Amphitheater Public Schools Amphitheater High School **GENERATORS**

Amphitheater High School

125 W. Yavapai Rd., Tucson, Az., 85705

100% CONSTRUCTION DOCUMENTS 04/06/2023

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PS1	12 of 12	PARTIAL PLUMBING SITE PLAN - GAS PIPING

DESCRIPTION OF WORK

THIS PROJECT INCLUDES BUT IS NOT LIMITED TO THE REMOVAL OF EXISTING ELECTRICAL FEEDERS AND INSTALLATION OF NEW GAS NATURAL STAND BY GENERATORS, AUTOMATIC TRANSFER SWICHTES, EMERGENCY PANELS AND ASSOCIATED FEEDERS/CONTROLS.

NEW GYM NEW CAFETERIA ST	MAIN GYMNASIUM LIBRARY ADMIN UDENT NTER PANTHER HALL BLDG. 400	CLASSROOM CLASSROOM CLASSROOM	WING 200 1 WING 300	AUTO SHOP DEPARTMENT OF THE PROPERTY OF THE PR
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	NDT TO SO	JALŁ		ROJECT ORTH



OWNER

AMPHITHEATER PUBLIC SCHOOL DISTRICT 701 W. WETMORE ROAD TUCSON, ARIZONA 85705 www.amphi.com ph: 520.696.5000 Contact: Kevin Chester



ELECTRICAL ENGINEER

MONRAD ENGINEERING INC. 1926 E. FORT LOWELL ROAD SUITE 200 TUCSON, ARIZONA 85719 www.monraengineeringinc.com ph: 520.884.0045 Contact: Chris Monrad



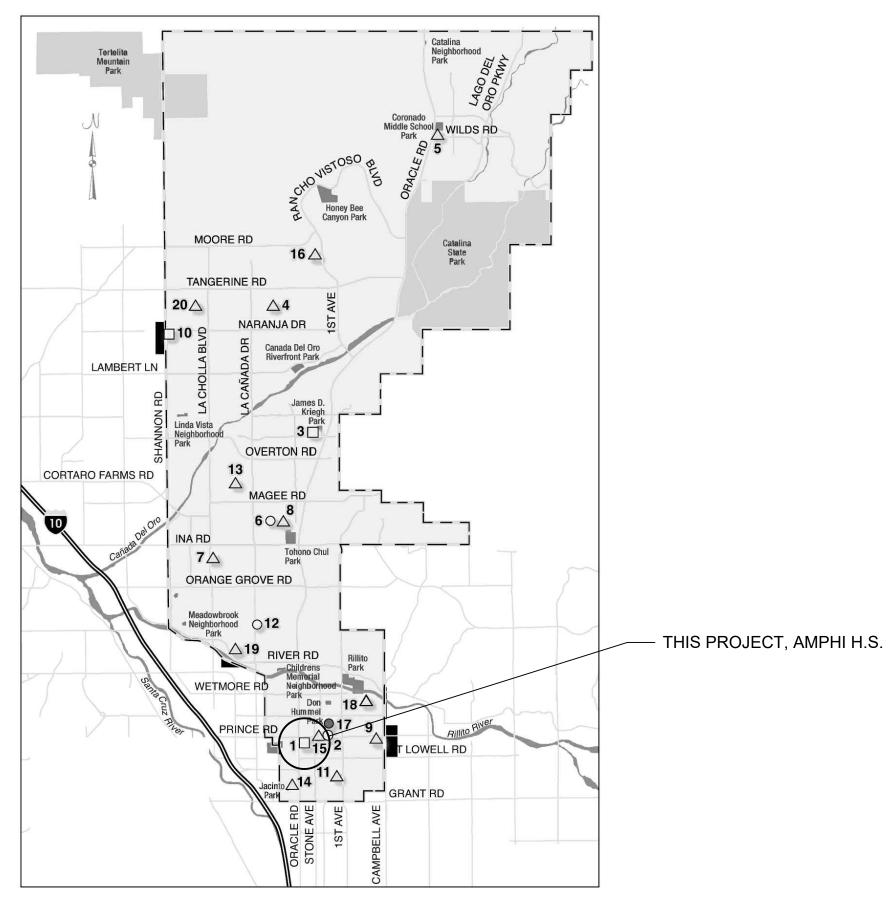
MECHANICAL ENGINEER

KELLY - WRIGHT ASSSOCIATES - PC 737 E. Tanque Verde Rd. TUCSON, ARIZONA 85715 www.kwmech.com ph: 520.887.1919 Contact: Donovan Kelly



LOCATION MAP (AMPHI SCHOOLS)

NOT TO SCALE



PROJECT NORTH

E0.0

- A. LOCATE AND PROTECT UNDERGROUND UTILITIES PRIOR TO START OF WORK. REPAIR OF DAMAGED UTILITIES SHALL BE AT CONTRACTOR EXPENSE.
- B. CUT, PATCH, AND RESTORE ALL FINISHES DISTURBED BY NEW WORK. WHERE TRENCHING OCCURS, RESTORE ALL SURFACES TO MATCH THOSE EXISTING PRIOR TO TRENCHING ACTIVITIES.
- C. ALL CONDUIT SHALL BE CONCEALED IN BUILDING.
- D. ALL PENETRATIONS THROUGH EXTERIOR WALL AND ROOFS SHALL BE SLEEVED, FLASHED AND SEALED WATERPROOF. PROVIDE ESCUTCHEON PLATES WHERE WALL PENETRATIONS ARE EXPOSED.
- E. ALL CONDUCTORS INSTALLED AT EXTERIOR AND/OR ABOVE ROOF SHALL BE THWN OR XHHW-2 TYPE.
- ELECTRICAL SITE FROM ONLINE SOURCE, SITE VISIT AND LIMITED RECORD DRAWINGS, VERIFY ALL LENGHTS/DIMENSIONS ON SITE.

AMPHITHEATER PUBLIC SCHOC
AMPHITHEATER HIGH SC
IT GENERATORS
125 W. Yavapai Rd. Tucson, Arizona OELECTRICAL KEYNOTES THIS SHEET ONLY

- . NEW 60kW/75kVA, 277/480V-3ø-4W EMERGENCY NATURAL GAS GENERATOR. OBTAIN APPROVED FOOTPRINT WITH NEC WORKING CLEARANCES BEFORE START ANY WORK, REFER TO ONE LINE DIAGRAM ON SHEET E1.
- 2. NEW 60kW/75kVA, 120/208V-3ø-4W EMERGENCY NATURAL GAS GENERATOR. OBTAIN APPROVED FOOTPRINT WITH NEC WORKING CLEARANCES BEFORE START ANY WORK, REFER TO ONE LINE DIAGRAM ON SHEET E2.
- 3. PROJECTION OF BUILDING INTERIOR ELECTRICAL EQUIPMENT, VERIFY ALL EXISTING CONDITIONS.
- 4. EXISTING TEP TRANSFORMER TO REMAIN, LOCATE AND PROTECT EXISTING U.G. PRIMARY AND SECONDARY FEDERS.
- 5. PROVIDE REMOVABLE STEEL CONCRETE FILLED BOLLARDS FOR EQUIPMENT PROTECTION, PROVIDE NEC WORKING

CLEARANCES.

ARTIAL ELECTRICAL SITE PLAN

37386 CHRISTIAN K MONRAD &

EXPIRES 3-31-26

Project Number M22110

AS-SHOWN ES1



Dial 8-1-1 or 1-800-STAKE-IT (782-5348)

