ELECTRICAL SYMBOLS

THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED. STANDARD MOUNTING HEIGHTS | ANNOTATION POWER EQUIPMENT & DEVICES | WIRING DEVICES & BOXES ELECTRICAL ONE-LINE ANNUNCIATOR PANELS (DISPLAY) ELECTRICAL PANELBOARD (SURFACE OR FLUSH MOUNT) SWITCH (RATING AS INDICATED) ELECTRICAL OR FIRE ALARM PLAN NOTE CALLOUT CONTROLS (TOP OF DEVICE) SIMPLEX RECEPTACLE - NEMA 5-20R, UNO EXIT SIGNS (WALL MOUNTED TO BOTTOM) FIRE ALARM ANNUNCIATOR PANEL (DISPLAY) PLUMBING EQUIPMENT DESIGNATION. (CONTRACTOR FURNISHED AND CONTROL SYSTEM CABINET (CONTROLS, SECURITY, A/V) INSTALLED). REFER TO PLUMBING FIXTURE OR EQUIPMENT FIRE ALARM BELL (EXTERIOR) (CENTERLINE) DUPLEX RECEPTACLE - NEMA 5-20R, UNO FIRE ALARM CONTROL PANEL/UNIT (DISPLAY) PULL STATIONS (TOP OF DEVICE) PLYWOOD TERMINAL BOARD FOR TELEPHONE SYSTEM, UNO. SIZE AS FUSED SWITCH (RATING, POLES AND FUSE TYPE AS INDICATED) RECEPTACLES (TO BOTTOM) EQUIPMENT DESIGNATION (OWNER FURNISHED, CONTRACTOR DOUBLE DUPLEX RECEPTACLE - NEMA 5-20R, UNO RECEPTACLES (EXTERIOR) RECEPTACLES (GARAGES) RECEPTACLES (POOLS) SPECIAL RECEPTACLE - NEMA TYPE AS NOTED SWITCHBOARD OR MOTOR CONTROL CENTER ON HOUSEKEEPING PAD MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED RECEPTACLES (ABOVE COUNTER) AND INSTALLED UNLESS NOTED OTHERWISE) RECEPTACLES IN EQUIPMENT ROOMS CIRCUIT BREAKER (RATINGS AS INDICATED) REMOTE INDICATING LIGHT (EQUIPMENT ROOMS) TWIST-LOCK TYPE RECEPTACLE ELECTRICAL DISTRIBUTION PANELBOARD CEILING REMOTE INDICATING LIGHT (FINISHED AREAS) DETAIL REFERENCE UPPER NUMBER INDICATES DETAIL NUMBER SAFETY SWITCHES (TOP OF DEVICE) LOWER NUMBER INDICATES SHEET NUMBER STARTERS (TOP OF DEVICE) GECLTYPE RECEPTACLE* TRANSFORMER SWITCHES (TOP OF DEVICE) SAME AS ADJACENT DEVICE, UNO TELEPHONÈ, DATA OUTLETS TELEPHONE TERMINAL BOARD (BOTTOM) SECTION CUT DESIGNATION ISOLATED GROUND TYPE RECEPTACLE* **%** PANELBOARD, SINGLE OR MULTI-SECTION (REFER TO SCHEDULES) REFER TO ARCH DRAWINGS TELEVISION OUTLETS FIRE ALARM DEVICES (CENTERLINE) EMERGENCY RECEPTACLE* DISCONNECT SWITCH - "200/3/150/3R" DENOTES ISOLATED POWER PANELBOARD W/ INTEGRAL TRANSFORMER AMPERES/POLE/FUSE/NEMA ENCLOSURE RATING, NF= NON-FUSED, (REFER TO SCHEDULES) CB= CIRCUIT BREAKER (200/3/CB), NO VALUE (200/3/150) FOR NEMA RECEPTACLE INSTALLED ABOVE COUNTER OR BACKSPLASH* ENCLOSURE MEANS STÀNDARD NEMA 1 RATING TRANSFORMER (TYPE AND RATINGS AS INDICATED) CIRCUITING & WIRING RECEPTACLE INSTALLED IN CEILING* USE THE DEFAULT MOUNTING HEIGHTS SHOWN ABOVE UNO IN THE CONSTRUCTION COMBINATION DISCONNECT (SAFETY) SWITCH AND MOTOR STARTER DOCUMENTS. MOUNTING HEIGHTS LISTED ARE ABOVE FINISHED FLOOR (AFF) OR ABOVE SHIELDED TRANSFORMER (TYPE AND RATINGS AS INDICATED) "30/3/15/1/3R" DENOTES AMPERES/POLE/FUSE/NEMA STARTER FINISHED GRADE (AFG) TO BOTTOM OF OUTLET BOX. ALL DEVICES SHALL BE INSTALLED IN SIZE/NEMA ENCLOSURE RATING. NF= NON-FUSED. CB= CIRCUIT HOMERUN TO PANELBOARD, INFORMATION AT ARROWS ARE CIRCUIT RECEPTACLE INSTALLED IN FLOOR* COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS. BREAKER (30/3/CB/1), NO VALUE (200/3/150/1) FOR NEMA ENCLOSURE NUMBERS AND PANELBOARD FOR TERMINATION. REFER TO P1-3,5,7 PANELBOARD SCHEDULES FOR BRANCH CIRCUIT CONDUCTOR SIZES. MEANS STÀNDARD NEMA 1 ENCLOSURE RATING ABBREVIATIONS AUTOMATIC TRANSFER SWITCH (RATINGS AS INDICATED) RECEPTACLE INSTALLED VIA DROP CORD* MAGNETIC MOTOR STARTER, NEMA SIZE AS NOTED. 3-POLE, UNO CIRCUIT CONTINUATION OR PARTIAL CIRCUIT AMPERE FRAME SIZE MAIN CIRCUIT BREAKER ABOVE FINISHED CEILING MOTOR CONTROL CENTER RECEPTACLE LETTER DESIGNATIONS AS FOLLOWS: AUTOMATIC TRANSFER SWITCH WITH BYPASS (RATINGS AS ABOVE FINISHED FLOOR MANUFACTURER C = AUTOMATICALLY CONTROLLED MANUAL MOTOR STARTER DISCONNECT INDICATED) CONDUIT CONCEALED ABOVE FINISHED GRADE D = DEMOLISHED **AUTHORITY HAVING** MAIN LUGS ONLY E = EXISTING JURISDICTION MOCP MAXIMUM OVERCURRENT EM = EMERGENCY POWER CONDUIT IN/UNDER FLOOR/GROUND CONSTRUCTION VARIABLE FREQUENCY DRIVE AIR HANDLING UNIT PROTECTION ER = EXISTING TO BE RELOCATED SENERATOR (RATINGS AS INDICATED) AMPERE INTERRUPTING MOUNTED GFCI = GROUND-FAULT CIRCUIT INTERRUPTER NOT APPLICABLE CAPACITY H = HORIZONTALLY MOUNTED RELAY OR CONTACTOR (# = QUANTITY OF RELAYS) EXPOSED CONDUIT AMPERE SWITCH NON-FUSED NON-SEPARATELY DERIVED SOURCE AMPERE TRIP SETTING NIGHT LIGHT (24HR ON) R = RELOCATED, NEW LOCATION AUTOMATIC TRANSFER SWITCH NATIONALLY RECOGNIZED SEPARATELY DERIVED SOURCE S = MANUALLY SWITCHED AUDIO VISUAL **TESTING LABORATORY** LIGHTING CONTROL PHOTOCELL (SHADE INDICATES AIMING) TR = TAMPER RESISTANT MDP SWITCHBOARD ELEC ROOM BUILDING AUTOMATION (CSA,ETL,NSF,UL) TV = TELEVISION OCCUPANCY SENSOR SWITCHGEAR, SWITCHBOARD AND/OR DISTRIBUTION USB = USB/DUPLEX LOW VOLTAGE CABLE (NOT ROUTED IN CONDUIT) BREAKER WP = WEATHER PROOF COVER PANELBOARD (TYPE, RATING, DEVICES AND ACCESSORIES PARTIAL CIRCUIT CONDUIT WR = WEATHER RESISTAN CATEGORY **ONDUIT TURNING DOWN** CABLE TELEVISION SYSTEM CLOSED CIRCUIT TELEVISION PNLBD PANELBOARD LOW-VOLTAGE PUSH-BUTTON (AUTO-OPENER / SECURITY) COMBINATION DIGITAL VOLT METER/AMMETER CANDELA PROVIDE FURNISH AND INSTALL CONDUIT TURNING UP POTENTIAL TRANSFORMER APPLICABLE CODE ADOPTED BY STOP-START PUSH BUTTON CONTROL STATION CODE QUANTITY CIRCUIT IDENTIFICATION (REFER TO CIRCUIT SCHEDULE) RECEPTACLE JURISDICTION LINETYPE LEGEND *SYMBOL DEMONSTRATED WITH DUPLEX RECEPTACLE, WHEN USED IN COMBINATION WITH **CURRENT TRANSFORMER** RELOCATE OTHER DEVICES MEANING IS SIMILAR FOR THOSE DEVICE TYPES. ST THROUGHOUT THE DRAWINGS DIFFERENT LINETYPES ARE USED IN COMBINATION WITH EMERGENCY POWER OFF BUTTON SHUNT TRIP CUMULATIVE VOLTAGE DROP ROOFTOP UNIT THE SYMBOLS TO INDICATE THE STATUS OF ITEMS AS EXISTING, TO BE DEMOLISHED, TO DEMOLITION SHORT-CIRCUIT CURRENT TECHNOLOGY DEVICES & BOXES BE INCLUDED AS PART OF NEW WORK AND/OR ITEMS WHICH ARE ANTICIPATED TO BE DOUBLE-POLE OVERHEAD PADDLE FAN PROVIDED IN THE FUTURE. THE STATUS OF ITEMS USING THESE LINETYPES ARE RELATIVE UTILITY METER (AS REQUIRED BY UTILITY) SMOKE DUCT DETECTOR DOUBLE-THROW TO THE VIEW IN WHICH THEY APPEAR. PHASING SHOWN IN DRAWINGS IS NOT INTENDED DPST DOUBLE-POLE SQUARE FEET TO FULLY DESCRIBE ALL NECESSARY CONSTRUCTION PHASING, WHICH IS DETERMINED B MULTI-OUTLET ASSEMBLY SINGLE-THROW SINGLE-POLE THE CONTRACTOR AS PART OF THEIR RESPONSIBILITIES. ANY SLICH PHASES DESCRIBED DOUBLE-THROW IN THE CONSTRUCTION DOCUMENTS ARE GENERAL AND ONLY INTENDED TO INDICATE A CURRENT TRANSFORMER RATING AS SPECIFIED OR REQUIRED SPST ELECTRICAL CONTRACTOR SINGLE-POLE, LIGHTING (REFER TO LIGHT FIXTURE SCHEDULE FOR MORE INFO) BROAD ORDER FOR THE SAKE OF DESCRIBING THE PROJECT. THE FOLLOWING LINETYPES TELEPHONE OUTLET EXHAUST FAN SINGLE-THROW MAY BE USED ON ANY DEVICE, EQUIPMENT, NOTE, LINE, SHAPE, ETC. EMERGENCY SHUNT TRIP POTENTIAL TRANSFORMER RATING AS SPECIFIED OR REQUIRED SWBD SWITCHBOARD SWGR SWITCHGEAR ENERGY MANAGEMENT SWITCHBOARD EXISTING SYSTEM a = SWITCHED BY SWITCH "a" EXISTING TO REMAIN TELECOMMUNICATIONS SURGE-PROTECTIVE DEVICE DEMOLISH -----FUTURE — — — — — — ELECTRIC WATER COOLER BONDING BACKBONE A = LIGHT FIXTURE TYPE "A" MULTI-SERVICE OUTLET; TELEPHONE AND DATA FIRE ALARM ANNUNCIATOR TO BE DETERMINED TELECOMMUNICATIONS NL = NIGHT LIGHT FITURE **GROUND CONNECTION** LIGHTING CONTROL DEVICES ABOVE COUNTER, TYP FACP FIRE ALARM CONTROL PANEL GROUND BUS BAR FAULT CURRENT AMPS AVAILABLE TWISTLOCK \circ ___ = WALL MOUNT - WALL, TYP SINGLE POLE SWITCH (NO LETTER DESIGNATION) TMGB TELECOMMUNICATIONS MAIN FAN COIL UNIT FINISHED FLOOR GROUND BUS BAR > = ARROW INDICATES AIMING DIRECTION SWITCH LETTER DESIGNATIONS AS FOLLOWS: FULL LOAD AMPS **TRANSFORMER** 2 = TWO POLE **FLOOR** 3 = THREE-WAY HEATER GENERAL CONTRACTOR LIGHT FIXTURE CIRCUITED ON BACK-UP POWER (NOT EGRESS) MULTI-SERVICE POWER POLE WITH TELEPHONE, DATA AND POWER 4 = FOUR-WAY GROUNDING ELECTRODE UNDERGROUND D = DIMMER OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND CONDUCTOR UNDERSLAB EMERGENCY LIGHT FIXTURE WITH EMERGENCY LIGHTING BATTERY F = FAN SPEED CONTROL GROUNDING ELECTRODE SYSTEM UNIT HEATER K = KEYED UNLESS NOTED OTHERWISE PACK OR CONNECTED TO LIFE-SAFETY GENERATOR CIRCUIT GROUND FAULT RELAY LV = LOW VOLTAGE UNINTERRUPTIBLE POWER GROUND MULTI-SERVICE FLOOR BOX WITH TELEPHONE, DATA AND POWER BLOCK LOAD KW OR KVA OS = OCCUPANCY SENSOR ISOLATED GROUND OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND P = SPST PILOT LIGHT SHORT CIRCUIT CURRENT VOLTAGE DROP LIGHT FIXTURE WITH DUAL BALLASTS CIRCUITED SEPARATELY VS = VACANCY SENSOR JB/J-BOX JUNCTION BOX VARIABLE FREQUENCY DRIVE X F# X FP# FAULT POINT REFENENCES ... S. ... VOLTAGE DROP SPREADSHEET FAULT POINT REFERENCED IN SHORT CIRCUIT CURRENT AND WIRE LOCKED ROTOR AMPS POKE THROUGH, A = TYPE, REFER TO PLANS, SCHEDULES AND **▼▼▼** LIGHTING TRACK WITH LIGHT FIXTURE TYPES AS INDICATED WEATHER PROOF LTG/LTS LIGHTING/LIGHTS AUTOMATIC LOAD CONTROL RELAY SPECIFICATIONS CONNECTION POINT OR EQUIPMENT TERMINATION MAU MAKE-UP AIR UNIT WEATHER RESISTANT MAX MAXIMUM WATERTIGHT EXTERIOR SITE PARKING LOT LIGHT FIXTURE MCA MINIMUM CIRCUIT AMPACITY **EXPLOSION-PROOF** BRANCH CIRCUIT TRANSFER SWITCH EXTERIOR PEDESTRIAN POST TOP LIGHT FIXTURE D JUNCTION BOX/OUTLET BOX RELAY OR CONTACTOR (# = QUANTITY OF RELAYS) EXTERIOR LIT BOLLARD LIGHT FIXTURE LIGHTING CONTROL PHOTOCELL (SHADE INDICATES AIMING) EXIT SIGN - CEILING / WALL MOUNTED, ARROWS AS INDICATED, FACE HATCHED EMERGENCY LIGHTING UNIT EQUIPMENT WITH BATTERY PACK-A NUMBER ADJACENT TO ANY TECHNOLOGY SYMBOL INDICATES TOTAL QUANTITY OF DITIONAL LETTER DESIGNATIONS AS FOLLOWS: LOWER CASE LETTERS DESIGNATE ZONE TO BE CONTROLLED.

