDER CIRCUITS & BUILDING SERVICE FEEDERS SHALL BE COPPER THINWALL 600 VOLT, 75 DEG C.

G. HALL CONDUIT, JUNCTION BOXES, ETC. ABOVE CEILINGS SHALL BE SUPPORTED FROM STRUCTURE. PIPE SLEEVES, HANGERS & SUPPORTS SHALL BE FURNISHED & SET & CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER & PERMANENT LOCATIONS.

SECTION 16200 - GROUNDING

A. SUPPLEMENT GROUNDING NEUTRAL OF SECONDARY DISTRIBUTION SYSTEM W/ EQUIPMENT GROUNDING SYSTEM. INSTALL SO THAT METALLIC STRUCTURES, ENCLOSURES, BACKBOX, RACKS, PANELS, OUTLET BOXES, CABINETS, MACHINE FRAMES, PORTABLE EQUIPMENT & OTHER CONDUCTIVE ITEMS OPERATE CONTINUOUSLY AT GROUND POTENTIAL & PROVIDE LOW IMPEDANCE PATH FOR GROUND FAULT CURRENTS.

B. SYSTEM SHALL COMPLY W/ NATIONAL ELECTRICAL CODE, DRAWINGS & AS SPECIFIED.

C. PROVIDE EQUIPMENT GROUND BUS IN BASE OF LOW VOLTAGE SWITCHGEAR BRAZED OR OTHERWISE ADEQUATELY CONNECTED AN APPROVED METHOD TO GROUNDING BUS LAYER WOUND WITH EPDM BASED MATERIAL. APPLIED TO EACH LAYER OF MAGNET WIRE. THE STATOR SHALL HAVE TWO DIPS AND BAKES USING CLASS H IMPREGNATING VARNISH. THE REVOLVING FIELD ASSEMBLY SHALL BE PROTOTYPE, TESTED FOR 2 HOURS AT 2700 RPM (150% OVERSPEED) AND 700 C. AND EACH PRODUCTION UNIT SHALL BE TESTED AT 2250 RPM (125% OVERSPEED) AT ROOM TEMPERATURE. THE REVOLVING FIELD ASSEMBLY SHALL BE BALANCED TO 0.5 ML PERK-PEAK.

D. THE GENERATOR EXCITER SHALL BE BRUSHLESS WITH THE CIRCUIT CONSISTING OF A THREE-PHASE ARMATURE AND A THREE-PHASE FULL WAVE BRIDGE RECTIFIER MOUNTED ON THE ROTOR SHAFT. SURGE SUPPRESSORS SHALL BE INCLUDED TO PROTECT THE ROTATING DIODES FROM VOLTAGE SPIKES.

E. A PERMANENT MAGNETIC (PM) GENERATOR SHALL PROVIDE THE SOURCE OF EXCITATION. THE EXCITER SHALL BE DESIGNED TO INCREASE MANUALLY TO INCREASE LOADS AND TO MAINTAIN 100% OF RATED CURRENT FOR 10 SECONDS DURING SHORT CIRCUIT CONDITIONS.

F. (VRS) THE AUTOMATIC VOLTAGE REGULATOR (AVR) SHALL MAINTAIN GENERATOR OUTPUT VOLTAGE WITHIN +/- 0.5% FOR A CONSTANT LOAD BETWEEN NO LOAD AND FULL LOAD. THE REGULATOR SHALL BE A TOTALLY SOLID STATE DESIGN WHICH OVERLEADS ELECTRONIC VOLTAGE BUILDUP VOLTS PER HERTZ REGULATION, THREE-PHASE SENSING, OVEREXCITATION PROTECTION, LOSS OF SENSING PROTECTION, TEMPERATURE COMPENSATION, SHALL LIMIT VOLTAGE OVERTSHOT ON STARTUP, AND SHALL BE SEALED FROM THE ENVIRONMENT.

G. CONTROLS - GENERATOR SET MOUNTED

1. THE CONTROL PANEL SHALL BE DESIGNED AND BUILT BY THE ENGINE-GENERATOR MANUFACTURER. IT SHALL BE MOUNTED ON THE GENERATOR SET AND INCORPORATE 100% SOLID STATE MICROPROCESSOR BASED CONTROL CIRCUITRY, SEALED DUST TIGHT, WATERPROOF MODULAR COMPONENTS WITH METAL HOUSINGS. DIGITAL DISPLAYS SHALL BE INSTALLED ON THE PANEL. THE PANEL SHALL BE LABELED WITH ISO SYMBOLS AND COMPLY WITH IEC 144, IP 22, AND NEMA 12 FOR EXTERNAL ENVIRONMENTAL RESISTANCE, AND IP 44 AND NEMA 12 FOR RESISTANCE OF THE INTERNAL SEALED MODULES. THE CONTROL PANEL SHALL BE CAPABLE OF REMOTE TEST AND RESET FUNCTIONS.

2. THE PANEL SHALL INCLUDE THE FOLLOWING EQUIPMENT/FUNCTIONS:

2.1. AUTOMATIC REMOTE START CAPABILITY WITH MODE OF OPERATION SELECTABLE FROM A PANEL-MOUNTED 4-POSITION SWITCH (STOP; MANUAL, AUTOMATIC, RESET).

2.2. CYCLING OF THE CRANK WITH ADJUSTABLE TRANS "W" AND "RESET" TIMES.

2.3. ADJUSTABLE COOLDOWN TIMER.

2.4. EMERGENCY STOP PUSH BUTTON REQUIRING MANUAL RESET.

2.5. VOLTAGE ADJUSTMENT POTENTIOMETER TO ADJUST VOLTAGE +10, -25% OF RATED.

2.6. (1) 16 LIGHT REMOTE ANNUNCIATOR LOCATED WHERE INDICATED ON PLANS.

