ELECTRICAL SYMBOLS LIST

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⊖3	DUPLEX CONVENIENCE OUTLET, +18" A.F.F. U.O.N., NUMBER DENOTES CIRCUIT, (EXAMPLE 3).		FIRE
$\ominus 2$	SIMPLEX CONVENIENCE OUTLET, +18" A.F.F. U.O.N., NUMBER DENOTES CIRCUIT, (EXAMPLE 2).	(S) (F)	SOU DISC
⊖GFI	GFI DENOTES GROUND FAULT INTERRUPTING.		DISC
	WP DENOTES IN-USE WEATHERPROOF COVER.	☐ F X	COM
⊖IG	IG DENOTES ISOLATED GROUND.		CON
\bigcirc	SPECIAL RECEPTACLE OUTLET CONFIGURATION.	St	MAN
\bigoplus	DOUBLE DUPLEX RECEPTACLE OUTLET.	VFC	VAR
H	WALL MOUNTED JUNCTION BOX FOR POWER SERVICE TO PANEL SYSTEM. NUMBER DENOTES CIRCUIT, EXAMPLE: 1)	2	ELE(DEN
\bigcirc	JUNCTION BOX, NUMBER DENOTES CIRCUIT (EXAMPLE 1)		PAN
	FLOOR MOUNTED OUTLET FOR POWER SERVICE, DATA SERVICE, AND TELEPHONE SERVICE TO PANEL SYSTEM. PROVIDE FINAL CONNECTIONS TO PANEL SYSTEM. NUMBER DENOTES CIRCUIT TYPICAL (EXAMPLE: 1).		PAN CON CON
$\Phi \mathbf{A}$	COMBINATION POWER/DATA FLOOR BOX SERVICE FITTING.		EQU
P	POWER SERVICE FOR FLOOR BOX SERVICE FITTING.		CRO THE
Y	DATA SERVICE FOR FLOOR BOX SERVING FITTING. INSTALL DATA COVERPLATE IN SERVICE FITTING.		
HC	DATA CABLE SERVICE, +18" A.F.F U.O.N., PROVIDE PLASTER RING AND PULL STRING TO ACCESSIBLE CEILING SPACE.		CRO CON EQU
HB	JUNCTION BOX WITH BLANK COVER PLATE +18" A.F.F U.O.N., PROVIDE PLASTER RING AND PULL STRING TO ACCESSIBLE CEILING SPACE.		ALL
ΗŢ	OUTLET FOR CABLE TV. +18" A.F.F. U.O.N. FURNISH AND INSTALL CONDUIT AND CABLE AS REQUIRED TO COMPLETE A FULLY OPERABLE SYSTEM.	Ę	CON FLE>
FACP	FIRE ALARM CONTROL PANEL.	HE	EME A.F.F
HF	ADA APPROVED FIRE ALARM MANUAL PULL STATION, +46" A.F.F. U.O.N. INTERFACE TO BASE BUILDING FIRE ALARM SYSTEM.	Sa	SING A.F.F
HSB	ADA APPROVED STROBE LIGHT. MATCH BUILDING STANDARD. MOUNT BOTTOM OF DEVICE AT 80" A.F.F. INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM. PROVIDE POWER SUPPLIES AS REQUIRED.	S3 Sd	LOW OR II THR
A H SB	ADA APPROVED STROBE LIGHT WITH AUDIBLE ALARM. MATCH BUILDING STANDARD. MOUNT BOTTOM OF DEVICE AT 80" A.F.F. INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM. PROVIDE POWER SUPPLIES AS REQUIRED.	Sos	WAL WAL SWIT
Ø	ADA APPROVED CEILING MOUNTED STROBE LIGHT. MATCH BUILDING STANDARD. INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM. PROVIDE POWER SUPPLIES AS REQUIRED.	LOS HOS	CEIL WAL
FX	ADA APPROVED CEILING MOUNTED STROBE LIGHT WITH AUDIBLE ALARM. MATCH BUILDING STANDARD. INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM. PROVIDE POWER SUPPLIES AS REQUIRED.	B 3	LED INDI INDI CIRC
S	ADA APPROVED FIRE ALARM VOICE ALARM SPEAKER. INTERFACE WITH FIRE ALARM SYSTEM.		NUM TWC
SD	ADA APPROVED SMOKE DETECTOR, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.		of t fixt the
DD	ADA APPROVED SMOKE DETECTOR, DUCT MOUNTED, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM. DETECTOR TO SHUTDOWN ASSOCIATED HVAC UNIT UPON ALARM.		EME WITH FIXT
\mathbb{K}	ADA APPROVED FIRE ALARM HORN, RECESSED, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.		LED LED,
WF	SPRINKLER SYSTEM FLOW SWITCH. INTERCONNECT TO BASE BUILDING FIRE SYSTEM.	Ю	LED, MOU
VPI	VALVE POSITION INDICATOR, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.		LED,
D	DOOR HOLD OPEN DEVICE, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.		LED, WAL
HCO	ADA APPROVED CARBON MONOXIDE DETECTOR.	D S SF	CEIL

1/16"=1'-0" 1/8"=1'-0" 1/4"=1'-0"

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0 8' 16' 32' 0 4' 8' 16' 0 2' 4' 8' 0 1' 2' 4' 0 1' 2' 0 6" 1' 2' 0 3" 6" 1'

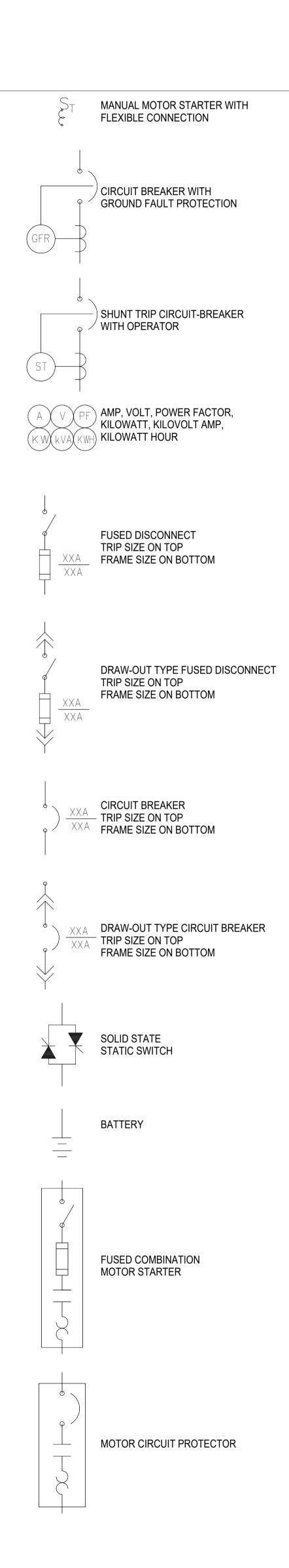
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FIREMAN'S COMMUNICATION JACK.	WAP	WIRELESS ACCESS POINT, FURNISHED AND INSTALLED BY
SOUND SYSTEM PAGING SPEAKER.		OWNER. CABLING, TERMINATIONS, TESTING AND MAPPING BY THE CONTRACTOR. REFER TO SPECIFICATION SECTION 270500.
DISCONNECT SWITCH, FUSED. DISCONNECT SWITCH, NON-FUSED.	SC	SECURITY CAMERAS, FURNISHED AND INSTALLED BY OWNER. CABLING, TERMINATIONS, TESTING AND MAPPING BY THE CONTRACTOR. REFER TO SPECIFICATION SECTION 281000.
COMBINATION STARTER, FUSED.	DS	DOOR STRIKE FOR SECURITY/ACCESS CONTROL. CABLING, TERMINATIONS, TESTING AND MAPPING BY THE CONTRACTOR.
COMBINATION STARTER, NON-FUSED.		REFER TO SPECIFICATION SECTION 281000.
MANUAL MOTOR STARTER WITH THERMAL OVERLOAD.	BG	BREAK GLASS DEVICE, CEILING MOUNTED FOR SECURITY/ACCESS CONTROL. CABLING, TERMINATIONS, TESTING AND MAPPING BY THE CONTRACTOR. REFER TO SPECIFICATION
VARIABLE FREQUENCY CONTROLLER, PROVIDED BY ELECTRICAL		SECTION 281000.
ELECTRIC MOTOR, NIEC, MAKE CONNECTIONS ONLY. NUMBER DENOTES HORSEPOWER. (EXAMPLE: 2HP)	ΗA	AUDIO/VISUAL DEVICE, WALL MOUNTED.
PANELBOARD, SURFACE MOUNTED.	P	TELEPHONE/POWER POLE
PANELBOARD, RECESSED MOUNTED.	HM	MICROPHONE OUTLET, 18" A.F.F. U.O.N., PROVIDE PLASTER RING AND PULL STRING TO ACCESSIBLE CEILING SPACE.
CONDUIT RUN BELOW SLAB OR UNDERGROUND.	HP	CEILING OR WALL MOUNTED PHOTOCELL.
CONDUIT HOMERUN, CONTINUOUS RUN TO PANEL OR	HCL	RECESSED CLOCK OUTLET, +80" A.F.F. U.O.N., NUMBER DENOTES
EQUIPMENT CABINET.		CIRCUIT (EXAMPLE 1).
CROSSMARKS ON BRANCH CIRCUIT CONDUIT RUNS INDICATE	HCR	CARD READER, +46" A.F.F U.O.N. SOLENOID VALVE.
THE QUANTITY OF CONDUCTORS, EXCEPT NO CROSSMARKS INDICATE TWO #12 AWG CONDUCTORS.	SV	
LONG CROSSMARKS INDICATE PHASE CONDUCTORS AND SHORT		DOOR POSITION MONITOR SWITCH.
CROSSMARKS WITHOUT DESIGNATION ARE NEUTRAL CONDUCTORS. SHORT CROSSMARKS WITH "G" ARE SEPARATE EQUIPMENT GROUNDING CONDUCTORS.		DOOR SWITCH, COORDINATE EXACT LOCATION WITH DOOR FRAMING.
ALL CONDUCTORS SHALL BE #12 AWG U.O.N.	EL	ELECTRIC DOOR LOCK, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.
ALL PVC CONDUITS SHOULD HAVE SEPARATE GROUNDING CONDUCTOR.	(H)	HEAT DETECTOR, INTERCONNECT TO BASE BUILDING FIRE ALARM SYSTEM.
FLEXIBLE METALLIC CONDUIT.	(GS)	GAS SENSOR
EMERGENCY POWER OFF PUSHBUTTON WITH LIFT COVER +46" A.F.F. U.O.N.	GK	GAS HORN, RECESSED TYPE.
SINGLE POLE TOGGLE OR MOMENTARY CONTACT SWITCH, +46" A.F.F. U.O.N. "a" INDICATES FIXTURES SWITCHED. ALSO USED IN		LIQUID SENSOR LOCATED BELOW RAISED FLOOR.
LOW VOLTAGE SWITCHING TO CONTROL REMOTE CONTACTOR OR IN DIRECT LINE VOLTAGE SWITCHING.	HP	DOOR RELEASE PUSHBUTTON, +46" A.F.F. U.O.N.
THREE-WAY TOGGLE SWITCH, +46" A.F.F. U.O.N.	ΗK	KEY PAD.
WALL BOX DIMMER SWITCH, +46" A.F.F. U.O.N.	HKO L	KEY OVERRIDE.
WALL MOUNTED OCCUPANCY SENSOR WITH MANUAL OVER-RIDE	I/C	INTERCOM, +46" A.F.F. U.O.N.
SWITCH, +46" A.F.F. U.O.N.	(B)	BACKGROUND MUSIC SPEAKER
CEILING MOUNTED OCCUPANCY SENSOR.	Ho	WALL MOUNTED PUSHBUTTON FOR INTERCOM, +46" A.F.F. U.O.N.
WALL MOUNTED OCCUPANCY SENSOR.	AIC	INTERRUPTION CAPACITY
LED OR FLUORESCENT LED FIXTURE. LOWER CASE LETTER	A	AMPS
INDICATES CONTROLLING SWITCH, "a". UPPER CASE LETTER INDICATES FIXTURE TYPE, i.e. "B". NUMERAL INDICATES PANEL	V	VOLTS
CIRCUIT NUMBER, i.e. "3". SWITCH, FIXTURE TYPE, AND CIRCUIT NUMBERS ARE TYPICAL FOR ALL LIGHTING FIXTURES. WHERE	IG	ISOLATED GROUND
TWO SWITCHING DESIGNATIONS ARE SHOWN CIRCUIT ONE LAMP OF TWO LAMP FIXTURES AND OUTER LAMPS OF 3 AND 4 LAMP	GND	GROUND
FIXTURES TO THE FIRST SWITCHING DESIGNATION SHOWN. AND THE REMAINING LAMP(S) TO THE SECOND DESIGNATION SHOWN.	3ø	PHASE DESIGNATION (EXAMPLE 3 PHASE)
EMERGENCY LED OR FLUORESCENT FIXTURE. PROVIDE FIXTURE	3W	NUMBER OF CONDUCTORS (EXAMPLE 3 WIRES)
WITH INTEGRAL BATTERY BACKUP, TYPICAL FOR ALL LIGHTING FIXTURES. REFER TO EMERGENCY BALLAST WIRING DIAGRAM.	З"С	CONDUIT SIZE (EXAMPLE 3" CONDUIT)
LED OR FLUORESCENT STRIP FIXTURE.	G	GENERATOR.
LED, INCANDESCENT, FLUORESCENT OR H. I. D. FIXTURE.		
LED, INCANDESCENT, FLUORESCENT OR H. I. D. FIXTURE, WALL MOUNTED.		 SWITCH/FUSE COMBINATION, INDIVIDUALLY MOUNTED. CIRCUIT BREAKER.
LED, INCANDESCENT, FLUORESCENT OR H. I. D. SCONCE.	°°	WATT-HOUR METER.
LED, INCANDESCENT, FLUORESCENT OR H. I. D. WALL WASHER.	<u>کتنا</u> ار	
WALL MOUNTED EGRESS FIXTURE.		CURRENT TRANSFORMER
CEILING MOUNTED EGRESS FIXTURE.		CURRENT
SINGLE FACE EXIT FIXTURE, CEILING OR WALL MOUNTED,		LETTER REPRESENTS DRAWING TITLE NUMBERS INDICATES SHEET NUMBER
PROVIDE DIRECTIONAL ARROW IF SHOWN. BRACKET DENOTES WALL MOUNTING. MOUNT FIXTURE FACE PARALLEL TO ADJACENT DOOR WHERE APPLICABLE.		INDICATES EXISTING EQUIPMENT - OR UNDERGROUND ROUTING
DOUBLE FACE EXIT FIXTURE, CEILING OR WALL MOUNTED, PROVIDE DIRECTIONAL ARROWS AS SHOWN. BRACKET DENOTES WALL MOUNTING. MOUNT FIXTURE FACE PERPENDICULAR TO ADJACENT DOOR WHERE APPLICABLE.		TRANSFORMER
NUMBERED NOTE: REFER TO SHEET CONTAINING NUMBERED NOTES.		7
		ELECTRICAL EQUIPMENT ENCLOSURE

1/2"=1'-0"

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3



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ELECTRICAL GENERAL NOTES

- THE SPACE ALLOCATION SHOWN ON THE PLAN DRAWINGS ARE BASED ON ONLY ONE MANUFACTURER. THE CONTRACTOR SHALL VERIFY THAT THE PROPOSED SWITCHGEAR (INCLUDING SWITCHBOARDS, PANELBOARDS AND TRANSFORMERS) WILL SATISFY THE SPACE REQUIREMENTS SHOWN ON THE DRAWINGS.
- 2. HERE CEILING SPACE IS A RETURN AIR PLENUM, ALL WIRING IN CEILING SPACE MUST BE IN CONDUIT OR USE TEFLON JACKETED CABLE TO MEET RETURN AIR PLENUM REQUIREMENTS.
- 3. THE CONTRACTOR IS RESPONSIBLE FOR SURVEYING THE SITE TO DETERMINE ALL EXISTING CONDITIONS RELATED TO THE NEW BUILDING. THIS INCLUDES ALL EXISTING UNDERGROUND UTILITIES. CONTRACTOR SHALL MAKE PROVISIONS FOR CROSSING, DISCONNECTING IN THE EVENT NEW UTILITY SERVICE TO NEW BUILDING ARE ROUTED THRU THESE AREAS.
- 4. SURFACE MOUNTED PANELS, DEVICES, AND RACEWAY WILL ONLY BE ALLOWED IN MECHANICAL AREAS.
- COMBINATION OF HOMERUN CIRCUITS SHALL BE AS FOLLOWS:
- A. ALL CIRCUITS WITH SEPARATE HOMERUN ARROWS SHALL BE INSTALLED IN DEDICATED CONDUITS. DO NOT COMBINE WITH OTHER BRANCH CIRCUITS.