> EM = EMERGENCY POWER ER = EXISTING TO BE RELOCATED R = RELOCATED, NEW LOCATION



CABLES AND PORTS TO BE INSTALLED AT THAT LOCATION.

THAT POWER IS ALSO TO BE INSTALLED IN THIS DEVICE.

IF A HOME-RUN IS USED ON ANY FLOOR-BOX OR MULTI-OUTLET ASSEMBLY, IT INDICATES

PROJECT LOCATION N

GENERAL NOTES

FULLY COORDINATE ALL WORK WITH ALL PROJECT SUBCONTRACTORS.

DOCUMENTS.

PROVIDE ALL CONTRACTORS A COMPLETE SET

OF FULL-SIZE BID DOCUMENTS. PROVIDE ALL VENDORS A COMPLETE SET OF BID

PRIOR TO SUBMITTING PROPOSAL, BIDDER SHALL EXAMINE ALL GENERAL CONSTRUCTION DRAWINGS AND SHALL HAVE HAD VISITED THE CONSTRUCTION SITE. CONTRACTOR SHALL BE FAMILIAR WITH THE EXISTING CONDITIONS UNDER WHICH THEY WILL HAVE TO OPERATE AND WHICH MAY AFFECT THE WORK.

ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE AND AND REPRESENT THE GENERAL SCOPE OF THE WORK AS IT PERTAINS TO THE ENGINEERED SYSTEMS AT HAND. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND PLANS FOR ADDITIONAL REQUIREMENTS THAT MAY NO BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS, NOTIFY THE ENGINEER OF ANY CONFLICTS OR DISCREPANCIES AND FOR EXACT LOCATION OF ANY SYSTEM COMPONENTS.

CODE REQUIREMENTS.

PROVIDE A SEPARATE CODE SIZED GREEN EQUIPMENT GROUND CONDUCTOR IN ALL UPSIZED FOR VOLTAGE DROP INCREASE

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EOR: BRETT LORENZEN

ALL WORK SHALL CONFORM TO THE LATEST EDITIONS OF LOCAL, STATE, AND NATIONAL CODES AND ORDINANCES. DRAWINGS AND SPECIFICATIONS GOVERN WHERE THEY EXCEED

CONDUITS AND RACEWAYS CONTAINING LINE VOLTAGE CIRCUITS. FOR ALL 20A CIRCUITS, EQUIPMENT GROUND CONDUCTOR SIZE SHALL MATCH PHASE CONDUCTOR SIZE. FOR CIRCUITS EQUIPMENT GROUNDING CONDUCTOR SIZE PER

AND EXPERIENCED WORKMEN FOR THIS WORK.

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THE CONTRACTOR SHALL EMPLOY QUALIFIED

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SHEET NAME **ELECTRICAL** SYMBOLS, ABBREVIATIONS AND GENERAL NOTES

SHEET NUMBER

GENERAL NOTES

- A. SEE SHEET E1 FOR GENERAL NOTES, SHEET E3 FOR ONE-LINE DIAGRAM, CONDUIT, AND WIRE SIZES. SEE SHEET E5-E6 FOR ELECTRICAL SPECIFICATIONS.
- B. CONTRACTOR SHALL PROVIDE SUBMITTALS FOR NEW GENERATOR SET, MANUAL TRANSFER SWITCHES, KIRK-KEY OPERATORS, AND GENERATOR CONNECTION CABINETS.

OPTIMIZED Lighting Engineering Design

842 EAST ISABELLA AVE.

MESA, AZ, 85204

602-699-6224

PROJECT: AHS180015A

EOR: BRETT LORENZEN

PE#: 53437

Sтамр:

CONSTRUCTION

ELECTRIC

RURAL ELEC

KEYED NOTES

- EXISTING 'NORTH BUILDING' ELECTRICAL
 SWITCHBOARD. SEE ONE-LINE DIAGRAM ON
 SHEET E3 FOR ADDITIONAL INFORMATION.
- 2. PROVIDE NEW MANUAL TRANSFER SWITCH WITH GENERATOR CONNECTION CAM-LOCKS AND (2) 200A OUTPUT CIRCUIT BREAKERS. CONNECT TO EXISTING SWITCHBOARD AS INDICATED ON THE ONE-LINE DIAGRAM ON SHEET E3.
- 3. PROVIDE NEW MANUAL TRANSFER SWITCH WITH GENERATOR CONNECTION CAM-LOCKS AND (2) 200A OUTPUT CIRCUIT BREAKERS. FEED WITH INCOMING ELECTRICAL SERVICE CONDUCTORS AND BACK-FEED OUTPUT TO EXISTING PANELBOARDS. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- EXISTING '9226 NORTH 13TH AVE.' NORTH METER SERVICE LINE-UP. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- EXISTING '9226 NORTH 13TH AVE.' SOUTH METER SERVICE LINE-UP. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- 6. PROVIDE NEW MANUAL TRANSFER SWITCH WITH GENERATOR CONNECTION CAM-LOCKS. FEED WITH INCOMING ELECTRICAL SERVICE CONDUCTORS AND BACK-FEED OUTPUT TO EXISTING PANELBOARDS. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- PROVIDE NEW GENERATOR CONNECTION CABINET AND CONNECT TO EXISTING DISTRIBUTION PANELBOARD VIA A NEW BREAKER. PROVIDE A KIRK-KEY INTERLOCK DEVICE WITH THE EXISTING MAIN BREAKER. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- EXISTING '9226 NORTH 13TH AVE.' SOUTH BUILDING PANEL 1 ELECTRICAL SERVICE. SEE ONE-LINE DIAGRAM ON SHEET E3 FOR MORE INFORMATION.
- EXISTING '9226 NORTH 13TH AVE.' SOUTH
 BUILDING PANEL 2 ELECTRICAL SERVICE. SEE
 ONE-LINE DIAGRAM ON SHEET E3 FOR MORE
 INFORMATION

SUNNY SERATO

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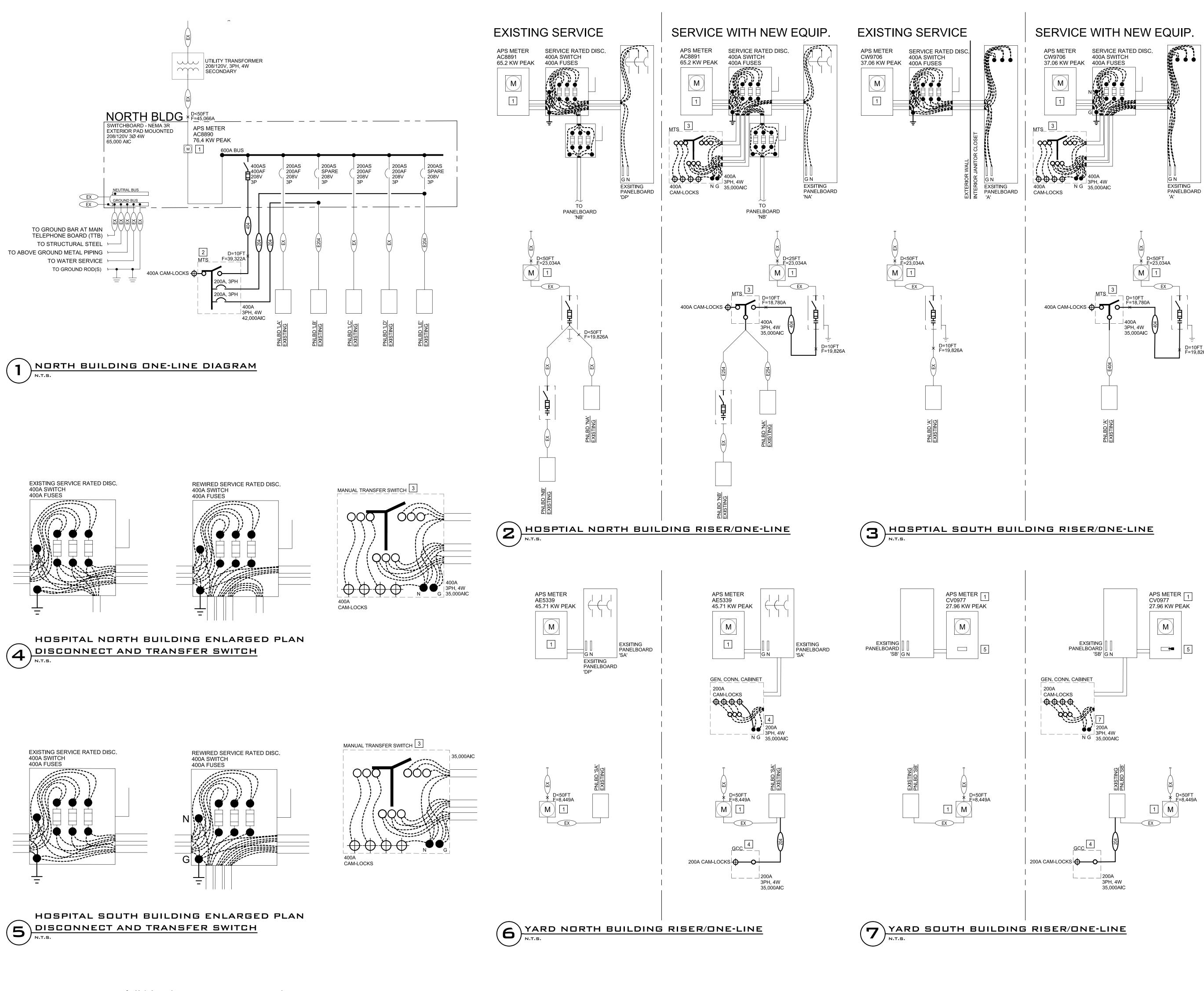
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SHEET NAME
ELECTRICAL
SITE POWER AND
DISTRIBUTION PLAN