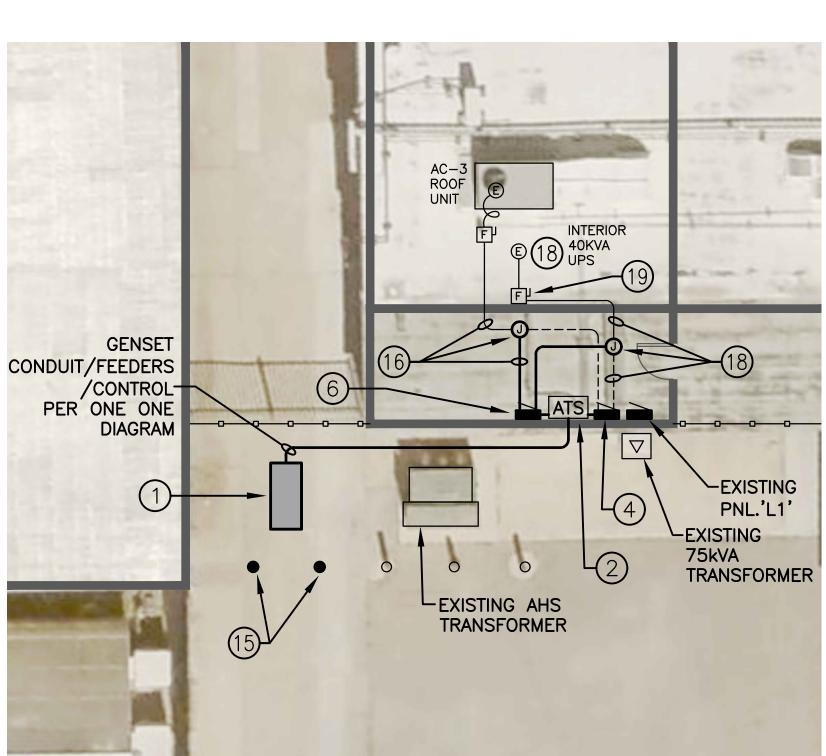
In Maricopa County: (602) 263-1100

PROVIDE APPROVED ARC-FLASH HAZARD WARNING ON ALL REQUIRED **ELECTRICAL EQUIPMENT PER NEC 110.16**

Electric Arc Flash Hazard Will cause severe injury

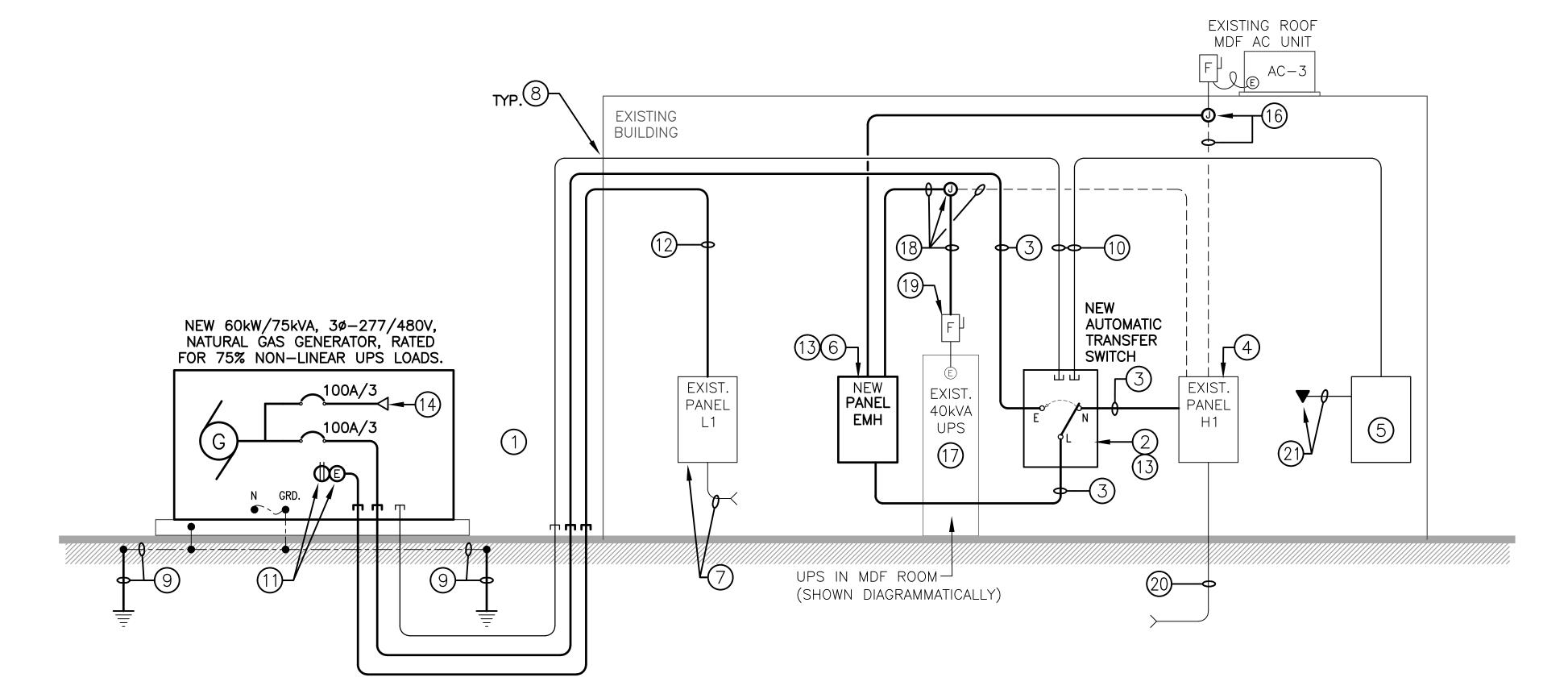
or death Wear proper protective equipment before opening or performing diagnostic measurements while energized. (See NFPA 70E)











ONE LINE DIAGRAM

ELECTRICAL KEYNOTES THIS SHEET ONLY

- 1. NEW 60kW/75kVA, 277/480V STANDBY NATURAL GAS GENERATOR WITH HOUSEKEEPING PAD, PROVIDE FOOTPRINT SHOP DRAWING WITH WORKING CLEARANCES FOR APPROVAL BEFORE START OF WORK.
- 2. NEW 100A 480V-3Ø-4 POLE AUTOMATIC TRANSFER SWITCH (ATS), WITH SOLID NEUTRAL.
- 3. NEW FEEDER: (4) #2 CU, (1) #6 CU GRD. 1-1/2°C.
- 4. EXISTING 400A-3ø-4W-27/480V PANEL TO REMAIN WITH NEW WORK PER PANEL SCHEDULE
- 5. INSTALL NEW ANNUNCIATOR PANEL PER OWNER DIRECTIONS.
- 6. NEW 100A-277/480V-3ø-4W PANEL 'EMH' PER PANEL SCHEDULE.
- 7. EXISTING PANEL 'L1' TO REMAIN WITH NEW WORK PER PANEL SCHEDULE. EXISTING FEEDER FROM PANEL 'H1' VIA EXTERIOR 480-120/208V TRANSFORMER.
- 8. ALL PENETRATIONS THROUGH EXTERIOR WALL AND ROOFS SHALL BE SLEEVED, FLASHED AND SEALED WATERPROOF. PROVIDE ESCUTCHEON PLATES WHERE WALL PENETRATIONS ARE EXPOSED.
- 9. NEW (2) 3/4"X10FT COPPERCLAD STEEL GROUND RODS AT OPPOSITE PAD CORNER PER DETAIL 2 THIS SHEET. PROVIDE #2 CU BOND TO EACH ROD, GENSET GRD. LUG, CONCRETE PAD REBAR. PROVIDE EXOTHERMIC WELD U.G. CONNECTIONS.
- 10. PROVIDE 1"C. FOR CONTROL/SIGNAL WIRING PER GENSET MFR.
- 11. PROVIDE 208V-1ø-30A CIRCUIT TO GENSET BLOCK HEATER. PROVIDE WP/GFCI RECEPTACLE FOR GENSET BATTERY CHARGER.

- 12. 1"C. WITH (2) #10 CU (208V-1ø), (2) #10 CU (120V), (1) #10 CU GRD.
- 13. PROVIDE "CAUTION, TWO SOURCES OF POWER" LABELS PER NEC.
- 14. FOR PORTABLE LOAD BANK CONNECTIONS.
- 15. PROVIDE NEW STEEL CONCRETE FILL BOLLARDS SIMILAR TO TEP SR-230.
- 16. DISCONNECT AC-3 CIRCUIT FROM PANEL 'H1', REMOVE WIRE CONDUIT FROM PANEL, INTERCEPT CEILING/ROOF MOUNTED CIRCUIT AND RE-DIRECT TO NEW 480V PANEL 'EMH'. USE (3) #12 CU, (1) #12 CU GRD. IN 3/4"C. UPDATE CIRCUIT DIRECTORY AND MARK PANEL BREAKER AS SPARE.
- 17. EXISTING RACK MOUNTED 40kVA UPS IN MDF ROOM TO REMAIN.
- 18. DISCONNECT UPS CIRCUIT FROM PANEL 'H1', REMOVE FEEDER CONDUIT FROM PANEL AND RE-DIRECT TO NEW 480V PANEL 'EMH'. USE (3) #4 CU, (1) #8 CU GRD. IN 1-1/2°C. TO EXISTING DISCONNECT. UPDATE CIRCUIT DIRECTORY AND MARK PANEL BREAKER AS SPARE.
- 19. EXISTING 125A-208V-3Ø HEAVY DUTY SAFETY SWITCH TO REMAIN.
- 20. EXISTING SERVICE CONDUCTORS FROM AHS TRANSFORMER TO REMAIN.
- 21. PROVIDE EMCS CONNECTION THROUGH BACNET SYSTEM PER OWNER DIRECTIONS. COORDINATE ALL REQUIREMENTS.

SHORT CIRCUIT CONSIDERATIONS

EXISTING 400A-277/480V-3ø-4W POWER CO. PADMOUNT TRANSFORMER CONTRIBUTIONS IS 24,100A. EXISTING 480V PANEL/BREAKERS ARE 35kAIC. NEW 480V PANEL IS 18kAIC. NO CHANGE OF SHORT CIRCUIT LEVEL IN THIS PROJECT

LOAD SUMMARY

NEW PANEL 'EMH' = 52 kVA FUTURE = 10 kVA

TOTAL = 62 kVA

62 kVA / 53 kW OR 74A AT 480V-3ø-4W. NEW 60kW / 75kVA GENSET IS ADEQUATELLY RATED.

MDF Project Number M22110 hecked By 4/06/2023

PARTIAL I

ELECTRICAL PLAN LINE DIAGRAM

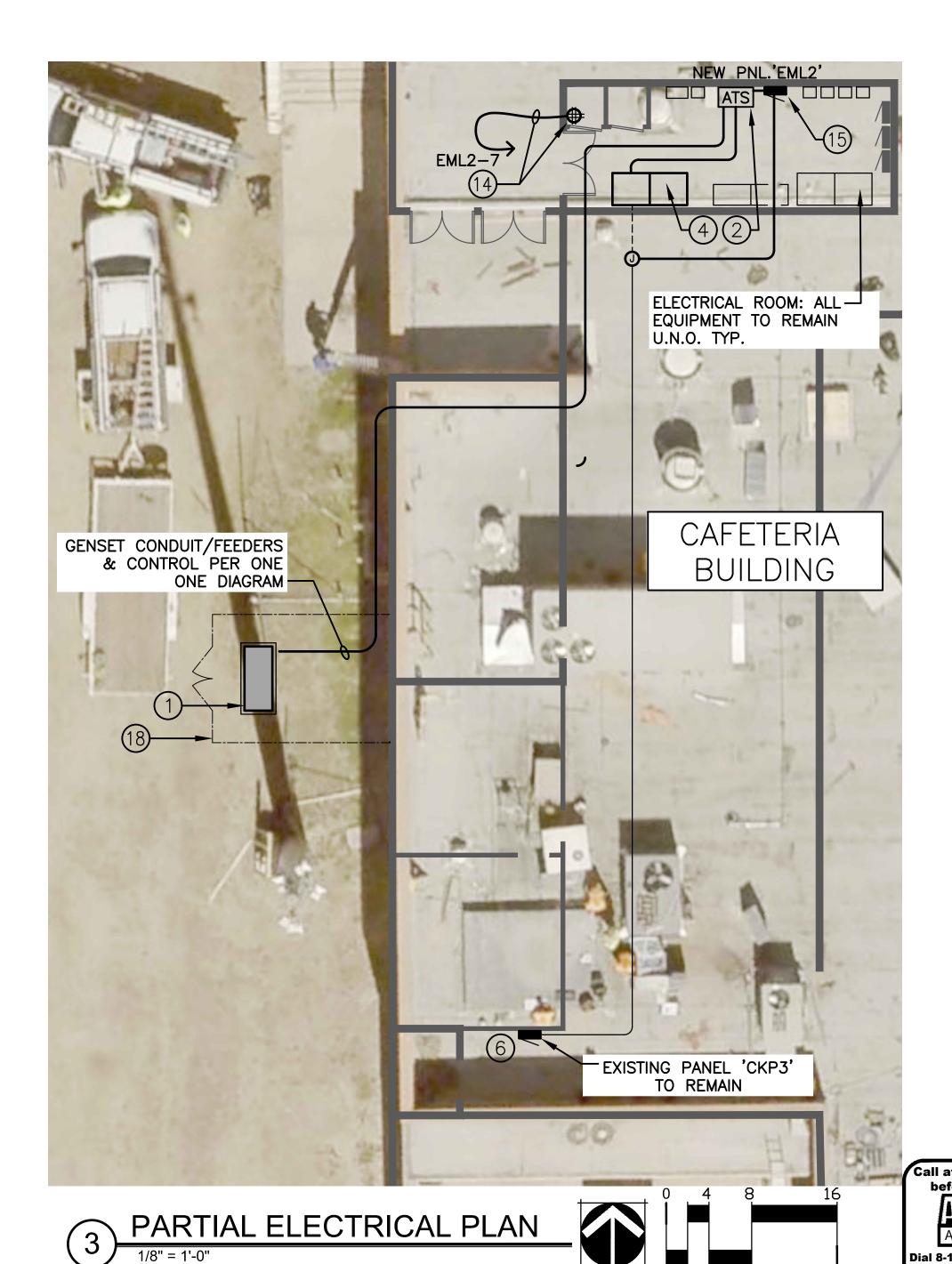
EXPIRES 3-31-26

CHOOL

AMPHITHEATER PUBLIC SCHOCAMPHITHEATER HIGH SCIT GENERATORS
125 W. Yavapai Rd. Tucson, Arizona