2.6.1. ANNUNCIATOR PANEL SHALL INCLUDE ALL ALARM/SHUTDOWN FUNCTIONS PROVIDED ON GENERATOR-MOUNTED CONTROLLER. PROVIDE ADDITIONAL ALARM/SHUTDOWN FUNCTIONS ON REMOTE ANNUNCIATOR PANEL AS FOLLOWS:

a. LOW ENGINE TEMPERATURE

b. HIGH ENGINE TEMPERATURE

c. LOW COOLANT LEVEL

d. BATTERY CHARGER AC FAIL

e. TANK FILLUP

f. LOW FUEL LEVEL

3.1. A COMMON ALARM HORN (WITH SILENCE SWITCH) AND INDIVIDUAL FLASHING LED'S SHALL BE PROVIDED FOR EACH OF THE FOLLOWING SHUTDOWNS:

3.1.1. OVERSPEED (RED), OVERCRANK (RED), HIGH COOLANT TEMPERATURE (RED), LOW OIL PRESSURE (RED), EMERGENCY STOP (RED).

4. PANEL ILLUMINATION LIGHTS (2) WITH ON/OFF SWITCH

5. AUTOMATIC DISPLAY AND PHASE SECTOR SWITCH FOR GENERATOR OPERATIONAL PARAMETERS. TRUE RMS VOLTAGES OF THESE PARAMETERS SHALL BE UTILIZED TO MINIMIZE DISTORTION DUE TO NON-SINUSOIDAL LOADS AND ENSURE ACCURACY.

5.1. AC VOLTS (+/- 0.5% ACCURACY), AC AMPS (+/- 0.5% ACCURACY), HERTZ (+/- 0.3 HZ ACCURACY)

6. DIGITAL DISPLAY FOR:

6.1. ENGINE RPM (+/- 0.5% ACCURACY), DC VOLTAGE (+/- 0.5% ACCURACY), OIL PRESSURE (+/- 0.5% ACCURACY), COOLANT TEMPERATURE (+/- 0.5% ACCURACY), OPERATING HOURS

7. UL-LISTED ALTERNATOR PROTECTIVE DEVICE.

G. RECI RECEPTACLE

1. 20A/120V GFCI RECEPTACLE SHALL BE PROVIDED WITH GENERATOR SET.

H. WIRING

1. ENGINE AND GENERATOR CONTROL WIRING SHALL BE MULTI-STRAND ANNEALED COPPER CONDUCTORS ENCASED BY CROSS-LINKED POLYETHYLENE INSULATION RESISTANT TO HEAT, ABRASION, OIL, WATER, ANTIFREEZE AND DIESEL FUEL. WIRING SHALL BE SUITABLE FOR CONTINUOUS USE AT 120C (250F) WITH INSULATION NOT BRITTLE AT -50C (-60F). EACH CABLE WILL BE HEAT STAMPED THROUGHOUT THE ENTIRE LENGTH TO IDENTIFY THE CABLE'S ORIGIN AND TERMINATION. CABLES SHALL BE ENCLOSED IN NYLON FLEXIBLE CONDUIT WHICH IS SLOTTED TO ALLOW EASY ACCESS AND MOISTURE TO ESCAPE. REPAIRABLE BULHEAD FITTINGS WILL ATTACH THE CABLE TO THE GENERATOR SET MOUNTED JUNCTION BOXES.

I. EXHAUST SILENCER

1. A CRITICAL EXHAUST SILENCER SHALL BE SIZED AND SUPPLIED BY THE ENGINE SUPPLIER. IT SHALL PROVIDE 15 DBA ATTENUATION WHILE IMPOSING NO MORE THAN 27 IN H2O RESTRICTION.

2. THE SILENCER SHALL BE ALUMINIZED TO PREVENT RUSTING AND MOUNTED (NEAR THE ENGINE TO MINIMIZE NOISE AND CONDENSATION). A PROVISION FOR DRAINING MOISTURE SHALL BE INCLUDED.

3. THE SILENCER SHALL BE INSTALLED IN THE WEATHERPROOF ENCLOSURE AND NOT ON THE OUTSIDE OF THE ENCLOSURE.

J. BASE

1. THE ENGINE AND GENERATOR SHALL BE ASSEMBLED TO A COMMON BASE BY THE ENGINE-GENERATOR MANUFACTURER. THE GENERATOR SET BASE SHALL BE DESIGNED AND BUILT BY THE ENGINE-GENERATOR MANUFACTURER TO RESIST DEFLECTION, MAINTAIN ALIGNMENT, AND MINIMIZE RESONANT LINEAR VIBRATION.

K. FUEL TANK AND FUEL

1. A U.L. LISTED DUAL WALL BASE MOUNTED FUEL TANK (SIZED FOR MINIMUM 24 HOURS SUPPLY AT 75% OF RATED LOAD) WITH ELECTRIC STUB-UP AND CONTAINMENT COVER SHALL BE PROVIDED WHICH COMPLES WITH LOCAL CODES AND ORDINANCES. THE TANK SHALL INCORPORATE THREADED PIPE CONNECTIONS, FUEL GAUGE, LOW FUEL LEVEL ALARM CONTACT (DUAL WALL - AND FUEL LEAKAGE CONTACT) WIRED TO INDICATING LIGHT ON THE GENERATOR SET CONTROL PANEL, VENT WITH CAP AND FILLER WITH EMERGENCY PRESSURE RELIEF VENT. CONTRACTOR SHALL SUPPLY A FULL SUPPLY OF FUEL AT THE PROJECT COMPLETION.

2. NORMAL TANK VENT SHALL EXTEND 12'-0" ABOVE GRADE.

L. CIRCUIT BREAKER - GENERATOR SET MOUNTED

1. THE THREE-POLE MAIN LINE CIRCUIT BREAKER(S) SHALL BE PROVIDED TO PROTECT THE GENERATOR AGAINST EXTERNAL FAULTS AND PROVIDE A POSITIVE DISCONNECT DEVICE AT THE GENERATOR OUTPUT TERMINALS. THE BREAKER(S) SHALL BE UL-LISTED, AND ALSO INCLUDE THE FOLLOWING FUNCTIONS/FEATURES:

1.1. SOLID STATE (ELECTRONIC) TRIP UNIT.

1.2. SHUNT TRIP DEVICE/ACCESSORY CONNECTED TO ENGINE/GENERATOR SAFETY SHUTDOWNS.

1.3. MOUNTED ON THE GENERATOR IN A GUARDED DRIP-PROOF ENCLOSURE.

M. BATTERY CHARGER

1. A DUAL RATE TO AMPERE BATTERY CHARGER SHALL BE PROVIDED WHICH SHALL ACCEPT 120 VOLT AC SINGLE PHASE INPUT TO PROVIDE 24 VOLT DC OUTPUT. IT SHALL BE FIRED ON THE AC INPUT AND DC OUTPUT, AND INCORPORATE CURRENT LIMITING CIRCUITRY TO AVOID THE NEED FOR A CRANK DISCONNECT RELAY. THE CHARGER SHALL INCLUDE A DC AMMETER AND VOLTMETER, AND BE HOUSED IN A NEW 1 ENCLOSURE SUITABLE FOR WALL MOUNTING.