SHEET NUMBER

E2



FEEDER LEGEND

E204 EXISTING 200A FEEDER TO REMAIN, VERIFY WIRE SIZE AND PROVIDE TO ENGINEER PRIOR TO INSTALLATION E254 EXISTING 250A FEEDER, EXTEND WIRING AND CONDUIT SIZE TO NEW EQUIPMENT AND SPLICE

WITH UL APPROVED PRODUCT. E404 EXISTING 404A FEEDER, EXTEND WIRING AND CONDUIT SIZE TO NEW EQUIPMENT AND SPLICE WITH UL APPROVED PRODUCT.

204 4 #3/0 CU, 1 #6 CU GROUND, 2" CONDUIT 404 2 SETS (4 #3/0 CU, 1 #3 CU GROUND, 2"

EXISTING MAXIMUM DEMAND READING FROM ARIZONA PUBLIC SERVICE UTILITY COMPANY METER. PROVIDED GENERATOR SHALL BE

PROVIDE NEW 400A MANUAL TRANSFER SWITCH WITH PROVISIONS FOR CONNECTING A TEMPORARY GENERATOR WHEN REQUIRED

PROVIDE NEW MANUAL TRANSFER SWITCH WITH PROVISIONS FOR CONNECTING A TEMPORARY GENERATOR WHEN REQUIRED AND DOUBLE TAP OUTPUT LUGS TO BACK-FEED EXISTING EQUIPMENT SHOWN. PROVIDE WARNING LABELS ON EQUIPMENT WITH 1/4" BLACK LETTERS STATING "240V 3PH DELTA SYSTEM, HIGH-LEG: PHASE B"

CABINET WITH PROVISIONS FOR CONNECTING A TEMPORARY GENERATOR WHEN REQUIRED. CONNECT TO EXISTING PANELBOARD AS INDICATED. PROVIDE WARNING LABELS ON EQUIPMENT WITH 1/4" BLACK LETTERS STATING "240V, 3PH, DELTA SYSTEM, HIGH-LEG: PHASE B"

EXISTING METER CABINET WITH INTEGRATED PULL OUT 200A, 240V, 3W, FUSED DISCONNECT SWITCH, PROVIDE KIRK-KEY DEVICE ON FACE OF CABINET TO INTERLOCK DISCONNECT WITH NEW BREAKER WITHIN PANELBOARD. SEE PANELBOARD SCHEDULES ON SHEET E4.

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RC

KEYED NOTES

CAPABLE OF SUPPLYING THIS LOAD.

AND TWO 200A OUTPUT BREAKERS.

PROVIDE NEW GENERATOR CONNECTION

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SHEET NAME ELECTRICAL ONE-LINE DIAGRAM, CALCS, PANEL SCHEDULES

SHEET NUMBER

PANELBOARD: NB (EXISTING) BUS AMPS: 400A MAIN SIZE/TYPE: 250A MCB VOLTS/PHASE: 240D/120V, 3PH, 4W SECTION: 1 CKT DESCRIPTION VOLTAMPS/PHASE						FED FROM: AIC RATING: CONTRACTOR TO VERIFY AND NOTIFY EOR SERVES: Hospital North MOUNTING: SURFACE LOCATION: Exterior Wall												
			Р	Р			VOL			DESCRIPTION	CKT							
3 C	NO.	AMP			AMP	NO.	Α	В	С		NO.							
											2							
	EX	50	3	3	40	EX				AC-X	4							
			_								6							
	EX	30	2	2	60	EX				AC-A	8							
				_		EV				DANIEL NO.	10							
	FV	4.5	2	2	80	EX				PANEL NC	12							
		45	S	2	60	EV				AC P	14 16							
	FX	30	2	_	00					1 ^{AC-B}	18							
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				2	100	EX				X-RAY	24							
	EX	20	1								26							
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JS AMPS: AIN SIZE/T								PITA JRF	NTRAC ALSOU ACE OR CL	EQUIPMENT GROUND BUS					
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	ING LOAD				EX	20	1	1	20	EX				EXISTING LOAD EXISTING LOAD	18
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	ING LOAD				EX	20	1	-	100					T NESS B	24
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	ING LOAD				EX	20	1	1	20	EX				EXISTING LOAD	48
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TOTAL	AMPS	LIGHTIN				0 1.25			CHEN				1.25		
T∩T∆I	PHASE C - VA	RECEPT				1.25			STING				1.00		
TOTAL	AMPS	MOTORS				1.07.5			G MOT				1.25	TOTAL DEMAND *	
TOT	AL PNLBD - VA	SUPP H				1.00				NDW			1.25	1017 E DEIWARD	-
. 01	AMPS	MISC EC				1.00			3 TRA				1.00		
NEI BOA	RD NOTES			1		1.00				-		* 🗅		I AMPS BASED ON HIGHEST P	HASE \//
NELDUA	ND NO IES											D		THRU CONNECTION: (2) Se	

BUS MAIN VOL7	NELBOARD: SA (EX AMPS: 250A I SIZE/TYPE: 200A MCB TS/PHASE: 208Y/120V, 3PH, 4W TION: 1		,		AIC F SERV MOU	VES: D NTING	OG : SI	KE URF	NNEL:	S	OVERIFY .	A ND NOTIF	Y EOR		
CKT NO.	DESCRIPTION	VOL A	TAMPS/P B	PHASE C		BKR AMP	Р	Р	BKR AMP	MRE NO.	VOL [*] A	TAMPS/PH B	IASE C	DESCRIPTION	
3	AC 2&3				EX	100	3	2	30	EX				HEATER 1	$oxed{ }$
5 7	SPACE				EX	20	1	2	80	EX				AC UNIT	-
	AC EAST				EX	30	2	2	30	EX				HEATER 2	_
13	LIGHTING				EX	20	1	1	20	EX				EXISTING LOAD	\exists
	SPACE EXISTING LOAD				EX	60	2	2	30	EX				SPACE AC WEST	+
21 23	SPACE EXISTING LOAD				EX	125	1	1	20	EX				SPACE EXISTING LOAD	_
	SPACE EXISTING LOAD				EV	00	1	1	20	EX				EXISTING LOAD SPACE	
31 33	GENERATOR FEED BREAKER DOUBLE WIDE BREAKER				OL	200	3	3	20 200	OL EX				GENERATOR FEED BREAKER DOUBLE WIDE BREAKER	-
37	LUG SPACE						3	3						LUG SPACE	-
	SUBTOTAL]									SUBTOTAL	<u> </u>
	TOTAL PHASE A - VA AMPS TOTAL PHASE B - VA	LOAD COOLIN HEATIN		CONN.	/A	DF 1.00 0		RE	AD FRIG GN/DIS	SD.	C	CONN. VA	DF 1.00 1.25		
	AMPS TOTAL PHASE C - VA	LIGHTIN				1.25 1.0/.5		KΠ	CHEN ISTING	١			1.00		
	AMPS TOTAL PNLBD - VA AMPS	MOTOR SUPP H MISC E	EAT			1.00 1.00 1.00		SH	G MO IOW W G TRA	MDW			1.25 1.25 1.00	TOTAL DEMAND	$\frac{1}{1}$
EX	ELBOARD NOTES EXISTING TO REMAIN SEE ONE-LINE DIAGRAM			1			<u> </u>						o seeded. De	•	