AS-SHOWN

CONDUIT/FEEDERS

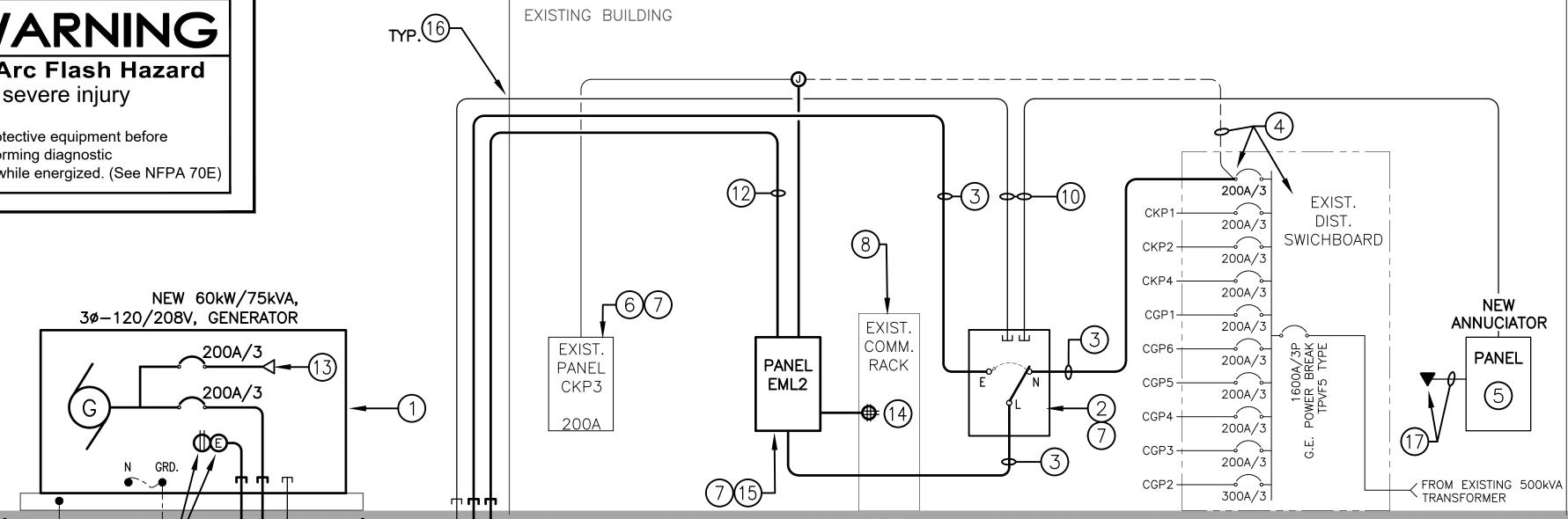


PROVIDE APPROVED ARC-FLASH HAZARD WARNING ON ALL REQUIRED **ELECTRICAL EQUIPMENT PER NEC 110.16**

Electric Arc Flash Hazard Will cause severe injury

or death

Wear proper protective equipment before opening or performing diagnostic measurements while energized. (See NFPA 70E)



ONE LINE DIAGRAM

SHORT CIRCUIT CONSIDERATIONS

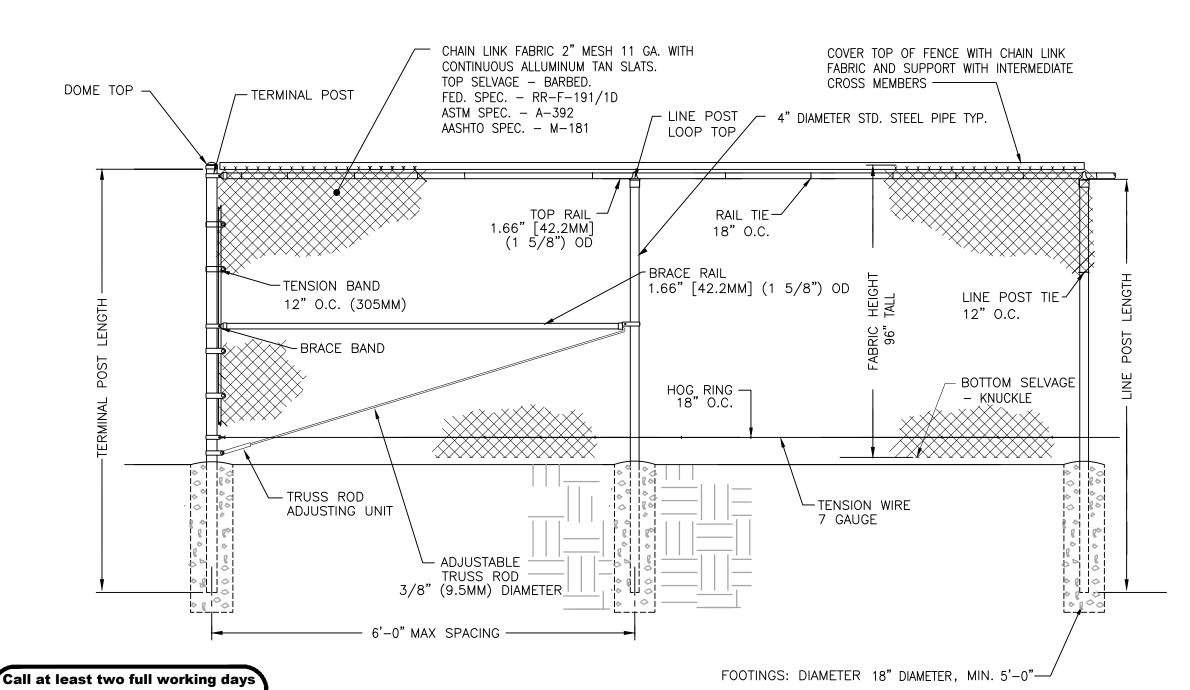
EXISTING 1600A-120/208V-3ø-4W SWITCHBOARD/500kVA TRANSFORMER AIC RATING IS 50,000AIC. NEW 208V ATS RATING IS 42 KAIC. NEW 208V PANEL RATING IS 22kAIC

LOAD SUMMARY

NEW PANEL 'EML2' = 38 kVA FUTURE = 15 kVA

TOTAL = 53 kVA

53 kVA / 45 kW OR 147A AT 208V-3ø-4W, LOAD IS ADEQUATE FOR NEW 60kW / 75kVA GENSET.



CHAIN LINK FENCE DETAIL

Dial 8-1-1 or 1-800-STAKE-IT (782-5348)

In Maricopa County: (602) 263-1100

NOTE: PROVIDE HINGED GATE PANELS PER PLAN.

ELECTRICAL KEYNOTES THIS SHEET ONLY

- NEW 60kW/75kVA, 120/208V STANDBY NATURAL GAS GENERATOR WITH HOUSEKEEPING PAD, COORDINATE WITH EXISTING UTILITIES (NAT.GAS, WATER, DOWNSPOUT, PULLBOXES), PROVIDE FOOTPRINT SHOP DRAWING WITH WORKING CLEARANCES FOR APPROVAL BEFORE STAR OF WORK.
- 2. NEW 200A 208V-3Ø-4 POLE AUTOMATIC TRANSFER SWITCH (ATS), WITH SOLID NEUTRAL. REWORK EXISTING WALL CONDUITS TO ALLOW NEW ATS INSTALLATION.
- 3. NEW FEEDER: (4) #3/0 CU, (1) #6 CU GRD. 2"C.
- 4. EXISTING 1600A-3Ø-4W-27/480V SWITCHBOARD TO REMAIN. INTERCEPT EXISTING FEEDER TO PANEL 'CKP3' AND EXTEND TO NEW 'EML2' AS SHOWN. PROVIDE NEW ID LABEL "PANEL 'EML2' VIA ATS" SIMILAR TO EXISTING.
- 5. NEW ANNUNCIATOR PANEL.
- 6. EXISTING 200A-3Ø-4W, 120/208V PANEL 'CKP3' TO REMAIN REFER TO PANEL SCHEDULE. PROVIDE NEW RED PLACARD.
- 7. PROVIDE "CAUTION, TWO SOURCES OF POWER" LABELS PER NEC.
- 8. EXISTING TELECOMMINICATIONS RACK.
- 9. NEW (2) 3/4"X10FT COPPERCLAD STEEL GROUND RODS AT OPPOSITE PAD CORNER PER DETAIL 2 THIS SHEET. PROVIDE #2 CU BOND TO EACH ROD, GENSET GRD. LUG, CONCRETE PAD REBAR. PROVIDE EXOTHERMIC WELD U.G. CONNECTIONS.
- 10. PROVIDE 1"C. FOR CONTROL/SIGNAL WIRING PER GENSET MFR.
- 11. PROVIDE 208V-1ø-30A CIRCUIT TO GENSET BLOCK HEATER. PROVIDE WP/GFCI RECEPTACLE FOR GENSET BATTERY CHARGER.
- 12. 1"C. WITH (2) #10 CU (208V-1ø), (2) #10 CU (120V), (1) #10 CU GRD.
- 13. FOR PORTABLE LOAD BANK CONNECTIONS.
- 14. PROVIDE NEW RED 20A/120V QUAD. RECEPTACLE WITH INTEGRAL SPD AND DEDICATED 20A/120V CIRCUIT ADJACENT TO EXISTING RACK SUPPORTED UPS. COORDINATE WITH OWNER.
- 15. NEW 200A-120/208V-3ø-4W PANEL 'EML2' PER PANEL SCHEDUE. REWORK EXISTING WALL CONDUITS TO ALLOW NEW PANEL INSTALLATION.
- 16. ALL PENETRATIONS THROUGH EXTERIOR WALL AND ROOFS SHALL BE SLEEVED, FLASHED AND SEALED WATERPROOF. PROVIDE ESCUTCHEON PLATES WHERE WALL PENETRATIONS ARE EXPOSED.
- 17. PROVIDE EMCS CONNECTION THROUGH BACNET SYSTEM PER OWNER DIRECTIONS. COORDINATE ALL REQUIREMENTS.
- 18. PROVIDE NEW CHAIN LINK FENCE PER DETAIL 3 THIS SHEET.

37386 CHRISTIAN MONRAD EXPIRES 3-31-26

> CHOOL AMPHITHEATER PUBLIC SCHOOL AMPHITHEATER HIGH SCIT GENERATORS

PLAN ELECTRICAL FELINE DIAGRAN PARTIAL EAND ONE IDF

Project Number M22110

4/06/2023 AS-SHOWN

E2

120/208 VOLTS, 3 PHASE, 4 WIRE

EXISTING

PANEL NAME: L1

	PANEL NAME:	H1						277/	480	VOL	٦S,	3 PF	IASI	Ξ, 4	- WII	RE	
	TYPE: EATON							35	000	MIN	IMU	M A.I.	C. R	AT	ING		
	400 A BUS, 400	A. N	ИΑ	IN B	REAL	(ER		,	•			UNTII				FLUSH	
												• • • • • • • • • • • • • • • • • • • •					
	LOCATION: EL	ECT	RI	CAL	. RM.4	118									X	SURFACE	
									Е	NCL	osu	IRE:	NEN	1A	1		
		BREA	VED			1	1 0 4	D (IN I	ν //Λ\				1	PDI	AKER		Π
	SERVES	AMP		WIRE	COND		LUA	В	(VA)	С		COND	WIDE		AMP	SERVES	
1	AC-2	20	3	**	**	3.9		В				COND	WIRE	3	20	SPARE	2
3	AO-2 -	-	-	**	**	3.9		3.9		1				_	20	- SPARE	4
5		_	-	**	**			3.3		3.9	l			_	_		6
7	AC-1	20	3	**	**	3.9				0.5				1	20	SPARE	8
9	-	-	<u> </u>	**	**	0.5		3.9	2.0	1		**	**	1	20	ELECT.RM.LGT	10
11	-	_	-	**	**					3.9				1	20	SPARE	12
13	LGT. COMP.RM.	20	1	**	**	2.0								1	20	SPARE	14
15	LGT. COMP.RM.	20	1	**	**			2.0		1		_		1	20	SPARE	16
17	SPARE	20	1											1	20	SPARE	18
19	SPARE	20	1											1	20	SPARE	20
21	SPARE	20	1							1				1	20	SPARE	22
23	SPARE	20	1											1	20	SPARE	24
25	SPARE	20	1					1						1	20	SPARE	26
27	SPARE	20	1							1				1	20	SPARE	28
29	SPARE	20	1											1	20	SPARE	30
31	NEW SPD	80	3	4	-			1						1	20	SPARE	32
33	100kA	-	-	4	-					1				1	20	SPARE	34
35	-	-	-	4	-									1	20	SPARE	36
37	NEW PANEL EMH	125	3	1	1-1/2"	17.2	18.0					**	**	3	100	TRANSFORMER 2	38
39	-	-	-	1	-			17.2	18.0			**	**	-	-	75kVA	40
41	-	-	-	1	-					17.2	18.0	**	**	-	-	(CALC.LOAD AT 75%)	42
	"*" CONTINUOUS LOAD X 1.25							5.0 0.0				REMA	RKS	:			
NON-CONTINUOUS LOAD X 1.0					43.0		43.0	0 43.0		1							
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					PHASE			48.0		43.0		ONNE					
	DEI	MAND) AN	IPS/F	PHASE	164		173		155		<u>DE</u>	MAN	D L	CAD:	136.5	kV/