2. THE CHARGER SHALL INCLUDE LED ANNUNCIATION FOR LOW BATTERY VOLTAGE, HIGH BATTERY VOLTAGE, BATTERY CHARGER MALFUNCTION, AND AC FAILURE, AND DRY CONTACTS FOR BATTERY CHARGER MALFUNCTION AND LOW BATTERY VOLTAGE, AS REQUIRED BY NFPA-110.

N. BATTERIES

1. TWENTY-FOUR (24) VOLT STARTING BATTERIES, SIZED AS RECOMMENDED BY THE GENERATOR SET MANUFACTURER, BATTERY CABLES, AND BASE MOUNTED BATTERY RACK SHALL BE PROVIDED.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

O. ENCLOSURES

1. WEATHER PROTECTIVE ENCLOSURE WITH REMOVABLE/HINGED DOORS AND REMOVABLE END PANELS. ALL HINGES AND LATCHES SHALL BE STAINLESS STEEL.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

P. ENCLOSURES

1. HINGED PROTECTIVE ENCLOSURE WITH REMOVABLE/HINGED DOORS AND REMOVABLE END PANELS. ALL HINGES AND LATCHES SHALL BE STAINLESS STEEL.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

Q. SUBMITTALS

1. SUBMITTALS FOR APPROVAL SHALL INCLUDE BUT NOT BE LIMITED TO:

2. COMPONENT LIST - A BREAKDOWN OF ALL COMPONENTS AND OPTIONS INCLUDING SWITCHGEAR.

3. TECHNICAL DATA - A MANUFACTURER PRODUCED GENERATOR SET SPECIFICATION OR DATA SHEET IDENTIFYING MAKE AND MODEL OF ENGINE AND GENERATOR, AND INCLUDING RELEVANT COMPONENT DESIGN AND PERFORMANCE DATA.

4. AUXILIARY EQUIPMENT - SPECIFICATION OR DATA SHEETS, INCLUDING SWITCHGEAR, TRANSFER SWITCH, VIBRATION ISOLATORS, AND DAY TANK.

5. DRAWINGS - GENERAL DIMENSIONS DRAWINGS SHOWING OVERALL GENERATOR SET MEASUREMENTS, MOUNTING LOCATION AND INTERCONNECT POINTS FOR LOAD LEADS, FUEL, EXHAUST, COOLING AND DRAIN LINES.

6. WIRING DIAGRAMS - WIRING DIAGRAMS, SCHEMATICS AND CONTROL PANEL OUTLINE DRAWINGS PUBLISHED BY THE MANUFACTURER FOR CONTROLS AND SWITCHGEAR SHOWING INTERCONNECTED POINTS AND LOGIC DIAGRAMS FOR USE BY CONTRACTOR AND OWNER.

7. WARRANTY STATEMENTS - WARRANTY VERIFICATION PUBLISHED BY THE MANUFACTURER.

R. REPORTING TESTS

1. THE SYSTEM MANUFACTURER MUST CERTIFY THAT ENGINE, GENERATOR, CONTROLS AND SWITCHGEAR HAVE BEEN TESTED AS COMPLETE SYSTEM OF REPRESENTATIVE ENGINEERING MODELS (NOT ON EQUIPMENT LOAD). PROTOTYPE TESTING SHALL INCLUDE:

1.1. FUEL CONSUMPTION AT 1/4, 1/2, 3/4 AND FULL LOAD, EXHAUST EMISSIONS, MECHANICAL AND LUBE OIL NOISE, GOVERNING SPEED REGULATION AT 1/4, 1/2, 3/4 AND FULL LOAD, AND DURING TRANSIENTS, MOTOR STARTING KVA, GENERATOR TEMPERATURE RISE IN ACCORDANCE WITH NEMA MG-1-22.40, VOLTAGE REGULATION AT 1/4, 1/2, 3/4 AND FULL LOAD, AND DURING TRANSIENTS.

2. CYCLING TESTS, INCLUDING LOAD, SPEED, DEPARTING FACTORS, IN ACCORDANCE WITH NFPA 110, SHORT CIRCUIT CAPABILITY, COOLING SYSTEM PERFORMANCE, TORSIONAL ANALYSIS, LINEAR VIBRATION ANALYSIS.

C. SYSTEM PERFORMANCE

1. THE POWER GENERATING SYSTEM SHALL CONFORM TO THE FOLLOWING PERFORMANCE CRITERIA AT THE SITE CONDITIONS.

2. RATING - ENGINE BRAKE HORSEPOWER SHALL BE SUFFICIENT TO DELIVER FULL RATED GENERATOR SET KVA/VA WHEN OPERATED AT RATED RPM AND EQUIPPED WITH ALL ENGINE-MOUNTED PARASITIC AND EXTERNAL LOADS SUCH AS RADIATOR FANS AND POWER GENERATORS.

3. START TIME AND LOAD ACCEPTANCE - ENGINE SHALL START, ACHIEVE RATED VOLTAGE AND FREQUENCY, AND BE CAPABLE OF ACCEPTING LOAD WITHIN 10 SECONDS WHEN PROPERLY EQUIPPED AND MAINTAINED.

4. WITH THE POWER GENERATING SYSTEM AT NORMAL OPERATING TEMPERATURE, IT SHALL ACCEPT A 100% LOAD, LESS APPLICABLE, WITHIN 10 SECONDS OF THE TIME WHEN THE LOAD IS APPLIED.

5. STEADY STATE VOLTAGE REGULATION SHALL BE +/- 0.33% WITH NO LOAD TO FULL LOAD SPEED DROP LESS THAN 3X.

6. VOLTAGE REGULATION SHALL BE +/- 0.5% FOR ANY STEADY STATE LOAD BETWEEN NO LOAD AND 100% OF RATED LOAD.

D. PRODUCTION TESTS

1. THE SYSTEM MANUFACTURER SHALL PERFORM PRODUCTION TESTS ON THE COMPLETE GENERATOR SET SUPPLIED. A CERTIFIED REPORT OF THESE TESTS SHALL BE AVAILABLE WHEN REQUESTED AT THE TIME OF THE GENERATOR SET ORDER. THESE TESTS AND CONTROLS SHALL INCLUDE BUT NOT BE LIMITED TO:

1.1. OPERATION AT RATED KW, TRANSIENT AND STEADY STATE GOVERNING, TRANSIENT AND STEADY STATE VOLTAGE REGULATION, OPERATION OF ALL ALARM AND SHUTDOWN DEVICES, SINGLE STEP LOAD PICKUP OF RATED KW.