E N	PANELBOARD: SB EXBUS AMPS: 250A MAIN SIZE/TYPE: MLO VOLTS/PHASE: 240D/120V, 1PH, 3 SECTION: 1		SIING			SERV MOU	ATINO ÆS: M NTINO	3: MATE 6: Sl	ERN JRF	IITY C	ARE	O VERIFY A	AND NOTIF	Y EOR	EQUIPMENT GROU	DND BOS
	CKT DESCRIPTION	VOLTAM	IPS/PHASE			Р	Р			VOLTAN	IPS/PHASE		DESCRIPTION	СКТ		
L	NO.			Α	В	NO.	AMP			AMP	NO.	Α	В			NO.
	1 SUB-PANEL					EX	60	2	2	40	EX			AC-24		2
	3															4
^ · L	-					EX	20	1	1	20	EX			EXHAUS		6
	7 LIGHTING					EX	20	1	1	20	EX			LIGHTIN		8
33						EX	20	1	1	20	EX				NURSERY	10
	11 WALK-IN COOLER LIGHTING					EX	20	1	1	20	EX				NURSERY	12
	13 WALK-IN COOLER					EX	30	2	2	25	EX			WATER I	HEATER	14
	15							Ļ	L				_	DDVED.		16
	17 DRYER					EX	30	2	2	30	EX			DRYER		18
	19	EXISTING LOAD									- V			AC UNIT		20
						EX	30	2	2	30	EX		_	AC UNIT		22
	23 EXISTING LOAD					EV	20	4	4	20	FV		_	 WASHER	2	24
						EX	20	1		20	EX			EXISTING LOAD		26
KK KK	7 NEW GENERATOR FEED BREAKER					OL	150	2	1	20	EX				ACK BREAKER	28 30
Ľ						1			1	20				FIGGIB	TO THE PERSON NAMED OF THE	30
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L	TOTAL PHASE A - VA	_	LOAD		CONN. V	Ά	DF		LO				CONN. VA			
L	AMPS	4	COOLIN				1.00			FRIG				1.00		
L	TOTAL PHASE B - VA	4	HEATIN				0			SN/DIS				1.25		
L	AMPS	4	LIGHTIN				1.25	.l		CHE				1.00		
F	TOTAL PNLBD - VA	4	RECEP				1.0/.5			ISTIN				1.00	TOTAL DEMAND	
┝	AMPS		MOTOR	_			1.00			G MO				1.25	TOTAL DEMAND	
		SUPP HEAT MISC EQUIP					1.00	-		G TRA	MDW			1.25 1.00		
-			IVIISC EC	JUIP			1.00		LIV	GIRA	ich			1.00		
	PANELBOARD NOTES															
	PB1 COMBINE EXISTING CKTS 5,				MC	ES	SEE O	NE-LIN	NE DIAGR	RAM						
	PB2 COMBINE EXISTING CKTS 7,			OL - SEE	ONE-LIN	E DIAG	SRAM									
F	PB3 MOVE PIGGY BACK CKT 29 T	ОС	KT 9													
I F	RL RELOCATED LOAD SEE PB2	ANI	D PB3													

842 EAST ISABELLA AVE.

MESA, AZ, 85204

602-699-6224

PROJECT: AHS180015A

EOR: BRETT LORENZEN

PE#: 53437

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ELECTRIC RURAL

DRAWN: CHECKED: NUMBER:
BSL AHS | 800 | 5A

REVISIONS:

SHEET NAME ELECTRICAL PANELBOARD SCHEDUELS

SHEET NUMBER

A. GENERAL REQUIREMENTS

- 1. Where the requirements of this section and division exceed those of industry standards and/or general conditions, the requirements of this section take precedence
- 2. Become thoroughly familiar with all of its contents as to requirements that affect this section.
- 3. Work required under this section includes all material, equipment, appliances, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonable inferred to be necessary to facilitate the function of the system and design intent.
- 4. The specifications and drawings for the project are complementary, and any portion of work described in one shall be provided as if described in both
- 5. In the event of discrepancies between specifications and drawings, notify the engineer and request clarification prior to proceeding with the work involved.

6. Drawings are diagrammatic in nature:

- a. Drawings are graphic representations of the work upon which the contract is based. b. Drawings show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without showing all of the exact details as
- to elevations, offsets, control lines, and other installation requirements c. Contractor shall use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and which when installed

per manufacturers' requirements, will ensure a complete, coordinated, satisfactory, and

properly operating system d. Exact location of any component shall be confirmed and/or dimensioned by architect prior to rough-in

B. DEFINITIONS

- 1. Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."
- 2. Install: "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."
- 3. Provide: "to furnish and install."
- 4. Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete, and ready for the intended use, including all items and services incidental to the work necessary for proper installation and operation. Include the installation under the warranty required by this division.
- 5. Engineer: Where referenced in this Division, "Engineer" is the Engineer of Record and the Design Professional for the work under this division, and is a consultant to, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, Engineer means increased involvement by and obligations to the Engineer, in addition to involvement by and obligations to the Architect.
- 6. AHJ: The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
- 7. NRTL: Nationally Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA), and acceptable to the AHJ over this project. Nationally recognized testing laboratories and standards listed are used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.
- 8. Homerun: That portion of an electrical circuit originating at a junction box, termination box, receptacle, or switch with termination at an electrical panelboard. Note: Where MC cable is utilized for receptacle and/or lighting branch circuiting loads, the originating point of the homerun shall be at the first load in the circuit or at a junction box located in an accessible ceiling space as close as possible to the first load.
- 9. Substitution: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.
- 10. The terms "approved equal", "equivalent", or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as equivalent to the item or manufacturer specified". The term "approved" shall mean labeled, listed, certified, or all three, by an NRTL, and acceptable to the AHJ over this project.

C. MATERIAL AND WORKMANSHIP

- 1. Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Pre-owned equipment may be used upon engineers review and
- 2. Model numbers listed in the specifications or shown on the drawings are not necessarily intended to designate the required trim, written descriptions of the trim govern model
- 3. Provide markings or a nameplate for all material and equipment identifying the manufacturer and providing sufficient reference to establish quality, size, and capacity
- 4. All workmanship shall be of the finest possible by experienced mechanics of the proper trade. In general, provide commercial specification grade products.
- 5. Provide all hoists, scaffolds, staging, runways, tools, machinery, and equipment required for the performance of the electrical work. Store and maintain material and equipment in clean condition, and protected from weather, moisture, and physical damage.
- 6. Furnish only material and equipment that are listed, labeled, certified, or all three, by an NRTL whenever any listing or labeling exists for the types of material and equipment
- 7. At a minimum, general work practices for electrical construction shall be in accordance with NECA 1 (latest edition), "Standard Practices for Good Workmanship in Electrical Construction".

E. MANUFACTURERS

specified.

- 1. In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.
- 2. Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.
- 3. Where manufacturers are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for no less than 5 years.

F. COORDINATION

G. ORDINANCES AND CODES

- 1. Coordinate all work with other divisions and trades so that various components of the systems are installed at the proper time, fit the available space, and allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.
- 2. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner as to not interfere with or delay the work of other trades.

3. Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take

- his own measurements at the building, as variations may occur.
- 4. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection.
- 5. Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed.
- 6. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.