	PANEL NAME:							3 PH				RE					
	TYPE: EATON							18	,000	MIN	IMUI	M A.I.	C. R	AT	ING		
	125 A BUS, 125	A. I	MΑ	IN B	REAL	(ER					MO	UNTI	NG:			FLUSH	
	LOCATION: EL	ECT	RI	CAL	RM.4	118									X	SURFACE	
									Е	NCL	osu	RE:	NEM	1A	1		
		BRE/	KER				LOA	D (IN	kVA)					BRE	AKER		
	SERVES	AM P	Р	WIRE	COND	Α		В		С		COND	WIRE	P	AMP	SERVES	
1	UPS 40KVA	60	3	6	1"	13.3	3.9					3/4"	12	3	20	AC-3	2
3	(CALC.LOAD AT 100%)	-	-	6	-			13.3	3.9			-	12	-	- 1	MDF	4
5	-	-	-	6	-	1				13.3	3.9	-	12	-	-	-	6
7	SPACE	20	1					1						1	20	SPACE	8
9	SPACE	20	1											1	20	SPACE	10
11	SPACE	20	1											1	20	SPACE	12
13	SPACE	20	1											1	20	SPACE	14
15	SPACE	20	1											1	20	SPACE	16
17	SPACE	20	1					1						1	20	SPACE	18
19	SPACE	20	1											1	20	SPACE	20
21	SPACE	20	1											1	20	SPACE	22
23	SPACE	20	1											1	20	SPACE	24
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	NON-CONTI	NUO	US	LOA	D X 1.0	17.2		17.2		17.2							
												1					
	D	EMAI	ND I	KVA/F	PHASE	17.2		17.2		17.2	(ONNE	CTE	D LO	OAD:		51.6 kV
					PHASE			62		62		1			OAD:		51.6 kV
	DEI	*1 <i> </i> -4 L		5/1	IIAOL	02		J 02		02		l DL	IAIV-AIA	ים כ	<u> </u>		OI.O KV

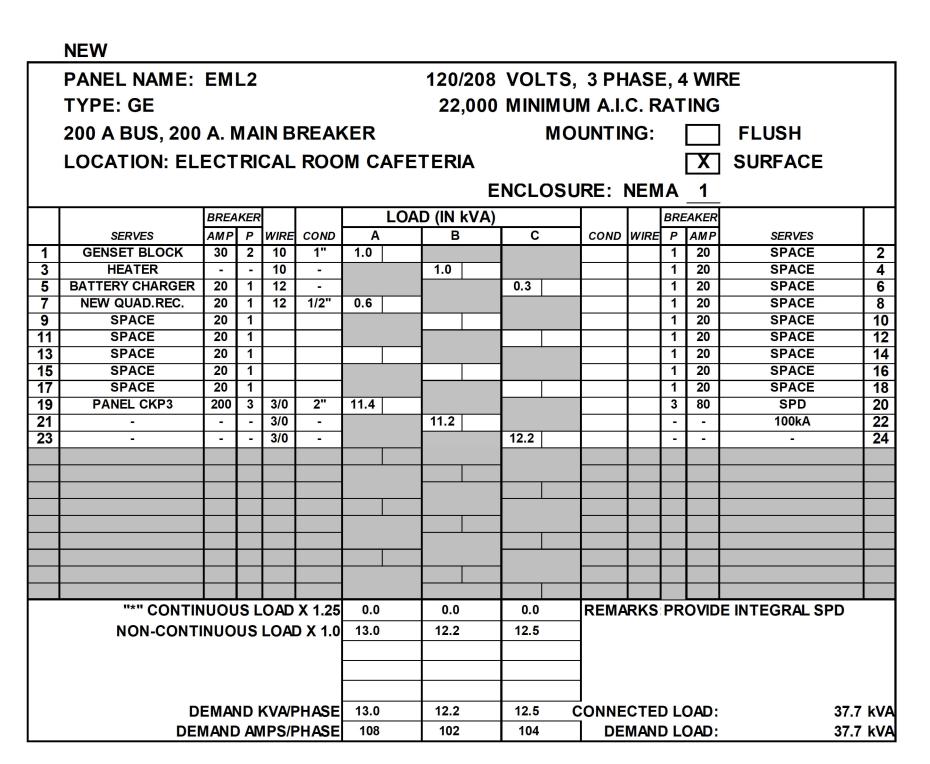
NEW

'N' DENOTES: EXISTING BREAKER, NEW WIRE/CONDUIT AND NEW LOAD. PROVIDE NEW LABEL

'R' DENOTES: REMOVE EXISTING WIRING/CONDUIT. PROVIDE NEW LABEL. 'B' DENOTES: NEW BREAKER, NEW WIRING. PROVIDE NEW LABEL.

	PANEL NAME:	CKI	P 3			120/208 VOLTS, 3 PHASE, 4 WIRE 10,000 MINIMUM A.I.C. RATING												
	TYPE: GE																	
	200 A BUS, 200	A. N	ЛΑ	IN B	REAM	(ER				X	_							
	LOCATION: KIT			–														
	LOCATION: KII	СП	ΞIN													SURFACE		
									Ε	NCL	osu	RE:	NEN	1A	1			
		BREA	KER				LOAD (IN kVA) BREAKER											
	SERVES	AMP	Р	WIRE	COND	Α		В		С		COND	WIRE	Р	AM P	SERVES		
1	EWC	20	1	**	**	0.6	1.2					**	**	1	20	COLD STORAGE RM.	2	
3	ICE MAKER	20	1	**	**			1.2				**	**	1	20	-	4	
5	REC.	20	1	**	**					0.6				1	20	SPARE	6	
7	FLY FAN	20	1	**	**									1	20	SPARE	8	
9	SPARE	20	1	**	**				1.2			**	**	3	20	MIXER	10	
1	DOUBLE DOOR R.IN	20	1	**	**					1.0	1.0	**	**	ī	-	-	12	
3	SPARE	20	3				1.0					**	**	1	-	-	14	
15	-	-	-						0.8			**	**	1	20	REC.	16	
7	-	-	-								0.8	**	**	1	20	REC.	18	
19	SPARE	20	3				1.0					**	**	1	20	REC.	20	
21	-	-	-						1.0			**	**	1	20	VENTILATOR	22	
23	-	-	-	**	**		- 1 0				1.2	**	**	1	20	CONV. OVEN	24	
25	FIRE ALARM	20	1	**	**	0.4	1.2	1.0	4.0			**	**	1	20	-	26	
27	REC.	20	1	**	**			1.0	1.0	4.0	4.0	**	**	2	20	HAMBURGER BRO.	28	
29	EASTICE MACHINE	20	1	**	**	4.0				1.0	1.0		^^	-	-	-	30	
31	WEST ICE MACHINE	20	1			1.0								1	20	SPARE	32	
33	SPARE	20	1	**	**					10	0.6	**	**	1	20	SPARE REC.	34	
35 37	REF.COMP.	20	3	**	**	1.0	4.0			1.0	0.6	**	**	3	50	WALK IN FR.	38	
39	=	_	-	**	**	1.0	4.0	1.0	4.0			**	**	<u>-</u>	50	REF.	40	
11	SPARE	20	1					1.0	4.0		4.0	**	**	-	-	INLI .	42	
			'		Y 1 25	0.0		0.0		0.0		REM <i>A</i>	DK6				T-2	
"*" CONTINUOUS LOAD X 1.25 NON-CONTINUOUS LOAD X 1.0													W/1/3	•				
						11.4		11.2		12.2		1						
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	D	EMAN	ND F	(VA /F	PHASE	11.4		11.2		12.2	C	ONNE	CTE	D LO	DAD:	34.8	kV	
					PHASE			93		102		1	MAN			34.8		

REPLACE ALL DEVICES AND PLATES SERVICNG FROM THIS PANEL WITH RED UNITS. PROVIDE RED PLACARDS FOR ALL SAFEFTY SWITCHED



PANEL SCHEDULE KEY: AS-SHOWN CKP3 EML2 **E**3

AMPHITHEATER PUBLIC SCHOCAMPHITHEATER HIGH SCIT GENERATORS
125 W. Yavapai Rd. Tucson, Arizona

SCHEDULE

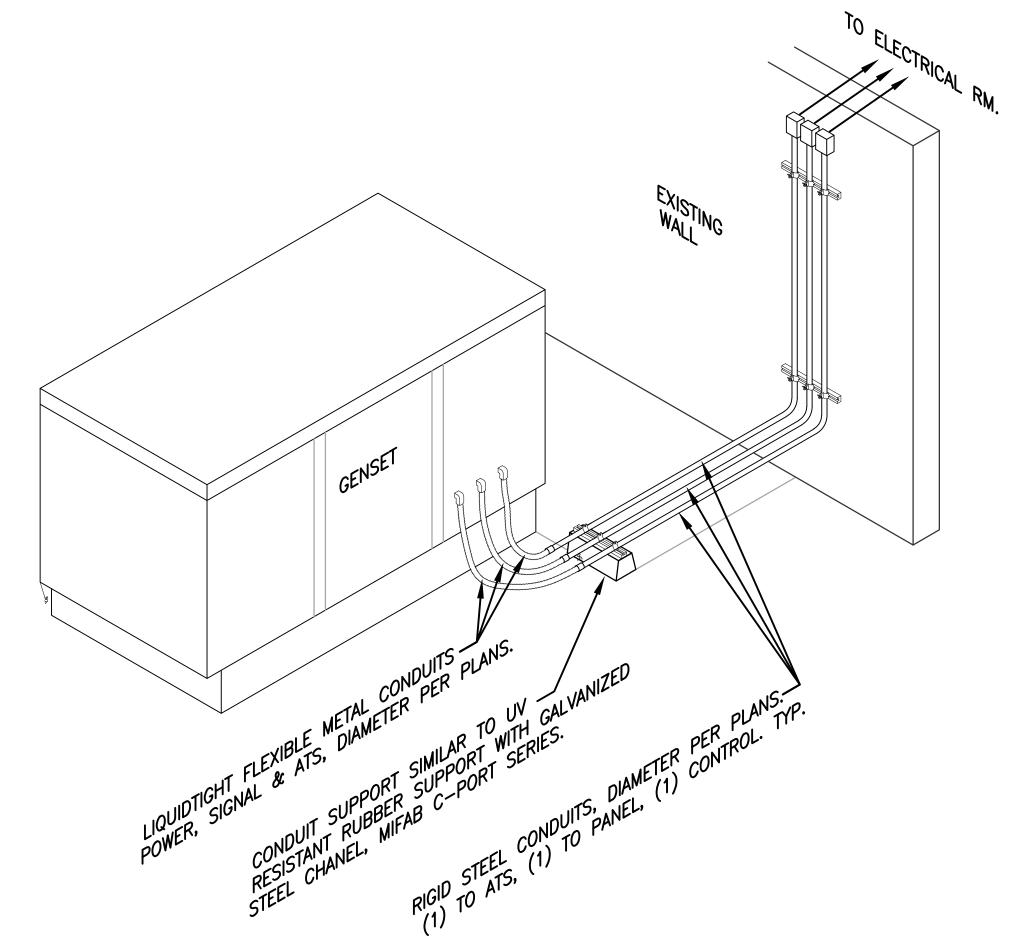
ANEL

ELECTRICAL NOTES:

- 1. THE WORK COVERED ON THESE DRAWINGS SHALL INCLUDE THE FURNISHING OF ALL LABOR, MATERIALS, TRANSPORTATION, TOOLS, APPLIANCES, FEES, AND PERMITS REQUIRED FOR THE INSTALLATION OF A COMPLETE AND OPERATING ELECTRICAL SYSTEM. DRAWINGS ARE DIAGRAMMATIC IN NATURE AND ARE NOT INTENDED TO SHOW EVERY DETAIL. THE CONTRACTOR SHALL PROVIDE BOXES, ACCESS PANELS, ETC. AS REQUIRED BY CODE AND INDUSTRY PRACTICE.
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THIS PHASE OF THE WORK WITH ALL EXISTING CONDITIONS AND WITH OTHER TRADES.
- 3. ALL WORK SHALL COMPLY WITH THE APPLICABLE RULES OF THE NATIONAL ELECTRICAL CODE, LOCAL ELECTRICAL CODES AND ORDINANCES.
- 4. ALL MATERIALS SHALL BE NEW AND BEAR THE U.L. SEAL. MATERIALS SHALL CONFORM TO REQUIREMENTS OF THE 2017 N.E.C., WHERE APPLICABLE.
- 5. ALL ELECTRICAL CONDUCTORS SHALL BE INSTALLED IN METALLIC STEEL CONDUIT.
- 6. ALL CONDUCTORS SHALL BE STRANDED SOFT-DRAWN ANNEALED COPPER WITH XHHW INSULATION. MINIMUM WIRE SIZE SHALL BE #12 UNLESS OTHERWISE
- 7. THE COMPLETE ELECTRICAL SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH N.E.C. ART. 250. PROVIDE GROUNDING WIRE IN ALL CONDUITS.
- 8. CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS PRIOR TO SUBMITTAL OF BID. VERIFY ALL EXISTING CIRCUITS TO BE REUSED PRIOR TO CONNECTIONS.
- 9. THE ELECTRICAL CONTRACTOR SHALL GUARANTEE AGAINST DEFECTS IN MATERIALS, EQUIPMENT, OR WORKMANSHIP FOR A PERIOD OF TWO (2) YEARS UPON OWNER'S FINAL ACCEPTANCE. CONTRACTOR SHALL REPAIR OR REPLACE ANY DEFECTS TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST.
- 10. COORDINATE THE DISPOSITION OF DEMOLISHED ELECTRICAL EQUIPMENT WITH THE OWNER PRIOR TO REMOVAL FROM THE SITE.

ELECTRICAL SYMBOL LEGEND

- RACEWAY CONCEALED IN WALL OR CEILING, (2) #12, (1) #12 GRD. IN 1/2" C. U.N.O.
- HOMERUN TO PANEL "HA", CIRCUITS 1 AND 3. NUMBER OF HASH MARKS INDICATE NUMBER OF CONDUCTORS, NOT INCLUDING GROUND CONDUCTOR, IN RACEWAY. REFER TO PANEL SCHEDULES FOR RACEWAY AND CONDUCTOR SIZES.
- FLEXIBLE STEEL CONDUIT. REFER TO SPECIFICATIONS FOR TYPES.
- DIMMER ON/OFF SENSOR WALL SWITCH, ACUITY CONTROL OR EQUAL LUTRON, HUBBELL,
- SPST TOGGLE SWITCH AT + 48" A.F.F., U.N.O. SUB SCRIPT LETTER INDICATES FIXTURES CONTROLLED..
- JUNCTION BOX
- WALL MOUNTED NEC COMPLY DUPLEX CONVENIENCE RECEPTACLE AT +18" A.F.F.,
- WALL MOUNTED NEC COMPLY GFCI DUPLEX CONVENIENCE RECEPTACLE AT +18" A.F.F.,
- WALL MOUNTED NEC COMPLY GFCI DUPLEX CONVENIENCE RECEPTACLE AT +6" ABOVE BACKSPLASH AT COUNTERTOP U.N.O. REFER TO ARCH. ELEVATIONS FOR EXACT LOCATIONS.
- WALL MOUNTED NEC COMPLY QUAD CONVENIENCE RECEPTACLE AT +18" A.F.F., U.N.O.
- WALL MOUNTED NEC COMPLY GFCI QUAD CONVENIENCE RECEPTACLE AT +6" ABOVE BACKSPLASH AT COUNTERTOP U.N.O. REFER TO ARCH. ELEVATIONS FOR EXACT LOCATIONS.
- PANEL PER PANEL SCHEDULE
- **ELECTRICAL CONNECTION**
- Eľ FUSED DISCONNECT SWITCH



GENSET AT-GRADE CONDUIT MOUNTING DETAIL

RMC THROUGH WALL SLEEVED, FLASHED AND SEALED WATERPROOF. PROVIDE ESCUTCHEON PLATES WHERE WALL PENETRATIONS ARE EXPOSED

PROVIDE N.E.C. WORKING CLEARANCES.

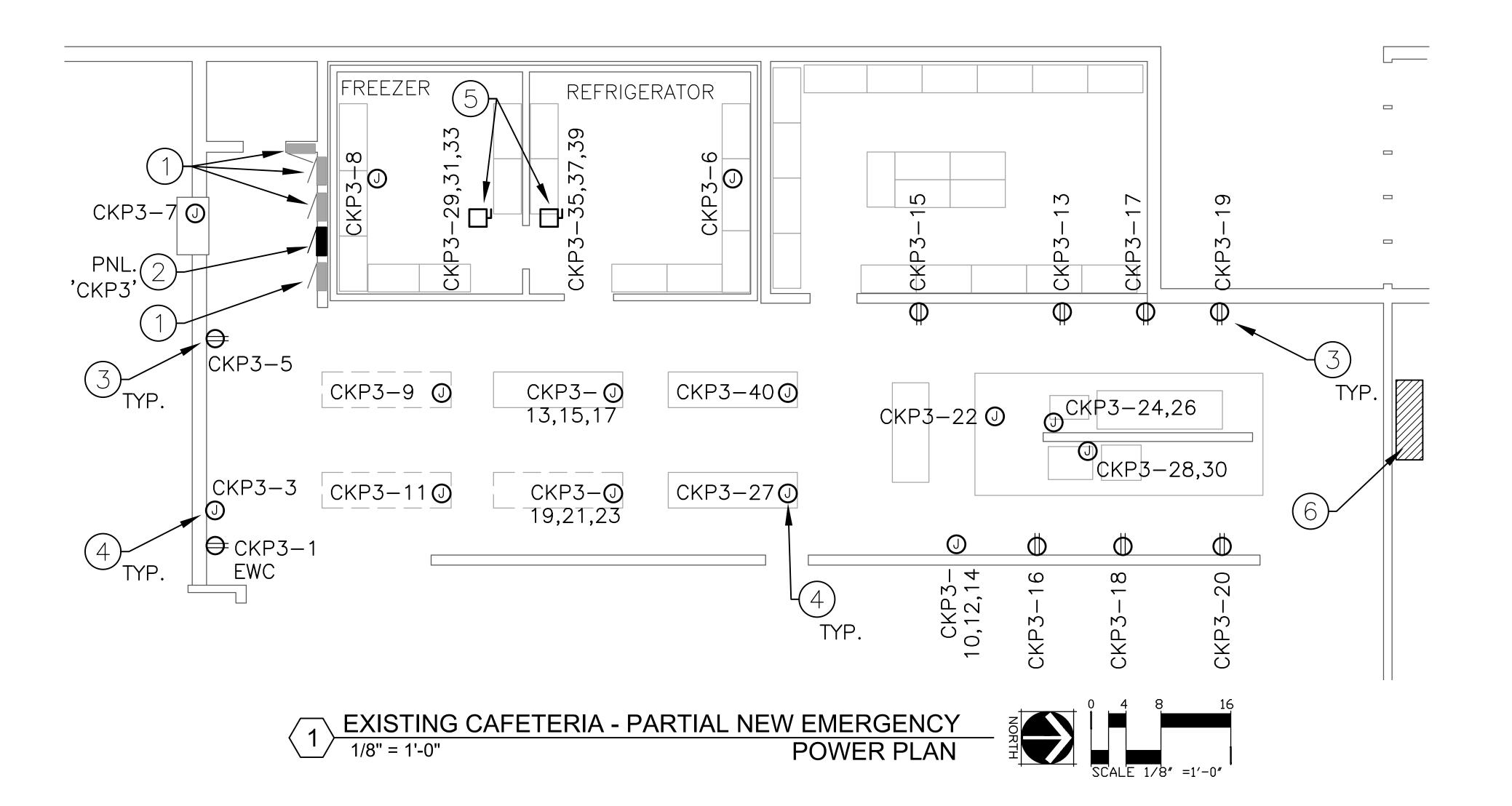
Drawn By SV

Checked By CM

Date 4/06/2023

Scale AS-SHOWN

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OELECTRICAL KEYNOTES THIS SHEET ONLY

- 1. EXISTING PANEL TO REMAIN.
- 2. EXISTING PANEL TO REMAIN WITH NEW WORK PER ONE LINE DIAGRAM SHEET E2. PROVIDE NEW RED PLACARD.
- 3. TRACE AND ID ALL RECPETACLES OF PANEL 'CKP3', REPLACE ALL RECEPTACLES AND PLATES WITH NEW RED UNITS. PROVIDE NEW CIRCUIT NUMBER LABEL.
- 4. TRACE AND ID ALL LOADS FROM PANEL 'CKP3', REPLACE ALL JUNCTION BOX COVERS WITH RED COVER AND INDICATE CIRCUIT NUMBER.
- 5. REPLACE/PROVIDE NEW RED PLACARD AT ALL SAFETY SWITCHES FEED FROM PANEL 'CKP3'.
- 6. EXISTING 1600A-3ø-4W-27/480V SWITCHBOARD PER ONE LINE DIAGRAM.