E. INSTALLATION/ON SITE TESTING

1. THE GENERATOR SHALL BE PERFORMED IN ACCORDANCE WITH SHOP DRAWINGS, SPECIFICATIONS AND THE MANUFACTURER'S INSTRUCTIONS, AND SHALL COMPLY WITH APPLICABLE STATE AND LOCAL CODES.

2. THE GENERATOR SET SHALL BE TESTED AS DEFINED BELOW BY THE MANUFACTURER'S AUTHORIZED DEALER TO SHOW IT IS FREE OF ANY DEFECTS AND WILL START AUTOMATICALLY AND CARRY FULL LOAD. THIS TESTING MAY BE SEPARATED AT THE FACILITY OF THE SYSTEM MANUFACTURER'S AUTHORIZED LOCAL DEALER OR AT THE JOBSITE. TESTING SHALL BE COMPLETED IN THE PRESENCE OF THE OWNER'S ENGINEER OR HIS APPOINTED REPRESENTATIVE.

3. A CONFIRMABLE TEST REPORT FOR TESTING SHALL BE FURNISHED BY THE BIDDER. ANY DEFECTS WHICH BECOME EVIDENT DURING THE TEST SHALL BE CORRECTED BY THE BIDDER AT HIS OWN EXPENSE.

4. GENERATOR MANUFACTURER SHALL PROVIDE CUSTOMER TRAINING OF GENERATOR SYSTEM.

5. OWNER OPERATION OF THE FOLLOWING SHALL BE DEMONSTRATED:

5.1. ALL AUXILIARY EQUIPMENT SUPPLIED TO THIS SPECIFICATION, STARTING AND CHARGING SYSTEM COMPONENTS, ALL CONTROLS, ENGINE SHUTDOWNS AND SAFETY DEVICES

5.2. FURNISHING MANUALS AND BOOKS

1. THE SYSTEM MANUFACTURER'S AUTHORIZED LOCAL DEALER SHALL FURNISH THREE COPIES OF EACH OF THE MANUALS AND BOOKS LISTED BELOW FOR EACH UNIT UNDER THIS CONTRACT:

G. OPERATING INSTRUCTIONS

1. WITH DESCRIPTION AND ILLUSTRATION OF ALL SWITCHGEAR CONTROLS AND INDICATORS AND ENGINE AND GENERATOR CONTROLS.

H. PARTS BOOKS

1. THAT ILLUSTRATE AND LIST ALL ASSEMBLIES, SUBASSEMBLIES AND COMPONENTS, EXCEPT STANDARD FASTENING HARDWARE (NUTS, BOLTS, WASHERS, ETC.).

I. PREVENTATIVE MAINTENANCE INSTRUCTIONS

1. ON THE COMPLETE SYSTEM THAT COVER DAILY, WEEKLY, MONTHLY, BIENNIAL AND ANNUAL MAINTENANCE AND MAINTENANCE MANUALS. IN ADDITION TO ITEMS SPECIFIED IN DIVISION 01 SECTION "OPERATION AND MAINTENANCE DATA," INCLUDE THE FOLLOWING:

1.1. FEATURES AND OPERATING SPECIFICATIONS, BOTH AUTOMATIC AND MANUAL.

1.2. LIST OF ALL FACTORY SETTINGS OF RELAYS, PROVIDE RELAY-SETTING AND CALIBRATION DATA INCLUDING SOFTWARE, WHERE APPLICABLE.

SECTION 16300 - ELECTRICAL IDENTIFICATION

A. MANUFACTURED LABELS FOR EACH PANELBOARD & TRANSFORMER. TYPEWRITTEN PANEL SCHEDULES MOUNTED IN PANELS.

B. PRINTED TAPE STYLE LABEL FOR EACH RECEPTACLE INDICATING PANEL & CIRCUIT #.

C. MANUFACTURED LABELS FOR ALL DISCONNECT SWITCHES INDICATING EQUIPMENT SERVED.

D. BRANCH CIRCUITS - IDENTIFY EACH CIRCUIT W/ WIRE MARKERS WHEN ENCLOSURE LABEL AND WIRE COLORS DO NOT PROVIDE ENOUGH INFORMATION TO IDENTIFY EACH CIRCUIT WITHOUT TRACING.

E. SHOWING FUNCTION OF ALL ELECTRICAL COMPONENTS.

8. GENERATOR MANUFACTURER SHALL PROVIDE FREIGHT TO JOB SITE, UNLOADING OF EQUIPMENT BY CONTRACTOR.

SECTION 16350 - ELECTRICAL IDENTIFICATION

A. MANUFACTURED LABELS FOR EACH PANELBOARD & TRANSFORMER. TYPEWRITTEN PANEL SCHEDULES MOUNTED IN PANELS.

B. PRINTED TAPE STYLE LABEL FOR EACH RECEPTACLE INDICATING PANEL & CIRCUIT #.

C. MANUFACTURED LABELS FOR ALL DISCONNECT SWITCHES INDICATING EQUIPMENT SERVED.

D. BRANCH CIRCUITS - IDENTIFY EACH CIRCUIT W/ WIRE MARKERS WHEN ENCLOSURE LABEL AND WIRE COLORS DO NOT PROVIDE ENOUGH INFORMATION TO IDENTIFY EACH CIRCUIT WITHOUT TRACING.

E. SHOWING FUNCTION OF ALL ELECTRICAL COMPONENTS.

8. GENERATOR MANUFACTURER SHALL PROVIDE FREIGHT TO JOB SITE, UNLOADING OF EQUIPMENT BY CONTRACTOR.

SECTION 163600 - TRANSFER SWITCHES

PART 1 GENERAL

A. RELATED DOCUMENTS

1. REFERENCE SECTION 260500.

2. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

B. SUMMARY

1. THIS SECTION INCLUDES TRANSFER SWITCHES RATED 600 V AND LESS, INCLUDING THE FOLLOWING:

1.1. AUTOMATIC TRANSFER SWITCHES.

1.2. NONAUTOMATIC TRANSFER SWITCHES.

1.3. REMOTE ANNUNCIATOR SWITCHES.

C. SUBMITTALS

1. PRODUCT DATA - INCLUDE RATED CAPACITIES, WEIGHTS, OPERATING CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.

2. SHOP DRAWINGS - DIMENSIONED PLANS, ELEVATIONS, SECTIONS, AND DETAILS SHOWING MINIMUM CLEARANCES, CONDUCTOR ENTRY PROVISIONS, GUTTER SPACE, INSTALLED FEATURES AND DEVICES, AND MATERIAL LISTS FOR EACH SWITCH SPECIFIED.