- 1. Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction.
- 2. Equipment furnished and associated installation work performed under this contract shall be in strict compliance with current applicable codes adopted by the local AHJ, including any
- a. National Fire Protection Association (NFPA)
- b. Underwriters Laboratories (UL) c. Occupational Safety and Health Administration (OSHA)
- d. American National Standards Institute (ANSI) e. American Society of Testing Materials (ASTM)
- f. Rules and regulations of public utilities and municipal departments affected by connection of services.
- g. Other national standards and codes where applicable.
- 3. Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence.
- 4. Where conflicts between various codes, ordinances, rules, and regulations exist, verify with the engineer.
- 5. Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer
- 6. Contractor will be held responsible for any violation of the law.
- 7. Procure and pay for permits and licenses required for the accomplishment of the work herein described.
- 8. Where required, obtain, pay for, and furnish certificates of inspection to Owner.
- 9. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

H. PROTECTION OF EQUIPMENT AND MATERIALS

- 1. Store and protect from damage equipment and materials delivered to job site
- 2. For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces.
- polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage.
- Contractor shall furnish new equipment and material of a like kind at his own expense.
- 5. Keep premises broom clean of foreign material created during work performed under this
- 7. Plug or cap open ends of conduits while stored and installed during construction when not in use to prevent the entrance of debris into the systems.

I. SUBSTITUTIONS

- 1. Materials, products, equipment, and systems described in the construction documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.
- 2. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Email a cut-sheet of the proposed equipment with all options and accessories highlighted and selected for review. Engineer will respond with a review form via email.
- 3. Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:
- a. Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise in the substitution request.
- replacement parts c. Proposed substitution has received necessary approvals of authorities having
- iurisdiction.
- d. Same warranty will be furnished for proposed substitution as for specified Work.
- e. If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
- f. Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.

J. SUBMITTALS

- literature for equipment to be furnished, and items requiring coordination between contractors under this contract.
- 2. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract
- 3. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible with and suitable for the intended use, will fit the available space, and maintain
- 4. If the size of equipment furnished makes necessary any change in location or configuration,
- submit a shop drawing showing the proposed layout. 5. Transmit submittals as early as required to support the project schedule. While we strive for one-week review please allow two-weeks, plus a duplication of this time for resubmittals, if
- 6. Only resubmit those sections requested for resubmittal or that were modified in any other
- 7. Submittals shall contain
- b. Applicable specification section
- c. Submittal data
- d. Equipment identifications acronym as used on the drawings
- e. Contractors review stamp a. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades.
- 8. Requirements to prevent submittal rejection:
- a. Submittals and shop drawings shall not contain firm name, logo, the seal, or signature of the Engineer.
- b. They shall not be copies of the work product of the Engineer.
- c. Each item or model number shall be clearly marked and accessories indicated. d. Label the catalog data with the equipment identification acronym or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical requirements and deviations from specified equipment or materials.

9. Electronic Submittals:

- a. Contractor shall notify the Architect and Engineer that the submittals have been posted
- b. Contractor shall include the website, user name, and password information needed to access the submittals
- c. For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer
- 10. The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for deviations from the drawings and specifications, errors in dimensions, details, sizes of equipment, or quantities, omissions of components or fittings, coordination of electrical requirements, and not coordinating items

with actual building conditions and adjacent work. Contractor shall request and secure

K. ELECTRONIC DRAWING FILES

- 1. Electronic drawing files are the intellectual property of the design professional and are covered under United States Copyright laws.
- 2. Requests for electronic drawing files will be considered on a case by case basis.
- 3. Optimized-LED retains the rights to charge for additional usage of the company's intellectual property outside of the original contractual agreement.
- 4. Request shall be made in writing to utilize electronic drawing files for any reason. Email is considered an acceptable form of written request.

L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

- 1. During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system.
- 2. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings.

M. OPERATION AND MAINTENANCE INSTRUCTIONS

- 1. During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project.
- 2. Include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment manufacturer.
- 3. Include an inside cover sheet that lists the Project Name, Date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.
- 4. Submit a copy of literature digitally to the owner.
- 5. Include Record Drawings as described above.

N. TRAINING

- 1. At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.
- 2. Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole.
- 3. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention
- 4. Review of data included in the operation and maintenance manuals.
- 5. Notify Owner and Engineer two-weeks prior to the scheduled training date to provide the option of attendance on site.
- 6. Submit a certification letter with the following information to the Architect and Engineer stating that the Owner's designated representative has been trained as specified herein. Letter shall include:
- a. Date
- b. Time c. Attendees
- d. The Contractor and the Owner's representative shall sign the certification letter indicating agreement that the training has been provided.

O. WARRANTIES

- 1. Warrant each system and each element thereof against all defects due to faulty workmanship, design, or material for a period of 12 months from date of Substantial Completion unless specific items are noted to carry a longer warranty in these construction
- properly executed, including term limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status.

2. At the time of Substantial Completion, deliver to the Owner all warranties, in writing and

3. Each warranty instrument shall be addressed to the Owner and state the commencement

documents or manufacturer's standard warranty exceeds 12 months.

GENERAL MATERIALS AND INSTALLATION

A. BUILDING OPERATION

- 1. Accomplish work requiring interruption of building operation at a time when the building is not in operation and only with written approval of building Owner and/or tenant.
- 2. Coordinate interruption of building operation with the Owner and/or tenant a minimum of seven (7) days in advance of work.

B. EXISTING EQUIPMENT REUSE AND REMOVAL

- 1. Remove all existing wiring, exposed conduits, and other electrical installations not reused prior to substantial completion of the work.
- 2. Cut, patch, and repair where required for new electrical installations, and patch and repair
- all surface damage resulting from this work.

3. Relocate all existing electrical systems required to be in operation at substantial completion

of the contract, if required, as a result of work included under this contract, even if not

- 4. Existing service entrance conductors and feeder conductors may be reused if all of the
- following conditions are met:

specifically indicated in the drawings or specifications.

- a. Conductor sizes meet or exceed the sizes specified on the drawings. b. Conductor insulation is in good or better condition.
- c. Conductor insulation is the correct type for the conditions.

C. EXCAVATION AND BACKFILLING

Trenching:

Engineer.

- a. Trenches shall be of sufficient width.
- b. Crib or brace trenches to prevent cave-in or settlement. c. Do not excavate trenches close to columns and walls of new building without prior
- consultation with the Architect. d. Use pumping equipment if required to keep trenches free of water.
- e. Backfill trenches in maximum 6-inch layers of well tamped dry earth in a manner to prevent future settlement.
- Excavation: a. Excavation as specified herein shall be classified as common excavation.
- within the limits of the work as specified and shown on the drawings. c. Excavation shall be performed to the lines and grades indicated on the drawings.
- d. Dispose of excavated materials that are considered unsuitable for backfill, and surplus of excavated material, which is not required for backfill, all to the satisfaction of the

b. Common excavation shall comprise the satisfactory removal and disposition of material

of whatever substances and of every description encountered, including rock, if any,

D. COINCIDENTAL DAMAGE

- 3. Repair work shall meet all requirements of the Owner, and local authorities having
- 4. Repair work shall be thoroughly first class.

E. CUTTING AND PATCHING

- 1. Cut walls, floors, ceilings, and other portions of the facility as required to install work under
- 2. Do not cut or disturb structural members without prior approval from the Architect.
- Cut holes as small as possible.
- 4. Patch walls, floors, and other portions of the facility as required by work under this division.
- 5. Patching shall match the original material and construction including fire ratings, if
- 6. Repair and refinish areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

F. ROUGH-IN

1. Coordinate without delay all roughing-in with other divisions. Conceal all conduit and raceways except in unfinished areas and where otherwise indicated on the drawings.

G. CONCRETE BASES

- 2. Concrete bases shall have chamfered edges.
- 3. Size of base shall be a minimum of 4 inches greater than the footprint of the equipment that it is supporting and shall have a minimum height of 3-1/2 inches.