B. ALL BRANCH CIRCUITS LARGER THAN 20A SHALL BE SEPARATELY HOMERUN TO PANEL.

C. A MAXIMUM OF SIX 20A BRANCH CIRCUIT PHASE CONDUCTORS IN COMMON HOMERUN.

- D. MINIMUM BRANCH CIRCUIT CONDUCTOR SHALL BE #12AWG, THHN.
- E. ALL 120V CIRCUITS SERVING NON-LIGHTING BRANCH CIRCUITS SHALL HAVE SEPARATE #12 AWG EQUIPMENT GROUNDING CONDUCTOR.
- 6. ELECTRICAL CONTRACTOR TO COORDINATE THE MOUNTING HEIGHTS OF ALL COMMUNICATION OUTLETS AND RECEPTACLES WITH ARCHITECTURAL DETAILS.
- 7. IN AREAS WHERE COMMUNICATION OUTLETS ARE INSTALLED IN WALL OF ROOM WITH A GYPBOARD CEILING, CONTRACTOR SHALL INSTALL 3/4" CONDUIT FROM OUTLET TO ACCESSIBLE CEILING.
- 8. CONTRACTOR TO COORDINATE WITH LANDSCAPE PLANS FOR ACTUAL LOCATION OF ALL EXTERIOR LANDSCAPE FIXTURES.
- 9. ALL 120 AND 277V BRANCH CIRCUITS GREATER THAN 100' SHALL BE #10 THHN, MINIMUM.
- 10. CONTRACTOR SHALL INSTALL A PULL STRING IN ALL EMPTY CONDUITS.
- 11. CONTRACTOR SHALL MAINTAIN MINIMUM SEPARATION OF 24" BETWEEN COMMUNICATIONS CONDUIT AND PRIMARY CONDUIT.
- 12. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING STARTER TYPE, OVERLOAD SIZE, AND DISCONNECT SIZE FOR ALL MOTORS WITH MECHANICAL CONTRACTOR.
- 13. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATION OF ALL FLOOR DEVICES. LOCATIONS SHALL BE IN ACCORDANCE WITH ALL UNDERWRITERS LABORATORIES AND LOCAL AUTHORITY REQUIREMENTS. IN NO CASE SHALL FIRE RATED POKE-THROUGH DEVICES BE INSTALLED LESS THAN 24" ON CENTER AND/OR MORE THAN ONE (1) PENETRATION PER 65 SQUARE FEET OF FLOOR AREA OF BEAM SPACE.
- 14. CONTRACTOR TO LOCATE ALL LIGHTING FIXTURES PER ARCHITECTURAL REFLECTED CEILING PLANS.
- 15. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING ELECTRICAL SERVICE TO ALL REMAINING AREAS OF THE FACILITY THROUGHOUT THE PROJECT EXCEPT DURING SCHEDULED SHUTDOWN TIMES.
- 16. ANY SHUTDOWNS OF THE EXISTING FACILITY SHALL BE MUTUALLY AGREED UPON BY OWNER AND CONTRACTOR. CONTRACTOR SHALL GIVE OWNER MINIMUM OF TWO WEEKS NOTICE OF ANY SHUTDOWNS OF EXISTING FACILITY.
- 17. ALL NEW ELECTRICAL PANELS SHALL BE INSTALLED A MINIMUM OF 8 " FROM ADJACENT PERPENDICULAR WALLS (TO ALLOW FOR FUTURE INSTALLATION OF ELECTRICAL PANELS ON ADJACENT PERPENDICULAR WALLS).
- 18. INSTALL ALL TRANSFORMERS A MINIMUM OF 6" FROM WALLS.
- 19. CONTRACTOR SHALL REVIEW ALL TRENCHING ON SITE WITH LANDSCAPE ARCHITECT AND OBTAIN APPROVAL BEFORE PERFORMING WORK.
- 20. CONTRACTOR SHALL ALLOW A MAXIMUM OF 3% VOLTAGE DROP ON ALL EMERGENCY BRANCH CIRCUITS THROUGHOUT THE AREAS UNDER THIS CONTRACT. CONTRACTOR SHOULD SIZE THE EMERGENCY BRANCH CIRCUITS FEEDERS ACCORDINGLY TO MAINTAIN THE MAXIMUM VOLTAGE DROP AS LISTED ABOVE.
- 21. CONTRACTOR TO REFER TO FIRE PROTECTION DRAWINGS FOR EXACT LOCATION OF ALL FLOW SWITCHES. CONTRACTOR TO PROVIDE CONNECTION TO FLOW SWITCHES FROM FIRE ALARM SYSTEM. CONTRACTOR TO ALSO PROVIDE CONNECTION TO ALL TAMPER SWITCHES FOR EXACT LOCATIONS COORDINATE WITH FIRE PROTECTION (SPRINKLER) CONTRACTOR.
- 22. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC. IT IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO PROVIDE A COMPLETE INSTALLATION IN ACCORDANCE WITH ALL APPLICABLE CODES INCLUDING NED PLUS ANY LOCAL COEDS. IT SHOULD BE NOTED THAT BASED ON OUR DESIGN STANDARDS THE DRAWINGS WILL HAVE AREAS THAT WILL EXCEED CODE REQUIREMENTS. THE AREAS ON THE CONTRACT DOCUMENTS THAT EXCEED CODE REQUIREMENTS SHOULD BE CONSIDERED POART OF THE SCOPE OF THE PROJECT AND SHOULD BE INCLUDED IN THE ELECTRICAL CONTRACTOR'S BID.
- 23. CONTRACTOR REPONSIBLE FOR COORDINATING EXACT ELECTRICAL REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH MANUFACTURER PRIOR TO INSTALLATION.
- 24. CONTRACTOR REPONSIBLE FOR COORDINATING EXACT ELECTRICAL REQUIREMENTS OF ALL OWNER PROVIDED EQUIPMENT WITH MANUFACTURER PRIOR TO INSTALLATION.



1/8" = 1'

	ON 26010 RICAL GENERAL PROVISIONS		
PART	GENERAL	1.09	SUBMITTALS
1.01	DESCRIPTION	A.	GENERAL: REFER TO GENERAL
A.	GENERAL: FURNISH LABOR, MATERIALS, APPARATUS, TOOLS, EQUIPMENT, TRANSPORTATION, TEMPORARY CONSTRUCTION AND SERVICES AS REQUIRED TO MAKE A COMPLETE WORKING ELECTRICAL INSTALLATION, AS SHOWN ON THE DRAWINGS OR DESCRIBED IN THESE SPECIFICATIONS. THE WORK SHALL INCLUDE MATERIALS, APPLIANCES AND APPARATUS NOT SPECIFICALLY MENTIONED HEREIN OR NOTED ON THE DRAWINGS, BUT REQUIRED FOR A COMPLETE INSTALLATION. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND UNUSED UNLESS OTHERWISE SPECIFIED. IN ADDITION, IT SHALL INCLUDE CONNECTION, INTERCONNECTION, AND POWER FOR ELECTRICAL EQUIPMENT	B.	REQUIREMENTS. FORMAT: FURNISH SUBMITTAL D OR BINDER WITH A TABLE OF CO PARAGRAPH NUMBER. DRAWING PREPARED BY COMPETENT DRAI ACCEPTED DRAFTING PRACTICE ALL ELECTRICAL EQUIPMENT (PA MODIFIED, AS NECESSARY, TO BI
	FURNISHED UNDER OTHER SECTIONS. CONTRACTOR SHALL REVIEW ALL CONTRACT DOCUMENTS INCLUDING, BUT NOT LIMITED TO, ARCHITECTURAL CEILING PLANS, ARCHITECTURAL DETAILS, DOOR HARDWARE SCHEDULES, AND MECHANICAL DOCUMENTS. ALL POWER SERVICE WIRING, BRANCH CIRCUIT WIRING, CONTROL WIRING OR OTHER WIRING NECESSARY FOR COMPLETE OPERATION OF EQUIPMENT OR FIXTURES, NOT SPECIFICALLY REQUIRED TO BE INSTALLED UNDER ANOTHER SECTION OF THIS SPECIFICATION, SHALL BE PROVIDED WHETHER OR NOT SUCH WIRING IS SPECIFICALLY SHOWN ON ELECTRICAL DRAWINGS OR DESCRIBED IN DIVISION 16		SUBMITTALS SHALL CONSIST OF "CATALOG CUTS" AND DATA SHEI INFORMATION, PERFORMANCE D MATERIALS USED IN FABRICATIO INDICATE THOSE OPTIONAL ACCI WHICH ARE EXCLUDED. SUBMIT SHOP DRAWINGS FOR: 1. PANELBOARDS.
	SPECIFICATIONS.	E.	SUBMIT MANUFACTURER'S DATA
B.	WORK INCLUDED: 1. WORK DESCRIBED IN DIVISION 16.		 LIGHTING FIXTURES. WIRING DEVICES AND DEVICE
	 ELECTRICAL WORK REQUIRED FOR CORRECT ELECTRICAL OPERATION OF EQUIPMENT AND APPARATUS FURNISHED UNDER DIVISION 15. 		 FIRE ALARM DEVICES. TRANSFORMERS. DISCONNECT SWITCHES.
	 ELECTRICAL WORK REQUIRED FOR CORRECT ELECTRICAL OPERATION OF EQUIPMENT FURNISHED UNDER ALL OTHER DIVISIONS OF THIS SPECIFICATION OR ON DRAWINGS. 		 PANELBOARDS MOTOR STARTERS METERS
C.	WORK FURNISHED AND INSTALLED UNDER ANOTHER SECTION REQUIRING POWER SUPPLY WIRING AND/OR CONNECTIONS UNDER THIS SECTION:	1.10 A	DRAWINGS LAYOUT: GENERAL LAYOUT SHO
	 ELECTRIC MOTORS. PACKAGE MECHANICAL EQUIPMENT; FANS, PUMPS, COMPRESSORS, ETC. 		EXCEPT WHERE OTHER WORK M SUCH CASE, ENGINEER SHOULD
D	3. TEMPERATURE CONTROL EQUIPMENT POWER SUPPLY WIRING. THE CONTRACTOR SHALL NOTIFY THE ENGINEER, ARCHITECT AND	В.	ACCURACY: 1. DRAWINGS FOR THE WORK U
2.	CONSTRUCTION MANAGER IF THE DELIVERY SCHEDULE OF ANY SPECIFIED PRODUCT WILL PROHIBIT THE CONSTRUCTION TO BE COMPLETED AS SCHEDULED. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY EXPEDITED DELIVERY COSTS WHICH MAY BE NECESSARY TO ACCOMPLISH THE COMPLETION SCHEDULE. ALL NOTIFICATIONS SHALL BE MADE IN WRITING A		 CONTRACTOR SHALL VERIFY THE DRAWINGS AND SHALL E SETTING OUT OF WORK AND CONDITIONS AT THE SITE.
E.	MINIMUM OF SEVEN BUSINESS DAYS PRIOR TO THE BID DATE. ALL REQUESTS FOR PRODUCT SUBSTITUTIONS SHALL BE SUBMITTED TO THE	1.11	EQUIPMENT LOCATION
	ENGINEER, ARCHITECT AND CONSTRUCTION MANAGER. ALL REQUESTS SHALL BE MADE IN WRITING A MINIMUM OF SEVEN BUSINESS DAYS PRIOR TO THE BID DATE.	A.	SURFACE MOUNTED PANELS, DE IN MECHANICAL EQUIPMENT ARE EXISTS.
1.02	GENERAL REQUIREMENTS, CODES AND STANDARDS	1.12	WORKMANSHIP
A.	REFERENCE TO CODES, STANDARDS, SPECIFICATIONS AND RECOMMENDATIONS OF TECHNICAL SOCIETIES, TRADE ORGANIZATIONS AND GOVERNMENTAL AGENCIES SHALL MEAN THAT LATEST EDITION OF SUCH PUBLICATIONS ADOPTED AND PUBLISHED PRIOR TO SUBMITTAL OF THE BID PROPOSED. SUCH CODES OR STANDARDS SHALL BE CONSIDERED A PART OF THIS SPECIFICATION AS THOUGH FULLY REPEATED HEREIN.	A.	PREPARATION, HANDLING AND IN THE MANUFACTURER'S WRITTEN PARTICULAR TO THE PRODUCT S OTHERWISE SPECIFIED. COORD FURNISHING AND PLACING THIS ' DONE BY OTHER TRADES AND TO
B.	WHEN CODES, STANDARDS, REGULATIONS, ETC. ALLOW WORK OF LESSER QUALITY OR EXTENT THAN IS SPECIFIED UNDER THIS DIVISION, NOTHING IN SAID CODES SHALL BE CONSTRUED OR INFERRED AS REDUCING THE QUALITY,		CONFORM TO THE NATIONAL ELE "STANDARD OF INSTALLATION" F
C.	REQUIREMENTS OR EXTENT OF THE DRAWINGS AND SPECIFICATIONS. WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE REQUIREMENTS OF ALL GOVERNING CODES, RULES AND REGULATIONS, INCLUDING THE FOLLOWING MINIMUM STANDARDS, WHETHER STATUTORY OR NOT:	1.13 A.	SPECIAL TOOLS ALL SPECIAL TOOLS FOR PROPE EQUIPMENT PROVIDED UNDER T OWNER'S REPRESENTATIVE.
	 NATIONAL ELECTRIC CODE (NEC). NATIONAL FIRE PROTECTION ASSOCIATION (NFPA). AMERICAN DISABILITY ACT (ADA) LOCAL CODES AND AMENDMENTS ADOPTED ENERGY CODE BASE BUILDING STANDARDS 	1.14 A.	PROJECT RECORD DRAWINGS REFER TO GENERAL CONDITIONS SUCH DRAWINGS SHALL FULLY R ACTUAL LOCATION OF OUTLETS, PHASE BALANCING ROUTINES, C ROUTING, REVISED FIXTURE SCH PRODUCTS ACTUALLY INSTALLED
D.	7. UNIFORM BUILDING CODE (UBC) EQUIPMENT AND MATERIALS SPECIFIED UNDER THIS DIVISION SHALL CONFORM TO THE FOLLOWING STANDARDS WHERE APPLICABLE:		TO DRAWINGS SHALL BE MADE B EXISTING LINEWORK AND LETTER BE MADE ON REPRODUCIBLE MY FURNISHED BY CONTRACTOR. D
	 UNDERWRITER'S LABORATORIES (UL). AMERICAN SOCIETY FOR TESTING MATERIALS (ASTM). CERTIFIED BALLAST MANUFACTURERS (CBM). INSULATED POWER CABLE ENGINEERS ASSOCIATION (IPCEA). NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA). AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI). 	В.	FOR APPROVAL. TYPEWRITTEN PANEL SCHEDULE INDICATING THE LOADS SERVED SCHEDULES SHALL MATCH THE F CONTAINED ON THE CONTRACT I
	7. ELECTRICAL TESTING LABORATORIES (ETL). BASE MATERIAL SHALL BE ASTM AND/OR ANSI STANDARDS. ELECTRICAL APPARATUS FURNISHED UNDER THIS SECTION SHALL CONFORM TO NATIONAL	1.15 A.	CLEANING AFTER OTHER WORK SUCH AS SA
	ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARDS AND THE NEC AND BEAR THE UNDERWRITER'S LABORATORIES (UL) LABEL WHERE SUCH LABEL IS APPLICABLE.		CLEAN LIGHTING FIXTURES, PAN ELECTRICAL EQUIPMENT TO REM AND LEAVE WORK IN CLEAN CON
1.03		1.16	VOLTAGE CHECK
A. 1.04	STRUCTURAL MEMBERS SHALL IN NO CASE BE DRILLED, BORED OR NOTCHED IN SUCH A MANNER THAT WILL IMPAIR THEIR STRUCTURAL VALUE. CUTTING OF HOLES, IF REQUIRED, SHALL BE DONE WITH CORE DRILL AND ONLY WITH THE APPROVAL OF THE ARCHITECT AND OF THE BUILDING MANAGEMENT. PENETRATIONS:		AT COMPLETION OF JOB, CHECK ON THE SYSTEM WHICH HAS BEE TEST, ENERGIZE INSTALLED LOA TESTS
	METAL SLEEVES: EXPOSED EXTERIOR CONDUIT RUNS PASSING THROUGH CONCRETE FLOORS OR WALLS. FOLLOWING CONDUIT INSTALLATION, SEAL ALL PENETRATIONS USING NON-IRON BEARING, CHLORIDE FREE, NON-SHRINKING, DRY-PACK GROUTING COMPOUND. CONDUITS PENETRATING EXTERIOR BUILDING WALLS AND BUILDING FLOOR SLAB SHALL BE RIGID STEEL.	A.	PERFORM TESTS AS SPECIFIED T WITH CONTRACT REQUIREMENTS CONSTRUCTION PERIOD AND AT WITH APPLICABLE CODES AND W OF ALL THE FOLLOWING TESTS S INSTRUCTIONS. TESTS, IN ADDIT
B.	FIRE SEPARATION WALLS/FLOORS: PACK OPENING AROUND CONDUITS OR CABLES WITH FIRE BARRIER CAULK 3M CP 25 NELSON FLAMESEAL.		ELSEWHERE, SHALL INCLUDE: 1. CIRCUIT CONTINUITY: TEST F
1.05	SUPERVISION		2. EQUIPMENT OPERATIONS: TI
A.	CONTRACTOR SHALL PERSONALLY OR THROUGH AN AUTHORIZED AND COMPETENT REPRESENTATIVE CONSTANTLY SUPERVISE THE WORK FROM BEGINNING TO COMPLETION AND WITHIN REASON, KEEP THE SAME WORKMEN AND FOREMAN ON THE PROJECT THROUGHOUT THE PROJECT DURATION.		 ROTATION. CIRCUIT NUMBERING VERIFIC CIRCUIT BREAKERS IN THE P. VERIFY COMPLIANCE OF THE
1.06 A.	PROTECTION KEEP CONDUITS, JUNCTION BOXES, OUTLET BOXES AND OTHER OPENINGS CLOSED TO PREVENT ENTRY OF FOREIGN MATTER. COVER FIXTURES, EQUIPMENT, DEVICES, APPARATUS AND PROTECT THEM AGAINST DIRT, PAINT, WATER, CHEMICAL OR MECHANICAL DAMAGE, BEFORE AND DURING CONSTRUCTION PERIOD. RESTORE TO ORIGINAL CONDITION ANY FIXTURE, APPARATUS OR EQUIPMENT DAMAGED PRIOR TO FINAL ACCEPTANCE. PROTECT BRIGHT FINISHED SURFACES AND SIMILAR ITEMS UNTIL IN SERVICE. NO RUST		 FIELD WIRING. PRODUCT FAILURE: PRODUCT RULED UNSATISFACTORY BY REPAIRED OR CORRECTED A EXPENSE OF THE CONTRACT REPAIRS, REPLACEMENTS OI PERFORMANCE IS DEMONST
1.07	OR DAMAGE WILL BE PERMITTED.		5. MISCELLANEOUS: INCLUDE T COST, IF ANY, FOR ALL TESTS
	THE CONTRACTOR SHALL VISIT THE SITE AND DETERMINE THE LOCAL, WORKING CONDITIONS, CONFLICTING UTILITIES AND THE CONDITIONS IN WHICH THE ELECTRICAL WORK WILL TAKE PLACE. NO ALLOWANCES WILL BE MADE SUBSEQUENTLY FOR ANY COSTS WHICH MAY BE INCURRED BECAUSE OF ANY ERROR OR OMISSION DUE TO FAILURE TO EXAMINE THE SITE AND TO NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BETWEEN DRAWINGS AND SPECIFICATIONS AND ACTUAL SITE CONDITIONS.		6. FIRE ALARM AND INTERLOCK SYMPTOMS IN OPERATING S' SYSTEMS. EACH FIRE ALARM SMOKE DETECTORS, SHALL E ANNUNCIATION AND ALARM S IONIZATION TYPE SMOKE DE BE ACCOMPLISHED BY MEAN MANUFACTURER'S RECOMME
1.08	SUBSTITUTIONS		TESTED BY INTERRUPTING LI CIRCUIT ANNUNCIATION IN TH SHALL BE VERIFIED. ALL FIRI
A.	DURING THE BIDDING PROCESS, THE CONTRACTOR MAY SUBMIT PERTINENT TEST DATA, CATALOG CUTS AND PRODUCT INFORMATION REQUIRED TO SUBSTANTIATE THAT THE PRODUCT IS IN FACT EQUAL. REFER TO GENERAL		 ALL DE VERIFIED. ALL FINI INSTALLED ON THE TENANT F EMERGENCY LIGHTING AND E