3. FIELD QUALITY-CONTROL TEST REPORTS.

4. OPERATION AND MAINTENANCE DATA - FOR EACH TYPE OF PRODUCT TO INCLUDE IN EMERGENCY, PARTS, AND EMERGENCY MAINTENANCE MANUALS. IN ADDITION TO ITEMS SPECIFIED IN DIVISION 01 SECTION "OPERATION AND MAINTENANCE DATA," INCLUDE THE FOLLOWING:

4.1. FEATURES AND OPERATING SPECIFICATIONS, BOTH AUTOMATIC AND MANUAL.

4.2. LIST OF ALL FACTORY SETTINGS OF RELAYS, PROVIDE RELAY-SETTING AND CALIBRATION DATA INCLUDING SOFTWARE, WHERE APPLICABLE.

D. QUALITY ASSURANCE

1. OPERATION - ELECTRICALLY ACTUATED BY PUSH BUTTONS DESIGNATED "NORMAL SOURCE" AND "ALTERNATE SOURCE" SWITCH SHALL BE CAPABLE OF TRANSFERRING LOAD IN EITHER DIRECTION WITH EITHER OR BOTH SOURCES ENERGIZED.

2. DOUBLE-THROW SWITCHING ARRANGEMENT: INCAPABLE OF PAUSES OR INTERMEDIATE POSITION STOPS DURING SWITCHING SEQUENCE.

3. NONAUTOMATIC TRANSFER-SWITCH ACCESSORIES:

3.1. PILOT LIGHTS: INDICATE SOURCE TO WHICH LOAD IS CONNECTED.

3.2. SOURCE-AVAILABLE INDICATING LIGHTS: SUPERVISE SOURCES VIA TRANSFER-SWITCH NORMAL- AND ALTERNATE-SOURCE SENSING CIRCUITS.

3.2.1. NORMAL POWER SUPERVISION: GREEN LIGHT WITH NAMEPLATE ENGRAVED "NORMAL SOURCE AVAILABLE."

3.2.2. EMERGENCY POWER SUPERVISION: RED LIGHT WITH NAMEPLATE ENGRAVED "ALTERNATE SOURCE AVAILABLE."

3.3. UNASSIGNED AUXILIARY CONTACTS: ONE SET OF NORMALLY CLOSED CONTACTS FOR EACH SWITCH POSITION, RATED 10 A AT 240-V AC.

F. SOURCE QUALITY CONTROL

1. FACTORY TESTS AND INSPECT COMPONENTS, ASSEMBLED SWITCHES, AND ASSOCIATED EQUIPMENT. ENSURE PROPER OPERATION. CHECK TRANSFER TIME AND VOLTAGE, FREQUENCY, AND TIME-DELAY SETTINGS FOR COMPLIANCE WITH SPECIFIED REQUIREMENTS. PERFORM DIELECTRIC STRENGTH TESTING WITH NEMA ICS 1.

PART 2 EXECUTION

A. INSTALLATION

1. FLOOR-MOUNTING SWITCH: ANCHOR TO FLOOR BY BOLTING.

1.1. CONCRETE BASE: 3-1/2 INCHES DIA. REINFORCED, WITH CHAMFERED EDGES. EXTEND BASE NO MORE THAN 4 INCHES IN ALL DIRECTIONS BEYOND THE MAXIMUM DIMENSIONS OF SWITCH, UNLESS OTHERWISE INDICATED OR UNLESS REQUIRED FOR SEISMIC SUPPORT.

2. IDENTIFY COMPONENTS ACCORDING TO DIVISION 16 SECTION "IDENTIFICATION FOR ELECTRICAL

1.2. SHUNT TRIP DEVICE/ACCESSORY CONNECTED TO ENGINE/GENERATOR SAFETY SHUTDOWNS.

1.3. MOUNTED ON THE GENERATOR IN A GUARDED DRIP-PROOF ENCLOSURE.

M. BATTERY CHARGER

1. A DUAL RATE TO AMPERE BATTERY CHARGER SHALL BE PROVIDED WHICH SHALL ACCEPT 120 VOLT AC SINGLE PHASE INPUT TO PROVIDE 24 VOLT DC OUTPUT. IT SHALL BE FIRED ON THE AC INPUT AND DC OUTPUT, AND INCORPORATE CURRENT LIMITING CIRCUITRY TO AVOID THE NEED FOR A CRANK DISCONNECT RELAY. THE CHARGER SHALL INCLUDE A DC AMMETER AND VOLTMETER, AND BE HOUSED IN A NEW 1 ENCLOSURE SUITABLE FOR WALL MOUNTING.

2. THE CHARGER SHALL INCLUDE LED ANNUNCIATION FOR LOW BATTERY VOLTAGE, HIGH BATTERY VOLTAGE, BATTERY CHARGER MALFUNCTION, AND AC FAILURE, AND DRY CONTACTS FOR BATTERY CHARGER MALFUNCTION AND LOW BATTERY VOLTAGE, AS REQUIRED BY NFPA-110.

N. BATTERIES

1. TWENTY-FOUR (24) VOLT STARTING BATTERIES, SIZED AS RECOMMENDED BY THE GENERATOR SET MANUFACTURER, BATTERY CABLES, AND BASE MOUNTED BATTERY RACK SHALL BE PROVIDED.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

O. ENCLOSURES

1. WEATHER PROTECTIVE ENCLOSURE WITH REMOVABLE/HINGED DOORS AND REMOVABLE END PANELS. ALL HINGES AND LATCHES SHALL BE STAINLESS STEEL.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

P. ENCLOSURES

1. HINGED PROTECTIVE ENCLOSURE WITH REMOVABLE/HINGED DOORS AND REMOVABLE END PANELS. ALL HINGES AND LATCHES SHALL BE STAINLESS STEEL.

2. THE GENERATOR BATTERY (OR BATTERIES) SHALL BE PROVIDED WITH A BATTERY HEATER.

Q. SUBMITTALS

1. SUBMITTALS FOR APPROVAL SHALL INCLUDE BUT NOT BE LIMITED TO:

2. COMPONENT LIST - A BREAKDOWN OF ALL COMPONENTS AND OPTIONS INCLUDING SWITCHGEAR.

3. TECHNICAL DATA - A MANUFACTURER PRODUCED GENERATOR SET SPECIFICATION OR DATA SHEET IDENTIFYING MAKE AND MODEL OF ENGINE AND GENERATOR, AND INCLUDING RELEVANT COMPONENT DESIGN AND PERFORMANCE DATA.