1. Provide concrete bases for equipment where indicated on the drawings and as specified

Concrete:

- a. Minimum 28-day, 4000-psi concrete conforming to American Concrete Institute Standard Building Code for Reinforced Concrete (ACI 318) and the latest applicable recommendations of the ACI standard practice manual.
- b. Concrete shall be composed of cement conforming to ASTM C 150 Type I, aggregate conforming to ASTM C33, and potable water. c. Exposed exterior concrete shall contain 5 to 7 percent air entrainment.

a. Unless otherwise specified or shown on the structural drawings, reinforce equipment bases with No. 4 reinforcing bars conforming to ASTM A615 or 6x6 - W2.9 x W2.9 welded wire mesh conforming to ASTM A185. Place reinforcing bars 24 inches on center with a minimum of two bars each direction.

a. Provide galvanized anchor bolts for equipment placed on concrete bases or on concrete

H. PENETRATIONS

- b. Anchor bolts size, number, and placement shall be as recommended by the manufacturer of the equipment.
- Walls and Floors: a. Steel Pipe Sleeves for Raceways and Cables: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends, and drip rings.

b. Cast Iron Pipe Sleeves for Raceways and Cables: Cast or fabricated "wall pipe,"

c. Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends

equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless

and integral waterstop, unless otherwise indicated. d. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052 [0.138]

inch thickness and of length to suit application.

I. FIRESTOPPING

- 1. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with UL 2079 or ASTM E 814, or other NRTL
- 2. Manufacturers:
- a. Hilti
- b. RectorSeal c. Specified Technologies Inc

d. United States Gypsum Company

- e 3M corp. 3. Through and Membrane Penetration Firestopping Systems Product Schedule: Provide UL listing, location, wall or floor rating, and installation drawing for each penetration fire stop
- 4. Where project conditions require modification to qualified testing and inspecting agency's illustrations for a particular firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Include qualifications data for testing agency.

J. SYSTEM TESTING AND ADJUSTING

- 1. Adjust, align, and test all electrical equipment on this project provided under this division and all electrical equipment furnished by others for installation or wiring under this division
- 2. Test all systems and equipment according to the requirements in NETA ATS (latest edition)

and all additional requirements specified in following sections.

K. EQUIPMENT IDENTIFICATION

- 1. Provide equipment identification nameplates:
- b. Panelboards c. Equipment enclosures
- d. Access doors e. Transformers

a. Switchboards

g. Enclosed circuit breakers h. Motor starters Feeder devices in switchboards

j. Distribution panelboards

f. Disconnect switches

- b. Field-applied permanent epoxy adhesive, compatible with the equipment finish. c. Self-adhering, with a permanent weatherproof adhesive.

d. Attached with stainless steel screws and hardware.

a. Engraved, contrasting color, three-layer, laminated plastic, indicating the name of the

equipment, load, or circuit as designated on the drawings and in the specifications:

e. Attachment method shall be acceptable to the manufacturers of the equipment to which the nameplates are being applied.

Nameplate Color:

- a. Black background with white letters for Normal Power;
- b. Red background with white letters for Emergency Power.

- 1. Perform the following prior to starting up the electrical systems:
 - b. Tighten screws and bolts for connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated,
- minimum load.
- e. After all systems have been inspected and adjusted, confirm all operating features required by the drawings and specifications and make final adjustments as necessary.

- 842 EAST ISABELLA AVE.
 - MESA, AZ, 85204 602-699-6224 PE#: 53437

PROJECT: AHS180015A EOR: BRETT LORENZEN

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DRAWN: CHECKED: NUMBER: AHS180015A

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REVISIONS:

08/10/18 | PERMIT/CONSTRUCTION SHEET NAME **ELECTRICAL**

SPECIFICATIONS 1

ISSUED FOR:

SHEET NUMBER

8/7/2018 9:48:47 AM, ARCH full bleed D (36.00 x 24.00 Inches)

- amendments and standards as set forth by the following:

- for final resolution.

- - 3. For other materials and equipment, cover with waterproof, tear-resistant, heavy tarp or
 - 4. Equipment and material damaged by construction activities shall be rejected, and
 - 6. Conduit, equipment, etc. shall have a neat and clean appearance at the termination of the
- - b. Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of
- 1. Assemble and submit for review shop drawings, material lists, manufacturer product
- Documents and the design concept.

required.

a. The project name

manufacturer recommended service clearances.

- d. Contractor shall allow two weeks for the Engineer review time as specified above.

- written acceptance from the Engineer and Architect prior to implementing any deviation.

- course of this Work.
 - 1. Repair streets, sidewalks, drives, paving, walls, finishes, and other facilities damaged in the
 - 2. Repair materials shall match existing construction.
 - Letter height: a. 3/8-inch minimum.
 - L. SYSTEM START UP
 - a. Check all components and devices and lubricate items accordingly.
 - use those specified in UL 486A and UL 486B.
 - c. Adjust taps on each transformer for rated secondary voltage when the transformer is at
 - d. Check and record building's service entrance voltage, grounding conditions, grounding resistance, and proper phasing.

TRIC

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steel products allowed. Reduced wall EMT is not allowed. a. Flexible Metal Conduit (FMC): Zinc-coated steel or aluminum, UL 1. Reduced-wall FMC

b. Intermediate Metal Conduit (IMC): Hot-dip Galvanized Rigid Steel Conduit, ANSI C80.6,

c. Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, UL 360; fittings: NEMA FB 1.

d. Hot-dip Galvanized Rigid Steel Conduit (GRS): ANSI C80.1, UL 6. e. Plastic-Coated IMC, RMC, and Fittings: NEMA RN 1, NRTL listed. Coating thickness of

0.04 inches minimum. f. IMC and RMC Fittings: NEMA FB 1; compatible with conduit type and material, NRTL

2. Manufacturers:

a. Western Tube and Conduit b. Wheatland Tube

c. Tyco International d. Allied Tube and Conduit

e. Republic Raceway

B. NON-METALLIC CONDUIT AND TUBING

Types:

a. Rigid Nonmetallic Conduit (RNC): Schedule 40 PVC, 90 deg C rated, b. Electrical Nonmetallic Tubing (ENT): NEMA TC 13, NRTL listed.

c. Liquidtight Flexible Nonmetallic Conduit (LFNC): UL 1660. d. ENT and LFNC Fittings: Compatible with conduit/tubing type and material, NRTL listed.

Fittings:

a. NEMA TC 3, TC 6; UL 651, compatible with conduit/tubing type and material, NRTL

Manufacturers: a. Amco

> b. Cantex c. Certainteed

d. Prime Conduit e. Raco.

f. Thomas and Betts.

A. GENERAL REQUIREMENTS

RACEWAY INSTALLATION

1. Install raceways parallel and perpendicular to building lines.

2. Install raceways to requirements of structure, other work on the project, and to clear all openings, depressions, pipes, ducts, reinforcing steel, and other immovable obstacles.

3. Install raceways set in forms for concrete structure in such a manner that installation will not affect the strength of the structure.

4. Install raceways continuous between connections to outlets, boxes, and cabinets with a minimum possible number of bends and not more than the equivalent of four 90-degree bends between connections. Use manufactured elbows for all 45- and 90-degree bends, unless approved by the Engineer in advance. Make other bends smooth and even and without flattening raceway or flaking galvanizing or enamel. Radii of bends shall be as long as possible and never shorter than the corresponding trade elbow.

5. Use long radius elbows for all underground installations, where necessary, or where otherwise indicated.

6. Securely fasten raceways in place with approved straps, hangers, and steel supports as required. Attach raceway supports to the building structure. Hang single raceways for feeders with supports spaced not more than 10 feet. Securely clamp vertical feeder raceways to structural steel members attached to structure. Install cable clamps for support of vertical feeders where required. Add raceway supports within 12 inches of all bends, on both sides of the bends.

7. Ream raceway ends, thoroughly clean raceways before installation, and keep clean after installation. Plug or cover openings and boxes as required to keep raceways clean during construction and fish all raceways clear of obstructions before pulling conductor wires.

8. Provide raceways of ample size for pulling of wire, not smaller than code requirements and not less than 1/2-inch in size, unless indicated otherwise on Drawings.

9. Protect all raceway installations against damage during construction. Repair all raceways damaged or moved out of line after roughing-in to meet Engineer's approval without additional cost to the Owner.

10. Align and install true and plumb all raceway terminations at panelboards, switchboards, and

11. Install a pull wire in each empty raceway that is left for installation of conductors or cables under other divisions or contracts. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24 inches of slack at each end of pull wire.

12. Make all joints and connections in a manner that will ensure mechanical strength and electrical continuity.

B. ABOVE GROUND RACEWAY USE:

1. Install all circular raceways concealed above suspended ceilings or concealed in walls or floors wherever possible except where otherwise indicated.