1.2 SUMMARY

A. Provide all labor, materials and equipment to furnish, install and place in operation a diesel fuelled power generation system in accordance with the contract documents and manufacturer's drawings and installation instructions. These specifications also describe requirements for the design, fabrication and testing of the power system. The total installation shall conform to manufacturer's recommendations.

- B. Dimensions shall not exceed those indicated on the drawings.
- C. This Section includes packaged engine—generator sets for emergency and standby power supply with the following features:
- 1. Natural Gas.
- 2. Unit-mounted cooling system.
- 3. Sound attenuating outdoor enclosure and critical silencer.
- D. 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.
- E. System Description
- 1. The electric power generating system shall have a site capability KW as shown on the drawings, under continuous standby operation.
- 2. The system shall consist of a diesel generator set that includes all controls, protection, output circuit breaker, wiring, and accessories for automatic start—stop operation.
- 3. The overload capability shall be in excess of this rating, at extreme limits of parameters specified, for not less than 1 hour. Where air temperature extremes are not the case, test results will be extrapolated.
- 4. The generator set shall include the capability of automatically controlling generator set operation. After starting, the unit will attain rated speed and voltage, and accept rated load. Generator set speed shall be controlled by the engine governor, while generating output voltage regulation shall be a function of the generator automatic voltage regulator. Manual adjustment of generator speed and voltage shall be provided.
- 5. The generator set start—stop sequence shall be initiated manually or automatically by closing or opening of a contact. The control system shall automatically engage the cranking motor, sense engine starting speed, disengage the motor and arm the engine protection circuit.
- 6. The set shall immediately shut down in the event of overspeed, low oil pressure, high water temperature and overcrank. Cause of shutdown shall be indicated by a light annunciator. System logic shall prevent restart until fault is cleared.
- 7. There shall be a provision for manual shutdown in the event of an emergency.
- E. System Performance, General
- 1. The power generating system shall conform to the following performance criteria:
- a. Rating Engine brake horsepower shall be sufficient to deliver full rated generator set KW/KVA at the installation site when operated at rated rpm and equipped with all engine—mounted parasitic and external loads such as radiator fans and power generators.
- b. Start Time and Load Acceptance Engines shall start, achieve rated voltage and frequency, and be capable of accepting load within 10 seconds when properly equipped and maintained.
- c. Block Load Acceptance Transient response shall conform to ISO 8528 requirements.
- 2. The power generating system shall satisfy the following performance criteria at site conditions:

Total Power Capability as shown on the drawings
Frequency 60 Hz

Voltage as shown on the drawings

Voltage Dip starting Largest Motor sequence 20%

Power Factor 0.8

Overload for 1 Hour 10%

3. Emissions shall meet EPA Tier 3 requirements.

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.

- 3. Component List A breakdown of all components and options including switch gear.
- 4. Technical Data Manufacturer produced generator set specification or data sheet identifying

make and model of engine and generator, and including relevant component design and performance data.

a. Engine:

Type, aspiration, compression ratio, and combustion cycle.

Bore, stroke, displacement, and number of cylinders.

Engine lubricating oil capacity.

Engine coolant capacity without radiator.

Engine coolant capacity with radiator.

Coolant pump external resistance (maximum). Where remote radiator is specified.

5. Generator: Model

Frame
Insulation class
Number of Leads
Weight, total
Weight, rotor

Air Flow

At rated voltage:

Efficiency at 0.8 power factor for: 50% load, 75% load, 100% load

Fault current, 3 phase symmetrical

Decrement curve

6. Radiator: (High Ambient, Brass)

Model

T. ... a

Туре

Coolant capacity, radiator

7. System:

Coolant capacity, radiator and engine

Weight:Dry, Wet

Dimensions: Length, Width, Height

Weight:Dry, Wet

Performance in 115°F air, 2400 MSL.

Continuous power rating at 0.8 power factor (KW) kVA rating

Fuel consumption at standard conditions for:

50%, 75% and 100% load Heat rejection to:

coolant, after-cooler, exhaust, atmosphere from engine,

and atmosphere from generator

Exhaust gas stack temperature

Exhaust gas components: % NOX. % SO

Tons particulate/yr/mo at 50%, 100% load

erification of 10% overload capability

Verification of 10% overload capability

- 8. Transient response of frequency and voltage for the generator set:
- 9. Auxiliary Equipment Specification or data sheets, including switchgear, spring type vibration

isolators, sub-base dual-wall fuel tank and leak detection system..

- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, 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. All installation drawings and wiring diagrams for the generator set, controls, and switchgear must conform to a common format of 8½" x 11", 11" x 17", and 24" x 36".
- 2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
- 3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer.

 Detail fabrication, including anchorages and attachments to structure and to supported equipment.

 Include base weights.
 - 4. Wiring Diagrams: Wiring diagrams, schematics and control panel outline drawings published

by the manufacturer in Joint Industrial Council (JIC) format for controls and switchgear showing

interconnected points and logic diagrams for use by contractor and owner.

Retain paragraph and subparagraphs below if required by seismic criteria applicable to Project.

Coordinate with Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

Retain option below for diesel-engine generators with day tank.

- C. Qualification Data: For installer, manufacturer and testing agency.
- D. Source quality—control test reports.
- 1. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
- 2. Report of factory test on units to be shipped for this Project, showing evidence of

- compliance with specified requirements.
- 3. Report of sound generation.
- 4. Report of exhaust emissions showing compliance with applicable regulations.
- 5. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

Retain first paragraph below if Contractor is responsible for field quality—control testing.

- 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 01 Section "Operation and Maintenance Data," include the following:
- 1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
- G. Warranty: Warranty verification published by the manufacturer.
- H. Service Location and description of supplier's parts and service facility including parts inventory and number of qualified generator set service personnel.

1.5 QUALITY ASSURANCE

- A. The complete power generation system, including engine, generator, dual—wall fuel tank, and main protective device shall be the product of one manufacturer who has been regularly engaged in the production of complete generating systems for at least 10 years. All components shall have been designed to achieve optimum physical and performance compatibility and prototype tested to prove integrated design capability. The complete system shall have been factory fabricated, assembled, and production tested as performed by Caterpillar, or prior approved systems.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- 2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 130 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- D. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.
- 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on—site testing specified in Part 3.
- E. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- F. 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.
- G. Comply with ASME B15.1.
- H. Comply with NFPA 37.
- I. Comply with NFPA 70.

Retain paragraph below for healthcare facilities.

J. Comply with NFPA 99.

Retain first paragraph below if generator is automatically started. See Editing Instruction No. 4 in the Evaluations.

- K. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- L. Comply with UL 2200.
- M. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- N. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling—air intake and discharge, and other components of installation

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
- 1. Notify Owner no fewer than two weeks in advance of proposed interruption of electrical service.
- 2. Do not proceed with interruption of electrical service without Owner's written permission.
- B. Environmental Conditions: Engine—generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

 1. The operating environment of the power generating system shall be:
- 1. Altitude 2700 ft.
- 2. Engine room temperature, max 125 F
- 3. Outside temperature, min 20 F
- 4. Outside Temperature max 125 F
- 5. Fuel type Diesel
- 1. Generators shall be designed to provide not less than 110% output, based on specified capacity, for a period of 2 hours at temperature extremes.

1.7 COORDINATION

C. 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 plan.

1.5 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.

- 3. The manufacturer shall have a local shall have a local authorized dealer who can provide factory trained servicemen, the required stock of replacement parts, technical assistance, and warranty administration.
- 4. The manufacturer's authorized dealer shall have a parts and service facility within 130 miles of the jobsite.
- 5. The generator set supplier shall have factory trained service representatives and tooling necessary to install, test, maintain, and repair all provided equipment.

B. Warranty Administration:

1. The manufacturer's authorized dealer shall be capable of administering the manufacturer's and dealer's warranty for all components supplied by the selling dealer (who may or may not be the same as the servicing dealer).

C. Warranty Terms.

- 1. The manufacturer's and dealer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start—up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall not be a limiting factor for the system warranty by either the manufacturer or servicing dealer. Submittals received without written warranties as specified will be rejected in their entirety.
- 2. The manufacturer's and dealer's extended warranty shall in no event be for a period of less than five (5) years from date of initial start—up of the system or 2500 operating hours, whichever comes first. It shall include repair parts, labor, reasonable travel expense necessary for repairs at the jobsite, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Applicable deductible costs shall be specified in the manufacturer's warranty and shall not exceed \$100 per event. Submittals received without written warranties as specified will be rejected in their entirety.

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.

B. Maintenance Contract

- The generator set supplier shall offer maintenance and repair contract which guarantees all support costs of the specified system. It shall include routine and 24 hour emergency access to a factory account manager to expedite emergency repairs. This shall be priced during the bid process as an additive bid item.
- 2. The contract shall protect the user from parts and labor price increases, and shall provide a refund of residual funds at any time of user dissatisfaction. Optional payment schedules shall include fixed rate throughout the life of the contract.
- C. Parts Availability
- 1. The generator set supplier shall have sufficient parts inventory to maintain over the counter availability of at least 90% of any normal wear and tear parts. (Bets, hoses, filters, turbines, pumps, safeties, regulators, injectors, gaskets)
- 2. The generator set supplier shall guarantee overnight 100% parts from the time an order is entered with the dealer.

D. Oil Sampling Service

The generator set supplier shall provide a scheduled oil sampling service to monitor engine condition on an ongoing basis. The sampling method shall be of the atomic absorption spectrophometry method.

Immediate notification of critical results shall be provided to the owner's representative.

E. Warranty Nameplate:

Termination Date:

1. A warranty nameplate of not less than 152 mm x 203 mm (6 in x 8 in) must be affixed to the generator set with the following data:

Warranty Period: Start-up Date:

Supplier Name:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Supplier Address:
24-Hour Emergency Number:

Preventive maintenance to be performed by:

F. These products shall be from vendors with factory approval as stocking dealer — distributors with evidence of having supplied and serviced units of equal size and performance for at least 5

A. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

1. Caterpillar; Engine Div. (Base bid).

2. Onan/Cummins Power Generation; Industrial Business Group (Optional price).

3. Kohler (Optional price).

2.2 ENGINE—GENERATOR SETA. Factory—assembled and —tested, engine—generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

5. 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. Coordinate paragraph and subparagraphs below with prototype test requirements in Part 1

"Submittals" Article and in Part 2 "Source Quality Control" Article.

G. 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.

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.

4. The generator shall be capable of withstanding a three phase load of 300% rated current

10 seconds, and sustaining 150% of continuous load current for 2 minutes with field set for normal rated load excitation.

5. It shall exhibit less than 5% waveform deviation at no load.

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CONSULTING ELECTORS (2008) 884-0045 / F

EXPIRES 3-31-26

AMPHITHEATER PUBLIC SCHOOLS
AMPHITHEATER HIGH SCHOOL
IT GENERATORS

PROJEC'

SPECIFICATIONS

Project Number M22110

Checked By CM

Date 4/06/2023

Scale AS-SHOWN

DRAWING NO.

E6.0

7. The generator housing shall be close coupled, drip proof and guarded, constructed to and IP 22 standards, single bearing, salient pole, revolving field, synchronous type with amortisseur

8. The generator housing shall be one piece and mount directly to the engine flywheel without bolted adaptors

9. Thermal Class 200 magnet wire as described by NEMA Magnet Wire Standard MW 1000, Section MW 35-C, shall be used for rotor and stator windinas. The windinas shall consist of copper magnet wire. All winding insulation materials shall be Class H in accordance with BS and IEEE standards.