4. AUXILIARY EQUIPMENT - SPECIFICATION OR DATA SHEETS, INCLUDING SWITCHGEAR, TRANSFER SWITCH, VIBRATION ISOLATORS, AND DAY TANK.

5. DRAWINGS - GENERAL DIMENSIONS DRAWINGS SHOWING OVERALL GENERATOR SET MEASUREMENTS, MOUNTING LOCATION AND INTERCONNECT POINTS FOR LOAD LEADS, FUEL, EXHAUST, COOLING AND DRAIN LINES.

6. WIRING DIAGRAMS - WIRING DIAGRAMS, SCHEMATICS AND CONTROL PANEL OUTLINE DRAWINGS PUBLISHED BY THE MANUFACTURER FOR CONTROLS AND SWITCHGEAR SHOWING INTERCONNECTED POINTS AND LOGIC DIAGRAMS FOR USE BY CONTRACTOR AND OWNER.

7. WARRANTY STATEMENTS - WARRANTY VERIFICATION PUBLISHED BY THE MANUFACTURER.

R. REPORTING TESTS

1. THE SYSTEM MANUFACTURER MUST CERTIFY THAT ENGINE, GENERATOR, CONTROLS AND SWITCHGEAR HAVE BEEN TESTED AS COMPLETE SYSTEM OF REPRESENTATIVE ENGINEERING MODELS (NOT ON EQUIPMENT LOAD). PROTOTYPE TESTING SHALL INCLUDE:

1.1. FUEL CONSUMPTION AT 1/4, 1/2, 3/4 AND FULL LOAD, EXHAUST EMISSIONS, MECHANICAL AND LUBE OIL NOISE, GOVERNING SPEED REGULATION AT 1/4, 1/2, 3/4 AND FULL LOAD, AND DURING TRANSIENTS, MOTOR STARTING KVA, GENERATOR TEMPERATURE RISE IN ACCORDANCE WITH NEMA MG-1-22.40, VOLTAGE REGULATION AT 1/4, 1/2, 3/4 AND FULL LOAD, AND DURING TRANSIENTS.

2. CYCLING TESTS, INCLUDING LOAD, SPEED, DEPARTING FACTORS, IN ACCORDANCE WITH NFPA 110, SHORT CIRCUIT CAPABILITY, COOLING SYSTEM PERFORMANCE, TORSIONAL ANALYSIS, LINEAR VIBRATION ANALYSIS.

C. SYSTEM PERFORMANCE

1. THE POWER GENERATING SYSTEM SHALL CONFORM TO THE FOLLOWING PERFORMANCE CRITERIA AT THE SITE CONDITIONS.

2. RATING - ENGINE BRAKE HORSEPOWER SHALL BE SUFFICIENT TO DELIVER FULL RATED GENERATOR SET KVA/VA WHEN OPERATED AT RATED RPM AND EQUIPPED WITH ALL ENGINE-MOUNTED PARASITIC AND EXTERNAL LOADS SUCH AS RADIATOR FANS AND POWER GENERATORS.

3. START TIME AND LOAD ACCEPTANCE - ENGINE SHALL START, ACHIEVE RATED VOLTAGE AND FREQUENCY, AND BE CAPABLE OF ACCEPTING LOAD WITHIN 10 SECONDS WHEN PROPERLY EQUIPPED AND MAINTAINED.

4. WITH THE POWER GENERATING SYSTEM AT NORMAL OPERATING TEMPERATURE, IT SHALL ACCEPT A 100% LOAD, LESS APPLICABLE, WITHIN 10 SECONDS OF THE TIME WHEN THE LOAD IS APPLIED.

5. STEADY STATE VOLTAGE REGULATION SHALL BE +/- 0.33% WITH NO LOAD TO FULL LOAD SPEED DROP LESS THAN 3X.

6. VOLTAGE REGULATION SHALL BE +/- 0.5% FOR ANY STEADY STATE LOAD BETWEEN NO LOAD AND 100% OF RATED LOAD.

D. PRODUCTION TESTS

1. THE SYSTEM MANUFACTURER SHALL PERFORM PRODUCTION TESTS ON THE COMPLETE GENERATOR SET SUPPLIED. A CERTIFIED REPORT OF THESE TESTS SHALL BE AVAILABLE WHEN REQUESTED AT THE TIME OF THE GENERATOR SET ORDER. THESE TESTS AND CONTROLS SHALL INCLUDE BUT NOT BE LIMITED TO:

1.1. OPERATION AT RATED KW, TRANSIENT AND STEADY STATE GOVERNING, TRANSIENT AND STEADY STATE VOLTAGE REGULATION, OPERATION OF ALL ALARM AND SHUTDOWN DEVICES, SINGLE STEP LOAD PICKUP OF RATED KW.

E. INSTALLATION/ON SITE TESTING

1. THE GENERATOR SHALL BE PERFORMED IN ACCORDANCE WITH SHOP DRAWINGS, SPECIFICATIONS AND THE MANUFACTURER'S INSTRUCTIONS, AND SHALL COMPLY WITH APPLICABLE STATE AND LOCAL CODES.

2. THE GENERATOR SET SHALL BE TESTED AS DEFINED BELOW BY THE MANUFACTURER'S AUTHORIZED DEALER TO SHOW IT IS FREE OF ANY DEFECTS AND WILL START AUTOMATICALLY AND CARRY FULL LOAD. THIS TESTING MAY BE SEPARATED AT THE FACILITY OF THE SYSTEM MANUFACTURER'S AUTHORIZED LOCAL DEALER OR AT THE JOBSITE. TESTING SHALL BE COMPLETED IN THE PRESENCE OF THE OWNER'S ENGINEER OR HIS APPOINTED REPRESENTATIVE.

3. A CONFIRMABLE TEST REPORT FOR TESTING SHALL BE FURNISHED BY THE BIDDER. ANY DEFECTS WHICH BECOME EVIDENT DURING THE TEST SHALL BE CORRECTED BY THE BIDDER AT HIS OWN EXPENSE.