CONDITIONS AND DIVISION 1 FOR REQUIREMENTS. ONLY ONE SUBSTITUTION

WILL BE CONSIDERED FOR EACH PRODUCT SPECIFIED EXCEPT FOR WIRING

FASHION TO ALLOW TIME FOR REVIEW AND PUBLICATION TO ALL CONTRACTORS.

SUBSTITUTION REQUESTS WHICH DO NOT ALLOW FOR THE PRECEDING WILL

DEVICES. SUBSTITUTION REQUESTS SHOULD BE SUBMITTED IN A TIMELY

NOT BE CONSIDERED.

32' 0 4' 8' 16' 0 2' 4' 8' 0 1' 2'

1/4"=1'-0"

1/8"=1'-0"

1/16"=1'-0"

JBMITTALS

EQUIREMENTS. ORMAT: FURNISH SUBMITTAL DATA NEATLY BOUND IN AN 8-1/2" X 11" FOLDER DR BINDER WITH A TABLE OF CONTENTS LISTING SPECIFICATION SECTION AND PARAGRAPH NUMBER. DRAWINGS REQUIRED TO BE SUBMITTED SHALL BE PREPARED BY COMPETENT DRAFTING PEOPLE ACCORDING TO GENERALLY ACCEPTED DRAFTING PRACTICES. THESE DRAWINGS AND SUBMITTAL DATA ON L ELECTRICAL EQUIPMENT (PANELBOARDS, LIGHT FIXTURES, ETC.) SHALL BE

ODIFIED, AS NECESSARY, TO BECOME "AS BUILT" DOCUMENTS. UBMITTALS SHALL CONSIST OF DETAILED SHOP DRAWINGS, SPECIFICATIONS, CATALOG CUTS" AND DATA SHEETS CONTAINING PHYSICAL AND DIMENSIONAL NFORMATION, PERFORMANCE DATA, ELECTRICAL CHARACTERISTICS, ATERIALS USED IN FABRICATION. MATERIAL FINISH AND SHALL CLEARLY NDICATE THOSE OPTIONAL ACCESSORIES WHICH ARE INCLUDED AND THOSE

VHICH ARE EXCLUDED. UBMIT SHOP DRAWINGS FOR:

PANELBOARDS.

UBMIT MANUFACTURER'S DATA FOR:

LIGHTING FIXTURES. WIRING DEVICES AND DEVICE PLATES (ALL TYPES).

PANELBOARDS MOTOR STARTERS METERS

RAWINGS

AYOUT: GENERAL LAYOUT SHOWN ON THE DRAWINGS SHALL BE FOLLOWED EXCEPT WHERE OTHER WORK MAY CONFLICT WITH OTHER EQUIPMENT. IN SUCH CASE, ENGINEER SHOULD BE NOTIFIED.

DRAWINGS FOR THE WORK UNDER THIS SECTION ARE DIAGRAMMATIC. CONTRACTOR SHALL VERIFY LINES, LEVELS AND DIMENSIONS SHOWN ON

THE DRAWINGS AND SHALL BE RESPONSIBLE FOR THE ACCURACY OF THE SETTING OUT OF WORK AND FOR ITS STRICT CONFORMANCE WITH EXISTING CONDITIONS AT THE SITE. EQUIPMENT LOCATION

URFACE MOUNTED PANELS, DEVICES, AND RACEWAY WILL ONLY BE ALLOWED MECHANICAL EQUIPMENT AREAS OR WHERE SUCH CONSTRUCTION ALREADY

ORKMANSHIP

REPARATION, HANDLING AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS AND TECHNICAL DATA ARTICULAR TO THE PRODUCT SPECIFIED AND/OR ACCEPTED EQUAL EXCEPT AS THERWISE SPECIFIED. COORDINATE WORK AND COOPERATE WITH OTHERS IN URNISHING AND PLACING THIS WORK. REVIEW SHOP DRAWINGS FOR WORK ONE BY OTHER TRADES AND TO FIELD MEASUREMENTS AS NECESSARY TO

ONFORM TO THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION'S STANDARD OF INSTALLATION" FOR GENERAL INSTALLATION PRACTICE.

SPECIAL TOOLS

L SPECIAL TOOLS FOR PROPER OPERATION AND MAINTENANCE OF THE QUIPMENT PROVIDED UNDER THIS SECTION SHALL BE DELIVERED TO THE WNER'S REPRESENTATIVE. PROJECT RECORD DRAWINGS

EFER TO GENERAL CONDITIONS. PROVIDE PROJECT RECORD DRAWINGS, SUCH DRAWINGS SHALL FULLY REPRESENT INSTALLED CONDITIONS, INCLUDING CTUAL LOCATION OF OUTLETS. TRUE PANELBOARD CONNECTIONS FOLLOWING

HASE BALANCING ROUTINES. CORRECT CONDUIT AND WIRE SIZING AS WELL AS OUTING, REVISED FIXTURE SCHEDULE LISTING THE MANUFACTURER AND PRODUCTS ACTUALLY INSTALLED AND REVISED PANEL SCHEDULE. CHANGES O DRAWINGS SHALL BE MADE BY QUALIFIED DRAFTSPERSONS TO MATCH EXISTING LINEWORK AND LETTERING AS CLOSE AS POSSIBLE. CHANGES SHALL E MADE ON REPRODUCIBLE MYLAR SEPIAS OF ORIGINAL DRAWINGS URNISHED BY CONTRACTOR. DRAWINGS SHALL BE SUBMITTED TO ENGINEER

YPEWRITTEN PANEL SCHEDULES SHALL BE PROVIDED FOR PANELBOARDS IDICATING THE LOADS SERVED AND THE CORRECT BRANCH CIRCUIT NUMBER. CHEDULES SHALL MATCH THE FORMAT SHOWN ON THE PANEL SCHEDULES ONTAINED ON THE CONTRACT DOCUMENTS.

FTER OTHER WORK SUCH AS SANDING, PAINTING, ETC, HAS BEEN COMPLETED. LEAN LIGHTING FIXTURES, PANELBOARDS, SWITCHBOARDS AND OTHER ECTRICAL EQUIPMENT TO REMOVE DUST. DIRT. GREASE OR OTHER MARKS ND LEAVE WORK IN CLEAN CONDITION.

COMPLETION OF JOB, CHECK VOLTAGE AT SEVERAL POINTS OF UTILIZATION IN THE SYSTEM WHICH HAS BEEN INSTALLED UNDER THIS CONTRACT. DURING EST, ENERGIZE INSTALLED LOADS.

FRORM TESTS AS SPECIFIED TO PROVE INSTALLATION IS IN ACCORDANCE VITH CONTRACT REQUIREMENTS. TESTS SHALL BE CONDUCTED DURING THE ONSTRUCTION PERIOD AND AT COMPLETION TO DETERMINE CONFORMITY VITH APPLICABLE CODES AND WITH THESE SPECIFICATIONS. TYPED RECORDS F ALL THE FOLLOWING TESTS SHALL BE INCLUDED IN MAINTENANCE STRUCTIONS. TESTS, IN ADDITION TO SPECIFIC SYSTEM TEST DESCRIBED

CIRCUIT CONTINUITY: TEST FEEDER AND BRANCH CIRCUITS FOR CONTINUITY. TEST NEUTRALS FOR IMPROPER GROUNDS.

PERFORMANCE IS DEMONSTRATED.

SUBMITTED TO ENGINEER.