D. Retain paragraph and subparagraphs below for loads involving sensitive electronic equipment, significant nonlinear load elements, or uninterruptible power supply systems. Coordinate with "Governor" Paragraph in "Engine" Article and with "Generator, Exciter, and Voltage Regulator" Article. See Evaluations.

H. Generator-Set Performance for Sensitive Loads, including non-linear UPS equipment:

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

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 to full load.

a. Generator output voltage drift no more than $\pm 1/2\%$ of rated value at constant temperature.

b. Generator output voltage drift no more than +1/-1% of rated value within a 40°

over ambient temperature range of -40°C to 70°C.

windings in the pole faces of the rotating field.

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

rated load, there shall be no random speed variations outside the steady—state operational band and no hunting or surging of speed.

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

percent total with no slot ripple. Telephone influence factor, determined according to NEMAMG 1, shall not exceed 50 percent.

a. Regulator time less than 20 milliseconds.

b. Telephone Influence Factor (TIF) of less than 50.

c. Electronic Interference/Radio Frequency Interference (EMI/RFI) suppressed to commercial standards.

d. The regulator shall include the following features:

1) Voltage level rheostat to provide generator output voltage adjustment of -25% to +10% of nominal.

2) Gain adjustment to provide output voltage compensation for changes in load or frequency.

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

Permanent magnet excitation in subparagraph below is a standard feature of some manufacturers' engine-generator sets larger than 200 kW.

seconds during a fault condition.

passing full flow

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. Crankcase drain shall extend outside of the mounting base.

and gear driven from the engine gear train. The system shall incorporate full flow filtration with

5. The bypass valve must be integral with the engine filter base of receptacle. Systems where bypass valves are located in the replaceable oil filter are not acceptable. Pistons shall be oil cooled by continuous jet spray to the underside or inside of the crown and piston pin.

6. System shall utilize synthetic lubricants with compatible filtration, and compatible engine approved by the engine manufacturer.

F. Engine Fuel System:

Main Fuel Pump: Mounted on engine. Pump ensures adequate fuel flow under starting and load

7. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel

8. A secondary fuel filter, water separator, manual fuel priming pump, fuel shutoff solenoid all fuel lines must be installed at the point of manufacture.

9. Primary diesel fuel filter shall be a replaceable cartridge type rated to remove contaminants 10 microns or larger.

G. Coolant Jacket Heater: HOTSTART TPS series electric—immersion type, factory installed in coolant jacket system with input and output shutoff valves on each side of the heater for ready maintenance. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

H. Jacket water heater shall be provided to maintain coolant temperature of 80 F to 100F while the engine is idle. Heaters shall accept 120 Volt AC single phase power.

I. Governor, Electronic Speed control:

1. The engine governor shall be a Woodward 2301 Electronic Speed Control with EG Electro-Hydraulic Actuator or Barber Coleman Equal. Speed droop shall be externally adjustable from 0 (isochronous) to 10% from no load to full rated load. Steady state frequency regulation shall be +/- 0.25 percent.

J. Generator frequency change not over 1/4 cycle no load to full load and back.

K. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump. The engine jacket water cooling system shall be a closed circuit design with provision for filling, expansion, and de—aeration. The cooling pump shall be driven by the engine. Auxiliary coolant pumps required for heat exchangers or separate circuit after cooling shall also be engine driven. Coolant temperature shall be internally regulated to disconnect external cooling systems until operating temperature is achieved.

1. Coolant: Solution of 50 percent ethylene—glycol—based antifreeze and 50 percent water,

anticorrosion additives as recommended by engine manufacturer.

2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start 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

4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer

of aging—, ultraviolet—, and abrasion—resistant fabric. a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82

and noncollapsible under vacuum. b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment

connections.

6. Coolant drain shall extend outside of the mounting base.

I. 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.

1. Minimum sound attenuation of 25 dB at 500 Hz.

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 35-A minimum continuous rating.

8. Battery Charger: Current—limiting, automatic—equalizing and float—charging type. Unit

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

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

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

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.

f. Enclosure and Mounting: NEMA 250, Type 1, wall—mounted cabinet.

O. Batteries

1. Batteries for starting and control shall be selected and supplied by the generator set manufacturer. They shall be a heavy duty SLI lead acid type with through—partition connectors, and housed in a hard rubber or polypropylene case with provision for venting.

Battery warranty shall be the responsibility of the generator set manufacturer.

P. Alternator

1. An engine mounted belt driven battery charging alternator shall be installed with an voltage regulator. It shall be suitable for heavy duty applications with a rating of 24 volts. Q. Radiator, Engine-Mounted

1. Heat rejected to the engine jacket water shall be discharged to the atmosphere through a close-coupled radiator. The radiator shall be sized to cool the engine continuously while operating at full rated load and at site conditions of 115°F ambient.

R. Fan And Belt Guarding

1. The fan, fan drive, and fan belts shall be covered with punched steel mesh guarding for personnel protection. The guarding shall conform UL 2200.

S. Blowerfan

1. The radiator cooling fan shall be a blower type driven from the engine. Air shall be drawn from the engine side and exhausted through the radiator core with no more than 12.7 mm (0.5

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:

1. AC voltmeter.

2. AC ammeter.

3. AC frequency meter.

4. DC voltmeter (alternator battery charging).

5. Engine-coolant temperature gage.

6. Engine lubricating—oil pressure gage.

9. Generator-voltage adjusting rheostat

7. Running-time meter.

8. Ammeter-voltmeter, phase-selector switch(es)

10. Generator overload.

E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required tol support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface— or flush-mounting type to suit mounting conditions indicated.

G. 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 Breakers: Molded-case, thermal magnetic type..

1. Tripping Characteristics: Fixed..

2. 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.

5. Provide multiple output breakers if shown on construction drawings.

6. Provide 5A rated secondary current transformers.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground—fault 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.

C. Electrical Insulation: Class H or Class F.

D. 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.

G. Instrument Transformers: Mounted within generator enclosure. H. Voltage Regulator: Solid—state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

2. Regulator shall use volts-per-hertz control, with true RMS sensing, to improve motor starting ability. 3. Regulator shall meet MIL-STD-461C part 9 for radiated and conducted emissions

4. Regulator shall be fully encapsulated for protection against moisture or abrasive

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew

susceptibility when mounted within alternator standard connection box.

A. Description: Sound attenuating, vandal—resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable with stainless steel security latches and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building

Revise wind speed in first subparagraph below to suit local conditions.

2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads. 3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when

4. Hinged Doors: With padlocking provisions.

5. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.

6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with jacket heater to maintain winter interior temperature within operating limits required by engine-generator-set components.

7. Muffler Location: External to enclosure.

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in) of water external restriction in addition to core restrictions. a. The permanent magnet excitation system shall derive excitation current from a pilot 2. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after 5. Regulator shall be tested to MIL-STD-705 Method 711.1d and salt fog tested to ASTM B117-73. mounted on the rotor shaft. It shall enable the generator to sustain 300% of rated current for ten is complete shall be 85 dBA or less. T. Turbocharging 1. Only single stage turbo charging shall be allowed. 10. Start Time: Comply with NFPA 110, Type 10, system requirements. J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element 2.3 ENGINE 2.4 FUEL OIL STORAGE J. Windings: Two—thirds pitch stator winding and fully linked amortisseur winding. and "blocked filter" indicator. A. Comply with NFPA 30. A. The engine shall be a stationary, liquid cooled, four cycle design, vertical in-line or V-type K. Subtransient Reactance: 12 percent, maximum. with dry exhaust manifolds. It shall be manufactured in the United States. Depending on NFPA 110 1. The engine air cleaner shall be engine mounted with dry element requiring replacement no class and local codes, LP-gas standby may not be required for natural gas-fueled systems. Verify 2.8 OUTDOOR GENERATOR-SET ENCLOSURE B. Base Mounted Dual-wall Diesel Fuel Oil Tank: Factory installed and piped, complying with UL more frequently than 250 operating hours or once each year. requirements with authorities having jurisdiction. 142 fuel oil tank. Features include the following: B. Fuel: Fuel Oil, Grade DF-2. K. Starting System: 24—V electric, with negative ground. 1. Tank level indicator C. Rated Engine Speed: 1800 rpm. 1. Components: Sized so they will not be damaged during a full engine—cranking cycle with 2. Capacity: Fuel for 48 hours operation at 100% rated power output. D. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s). B. Description: Prefabricated enclosure with the following features: ambient temperature at maximum specified in Part 1 "Project Conditions" Article. 3. Containment: Integral rupture basin E. Lubrication System: The following items are mounted on engine or skid: 4. Vandal-Resistant fill cap. 2. Cranking Motor: Heavy—duty unit that automatically engages and releases from engine erected on concrete foundation. 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller flywheel without binding. 5. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm 3. Cranking Cycle: As required by NFPA 110 for system level specified. 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. locally and remotely) in the event of a tank leak. 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project engine is not running while excluding exterior dust, birds, and rodents. 6. Provide fuel quantity to perform acceptance testing and refill tank after testing. Conditions" Article to provide specified cranking cycle at least three times without recharging. 2.5 CONTROL AND MONITORING 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control Include required interconnecting conductors and connection accessories. 4. The lubrication oil pump shall be a positive displacement type that is integral with the and monitoring panel is in the automatic position, remote—control contacts in one or more separate 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal automatic transfer switches initiate starting and stopping of generator set. When mode-selector bypass valve to continue lubrication in the event of filter cloaging.

1. Louvers: Fixed—engine, cooling—air inlet and discharge. Storm—proof and drainable louvers prevent entry of rain and snow.

2. Automatic Dampers: At engine cooling—air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

2.9 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint. Steel spring isolators shall be installed between the generator set base and the mounting surface. The isolators shall bolt to the base, and have a waffled or ribbed pad on their bottom surface. The pads shall be resistant to heat and age, and impervious to oil, water, antifreeze, diesel fuel, and cleaning compounds

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory—drilled baseplate bonded to 1/4—inch— (6—mm—) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.10 FINISHES

A. Outdoor Enclosures and Components: Outdoor generator enclosures shall be factory finished with polyester powder coat.

2.11 SOURCE QUALITY CONTROL

A. Proiect—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 factor. Include the following tests:

1. Full load run.

2. Maximum power.

3. Voltage regulation.

4. Transient and steady-state governing

5. Single-step load pickup.

6. Safety shutdown.

7. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

8. Report factory test results within 10 days of completion of test.

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.

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 restrained spring isolators having a minimum deflection of 1 inch (25 mm) on 6-inch- (150-mm-) high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Not Used.

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.

E. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Svstems."

F. Connect wiring according to Division 26 Section "Low—Voltage Electrical Power Conductors and Cables.

3.4 IDENTIFICATION

A. Identify system components per NFPA 70.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and

Retain paragraph below to require a factory—authorized service representative to perform inspections, tests, and adjustments.

B. 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.

Retain paragraph and subparagraph below to require Contractor to perform tests and inspections.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory—authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in

Retain first paragraph and subparagraphs below to describe tests and inspections to be performed by any of the entities in three paragraphs above.

D. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection.

2. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions.