4. GENERATOR MANUFACTURER SHALL PROVIDE CUSTOMER TRAINING OF GENERATOR SYSTEM.

5. OWNER OPERATION OF THE FOLLOWING SHALL BE DEMONSTRATED:

5.1. ALL AUXILIARY EQUIPMENT SUPPLIED TO THIS SPECIFICATION, STARTING AND CHARGING SYSTEM COMPONENTS, ALL CONTROLS, ENGINE SHUTDOWNS AND SAFETY DEVICES

5.2. FURNISHING MANUALS AND BOOKS

1. THE SYSTEM MANUFACTURER'S AUTHORIZED LOCAL DEALER SHALL FURNISH THREE COPIES OF EACH OF THE MANUALS AND BOOKS LISTED BELOW FOR EACH UNIT UNDER THIS CONTRACT:

G. OPERATING INSTRUCTIONS

1. WITH DESCRIPTION AND ILLUSTRATION OF ALL SWITCHGEAR CONTROLS AND INDICATORS AND ENGINE AND GENERATOR CONTROLS.

H. PARTS BOOKS

1. THAT ILLUSTRATE AND LIST ALL ASSEMBLIES, SUBASSEMBLIES AND COMPONENTS, EXCEPT STANDARD FASTENING HARDWARE (NUTS, BOLTS, WASHERS, ETC.).

I. PREVENTATIVE MAINTENANCE INSTRUCTIONS

1. ON THE COMPLETE SYSTEM THAT COVER DAILY, WEEKLY, MONTHLY, BIENNIAL AND ANNUAL MAINTENANCE AND MAINTENANCE MANUALS. IN ADDITION TO ITEMS SPECIFIED IN DIVISION 01 SECTION "OPERATION AND MAINTENANCE DATA," INCLUDE THE FOLLOWING:

1.1. FEATURES AND OPERATING SPECIFICATIONS, BOTH AUTOMATIC AND MANUAL.

1.2. LIST OF ALL FACTORY SETTINGS OF RELAYS, PROVIDE RELAY-SETTING AND CALIBRATION DATA INCLUDING SOFTWARE, WHERE APPLICABLE.

SECTION 16350 - ELECTRICAL IDENTIFICATION

A. MANUFACTURED LABELS FOR EACH PANELBOARD & TRANSFORMER. TYPEWRITTEN PANEL SCHEDULES MOUNTED IN PANELS.

B. PRINTED TAPE STYLE LABEL FOR EACH RECEPTACLE INDICATING PANEL & CIRCUIT #.

C. MANUFACTURED LABELS FOR ALL DISCONNECT SWITCHES INDICATING EQUIPMENT SERVED.

D. BRANCH CIRCUITS - IDENTIFY EACH CIRCUIT W/ WIRE MARKERS WHEN ENCLOSURE LABEL AND WIRE COLORS DO NOT PROVIDE ENOUGH INFORMATION TO IDENTIFY EACH CIRCUIT WITHOUT TRACING.

E. SHOWING FUNCTION OF ALL ELECTRICAL COMPONENTS.

8. GENERATOR MANUFACTURER SHALL PROVIDE FREIGHT TO JOB SITE, UNLOADING OF EQUIPMENT BY CONTRACTOR.

SECTION 163600 - TRANSFER SWITCHES

PART 1 GENERAL

A. RELATED DOCUMENTS

1. REFERENCE SECTION 260500.

2. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

B. SUMMARY

1. THIS SECTION INCLUDES TRANSFER SWITCHES RATED 600 V AND LESS, INCLUDING THE FOLLOWING:

1.1. AUTOMATIC TRANSFER SWITCHES.

1.2. NONAUTOMATIC TRANSFER SWITCHES.

1.3. REMOTE ANNUNCIATOR SWITCHES.

C. SUBMITTALS

1. PRODUCT DATA - INCLUDE RATED CAPACITIES, WEIGHTS, OPERATING CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.

2. SHOP DRAWINGS - DIMENSIONED PLANS, ELEVATIONS, SECTIONS, AND DETAILS SHOWING MINIMUM CLEARANCES, CONDUCTOR ENTRY PROVISIONS, GUTTER SPACE, INSTALLED FEATURES AND DEVICES, AND MATERIAL LISTS FOR EACH SWITCH SPECIFIED.

3. FIELD QUALITY-CONTROL TEST REPORTS.

4. OPERATION AND MAINTENANCE DATA - FOR EACH TYPE OF PRODUCT TO INCLUDE IN EMERGENCY, PARTS, AND EMERGENCY MAINTENANCE MANUALS. IN ADDITION TO ITEMS SPECIFIED IN DIVISION 01 SECTION "OPERATION AND MAINTENANCE DATA," INCLUDE THE FOLLOWING:

4.1. FEATURES AND OPERATING SPECIFICATIONS, BOTH AUTOMATIC AND MANUAL.

4.2. LIST OF ALL FACTORY SETTINGS OF RELAYS, PROVIDE RELAY-SETTING AND CALIBRATION DATA INCLUDING SOFTWARE, WHERE APPLICABLE.

D. QUALITY ASSURANCE

1. OPERATION - ELECTRICALLY ACTUATED BY PUSH BUTTONS DESIGNATED "NORMAL SOURCE" AND "ALTERNATE SOURCE" SWITCH SHALL BE CAPABLE OF TRANSFERRING LOAD IN EITHER DIRECTION WITH EITHER OR BOTH SOURCES ENERGIZED.

2. DOUBLE-THROW SWITCHING ARRANGEMENT: INCAPABLE OF PAUSES OR INTERMEDIATE POSITION STOPS DURING SWITCHING SEQUENCE.

3. NONAUTOMATIC TRANSFER-SWITCH ACCESSORIES:

3.1. PILOT LIGHTS: INDICATE SOURCE TO WHICH LOAD IS CONNECTED.

3.2. SOURCE-AVAILABLE INDICATING LIGHTS: SUPERVISE SOURCES VIA TRANSFER-SWITCH NORMAL- AND ALTERNATE-SOURCE SENSING CIRCUITS.

3.2.1. NORMAL POWER SUPERVISION: GREEN LIGHT WITH NAMEPLATE ENGRAVED "NORMAL SOURCE AVAILABLE."

3.2.2. EMERGENCY POWER SUPERVISION: RED LIGHT WITH NAMEPLATE ENGRAVED "ALTERNATE SOURCE AVAILABLE."

3.3. UNASSIGNED AUXILIARY CONTACTS: ONE SET OF NORMALLY CLOSED CONTACTS FOR EACH SWITCH POSITION, RATED 10 A AT 240-V AC.