4' 0

1/2"=1'-0"

EQUIPMENT OPERATIONS: TEST MOTORS FOR CORRECT OPERATION AND ROTATION. CIRCUIT NUMBERING VERIFICATION: SELECT ON A RANDOM BASIS, VARIOUS CIRCUIT BREAKERS IN THE PANELBOARDS AND CYCLE THEM ON AND OFF TO VERIFY COMPLIANCE OF THE TYPED PANEL DIRECTORIES WITH ACTUAL

FIELD WIRING. PRODUCT FAILURE: PRODUCTS WHICH FAIL DURING THE TESTS OR ARE RULED UNSATISFACTORY BY THE ARCHITECT SHALL BE REPLACED, REPAIRED OR CORRECTED AS PRESCRIBED BY THE ARCHITECT AT THE EXPENSE OF THE CONTRACTOR. TESTS SHALL BE PERFORMED AFTER REPAIRS, REPLACEMENTS OR CORRECTIONS UNTIL SATISFACTORY

MISCELLANEOUS: INCLUDE TEST RESULTS IN THE MAINTENANCE MANUAL. COST, IF ANY, FOR ALL TESTS SHALL BE PAID BY THE CONTRACTOR.

FIRE ALARM AND INTERLOCK SYSTEMS: PRODUCE MALFUNCTION SYMPTOMS IN OPERATING SYSTEMS TO TEST ALARM AND INTERLOCK SYSTEMS. EACH FIRE ALARM SIGNAL INITIATING DEVICE, INCLUDING ALL SMOKE DETECTORS. SHALL BE ACTIVATED TO VERIFY PROPER ZONE ANNUNCIATION AND ALARM SIGNAL INTERLOCKS. ACTIVATION OF IONIZATION TYPE SMOKE DETECTORS, BOTH CEILING AND DUCT TYPE, SHALL BE ACCOMPLISHED BY MEANS OF A SMOKE EMITTING DEVICE PER MANUFACTURER'S RECOMMENDATIONS. PHOTOELECTRIC TYPE SHALL BE TESTED BY INTERRUPTING LIGHT BEAM. CORRECT OPERATION OF ALARM CIRCUIT ANNUNCIATION IN THE FIRE ALARM ZONE ANNUNCIATION PANEL

SHALL BE VERIFIED. ALL FIRE ALARM DEVICES, BOTH EXISTING AND NEW, INSTALLED ON THE TENANT FLOORS SHALL BE TESTED. 7. EMERGENCY LIGHTING AND EXIT LIGHT: CONTRACTOR SHALL TEST IN FIELD AFTER INSTALLATION EACH EMERGENCY LIGHT AND EXIT LIGHT. TEST RESULTS SHALL BE DOCUMENTED IN TYPE WRITTEN REPORT AND

SECTION 26100 **BASIC MATERIALS & METHODS**

PART I GENERA

ENERAL: REFER TO GENERAL CONDITIONS FOR SUBMITTAL PROCEDURES AND 1.01 DESCRIPTION A. GENERAL: WORK SPECIFIED IN THIS SECTION ENCOMPASSES PRODUCTS. ASSEMBLIES AND BASIC INSTALLATION METHODS REQUIRED FOR ELECTRICAL PROJECT SYSTEMS SPECIFIED UNDER THIS SECTION AND INCLUDES, BUT IS NOT LIMITED TO:

- 1. CONDUIT, RACEWAYS AND FITTINGS. . WIRES AND CABLES.
- WIRE CONNECTIONS AND DEVICES. . OUTLET BOXES.
- 5. PULL AND JUNCTION BOXES. . SWITCHES AND RECEPTACLES DEVICE PLATES.
- MOTOR STARTERS. 9. DISCONNECT SWITCHES.
- 10. CIRCUIT BREAKERS. 11. BRANCH CIRCUIT PANELBOARDS. 12. LOW VOLTAGE DRY-TYPE TRANSFORMERS 13. LIGHTING FIXTURES

PART 2 PRODUCTS

2.01 CONDUIT AND FITTINGS A. ELECTRICAL METALLIC TUBING:

- 1. CONDUIT: FORMED OF COLD ROLLED STRIP STEEL, ELECTRICAL RESISTANCE WELDED CONTINUOUSLY ALONG THE LONGITUDINAL SEAM AND HOT-DIP GALVANIZED AFTER FABRICATION. CONFORM TO ANSI C80.3 AND MEET UL REQUIREMENTS.
- B. FLEXIBLE METALLIC CONDUIT:
- 1. CONDUIT: FABRICATED IN CONTINUOUS LENGTHS FROM GALVANIZED STEEL STRIP, SPIRAL WOUND AND FORMED TO PROVIDE AN INTERLOCKING DESIGN. 2.06 RECEPTACLES AND SWITCHES 2. FITTINGS: ONE SCREW (USE TWO SCREW WHEN AVAILABLE) DOUBLE CLAMP A. GENERAL VARIETY CONNECTORS WITH CAST MALLEABLE IRON BODIES AND THREADED
- MALE HUBS WITH INSULATED THROATS. 2. LIQUID TIGHT FLEXIBLE METALLIC CONDUIT:

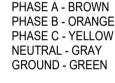
CONDUIT: ANACONDA TYPE UA, COLEMAN TYPE UXT1. FITTINGS: CONNECTOR BODY AND GLAN NUT SHALL BE OF CADMIUM PLATED CAST MALLEABLE IRON, WITH TAPERED, MALE THREADED HUB; INSULATED THROAT AND NEOPRENE "O" RING GASKET RECESSED INTO THE FACE OF THE STOP NUT. THE CLAMPING GLAND SHALL BE OF MOLDED NYLON WITH AN INTEGRAL BRASS PUSH-IN FERRULE.

2.02 WIRES AND CABLES A. GENERAL:

- 1. APPROVED MANUFACTURERS: AMERICAN INSULATED WIRE, SOUTHWIRE ROME CABLE, OR TRIANGLE.
- 2. CONDUCTOR MATERIAL: ALL WIRE AND CABLE SHOWN ON THE DRAWINGS IS INSULATED COPPER CONDUCTOR UNLESS OTHERWISE NOTED.
- MINIMUM CONDUCTOR SIZE: AWG NO. 12 FOR POWER AND LIGHTING BRANCH CIRCUITS. ALL BRANCH CIRCUITS EXCEEDING 100' SHALL UTILIZE # 10 MINIMUM CONDUCTOR. AWG NO. 14 FOR SIGNAL AND CONTROL CIRCUITS
- UNLESS OTHERWISE NOTED ON THE DRAWINGS OR SPECIFIED HEREIN. 4. COLOR CODING: COLOR CODING SHALL CONFORM TO ALL LOCAL AND GOVERNING CODES, RULES AND REGULATIONS. SYSTEM CONDUCTORS SHALL BE IDENTIFIED AS TO VOLTAGE AND PHASE CONNECTIONS BY MEANS OF COLOR IMPREGNATED INSULATION OR APPROVED COLOR MARKING TAPE
- AS FOLLOWS: A. FOR 120/208 VOLT, 3 PHASE, 4 WIRE SYSTEMS:



B. FOR 277/480 VOLT, 3 PHASE, 4 WIRE SYSTEMS:



- C. SECONDARY WIRE, 0 TO 600 VOLTS:
- 1. NEC TYPE THHN FOR FEEDERS AND BRANCH CIRCUITS IN DRY LOCATIONS, THWN IN WET LOCATIONS. NEC TYPE THHN FOR WIRE INSTALLED IN FIXTURE RACEWAYS AND USED AS
- BRANCH CIRCUIT FEEDERS IN DRY LOCATIONS. 2.03 WIRE CONNECTIONS AND DEVICES
- A. WIRE JOINTS: WIRES IN SIZES FROM NO. 18 TO NO. 8 AWG, SOLID OR STRANDED CONDUCTOR, WITH INSULATION RATED 105°C. OR LESS SHALL BE JOINED WITH ELECTRICAL SPRING CONNECTORS OF THREE-PART CONSTRUCTION INCORPORATING A NON-RESTRICTED, ZINC COATED STEEL SPRING ENCLOSED IN A STEEL SHELL WITH AN OUTER JACKET OF VINYL PLASTIC WITH A FLEXIBLE INSULATING SKIRT
- . MECHANICAL COMPRESSION CONNECTORS AND TAPS: STRANDED CONDUCTORS FROM NO. 6 AWG TO 750 MCM SHALL BE JOINED OR TAPPED USING BOLTED PRESSURE CONNECTORS HAVING CAST BRONZE COMPRESSION BOLTS. FITTINGS SHALL BE WIDE RANGE-TAKING AND DESIGNED TO FACILITATE THE MAKING OF PARALLEL TAPS, TEES, CROSSES OR END-TO-END CONNECTIONS.
- C. FIXTURE CONNECTIONS: SPLICE FIXTURE WIRE TO CIRCUIT WIRING WITH SOLDERLESS CONNECTORS IN ACCORDANCE WITH PARAGRAPH A, PART 2, 2.03.
- D. TERMINATING LUGS: CONDUCTORS FROM SIZE NO. 6 AWG TO 750 MCM, COPPER. SHALL BE TERMINATED USING TIN PLATED COPPER COMPRESSION LUGS ATTACHED WITH HAND OR HYDRAULICALLY OPERATED CRIMPING TOOLS AND DIES AS STIPULATED BY THE LUG MANUFACTURER. LUGS SHALL BE 3M "SCOTCHLOK" SERIES 30014, BURNDY TYPE Y-AL SERIES.
- . SPLICING AND INSULATING TAPE (600 VOLTS AND BELOW): GENERAL PURPOSE 2.08 MOTOR STARTERS ELECTRICAL TAPE SHALL BE SUITABLE FOR TEMPERATURES FROM MINIMUM 18° C. 105°C., SHALL BE BLACK, ULTRAVIOLET PROOF, SELF-EXTINGUISHING, 7 MIL THICK WITH A DIELECTRIC STRENGTH OF 10,000 VOLTS.
- F. INSULATING PUTTY (600 VOLTS AND BELOW): PADS OR ROLLS OF NON CORROSIVE, SELF-FUSING, 1/8 INCH THICK RUBBER PUTTY WITH PVC BACKING SHEET. PUTTY SHALL BE SUITABLE FOR TEMPERATURES FROM MINUS 17.8°C. TO 80°C. AND SHALL HAVE A DIELECTRIC STRENGTH OF 570 VOLTS/MIL MINIMUM.
- G. INSULATING RESIN: TWO-PART LIQUID EPOXY RESIN WITH RESIN AND CATALYST IN PREMEASURED, SEALED MIXING POUCH. RESIN SHALL HAVE A SETUP TIME OF APPROXIMATELY 30 MINUTES AT 21.1°C. AND SHALL HAVE THERMAL AND DIELECTRIC PROPERTIES EQUAL TO THE INSULATION PROPERTIES OF THE CABLES IMMERSED IN THE RESIN.
- H. TERMINAL STRIP CONNECTORS: TERMINATE WIRE IN LOCKING TONGUE STYLE. PRESSURE TYPE, SOLDERLESS LUG WHERE APPLICABLE.

1' 2' 0 6" 1' 2' 0 3" 6" 1'

3/4"=1'-0" 11/2"=1'-0" 3"=1'-0"

2.04 OUTLET BOXES

- A. STANDARD OUTLET BOXES: GALVANIZED, ONE-PIE STEEL, KNOCK-OUT TYPE OF SIZE AND CONFIGURA APPLICATION INDICATED ON THE PLANS. MINIMUM 3-1/2 INCH IN HEIGHT AND 2-1/2 INCH IN DEPTH.
- B. CONCRETE RINGS: GALVANIZED STEEL, 4 INCH OCTAGON RINGS WITH MOUNTING LUGS, BACKPLATE AND ADAPTER RING AS REQUIRED. SELECT HEIGHT AS NECESSARY TO POSITION KNOCKOUTS ABOVE CONCRETE REINFORCING STEEL.
- C. SWITCH BOXES: 2 INCH WIDE BY 3 INCH LONG GALVANIZED STEEL SWITCH BOXES USED FOR THE INSTALLATION OF SINGLE SWITCHES. INSTALL MULTIPLE SWITCHES IN STANDARD GANG BOXES WITH RAISED DEVICE COVERS SUITABLE FOR THE APPLICATION INDICATED.
- D. TILE BOXES: OUTLET BOXES INSTALLED IN TILE: STEEL CITY GW SERIES. APPLETON M SERIES. STANDARD OUTLET BOXES WITH RAISED, SQUARE CORNERED, DEVICE COVERS ARE ACCEPTABLE.
- E. CAST METAL OUTLET BOXES: 4 INCH, CAST IRON ALLOY WITH THREADED HUBS AND MOUNTING LUGS AS REQUIRED. BOXES SHALL BE FURNISHED WITH CAST COVER PLATES OF THE SAME MATERIAL AS THE BOX AND NEOPRENE COVER GASKETS. CROUSE-HINDS FS AND FD SERIES. APPLETON JBX SERIES. 2.05 PULL AND JUNCTION BOXES
- A. SHEET METAL BOXES: USE STANDARD OUTLET OR CONCRETE RING BOXES WHEREVER POSSIBLE, OTHERWISE USE MINIMUM 16 GAUGE GALVANIZED SHEET METAL. NEMA 1 BOXES, SIZED TO CODE REQUIREMENTS WITH COVERS SECURED BY CADMIUM PLATED MACHINE SCREWS LOCATED 6 INCHES ON CENTERS. CIRCLE AW PRODUCTS. HOFFMAN ENGINEERING COMPANY.
- 2. COUPLINGS: STEEL, ZINC PLATED SET SCREW COUPLINGS. OZ/GEDNEY 5000 B. CAST METAL BOXES: USE STANDARD CAST MALLEABLE IRON OUTLET OR DEVICE BOXES WHEREVER POSSIBLE; OTHERWISE USE CADMIUM PLATED, CAST MALLEABLE IRON JUNCTION BOXES WITH BOLT-ON. INTERCHANGEABLE CONDUIT HUB PLATES WITH NEOPRENE GASKETS. CROUSE HINDS SIDEWALK BOXES, TYPE WJBF OR APPLETON RS SERIES.