3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

4. 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.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

G. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

H. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

I. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and

J. Remove and replace malfunctioning units and retest as specified above.

K. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

L. 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 generators. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 32 13

SECTION 26 36 00 TRANSFER SWITCHES

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Contract Forms, Conditions of the Contract, including Supplemental General Conditions and Exhibits, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches with. Bypass/isolation function, 4-pole, open transition, 800 amp... 2.. Remote annunciation systems.

B. Code Compliance: The ATS shall conform to the requirements of:

1. 3—cycle rating in excess of UL 1008—Standard for Automatic Transfer Switches.(Fully rated.)

2. NFPA 70 — National Electrical Code including use in emergency and standby systems in accordance with Articles 571, 700, 701 and 702,

4. NFPA 110 — Standard for Emergency and Standby Power Systems.

5. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems (Orange Book).

6. IEEE Standard 241 - IEEE Recommended Practice for Electric Power Systems in commercial buildings (Gray Book).

7. NEMA Standard ICS - 2-447 - AC Automatic Transfer Switches.

8. IEC - Standard for Automatic Transfer Switches.

C. General Description:

1. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single—solenoid mechanism, momentarily energized to minimize power consumption and heat generation. The switch shall be positively locked and unaffected by voltage variations or momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life. The switch shall be mechanically interlocked to ensure only one of two possible positions – normal or emergency.

2. All main contacts shall be silver composition.

3. Inspection of all contacts (movable and stationary) shall be possible from the front of the switch

disassembly of operating linkages and without disconnection of power conductors. A manual operation handle shall permit the operator to stop the contacts at any point throughout the entire travel to properly inspect and service the contacts when required.

4. A control module shall direct the operation of the transfer switch. The module's sensing and logic

be controlled by a built-in microprocessor for maximum reliability, minimum maintenance and inherent digital communications capability. The control module shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the control module to be disconnected from the transfer switch for routine maintenance.

5. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE standard 472-1974 (ANSI C37, 90a-1974) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.

E. Operation:

1. The voltage of each phase of the normal source shall be monitored, with pickup adjustable from 85

100% and dropout adjustable from 75 to 98% of pickup setting, both in increments of 1%, and shall be fully field—adjustable without the use of any tools, meters or power supplies. Repetitive accuracy of settings shall be $\pm -2\%$ or better over an operating temperature range of ± -20 C to ± -70 C. Factory set to pickup at 90% voltage and 95% frequency.

2. The control module shall include four time delays that are fully adjustable over the entire range as

a. Time delay to override momentary normal source outages to delay all transfer switch and engine

signals. Adjustable from 0 to 6 seconds. Factory set at 1 second.

b. Transfer to emergency time delay. Adjustable from 0 to 5 minutes. Factory set at 0 minutes indicated otherwise on the plans.

c. Retransfer to normal time delay. Time delay is automatically bypassed if emergency source fails

normal source is acceptable. Adjustable from 0 to 30 minutes. Factory set at 10 minutes. d. Unload running item delay for emergency engine generator cool down. Adjustable from 0 to 60

Factory set at 15 minutes.

minutes.

e. Exercising and cool down clocks.

f. All standard features commonly shown in manufacturer's literature.

g. The operating transfer time* in either direction shall not exceed one—sixth (1/6) of a second. Operating

transfer time is the time measured from instant of monitored source deviation to closing of main contacts on a n available alternate power source exclusive of any purposefully introduced time delay.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. 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.

Retain subparagraph below if retaining Part 2 "Bypass/Isolation Switches" Article.

1. Single—Line Diagram: Show connections between transfer switch, bypass/isolation switch, power

and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch. Retain paragraph and subparagraphs below if required by seismic criteria applicable to Project. Coordinate with Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled

components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any

parts from the device when subjected to the seismic forces specified and the unit will

be fully operational after the seismic event."

Retain one of first two subparagraphs below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Second definition is used for essential facilities where equipment must operate immediately after an earthquake.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For manufacturer and testing agency.

E. Field quality—control test reports.

F. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data." include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays; provide relay—setting and calibration instructions, including software,

where applicable.

3. Trouble shooting hints.

4. 0 & M manuals.

5. Complete ladder logic control schematic.

6. Wiring diagram.

7. Parts list.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts,

and emergency maintenance repairs within a response period of less than 24 hours from time of notification. 1. The ATS manufacturer shall maintain a local service center capable of emergency service or routine

preventative maintenance contracts. The manufacturer shall maintain records of each switch by serial number

for a minimum of 20 years. B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association

or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is

acceptable to authorities having jurisdiction. 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testina Association or the National Institute for Certification in Engineering Technologies to supervise on—site

testing specified in Part 3. C. Source Limitations: Obtain automatic transfer switches and/or bypass/isolation switches with respective remote annunciators through respective manufacturers.

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.

F. Comply with NFPA 70. G. Retain one or both of first two paragraphs below if applicable to Project.

E. Comply with NEMAICS 1.

A. Comply with NFPA 99.

H. Comply with NFPA 110. I. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5 PROJECT CONDITIONS

A Retain this Article if interruption of existing electrical service is required.

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Owner no fewer than two weeks in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Owner's written permission.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor—bolt inserts into bases.

PART 2 -**PRODUCTS**

2.1MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE Zenith Controls.

2. Russ Electric

ASCO.

4. Others as approved.

2.2 GENERAL PRODUCT REQUIREMENTS

Coordinate paragraph below with Drawings and indicate percentage of tungsten filament lamp load for switches where it exceeds 30 percent. This percentage may affect switch selection. Some manufacturers' ratings for some switch lines apply to all classes of load, including tungsten lamps.

A. The ATS shall be UL listed in accordance with UL 1008 as follows:

1. Rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric—heating and tungsten—filament lamp loads as referred to in Paragraph 38.13 of UL 1008.

2. Overload and endurance at 480 Volts AC per tables 25.1, 25.2, 27.1 and 27.2 of UL 1008 when enclosed according to Paragraph 1.6.

3. Temperature rise tests after the overload and endurance tests to confirm the ability of the transfer switches to carry their rated current within the allowable temperature limits.

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- 5. Dielectric tests at 1960 Volts, RMS, minimum after the withstand current tests.
- 6. Additional optional testing for 3 cycle compliance.
- 7. The ATS shall be rated to withstand the fault current noted on the contract drawings single line diagram, at the ATS terminals, for 3 full cycles, verified by oscilloscope testing by an independent test agency, in EXCESS of UL 1008 without series protection of fuses or circuit breakers.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. Comply with Level 1 equipment according to NFPA 110.
- B. Switching Arrangement: Double—throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.
- E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.
- F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
- H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor—control circuit inrush and seal currents are rated for actual currents to be encountered.
- I. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

J. Automatic Transfer-Switch Features:

- 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase—to—ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
- 2. Adjustable Time Delay: For override of normal—source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
- 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95
- 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored
- 5. Test Switch: Simulate normal—source failure.
- 6. Switch-Position Pilot Lights: Indicate source to which load is connected
- 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal— and emergency-source sensing circuits.
- a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
- b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
- 9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

11. Retain one of first two subparagraphs below.

Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine—aenerator controls after retransfer of load to normal source.

- 12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine—generator controls after retransfer of load to normal source.
- 13. Engine—Generator Exerciser: Solid—state, programmable—time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include
- a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
- b. Push-button programming control with digital display of settings.
- c. Integral battery operation of time switch when normal control power is not available.

K. Provide cable adaptor bay for both top and bottom cable entry.

2.4 BYPASS/ISOLATION FUNCTION

- A. Comply with requirements for Level 1 equipment according to NFPA 110.
- B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:
- 1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
- 2. Drawout Arrangement :Not required.
- 3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or

- areater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
- 4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
- 5. Operability: Constructed so load bypass and transfer—switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
- 6. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
- 7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.
- C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory—installed copper bus bars: plated at connection points and braced for the indicated available short-circuit current.
- Delete one or both of first two articles below. Coordinate location of equipment and wiring with Drawings. Coordinate with transfer—switch description and with Division 26 Section "Engine Generators." Edit retained Article to specify required system features and functions. See Editing Instruction No. 2 in the Evaluations.

2.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

Sources available, as defined by actual pickup and dropout settings of transfer—switch controls. Switch position.

Switch in test mode

Failure of communication link

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

Indicating Lights: Grouped for each transfer switch monitored. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves. Mounting: Flush, modular, steel cabinet, unless otherwise indicated. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.6 SOURCE QUALITY CONTROL

A. Factory test 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 test complying with NEMAICS 1.

PART 3 -**EXECUTION**

- 3.1 INSTALLATION
- A. Retain applicable mounting paragraphs in this Article. Coordinate with Drawings

Retain paragraph below if seismic controls are a project requirement. Coordinate with Drawings.

- A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Retain paragraph below for floor-mounting switches and coordinate with Drawings.
- B. Floor-Mounting Switch: Anchor to floor by bolting.
- 1. Retain subparagraph below to require floor-mounting switches to be installed on concrete bases. Coordinate with Drawings.
- Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."
- C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.
- D. Identify components according to Division 26 Section "Identification for Electrical Systems."
- E. Set field—adjustable intervals and delays, relays, and engine exerciser clock.
- 3.2 CONNECTIONS
- A. 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 raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- 3.3 FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and prepare test reports.
- B. 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
- C. Perform tests and inspections and prepare test reports.
- 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.
- 2. After installing equipment and after electrical circuitry has been energized, test for compliance with
- 3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- 4. Measure insulation resistance phase—to—phase and phase—to—ground with insulation—resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
- a. Check for electrical continuity of circuits and for short circuits.
- b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
- c. Verify that manual transfer warnings are properly placed.
- d. Perform manual transfer operation.
- 5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source

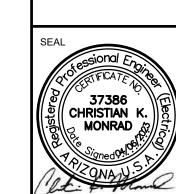
- with normal source available.
- b. Retain test in first subparagraph below if three-phase undervoltage sensing is specified in Part 2.
- b. Simulate loss of phase-to-around voltage for each phase of normal source.
- d. Verify pickup and dropout voltages by data readout or inspection of control settings.
- e. Test bypass/isolation unit functional modes and related automatic transfer—switch operations.
- f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms
- q. Verify proper sequence and correct timing of automatic engine starting, transfer time delay,
- E. Coordinate tests with tests of generator and run them concurrently.
- F. 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 tested component indicating satisfactory completion of tests. The manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards and withstand current ratinas. The certification shall identify by serial number(s) the eauipment involved. No exceptions to the specifications other than those stipulated at the time of submittal shall be included in the certification.
- G. Remove and replace malfunctioning units and retest as specified above.
- 3.4 DEMONSTRATION
- A. Engage a factory—authorized service representative to train Owner's maintenance personnel to adjust operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01 Section "Demonstration and Training."
- B. Coordinate this training with that for generator equipment.

END OF SECTION 26 36 00

Test requires advance preparation by testing agency.

- c. Verify time-delay settings.

- f. Usually require test in first subparagraph below only for critical and extensive installations and for switches rated 1600 A and more in other installations.
- and values for 1 pole deviating by more than 50 percent from other poles.
- retransfer time delay on restoration of normal power, and engine cool-down and shutdown.



EXPIRES 3-31-26

CHOOL AMPHITHEATER PUBLIC SCHOOL AMPHITHEATER HIGH SCIT GENERATORS

ECIFICATION

Project Number M22110 Drawn By hecked By 4/06/2023 AS-SHOWN

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