F. SOURCE QUALITY CONTROL

1. FACTORY TESTS AND INSPECT COMPONENTS, ASSEMBLED SWITCHES, AND ASSOCIATED EQUIPMENT. ENSURE PROPER OPERATION. CHECK TRANSFER TIME AND VOLTAGE, FREQUENCY, AND TIME-DELAY SETTINGS FOR COMPLIANCE WITH SPECIFIED REQUIREMENTS. PERFORM DIELECTRIC STRENGTH TESTING WITH NEMA ICS 1.

PART 2 EXECUTION

A. INSTALLATION

1. FLOOR-MOUNTING SWITCH: ANCHOR TO FLOOR BY BOLTING.

1.1. CONCRETE BASE: 3-1/2 INCHES DIA. REINFORCED, WITH CHAMFERED EDGES. EXTEND BASE NO MORE THAN 4 INCHES IN ALL DIRECTIONS BEYOND THE MAXIMUM DIMENSIONS OF SWITCH, UNLESS OTHERWISE INDICATED OR UNLESS REQUIRED FOR SEISMIC SUPPORT.

2. IDENTIFY COMPONENTS ACCORDING TO DIVISION 16 SECTION "IDENTIFICATION FOR ELECTRICAL

SYSTEMS."

3. SET FIELD-ADJUSTABLE INTERVALS AND DELAYS, RELAYS, AND ENGINE EXERCISER CLOCK.

B. CONNECTIONS

1. GROUND EQUIPMENT ACCORDING TO DIVISION 16.

2. CONNECT WIRING ACCORDING TO DIVISION 16.

3. WIRING TO REMOTE COMPONENTS: MATCH TYPE AND NUMBER OF CABLES AND CONDUCTORS TO CONTROL AND COMMUNICATION REQUIREMENTS OF TRANSFER SWITCHES AS RECOMMENDED BY MANUFACTURER. INCREASE BACKWIRE SIZES AT NO ADDITIONAL COST TO OWNER IF NECESSARY TO ACCOMMODATE REQUIRED WIRING.

C. WARRANTY

1. DURATION OF WARRANTY:

1.1. 2 YEARS INCLUSIVE OF LABOR/WORKMANSHIP

1.2. 5 YEARS ON PARTS

1.3. 10 YEARS ON THE MAIN CONTACTS

D. FIELD QUALITY CONTROL

1. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.

1.1. MANUFACTURER'S FIELD SERVICE: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO INSPECT COMPONENTS, ASSEMBLIES, AND EQUIPMENT INSTALLATION, INCLUDING CONNECTIONS, AND TO ASSIST IN TESTING.

1.2. AFTER INSTALLING EQUIPMENT AND AFTER ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, TEST FOR COMPLIANCE WITH REQUIREMENTS.

1.3. PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CERTIFY COMPLIANCE WITH TEST PARAMETERS.

1.4. MEASURE INSULATION RESISTANCE PHASE-TO-PHASE AND PHASE-TO-GROUND WITH INSULATION-RESISTANCE TESTER. INCLUDE EXTERNAL ANNUNCIATION AND CONTROL CIRCUITS. USE MANUF. VOLTAGES AND PROCEDURE RECOMMENDED BY MANUFACTURER. COMPLY WITH MANUFACTURER'S SPECIFIED MINIMUM RESISTANCE.

1.4.1. CHECK FOR ELECTRICAL CONTINUITY OF CIRCUITS AND FOR SHORT CIRCUITS.

1.4.2. INSPECT FOR PHYSICAL DAMAGE, PROPER INSTALLATION AND CONNECTION, AND INTEGRITY OF PARTS, COVER, AND SAFETY FEATURES.

1.4.3. VERIFY THAT MANUAL TRANSFER WARNINGS ARE PROPERLY PLACED.

1.4.4. PERFORM MANUAL TRANSFER OPERATION.

1.5. AFTER ENERGIZING CIRCUITS, DEMONSTRATE INTERLOCKING SEQUENCE AND OPERATIONAL FUNCTION FOR EACH SWITCH.

1.5.1. SIMULATE POWER FAILURES OF NORMAL SOURCE TO AUTOMATIC TRANSFER SWITCHES AND OF EMERGENCY SOURCE WITH NORMAL SOURCE AVAILABLE.

1.5.2. SIMULATE LOSS OF PHASE-TO-GROUND VOLTAGE FOR EACH PHASE OF NORMAL SOURCE.

1.5.3. VERIFY TIME-DELAY SETTINGS.

1.5.4. VERIFY PICKUP AND DROPOUT VOLTAGES BY DATA READOUT OR INSPECTION OF CONTROL SETTINGS.

1.5.5. VERIFY PROPER SEQUENCE AND CORRECT TIMING OF AUTOMATIC ENGINE STARTING, TRANSFER TIME DELAY, RETRANSFER TIME DELAY ON RESTORATION OF NORMAL POWER, AND ENGINE COOL-DOWN AND SHUTDOWN.

2. COORDINATE TESTS WITH TESTS OF GENERATOR AND RUN THEM CONCURRENTLY.

3. REPORT RESULTS OF TESTS AND INSPECTIONS IN WRITING. RECORD ADJUSTABLE RELAY SETTINGS AND MEASURED INSULATION AND CONTACT RESISTANCES AND TIME DELAYS. ATTACH A LABEL OR TAG TO EACH SWITCH INDICATING SATISFACTORY COMPLETION OF TESTS.

4. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.

E. DEMONSTRATION

1. ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO TRAIN OWNER'S MAINTENANCE PERSONNEL IN ADJUST, OPERATE, AND MAINTAIN TRANSFER SWITCHES AND RELATED EQUIPMENT AS SPECIFIED BELOW.

2. COORDINATE THIS TRAINING WITH THAT FOR GENERATOR EQUIPMENT.

END OF SECTION 163600

SECTION 16400 - WIRING DEVICES

A. COGNITION OF DEVICES - SPEC GRADE 20 AMP DUPLEX W/ GROUND & SS WALL PLATES. OTHER OUTLETS SHALL BE VERIFIED W/ EQUIPMENT SUPPLIERS FOR PROPER NEMA CONFIGURATIONS.

PROVIDE GFCI RATED DEVICES WHERE INDICATED AND AS REQ'D PER CODE.

B. BRIGHT SWITCHES - SPEC GRADE 20 AMP TOGGLE SWITCHES W/ SS WALL PLATES.

C. WALL MOUNT SWITCHES - SPEC GRADE, PIR, OVERHIDE.

D. CEMILING MOT