- 1. ALL GENERAL PURPOSE 20 AMPERE, 125/250 VOLT RECEPTACLES AND 120/277 VOLT SWITCHES (NEMA WD-1).
- 2. UNLESS OTHERWISE NOTES BY ARCHITECT, THE COLOR OF ALL DEVICES SHALL BE GRAY EXCEPT DEDICATED COMPUTER (ISOLATED GROUND)
- RECEPTACLES WHICH SHALL BE GRAY WITH AN ORANGE TRIANGLE. 3. UNLESS OTHERWISE NOTED BY THE ARCHITECT, THE FINISH OF ALL DEVISE
- PLATES SHALL BE GRAY. B. RECEPTACLES, NEMA 5-20R, 20 AMP, 125 VOLT, 2 POLE, 3 WIRE, GROUNDING
- 1. GENERAL PURPOSE SINGLE OUTLET SELF-GROUNDING, SIDE WIRED, WITH BINDING HEAD STAKED TERMINAL SCREW. LEVITON 5351 OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL.
- 2. GENERAL PURPOSE DUPLEX RECEPTACLES SELF-GROUNDING, SIDE WIRED, WITH BINDING HEAD STAKED TERMINAL SCREWS AND BREAK-OFF STRIP FOR TWO CIRCUIT WIRING. LEVITON 5342 OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL.
- 3. ISOLATED GROUND DUPLEX RECEPTACLES SELF-GROUNDING, SIDE WIRED WITH BINDING HEAD STAKED TERMINAL SCREWS. LEVITON 5362-IG-I OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL.
- 4. CLOCK RECEPTACLE/HANGER, SIDE WIRED WITH BINDING HEAD STAKED TERMINAL SCREWS. LEVITON 628-I OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL.
- C. LIGHT SWITCHES: TWENTY AMPERE 120/277 VOLT, FAST MAKE-FAST BREAK, QUIET TYPE SWITCH WITH SILVER CADMIUM ALLOY CONTACTS, BINDING HEAD TERMINAL SCREWS, SIDE WIRED.
- 1. SINGLE-POLE. SINGLE-THROW: LEVITON 1121 SERIES OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL.
- 2. DOUBLE-POLE, SINGLE-THROW: LEVITON OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL. MATCH ITEM 1 STYLE.
- 3. THREE-WAY: LEVITON OR EQUAL BY GENERAL ELECTRIC, PASS AND SEYMOUR, HUBBELL, MATCH ITEM 1 STYLE.
- D. DIMMER(S) SHALL BE LUTRON NOVA T SERIES, SIZE AND DERATE IN ACCORDANCE WITH LUTRON'S RECOMMENDATIONS. SWITCHES AT DIMMER LOCATIONS SHALL BE LUTRON NOVA T SERIES. AT LOCATIONS WHERE BOTH DIMMER CONTROLS AND SWITCHES ARE SHOWN CONTRACTOR SHALL FURNISH AND INSTALL ONE-PIECE MULTIGANG FACEPLATE WHICH SHALL INCLUDE DIMMERS AND SWITCHES. UNLESS OTHERWISE NOTED BY THE ARCHITECT.
- THE COLOR OF ALL DIMMERS AND FACEPLATES SHALL BE STAINLESS STEEL E. MOTOR RATED SWITCHES: FRACTIONAL HORSEPOWER MANUAL STARTERS WITH MELTING ALLOY TYPE THERMAL OVERLOAD RELAY, PILOT LIGHT AND LOCK-OFF/HANDLE GUARD. 1 OR 2 POLE, 115/230 VOLT, SQUARE D, CLASS 2510.

2.07 DEVICE PLATES

- A. GENERAL: 1. FURNISH DEVICE PLATES FOR SWITCHES AND RECEPTACLES. DEVICE PLATE COLOR AND MATERIAL SHALL BE SELECTED BY ARCHITECT AT SUBMITTAL
- TIME REGARDLESS OF WHAT IS SPECIFIED BELOW. 2. PLATES: SMOOTH AND FREE OF GROOVES, EMBOSSING OR OTHER EMBELLISHMENT.
- 3. MOUNTING SCREWS: MATCH PLATE FINISH. 4. MARKER PLATES: PERMANENTLY ENGRAVED WITH 1/8 INCH HIGH PAINT
- FILLED LETTERS, UNLESS OTHERWISE NOTED. B. PLASTIC DEVICE PLATES: SOLID .100" THICK WITH OPENINGS TO ACCOMMODATE
- DEVICES INDICATED ON THE DRAWINGS. LEVITON, PASS AND SEYMOUR, HUBBELL
- C. STAINLESS STEEL DEVICE PLATES: SOLID 0.032" THICK TYPE 430 WITH OPENINGS TO ACCOMMODATE DEVICES INDICATED ON THE DRAWINGS. LEVITON, PASS AND SEYMOUR, HUBBELL.

CORRECT SIZE.

2.09 FIRE RATED POKE THROUGH

RATED FOR 75°C.

ENGINEER PRIOR TO INSTALLATION.

AND LOAD TERMINALS OF THE DEVICE RATED 100 AMPERES OR LESS SHALL BE

- A. FULL VOLTAGE STARTERS: ACROSS-THE-LINE, MAGNETIC TYPE, DOUBLE-BREAK SILVER ALLOY CONTACTS, GRAVITY DROP-OUT, MOLDED OPERATING COIL AND MELTING ALLOY THERMAL OVERLOAD RELAYS ON PHASE CONDUCTORS. 120V CONTROL WITH TRANSFORMER. SIZE: 0 MINIMUM. ALL LINE AND LOAD TERMINALS OF THE DEVICE RATED 100 AMPERES OR LESS SHALL BE RATED FOR 75°C
- B. OVERLOAD RELAYS AND THERMAL UNITS: 1. ELEMENTS FOR 100% FULL LOAD CURRENT FOR 55°C. RISE MOTORS OR 115% FULL LOAD CURRENT FOR 40°C. RISE MOTORS AND SHALL BE AMBIENT COMPENSATED.

ECE, DIE FORMED OR DRAWN ATION BEST SUITED TO THE M BOX SIZE, 2 INCH IN WIDTH,	

- 2. IF THE OVERLOAD ELEMENTS ARE OF THE WRONG SIZE FOR THE NAMEPLATE RATING OF THE MOTOR, REPLACE WITH ELEMENTS OF THE
- A. SERVICE FITTING: CAST ALUMINUM HOUSING WITH FINISH SELECTED BY ARCHITECT. REFER TO 2.06 FOR RECEPTACLE SPECIFICATION. PROVIDE COMPLETE BARRIER BETWEEN LOW TENSION AND 120 VAC SERVICE. SUBMIT TO
- 2.10 SEPARATELY ENCLOSED COMBINATION STARTERS A. MEET THE REQUIREMENTS OF MOTOR STARTERS. IN ADDITION, STARTER AND FUSED DISCONNECT DEVICE SHALL BE HOUSED TOGETHER IN ENCLOSURE OF REQUIRED TYPE MEETING OR EXCEEDING NEMA STANDARDS. GREEN "RUNNING" INDICATING LAMP WITH PUSH TO TEST FEATURE. HAND/OFF/AUTO CONTROL SWITCH ON COVER. 120 VOLT CONTROL VOLTAGE. NEMA 1 FOR NDOORS AND NEMA 3R FOR OUTDOORS OR AS SHOWN ON DRAWINGS. ALL LINE

- 2.11 DISCONNECT SWITCHES
- A. SWITCH INTERIOR: DEAD-FRONT CONSTRUCTION WITH HINGED ARC SUPPRESSER AND SWITCH BLADES WHICH ARE FULLY VISIBLE IN THE "OFF" POSITION AND WITH DOOR OPEN.
- B. SWITCH MECHANISM: QUICK-MAKE AND QUICK-BREAK OPERATING HANDLE AND MECHANISM WITH A DELETE DUAL COVER INTERLOCK TO PREVENT UNAUTHORIZED OPENING OF THE SWITCH DOOR IN THE "ON" POSITION OR CLOSING THE SWITCH MECHANISM WHILE THE DOOR IS OPEN. AN ELECTRICAL INTERLOCK SWITCH SHALL BE PROVIDED TO DEGENERIZE CONTROL WIRING AS REQUIRED. ALL LINE AND LOAD TERMINALS OF THE DEVICE RATED 100 AMPERES OR LESS SHALL BE RATED FOR 75°C.
- C. RATINGS: SWITCHES HORSEPOWER RATED FOR 600 VOLTS. 60 HZ AND WHERE INDICATED TO BE FUSED SHALL HAVE PROVISIONS FOR FUSES. D. ENCLOSURES: NEMA 1, CODE GAUGE SHEET STEEL WITH HINGED COVER,
- UNLESS USED WHERE EXPOSED TO THE WEATHER, IN WHICH CASE, USE NEMA 2.12 PROTECTIVE DEVICES
- A. FUSED SWITCHES:
- 1. GENERAL: FUSED SWITCHES FOR SIZES 30 AMP THROUGH 1200 AMP. 2. FUSIBLE SWITCHES: QUICK-MAKE, QUICK-BREAK OF THE SIZES SHOWN ON THE DRAWINGS. APPROVED BY UNDERWRITER'S LABORATORIES AND, WHERE APPLICABLE, DUAL HORSEPOWER RATED FOR BOTH STANDARD ONE-TIME OR DUAL ELEMENT FUSES. ALL LINE AND LOAD TERMINALS OF THE DEVICE RATED 100 AMPERES OR LESS SHALL BE RATED FOR 75°C.
- UNITS PADLOCKING: IN THE "OFF" POSITION AND THE OPERATING HANDLING POSITION SHALL GIVE POSITIVE SWITCH INDICATION, I.E., HORIZONTAL "OFF". DIAGONAL "ON". SWITCHES SHALL PASS INDUSTRY STANDARD I-SQUARED-T WITHSTANDABILITY TEST AND FUSE RACE TEST. B. CIRCUIT BREAKERS:
- 1. CIRCUIT BREAKERS: INTERRUPTING CAPACITY AS NOTED ON THE DRAWINGS AND IF NOT SHOWN, BREAKERS FOR 208 VOLT SYSTEM SHALL HAVE INTERRUPTING CAPACITY OF NOT LESS THAN 10.000 AMPS. CIRCUIT BREAKERS FOR 480 VOLT SYSTEM SHALL HAVE A MINIMUM INTERRUPTING RATING OF 18,000 AMPS. CIRCUIT BREAKERS MOLDED CASE, TRIP INDICATING, THERMAL MAGNETIC TYPE, 40°C., AMBIENT TEMPERATURE COMPENSATED 40°C. RATED OR AMBIENT COMPENSATED. ALL LINE AND LOAD TERMINALS OF THE DEVICE RATED 100 AMPERES OR LESS SHALL BE
- RATED FOR 75°C. 2. FACTORY CERTIFICATION OF TRIP CHARACTERISTICS PROVIDED WITH THE SUBMITTALS FOR EVERY CIRCUIT BREAKER.
- 3. COVERS: SEALED ON NON-INTERCHANGEABLE TRIP BREAKERS AND TRIP UNIT COVERS SEALED ON INTERCHANGEABLE TRIP BREAKERS TO PREVENT TAMPERING. BREAKER CIRCUIT RATINGS CLEARLY VISIBLE AFTER INSTALLATION OR ENGRAVED NAMEPLATES STATING THE RATING. FERROUS PARTS PLATED TO MINIMIZE CORROSION.
- 4. BREAKERS: BOLT ON, TOGGLE, QUICK-MAKE AND QUICK-BREAK OPERATING MECHANISMS WITH TRIP-FREE FEATURE TO PREVENT CONTACTS BEING HELD CLOSED AGAINST OVERCURRENT CONDITIONS IN THE CIRCUIT. TRIP POSITION OF THE BREAKERS SHALL BE CLEARLY INDICATED BY OPERATING HANDLES MOVING TO A CENTER POSITION.
- 5. MAGNETIC TRIP ELEMENT: EACH POLE BEING INDIVIDUALLY CALIBRATED. MULTIPLE BREAKERS SHALL HAVE A SINGLE HANDLE TO OPEN AND CLOSE CONTACT SIMULTANEOUSLY IN BOTH MANUAL OPERATING AND UNDER AUTOMATIC TRIPPING. INTERPOLE BARRIERS SHALL BE PROVIDED INSIDE THE BREAKER TO PREVENT ANY PHASE-TO-PHASE FLASHOVER. EACH POL OF THE BREAKERS SHALL HAVE ADEQUATE MEANS OF ARC EXTINCTION.
- 6. CIRCUIT BREAKERS OF STANDARD RATINGS: UNDERWRITER'S LABORATORIES, INC. LABEL AND NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION PUBLICATION AB-1-1975.
- 7. ALL 20 AMP CIRCUIT BREAKERS SHALL BE RATED FOR FREQUENT SWITCHING, SWD RATING. C. FUSES, UNLESS OTHERWISE NOTED ON THE DRAWINGS:
- 1. MOTOR CIRCUITS, FEEDERS AND FEEDERS FOR CIRCUIT BREAKER PANEL BOARDS - DUAL ELEMENT FUSES: 0-600 AMPS, BUSSMAN LOW-PEAK (LPN-RK, LPS-RK), CLASS RK-1.
- 2.13 ELECTRICAL SUPPORTING DEVICES A. CONCRETE FASTENERS: PHILLIPS "RED-HEAD". POWER DRIVEN CONCRETE PIN FASTENERS, LOW VELOCITY TYPE. POWER DRIVEN FASTENERS SHALL BE REMINGTON, RAMSET OR HILTI POWER DRIVEN CONCRETE PIN FASTENERS, LOW VELOCITY TYPE.
- B. CONDUIT STRAPS: HOT-DIP GALVANIZED, CAST MALLEABLE IRON, ONE HOLE TYPE STRAP WITH CAST CLAMP-BACKS AND SPACERS AS REQUIRED. OZ/GEDNEY NO. 14-50G STRAP AND NO. 141G SPACER; EFCOR NO. 23L STRAP AND NO. 131 SPACER.
- C. CONCRETE INSERTS: PRESSED GALVANIZED STEEL. SPOT INSERT WITH OVAL SLOT CAPABLE OF ACCEPTING SUPPORT NUTS OF 1/4 INCH TO 1/2 INCH DIAMETER THREAD. UNISTRUT NO. M2506 SERIES, GLOBE-STRUT CSI SERIES.
- D. CONSTRUCTION CHANNEL: 1 5/8 INCH BY 1 5/8 INCH 12 GAUGE GALVANIZED STEEL CHANNEL WITH 17/32 INCH DIAMETER BOLT HOLES, 1-1/2 INCH ON CENTER, IN THE BASE OF THE CHANNEL. KINDORF 905 SERIES, UNISTRUT P-1000-HS.
- E. CABLE TIES AND CLAMPS: THOMAS AND BETTS CO. "TY-RAPS" PANDUIT "PAN-TY". ONE-PIECE, NYLON, REUSABLE TYPE LASHING TIES. F. FASTENERS (GENERAL): WOOD SCREWS FOR FASTENING TO WOOD. MACHINE SCREWS FOR FASTENING TO STEEL. TOGGLE BOLTS FOR FASTENING TO GYPSUM BOARD OF PLASTER WALLS. EXPANSION ANCHORS FOR ATTACHMENTS
- 2.14 FIRE ALARM SYSTEM

TO PREPOURED CONCRETE.

- A. ALL FIRE ALARM SYSTEM COMPONENTS SHALL BE BASE BUILDING UNLESS OTHERWISE NOTED.
- 2.15.1 BRANCH CIRCUIT PANELBOARDS
- A. MANUFACTURE SHALL BE CUTLER-HAMMER, SQUARE D, GENERAL ELECTRIC, CHALLENGER OR ITE SIEMENS .. B. CONSTRUCTION: CABINETS SHALL BE PROVIDED WITH STRETCHER LEVELED, STEEL DOORS AND TRIM OF CODE THICKNESS, COMPLETE WITH CONCEALED BUTT HINGES. PROVIDE COMBINATION SPRING CATCH AND LOCK ON INSIDE EDGE OF DOOR TRIMS WITH FLUSH FITTING JOINT BETWEEN DOOR AND TRIM. LOCKS ON ALL PANELBOARDS SHALL BE KEYED ALIKE
- C. BUS ASSEMBLY:
- 1. BUS SHALL BE PLATED ALUMINUM WITH TAPS ARRANGED FOR "DISTRIBUTED PHASE" CONNECTIONS TO BRANCH CIRCUIT BREAKERS.
- 2. SPACE CONNECTORS SHALL BE DRILLED AND TAPPED FOR BOLT ON CIRCUIT BREAKER CONNECTIONS, ARRANGED FOR DOUBLE ROW PLACEMENT OF BREAKERS AND DESIGNED TO PERMIT REMOVAL OR ADDITION OF PROTECTIVE DEVICES WITHOUT DISTURBING ADJACENT BREAKERS OR REMOVING MAIN BUS CONNECTIONS.
- D. FINISH: FIVE-STEP ZINC PHOSPATIZING PRE-TREATMENT, ONE COAT RUST INHIBITING DICHROMATE PRIMER, ONE COAT BAKED-ON ENAMEL.
- E. TERMINAL LUGS: APPROVED FOR USE WITH COPPER CONDUCTORS. F. MISCELLANEOUS REQUIREMENTS
- 1. CIRCUIT NUMBERING: STARTING AT THE TOP, ODD NUMBERED CIRCUITS IN SEQUENCE DOWN THE LEFT HAND SIDE AND EVEN NUMBERED CIRCUITS DOWN THE RIGHT HAND SIDE.
- 2. DIRECTORIES: A CIRCUIT DIRECTORY FRAME AND CARD WITH CLEAR PLASTIC COVERING SHALL BE PROVIDED INSIDE THE PANEL DOOR.
- 3. EQUIPMENT GROUND BUS: PROVIDE A SEPARATE EQUIPMENT GROUNDING
- 4. REFER TO PANEL SCHEDULES AND ELECTRICAL DRAWINGS FOR THE FOLLOWING:

- A. SERVICE VOLTAGE. B. TERMINAL LUG SIZE, LOCATION AND QUANTITY. (WHERE NOT SPECIFIED, USE
- ARRANGEMENT COMPATIBLE WITH EXTERNAL WIRING.) C. BUS AMPACITY D. INTERRUPTING CAPACITY OF BUS AND BREAKERS. (USE BREAKER RATING SPECIFIED IN SECTION 16100 WHEN NOT SPECIFIED ON SCHEDULE). E. QUANTITY, POLES AND RATING OF PROTECTIVE DEVICES.
- 2.16 LOW VOLTAGE K-RATED DRY-TYPE TRANSFORMER
- A. SHALL HAVE THE FOLLOWING FEATURES: 1. SELF-COOLED BY NATURAL CONVECTION, ISOLATING WINDINGS, INDOOR, DRY TYPE APPROVED BY THE UL. AUTOTRANSFORMERS WILL NOT BE ACCEPTED.
- 2. RATINGS AND WINDING CONNECTIONS SHALL BE AS INDICATED ON THE DRAWINGS. UNLESS OTHER SPECIFIED TRANSFORMERS SHALL BE 480-208Y/120V, DELTA CONNNECTED PRIMARY AND WYE CONNECTED SECONDARY
- 3. RATINGS INDICATED ARE FOR CONTINUOUS DUTY WITHOUT THE USE OF COOLING FANS.
- 4. TEMPERATURE RISE SHALL NOT EXCEED 150°C WITH LIMITING TEMPERATURE IN ACCORDANCE WITH NEMA STANDARDS.
- 5. CORE AND COIL ASSEMBLIES:
- A. RIGIDLY BRACED TO WITHSTAND THE STRESSES CAUSED BY SHORT CIRCUIT CURRENTS AND ROUGH HANDLING DURING SHIPPING.
- B. CORES SHALL BE COMMON CORE CONSTRUCTION HAVING LOW HYSTERISIS AND EDDY CURRENT LOSSES. CORE FLUX DENSITY SHALL BE BELOW SATURATION PINT AT RATED HARMO

SECTION 260923 LIGHTING CONTROL DEVICES

- PART 1 PRODUCTS
- 1.1 MANUFACTURERS
- A. IN OTHER PART 2 ARTICLES WHERE TITLES BELOW INTRODUCE LISTS, THE FOLLOWING REQUIREMENTS APPLY TO PRODUCT SELECTION: 1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS. PROVIDE PRODUCTS BY ONE OF THE MANUFACTURERS SPECIFIED.
- 1.2 INDOOR OCCUPANCY SENSORS
- A. MANUFACTURERS:
- 1. WATT STOPPER (THE). 2. LUTRON
- B. MANUFACTURER PRODUCT SERIES:
- 1. WATT STOPPER (THE) DIGITAL LIGHTING MANAGEMENT (DLM) SYSTEM. a. PROVIDE INDEPENDENT AND NON-NETWORKED OCCUPANCY SENSOR SYSTEM(S) UTILIZING DLM COMPONENTS TO ALLOW FOR FUTURE
- NETWORKED INTEGRATION FOR OCCUPANCY SENSOR SYSTEM(S). b. THE DLM COMPONENTS SHALL ONLY BE UTILIZED FOR CEILING MOUNTING OCCUPANCY SENSORS AND SYSTEM(S) INDICATED ON THE
- DRAWINGS. c. NETWORK BRIDGES, ADDITIONAL CATEGORY CABLING AND OTHER NETWORKING TYPE COMPONENTS SHALL NOT BE REQUIRED.
- LUTRON MAESTRO OCCUPANCY SENSING SWITCH. a. PROVIDE LUTRON MODEL #MS-OPS6M2-DV-XX DEVICES FOR ALL WALL MOUNTED COMBINATION OCCUPANCY SENSOR AND MANUAL OVER-RIDE CONTROL STATIONS (EXAMPLE: OFFICES AND STORAGE ROOMS WITH \$OS SYMBOLOGY).
- GENERAL DESCRIPTION: WALL- OR CEILING-MOUNTING, SOLID-STATE UNITS WITH A SEPARATE RELAY UNIT.
- 1. OPERATION: UNLESS OTHERWISE INDICATED, TURN LIGHTS ON WHEN COVERED AREA IS OCCUPIED AND OFF WHEN UNOCCUPIED; WITH A TIME
- DELAY FOR TURNING LIGHTS OFF, ADJUSTABLE OVER A MINIMUM RANGE OF 1 TO 15 MINUTES. 2. SENSOR OUTPUT: CONTACTS RATED TO OPERATE THE CONNECTED RELAY,
- COMPLYING WITH UL 773A. SENSOR SHALL BE POWERED FROM THE RELAY 3. RELAY UNIT: DRY CONTACTS RATED FOR 20-A BALLAST LOAD AT 120- AND 277-V AC, FOR 13-A TUNGSTEN AT 120-V AC, AND FOR 1 HP AT 120-V AC.
- POWER SUPPLY TO SENSOR SHALL BE 24-V DC, 150-MA, CLASS 2 POWER SOURCE AS DEFINED BY NFPA 70. 4. MOUNTING:
- a. SENSOR: SUITABLE FOR MOUNTING IN ANY POSITION ON A STANDARD OUTLET BOX. b. RELAY: EXTERNALLY MOUNTED THOUGH A 1/2-INCH KNOCKOUT IN A STANDARD ELECTRICAL ENCLOSURE. c. TIME-DELAY AND SENSITIVITY ADJUSTMENTS: RECESSED AND CONCEALED BEHIND HINGED DOOR.
- 5. INDICATOR: LED, TO SHOW WHEN MOTION IS BEING DETECTED DURING TESTING AND NORMAL OPERATION OF THE SENSOR.
- 6. BYPASS SWITCH: OVERRIDE THE ON FUNCTION IN CASE OF SENSOR FAILURE 7. AUTOMATIC LIGHT-LEVEL SENSOR: ADJUSTABLE FROM 2 TO 200 FC: KEEPS
- LIGHTING OFF WHEN SELECTED LIGHTING LEVEL IS PRESENT D. PIR TYPE: CEILING MOUNTING: DETECT OCCUPANCY BY SENSING A
- COMBINATION OF HEAT AND MOVEMENT IN AREA OF COVERAGE. 1. DETECTOR SENSITIVITY: DETECT OCCURRENCES OF 6-INCH MINIMUM
- MOVEMENT OF ANY PORTION OF A HUMAN BODY THAT PRESENTS A TARGET OF AT LEAST 36 SQ. IN. 2. DETECTION COVERAGE (ROOM): DETECT OCCUPANCY ANYWHERE IN A
- CIRCULAR AREA OF 1000 SQ. FT. WHEN MOUNTED ON A 96-INCH- HIGH CEILING
- 3. DETECTION COVERAGE (CORRIDOR): DETECT OCCUPANCY WITHIN 90 FEET WHEN MOUNTED ON A 10-FOOT- HIGH CEILING. 4. PIR TYPE OCCUPANCY SENSORS SHALL BE USED IN ALL OFFICES, CLASSROOMS, MEETING ROOMS, STORAGE ROOMS, BREAKROOMS,
- CORRIDORS, LOBBIES AND OTHER PUBLIC AREAS, EXCLUDING RESTROOMS. E. ULTRASONIC TYPE: CEILING MOUNTING; DETECT OCCUPANCY BY SENSING A CHANGE IN PATTERN OF REFLECTED ULTRASONIC ENERGY IN AREA OF COVERAGE.
- 1. DETECTOR SENSITIVITY: DETECT A PERSON OF AVERAGE SIZE AND WEIGHT MOVING AT LEAST 12 INCHES IN EITHER A HORIZONTAL OR A VERTICAL MANNER AT AN APPROXIMATE SPEED OF 12 INCHES/S. 2. DETECTION COVERAGE (SMALL ROOM): DETECT OCCUPANCY ANYWHERE WITHIN A CIRCULAR AREA OF 600 SQ. FT. WHEN MOUNTED ON A 96-INCH-

ANYWHERE WITHIN A CIRCULAR AREA OF 1000 SQ. FT. WHEN MOUNTED ON

4. DETECTION COVERAGE (LARGE ROOM): DETECT OCCUPANCY ANYWHERE

5. DETECTION COVERAGE (CORRIDOR): DETECT OCCUPANCY ANYWHERE

WITHIN 90 FEET WHEN MOUNTED ON A 10-FOOT- HIGH CEILING IN A

6. ULTRASONIC TYPE OR DUAL-TECHNOLOGY TYPE OCCUPANCY SENSORS

WITHIN A CIRCULAR AREA OF 2000 SQ. FT. WHEN MOUNTED ON A 96-INCH-

3. DETECTION COVERAGE (STANDARD ROOM): DETECT OCCUPANCY

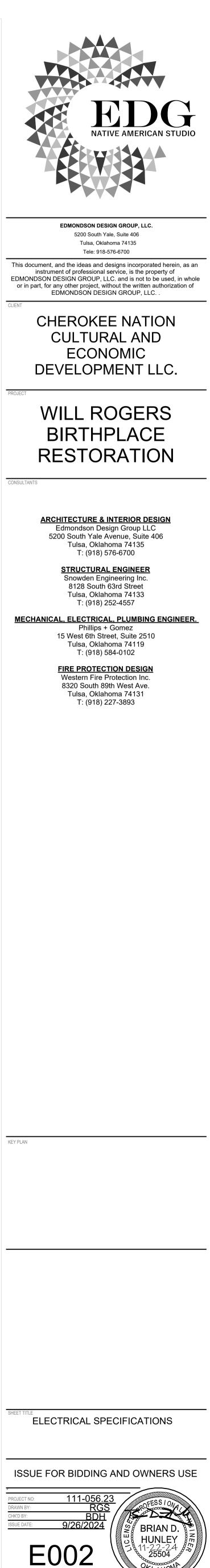
HIGH CEILING.

HIGH CEILING

AN 8-FOOT- HIGH CEILING.

CORRIDOR NOT WIDER THAN 14 FEET.

SHALL ONLY BE INSTALLED IN RESTROOMS.



1/8" = 1

1.1 RELATED DOCUMENTS A. Drawings and generalP provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

- 1.2 SUMMARY A. This Section includes packaged engine-generator sets for emergency and standby power supply with the following features:
- 1. Diesel engine. 2. Unit-mounted cooling system.
- 3. Unit-mounted control and monitoring. 4. Performance requirements for sensitive loads.
- Outdoor enclosure. B. Related Sections include the following:
- 1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.
- 1.3 DEFINITIONS A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter. 1.4 SUBMITTALS
- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
- 1. Thermal damage curve for generator. 2. Time-current characteristic curves for generator protective device.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, the method of field assembly, components, and location and size of each field connection. 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified. 2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
- 3. Wiring Diagrams: Power, signal, and control wiring. 4. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting
- and anchorage provisions. 5. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Qualification Data: For manufacturer. D. Source quality-control test reports.
- 1. Certified summary of prototype-unit test report. 2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested
- on prototype unit. 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance
- criteria for sensitive loads 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified
- requirements. 5. Report of sound generation
- 6. Report of exhaust emissions showing compliance with applicable regulations. 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- E. Field quality-control test reports. F. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following: 1. List of tools and replacement items recommended shall be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
- G. Warranty: Special warranty specified in this Section. 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Proiect. 1. Maintenance Proximity: Not more than four hours normal travel time from Installer's place of business to
- Project site. B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 of Project site, a service center
- capable of providing training, parts, and emergency maintenance repairs. C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single
- manufacturer. D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a
- testing agency acceptable to authorities having jurisdiction, and marked for intended use. E. Comply with ASME B15.1.
- F. Comply with NFPA 37.
- G. Comply with NFPA 70. H. Comply with NFPA 99.
- I. Comply with NFPA 110 requirements for Level 1 emergency power supply system. J. Comply with UL 2200.
- K. Engine Exhaust Emissions: Comply with applicable federal, state and local government requiremen
- ... Noise Emission: Comply with applicable state and local government requirements for maximum noise level due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation. M. IEEE446-Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
- N. ICE8528 part 4. Control Systems for Generator Sets. 1.6 PROJECT CONDITIONS
- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability: 1. Ambient Temperature: 5 to 40 deg C.
- 2. Altitude: Sea level to 725'. 1.7 COORDINATION
- A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3. B. Coordinate size and location of roof curbs, equipment supports, and wall penetrations for remote radiators. C. Coordinate louvers and exhaust with Mechanical Contractor for orientation of Generator. This is for connection of exhaust, air exhaust from radiator and natural gas connection.
- 1.8 WARRANTY A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within
- specified warranty period. 1. Warranty Period: One year from date of Substantial Completion.
- **1.9 MAINTENANCE SERVICE**
- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in
- the manufacture and installation of original equipment. 1.10 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. 1. Fuses: One for every 10 of each type and rating, but no less than one of each.
- Indicator Lamps: Two for every six of each type used, but no fewer than two of each. 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
- PART 2 PRODUCTS 2.1 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: 1. Onan/Cummins Power Generation; Industrial Business Group. . Kohler Co.; Generator Division.
- Caterpillar
- 2.2 ENGINE-GENERATOR SET A. Factory-assembled and tested, engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments. 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- C. Capacities and Characteristics: 1. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing. Generator shall have ratings as shown on drawings or as required to supply loads appearing in Generator Load Table with a maximum of 25% voltage drop during starting
- conditions. 2. Output Connections: Three-phase, four wire.
- 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. D. Generator-Set Performance for Sensitive Loads: 1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified
- performance. a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than
- ratings that would normally be applied to generator size installed. 2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load. 3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or
- decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second. 4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
- 5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of
- 6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease.
- Frequency shall recover and remain within the steady-state operating band within three seconds. 7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
- 8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
- 9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load. a. Provide permanent magnet excitation for power source to voltage regulator. 10. Start Time: Comply with NFPA 110, Type 10(10 Seconds), System requirements.
- 2.3 ENGINE A. Fuel: Fuel oil, Grade DF-2.

1/16"=1'-0"

- B. Rated Engine Speed: 1800 rpm. 2. Maximum Piston Speed for Four-Cycle Engines: 1250 f/min.
- D. Lubrication System: The following items are mounted on engine or skid: Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow. 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be
- capable of full flow and is designed to be fail-safe. 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no
- disassembly and without use of pumps, siphons, special tools, or appliances.
- E. Engine Fuel System: 1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions. 2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity. G. Governor: Adjustable isochronous, with speed sensing.
- H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump. 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer. 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load
- condition 3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to
- maintain optimum constant coolant temperature as recommended by engine manufacturer.

0"

ultraviolet-, and abrasion-resistant fabric. a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum. b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections. Muffler/Silencer: Critical type sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. Minimum sound attenuation of 25 dB at 500 Hz. 2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 85dBA or less Muffler Mounting: Muffler and piping shall be mounted inside generator enclosure. K. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator. L. Starting System: 12-V electric, with negative ground. 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article. 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without 3. Cranking Cycle: As required by NFPA 110 for system level specified. 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging. 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories. 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place. 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 65-A minimum continuous rating. 8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features: a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again. b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures. c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent. d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates. e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel. 9. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet or unit mounted. 2.4 FUEL OIL STORAGE A. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Remote-Mounted Fuel Oil Tank: Field installed and piped, complying with UL 142 fuel oil tank. Refer to drawings for specific requirements. Features include the following: 1. Tank level indicator with direct reading magnetic gauge with a hermetically sealed vacuum tested dial. 2. Capacity: Fuel for 48 hours or as indicated on drawings continuous operation at 75 percent rated power output. Minimum size shall be 2000 gallons. Vandal-resistant and lockable fill cap. 4. Emergency vent shall be sized according to NFPA 30 based on 100% of the primary tank. Zinc plated emergency pressure relief vent cap. 5. Containment Provisions: Comply with requirements of authorities having jurisdiction. Low Fuel Level Switch connected for both remote and local annunciation. 7. Fuel tanks mounted on roofs shall utilize noncombustible supports and provided with spill containment according to NFPA 37. 2.5 CONTROL AND MONITORING A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set. B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration. C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following: 2. AC ammeter. 3. AC frequency meter. 4. DC voltmeter (alternator battery charging). . Engine-coolant temperature gage. Engine lubricating-oil pressure gage. Running-time meter. 8. Ammeter, voltmeter, phase-selector switches. 9. Generator overload. 10. Fuel tank high-level shutdown of fuel supply alarm. D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise E. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel. Remote Annunciator panel shall include: Overcrank shutdown. . Coolant low-temperature alarm. Control switch not in auto position. Battery-charger malfunction alarm. 5. Battery low-voltage alarm. Engine high-temperature shutdown Lube-oil, low-pressure shutdown. 8. Overspeed shutdown. Remote emergency-stop shutdown 10. Engine high-temperature prealarm. 11. Lube-oil, low-pressure prealarm. 12. Low coolant level. 13. Fuel tank, low-fuel level. F. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation. 2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION A. Generator Circuit Breaker: Molded-case, electronic-trip type; 80 percent rated; complying with UL 489. Tripping Characteristics: Adjustable long-time and short--time delay and instantaneous. Trip Settings: Selected to coordinate with generator thermal damage curve. 3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices. 4. Mounting: Adjacent to or integrated with control and monitoring panel. B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate groundfault alarm indication with other generator-set alarm indications. 2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR A. Comply with NEMA MG 1. B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor. . Electrical Insulation: Class H or Class F. . Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity. F. Enclosure: Dripproof, open skid mounted package. 2.8 OUTDOOR GENERATOR-SET ENCLOSURE A. Description: Prefabricated or preengineered enclosure with the following features: Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation. Refer to FINISHES for painting color. All sides shall be vertical surfaces aligned with outside structural base to form uninterrupted uniform exterior appearance. Doors shall be located as necessary for access with a minimum of two double doors on each side. Structural Design and Anchorage: Comply with ASCE 7 for wind loads. 3. Space Heater: Thermostatically controlled and sized to prevent condensation. 4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents. Hinged Doors: With padlocking provisions. 6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents. Ventilation air shall be discharged vertically through plenum concealed from horizontal exterior view. 7. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components. Plenum attached to radiator discharge shall be constructed to direct air vertically. 8. Muffler Location: Within enclosure. Exhaust shall be discharged inside ventilation plenum without affecting causing excessive heat inside plenum. If possible, top of exhaust pipe shall be concealed from horizontal

Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-,

9. Acoustical: Critical type, Level II. The maximum sound level measured 7 meters horizontally, in any direction, from enclosure shall be 80dBA at ground level. This will be measured when generator is running at a minimum of 75% load and include all components of sound when engine is running. B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits

when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of 2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure

system service conditions.

Muffler: Mount inside enclosure.

voltage operating band.

factor. Include the following tests:

5. Transient and steady--state governing.

2.10 SOURCE QUALITY CONTROL

2. Full load run.

3. Maximum power. 4. Voltage regulation.

6. Single-step load pickup. Safety shutdown.

I. Subtransient Reactance: 12 percent, maximum.

heat loss in cold weather when unit is not operating.

. Instrument Transformers: Mounted within generator enclosure.

prototype to demonstrate compatibility and reliability.

0 1'

1/2"=1'-0"

rain and snow.

2.9 FINISHES

1/4"=1'-0"

. Convenience Outlets: Factory wired. Arrange for external electrical connection. F. Voltage Regulator: Solid-state type, separate from exciter, to provide performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-G. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point H. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

A. Outdoor Enclosure: Owner selected color applied at factory according to manufacturer's standard painting procedure. Finish shall be applied over corrosion-resistant pretreatment and compatible primer.

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power 1. Test components and accessories furnished with installed unit that are not identical to those on the tested

8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative. 9. Report factory test results within 10 days of completion of test.

3/4"=1'-0"

1"=1'-0"

PART 3 - EXECUTION 3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance. B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

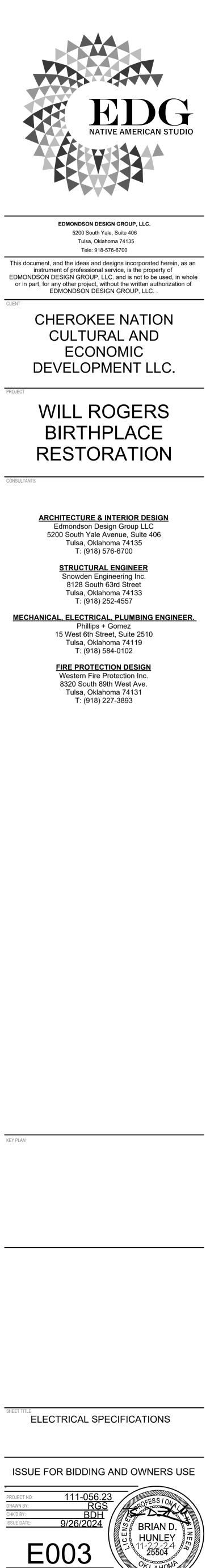
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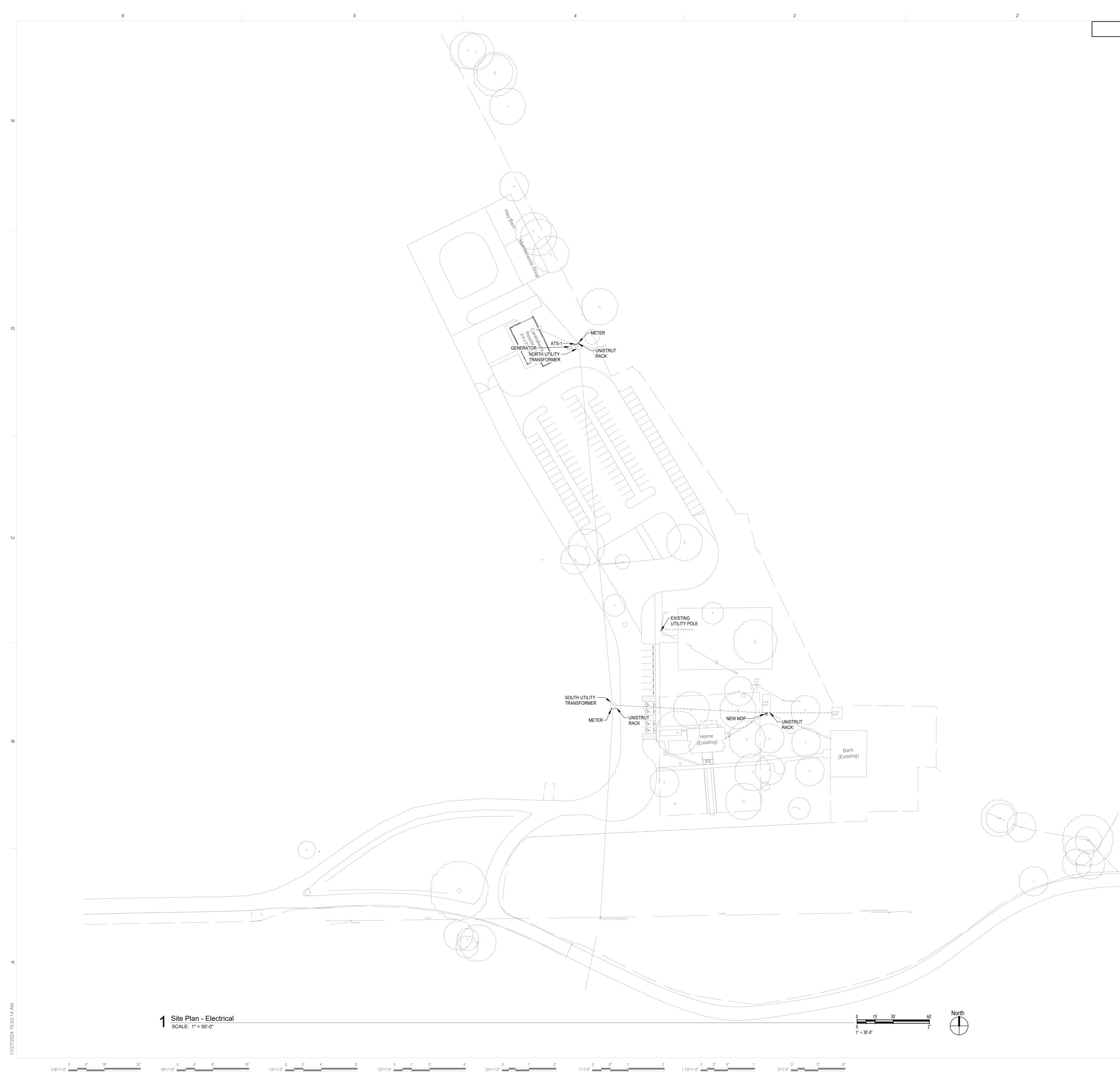
- C. Proceed with installation only after unsatisfactory conditions have been corrected. 3.2 INSTALLATION
- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance. C. Install packaged engine generator with elastomeric isolator pads having a minimum deflection of 1 inch on 4-inchhigh concrete base. Secure sets to anchor bolts installed in concrete bases.
- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted 3.3 CONNECTIONS A. Piping installation requirements are specified in Mechanical Sections. Drawings indicate general arrangement of
- piping and specialties. B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Connect engine exhaust pipe to engine with flexible connector. D. Connect fuel piping to engines with a gate valve and union and flexible connector. 1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems outside the building are specified in Division 2 Section "Fuel Oil Distribution."
- 2. Diesel fuel piping, valves, and specialties inside the building are specified in Division 23 Section "Fuel Oil Piping."
- E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systsms." F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- 3.4 IDENTIFICATION A. Identify system components according Mechanical Identification and Division 26 Section "Identification for Electrical Systems." 3.5 FIELD QUALITY CONTROL
- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing. 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. B. Tests and Inspections:
- 1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection (except those indicated to be optional) for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test. 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
- a. Measure charging voltage and voltages between available battery terminals for full-charging and floatcharging conditions. Check electrolyte level and specific gravity under both conditions. b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the c. Verify acceptance of charge for each element of the battery after discharge.
- d. Verify that measurements are within manufacturer's specifications. 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions. 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- C. Coordinate tests with tests for transfer switches and run them concurrently. D. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Remove and replace malfunctioning units and retestas specified above. G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met. H. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- 3.6 DEMONSTRATION A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generator. Include a minimum of four hours of Owner's maintenance personnel training and demonstration by factory-authorized service representative. END OF SECTION

1 1/2"=1'-0"

3"=1'-0"

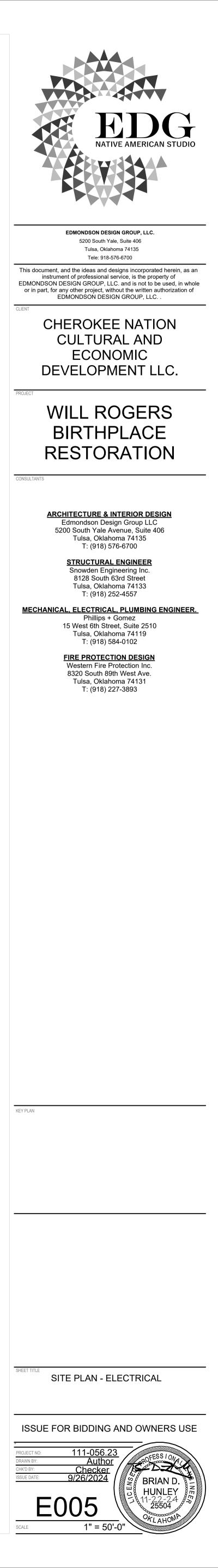
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KEYNOTES



RK	FEEDER SIZES	MARK	FEEDER SIZES
C1	3#12, 1#12GND, 3/4"C.	C45	3-500MCM, 2-500MCM NEUTRAL, 1-500MCM I.G., 1-500MCM GND, 4"C.
C2	3#10, 1#10GND, 3/4"C.	C46	TWO (2) SETS 3#3/0, 1#3GND, 2"C.
C3	4#10, 1#10GND, 3/4"C.	C47	TWO (2) SETS 4#3/0, 1#3GND, 2 1/2"C.
C4	3#8, 1#10GND, 3/4"C.	C48	TWO (2) SETS 3#3/0, 2#3/0 NEUTRAL, 1#3/0 I.G., 1#3/0GND, 3"C.
C5	4#8, 1#10GND, 1"C.	C49	TWO (2) SETS 3#4/0, 1#2GND, 2"C.
C6	3#6, 1#10GND, 1"C.	C50	TWO (2) SETS 4#4/0, 1#2GND, 2 1/2"C.
C7	4#6, 1#10GND, 1"C.	C51	TWO (2) SETS 3#4/0, 2#4/0 NEUTRAL, 1#4/0 I.G., 1#4/0GND, 3"C.
C8	3#4, 1#8GND, 1 1/4"C.	C52	TWO (2) SETS 3-250MCM, 1#2GND, 2 1/2"C.
C9	4#4, 1#8GND, 1 1/4"C.	C53	TWO (2) SETS 4-250MCM, 1#2GND, 3"C.
C10	3#3, 1#8GND, 1 1/4"C.	C54	TWO (2) SETS 3-250MCM, 2-250MCM NEUTRAL, 1-250MCM I.G., 1-250MCM GND, 3"C.
C11	4#3, 1#8GND, 2"C.	C55	TWO (2) SETS 3-350MCM, 1#1GND, 3"C.
C12	3#3, 2#3 NEUTRAL, 1#3 I.G., 1#3GND, 1 1/2"C.	C56	TWO (2) SETS 4-350MCM, 1#1GND, 3 1/2"C.
C13	3#2, 1#6GND, 1 1/4"C.	C57	TWO (2) SETS 3-350MCM, 2-350MCM NEUTRAL, 1-350MCM I.G., 1-350MCM GND, 3 1/2"C.
C14	4#2, 1#6GND, 1 1/2"C.	C58	TWO (2) SETS 3-500MCM, 1#1/0GND, 3"C.
C15	3#2, 2#2 NEUTRAL, 1#2 I.G., 1#2GND, 2"C.	C59	TWO (2) SETS 4-500MCM, 1#1/0GND, 3 1/2"C.
C16	3#1, 1#6GND, 1 1/2"C.	C60	TWO (2) SETS 3-500MCM, 2-500MCM NEUTRAL, 1-500MCM I.G., 1-500MCM GND, 4"C.
C17	4#1, 1#6GND, 2"C.	C61	THREE (3) SETS 3-250MCM, 1#1/0GND, 2 1/2"C.
C18	3#1, 2#1 NEUTRAL, 1#1 I.G., 1#1GND, 2 1/2"C.	C62	THREE (3) SETS 4-250MCM, 1#1/0GND, 3"C.
C19	3#1/0, 1#6GND, 1 1/2"C.	C63	THREE (3) SETS 3-300MCM, 1#1/0GND, 2 1/2"C.
C20	4#1/0, 1#6GND, 2"C.	C64	THREE (3) SETS 4-300MCM, 1#1/0GND, 3"C.
C21	3#1/0, 2#1/0 NEUTRAL, 1#1/0 I.G., 1#1/0GND, 2 1/2"C.	C65	THREE (3) SETS 3-400MCM, 1#2/0GND, 3"C.
C22	3#2/0, 1#6GND, 2"C.	C66	THREE (3) SETS 4-400MCM, 1#2/0GND, 3"C.
C23	4#2/0, 1#6GND, 2"C.	C67	FOUR (4) SETS 3-350MCM, 1#3/0GND, 3"C.
C24	3#2/0, 2#2/0 NEUTRAL, 1#2/0 I.G., 1#2/0GND, 2 1/2"C.	C68	FOUR (4) SETS 4-350MCM, 1#3/0GND, 3"C.
C25	3#3/0, 1#6GND, 2"C.	C69	FOUR (4) SETS 3-500MCM, 1#4/0GND, 3"C.
C26	4#3/0, 1#6GND, 2 1/2"C.	C70	FOUR (4) SETS 4-500MCM, 1#4/0GND, 3 1/2"C.
C27	3#3/0, 2#3/0 NEUTRAL, 1#3/0 I.G., 1#3/0GND, 3"C.	C71	FIVE (5) SETS 3-500MCM, 1#4/0GND, 3"C.
C28	3#4/0, 1#4GND, 2"C.	C72	FIVE (5) SETS 4-500MCM, 1#4/0GND, 3 1/2"C.
C29	4#4/0, 1#4GND, 2 1/2"C.	C73	SIX (6) SETS 3-500MCM, 1-250MCM GND, 3 1/2"C.
C30	3#4/0, 2#4/0 NEUTRAL, 1#4/0 I.G., 1#4/0GND, 3"C.	C74	SIX (6) SETS 4-500MCM, 1-350MCM GND, 3 1/2"C.
C31	3-250MCM, 1#4GND, 2 1/2"C.	C75	ELEVEN (11) SETS 3-500MCM, 1#4/0 NEUTRAL, 3 1/2"C.
C32	4-250MCM, 1#4GND, 2 1/2"C.	C76	ELEVEN (11) SETS 3-500MCM, 1#4/0 NEUTRAL, 1-500GND, 3 1/2"C.
C33	3-250MCM, 2-250MCM NEUTRAL, 1-250MCM I.G., 1-250MCM GND, 3 1/2"C.	C77	TWO (2) 2"C. WITH PULL STRINGS
C34	3-300MCM, 1#4GND, 2 1/2"C.	C78	TWO (2) 3"C. WITH PULL STRINGS
C35	4-300MCM, 1#4GND, 3"C.	C79	TWO (2) 1 1/2"C. WITH PULL STRINGS
C36	3-300MCM, 2-300MCM NEUTRAL, 1-300MCM I.G., 1-300MCM GND, 3 1/2"C.	C80	TWO (2) 4"C. WITH PULL STRINGS
C37	3-350MCM, 1#4GND, 2 1/2"C.	C81	THREE (3) 4"C. WITH PULL STRINGS
C38	4-350MCM, 1#4GND, 3"C.	C82	NINE (9) SETS 4-500MCM, 4"C.
C39	3-350MCM, 2-350MCM NEUTRAL, 1-350MCM I.G., 1-350MCM GND, 3 1/2"C.	C83	SIX (6) SETS 4-400MCM, 1-250MCM GND., 4"C.
C40	TWO (2) SETS 3#2/0, 1#3GND, 2"C.	C84	ONE (1) 1"C. WITH PULL STRINGS
C40	TWO (2) SETS 4#2/0, 1#3GND, 2"C.	C85	ONE (1) 4"C. WITH PULL STRINGS
C42	TWO (2) SETS 3#2/0, 2#2/0 NEUTRAL, 1#2/0 I.G., 1#2/0GND, 2 1/2"C.	C85	ONE (1) 2"C. WITH PULL STRINGS
C43	3-500MCM, 1#3GND, 3"C.		
C44	4-500MCM, 1#3GND, 3 1/2"C.		

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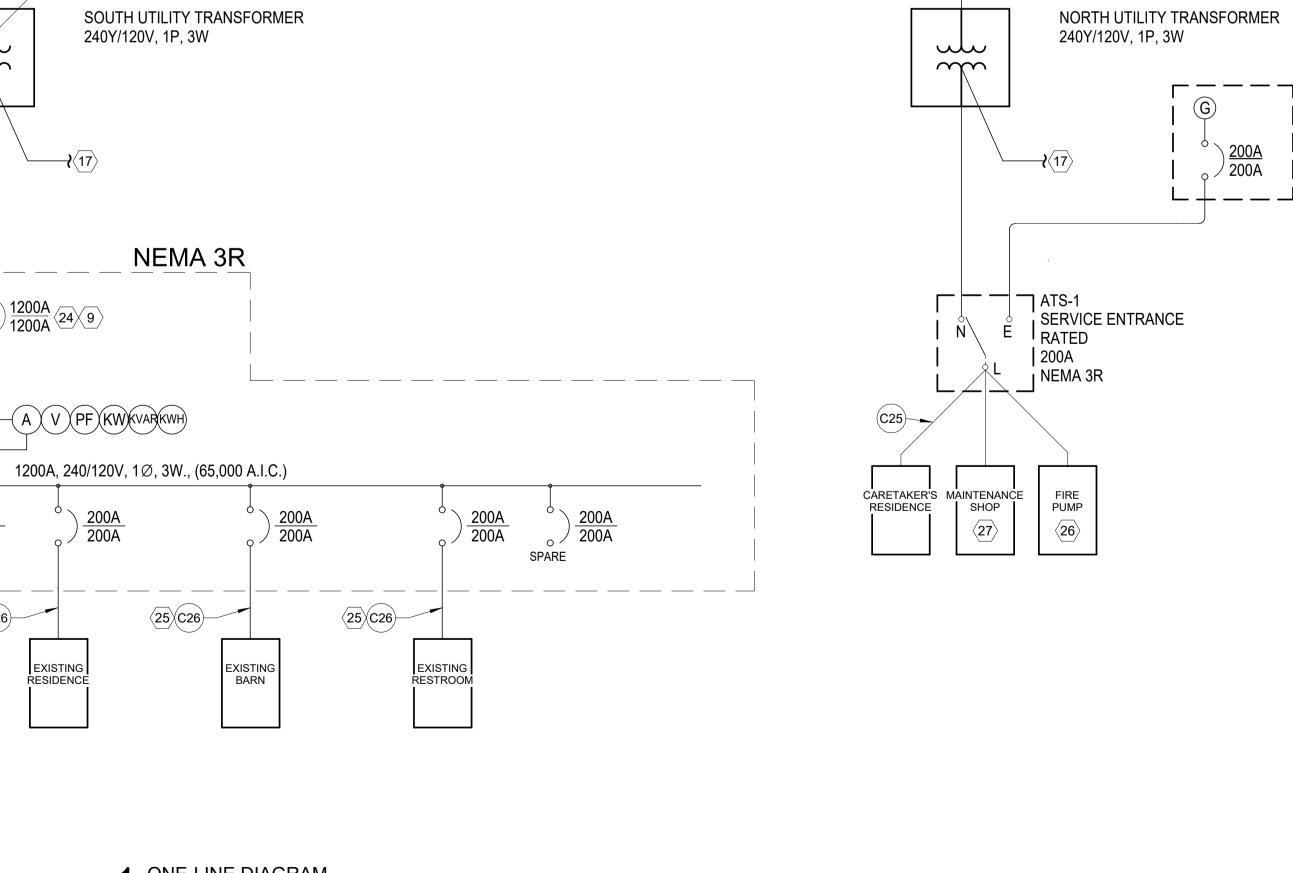
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TO UTILITY \sim (14) ulu \sim **C67** 23 M MDP) <u>1200A</u> (24) 9 €FR— 30A <u>〈21</u>〉 30A TVSS 25 C26 EXISTING RESIDENCE PER ARTICLE NEC 250.12

CONDUIT SCHEDULE

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1 ONE-LINE DIAGRAM SCALE: 1/8" = 1'-0"

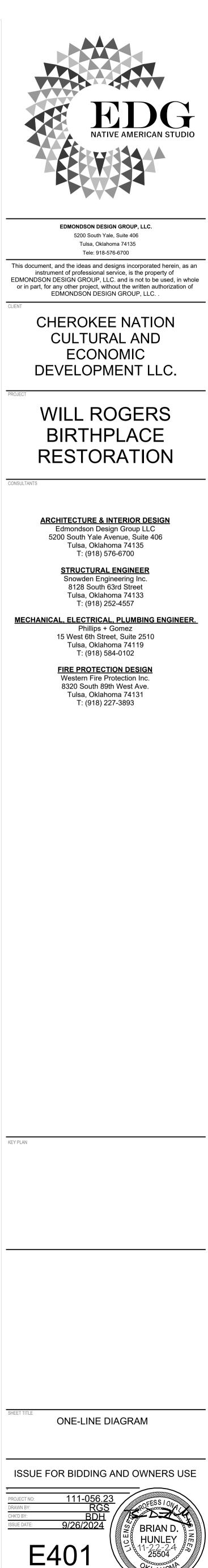
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	# KEYNOTES
9	REFEED ALL EXISTING SINGLE PHASE ELECTRICAL SERVICE FROM NEW PANEL MDP. COORDINATE EXACT QUANTITY AND SIZE OF BRANCH CIRCUIT BREAKERS NEEDED WITH EXISTING UTILITY SERVICES. EXTEND EXISTING UNDERGROUND SERVICE TO NEW PANEL LOCATION. PROVIDE NEW UNDERGROUND FEEDERS TO REPLACE EXISTING OVERHEAD. EXISTING SERVICES TO BE REFED INCLUDE THE CARETAKERS HOUSE, RV PARKING AREA, FIELD HOUSE, RANCH HOUSE, BARN AND OUTBUILDING.
14	FURNISH AND INSTALL PER VVEC SPECIFICATIONS THREE(3) TWO(2) INCH CONDUITS ONLY WITH PULL STRING FOR PRIMARY CONDUCTORS BY UTILITY. PRIOR TO BID/INSTALLATION VERIFY ROUTING AND LOCATION OF PAD/POLE MOUNTED TRANSFORMER WITH VVEC AND ARCHITECT/OWNER. CONTRACTOR TO PERFORM ALL NECESSARY TRENCHING, INSTALL CONDUIT, BEDDING AND WARNING TAPE, PERFORM ALL TRENCH BACKFILLING AND COMPACTION AND CONSTRUCT REQUIRED TRANSFORMER PADS. WHERE CONDUIT IS INSTALLED UNDER HARD SURFACES CONTRACTOR TO FURNISH AND INSTALL CONTINUOUS LENGTH SCHEDULE 80 CONDUIT. CONDUIT SHALL BE PLACED FOUR(4) FEET BELOW FINAL FINISHED GRADE. COORDINATE FINAL REQUIRMENTS WITH VVEC SPECIFICATIONS.
17	PROVIDE FOUR(6)-4" CONDUITS STUBBED OUT OF TRANSFORMER SECONDARY VAULT FOR SERVICE TO FUTURE PHASES.
21	INTEGRAL SURGE PROTECTION FOR SWITCHBOARD. REFER TO ELECTRICAL SPECIFICATION SECTION 264313 FOR FURHTER INFORMATION. COORDINATE OVERCURRENT SIZE WITH MANUFACTURER'S RECOMMENDATIONS.
22	ALL GROUNDING / BONDING IS TO BE PER LATEST NEC REQUIREMENTS. GROUNDING ELECTRODE CONDUCTORS SHALL BE INSTALLED IN GRC. FURNISH AND INSTALL ALL CONNECTIONS TO GROUND RODS, BUILDING STEEL, ETC PER NATIONAL AND LOCAL CODE, AND UTILITY REQUIREMENTS USING BURNDY HYGROUND COMPRESSION GROUNDING SYSTEM. SEE SERVICE GROUNDING DETAIL ON SAME SHEET.
23	METER CAN PROVIDED BY VVEC. INSTALL METER CAN WITH 1 INCH CONDUIT AS SPECIFIED BY VVEC. LOCATION AND MOUNTING OF METER CAN WITH CONDUIT ROUTING AS DIRECTED BY UTILITY.
24	MAIN BREAKER TO BE 100% RATED AND SERVICE ENTRANCE RATED PER NEC.
25	CONTRACTOR TO VERIFY BREAKER AND FEEDER SIZES WITH EXISTING PANELS BEING REFED FROM NEW MDP.
26	VERIFY PANEL AND FEEDER SIZE WITH FIRE PUMP MANUFACTURER.
27	VERIFY PANEL AND FEEDER SIZE WITH OWNER PROVIDED MAINTENANCE SHOP.

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NEW DEISEL GENERATOR GENERAC RG03624ANAX OR APPROVED EQUAL 200A 43KVA, 36KW, 0.8 PF, _ __ __ 240Y/120V, 1PH,3W NEMA 3R

2



1/8" = 1'-0