2. Provide GRS for all conduits exposed to any forms of damage, physical, chemical, or

3. Unless noted otherwise, all other raceway may be EMT. Use compression type fittings for all conduit 2" and smaller. Use set-screw fittings for all conduit over 2".

C. UNDERGROUND RACEWAY USE:

1. RNC conduit may be used underground where permitted by local code and where not specifically restricted by these documents.

D. EQUIPMENT CONNECTIONS

1. Use FMC or LMFC (liquid or vapor areas) for final connection to each motor, transformer and any device that would otherwise transmit motion, vibration, or noise. Provide all FMC

and LFMC with an insulated green or bare copper bonding ground conductor. E. BUSHINGS AND LOCKNUTS

1. Rigidly terminate conduits entering sheet metal enclosures to the enclosure with a bushing and locknut on the inside and a locknut or an approved hub on the outside. Conduit shall enter the enclosure squarely.

2. Provide bushings and locknuts made of galvanized malleable iron with sharp, clean-cut

3. Where EMT enters a box, provide approved EMT compression connectors.

4. Use insulated, grounding, or combination bushings wherever connection is subject to vibration or moisture, when required by NFPA 70.

CONDUCTORS AND CABLES

A. CONDUCTORS

1. Annealed (soft) copper complying with ICEA S-95-658/NEMA WC70 and UL standards 44 or 83 as applicable.

8/7/2018 9:48:51 AM, ARCH full bleed D (36.00 x 24.00 Inches)

2. Aluminum conductor option (conductors 1/0 or larger):

a. Compact stranded, aluminum alloy (AA-8000 series), complying with ICEA S-95-658/NEMA WC70. b. Increase the raceway size as required, at no additional cost to the Owner, to

accommodate the increased size of the aluminum Conductors.

c. Aluminum conductor size shall meet or exceed the ampere rating of the scheduled copper conductors at 75 degrees C.

3. Copper Conductor Manufacturer: a. General Cable

b. Southwire c. US Wire and Cable d. American Wire and Cable

Brown and Sharpe).

e. Cable USA f. Okonite g. Advance Wire and Cable h. Encore Wire

4. Aluminum Conductor Manufacturer: a. General Cable

5. Conductor Insulation Types: 90-degree C-rated, Type THHN/THWN-2 or XHHW-2 complying with ICEA S-95-658/NEMA WC70.

6. Sizes of conductors and cables indicated or specified are in American Wire Gage (AWG -

7. All feeder and branch circuit conductors No. 8 AWG and larger: Stranded.

8. All conductors, No. 10 AWG and smaller: Solid copper.

9. All Branch Circuit Wiring: Not smaller than No. 12 AWG.

10. If no conductor size is indicated on the Drawings for a branch circuit, contact engineer.

11. Control Wiring: a. Stranded copper conductors, 600V insulation, of the proper type, size, and number as required to accomplish specified function. Minimum size: No. 14 AWG, unless noted otherwise

B. TERMINATIONS

1. Tinned, mechanical type only; NRTL-listed for copper and aluminum conductors at 75

2. Where aluminum conductors terminate existing panelboards, switchboards or switchgear that utilize compression connections use hydraulic-compression type connectors with a zinc base, anti-oxidizing compound. Use compression tools of the type that will not release unless the correct pressure has been applied.

3. Measure the temperature of all conductors at all splices and terminations. Make each test under typical building load Conditions after the building is occupied and in operation for a minimum of two weeks.

a. Replace all joints or splices indicating excessive heating. b. Take measurements with a non_contact type infrared thermometer.

C. MC CABLE

1. Shall not be utilized on this project.

CONDUCTORS AND CABLES INSTALLATION

A. GENERAL REQUIREMENTS

1. Install all wiring in approved raceway and enclosures, except where specified or indicated for low-voltage wiring or where type MC cable is indicated or specified as acceptable.

2. Install all conductors and cables in raceways continuous without taps or splices. Splice or tap only in approved boxes and enclosures with approved solderless connectors and keep to the minimum required. Insulate all splices, taps, and joints as required by codes.

3. All materials used to terminate, splice, or tap conductors shall be NRTL listed for the specific application and conductors involved, and installed in strict accordance with the manufacturer's recommendations.

4. Provide an equipment-grounding conductor or bonding jumper, as applicable, in all feeders and branch circuits, sized in accordance with NFPA 70 Tables 250.66 or 250.122.

Cable Color:

a. Wiring shall have insulation of the proper color to match color code system in the table below unless there is a color system currently in use by the facility, in which case the colors are to match the existing system. In larger sizes where properly colored insulation is not available, use vinyl plastic electrical tape of the appropriate color around each conductor at all termination points, junctions, and pull boxes.

b. System Voltage: 240V and under

Phase A: Black. Phase B: Red. Phase C: Blue.

Neutral: White. Equipment Ground: Green.

B. MC CABLE

1. Shall not be installed on this project.

ELECTRICAL BOXES AND CABINETS

A. GENERAL REQUIREMENTS 1. Provide junction boxes, pull boxes, cabinets, and wireways wherever necessary for proper installation of various electrical systems according to NFPA 70 and where indicated on the

2. Size as required for the specific function or as required by NFPA 70, whichever is larger. Construction shall be of a NEMA design suitable for the environment installed.

Manufacturers:

i. Appleton Cooper k. Erikson Electrical

Hoffman

m. Killark Electric

n. Raco.

 Robroy Industries p. Thomas and Betts

q. Steel City

EXISTING ELECTRICAL SERVICE AND GROUNDING

A. ELECTRICAL SERVICE

1. See one-line diagram for the following information:

 Equipment Type b. Size

c. Voltage

d. Phase e. NEMA Ratings

f. Existing or New Equipment

2. Contractor shall provide and install all required raceways, terminations, and miscellaneous equipment as required for electrical and telephone services for connection by the serving

3. Contractor shall become fully acquainted with serving utility installation guide and applicable codes in the jurisdiction and install in strict compliance.

the utility. 5. Contractor shall pay all applicable charges required by the serving electrical utility.

6. Contractor shall complete and provide necessary information to the utility company without

delay. If concern about missing information arises contact the electrical engineer. Required

4. Contractor shall fully understand the division of work between the installing contractor and

b. Features c. Wiring diagrams d. Vibration isolation

A. PACKAGED ENGINE GENERATORS

a. Detailed dimensioned drawings

f. Output breaker information g. Size and capacity h. Available fault current

Testing procedures

information may include but is not limited to:

1. Permanently and effectively ground and bond the electrical installation in a thorough and

3. Where grounding on plans indicates grounding above minimum code requirements,

4. Use bare or green insulated conductors as specified herein, and other materials indicated

a. Number of phases and ratings of switch and fuses shall be provided as indicated on the

e. Provide with integral and separate neutral and ground assemblies, suitable for the sizes

f. Do not double-lug any terminations not specifically listed as suitable for more than one

d. Provide an engraved nameplate that may withstand the elements for identification.

B. CIRCUIT BREAKERS IN EXISTING PANELBOARDS/SWITCHBOARDS

panel rating or the available fault current indicated on the drawings.

1. Provide new circuit breakers for installation in existing panelboards/switchboards, of the

a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561.

b. For three-phase transformers less than 15 kVA and all single-phase:

degree C rise above a 40 degree C ambient temperature.

degree C rise above a 40 degree C ambient temperature.

c. For three-phase transformers 15 kVA and larger:

factory tested according to IEEE C57.12.91.

a. For three-phase below 25 kVA and all single-phase

percent taps (2 above, 4 below)

i. Four 2.5 percent (2 above, 2 below).

a. Mounted on integral vibration-absorbing pads.

6. Transformer Core and Coil Assemblies:

suitable for the load.

the support

8. Transformer Enclosures:

a. Removable front cover

stainless steel.

thru 431.196 requirements.

11 Manufacturers:

d. Siemens

e. Square D

a. ACME

b. Eaton

c. G.E.

Submittals

e. Fuel tank

gauge sheet steel construction.

c. Dry locations shall be ventilated, NEMA 250 Type 2.

EMERGENCY SYSTEM STANDBY EQUIPMENT

a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating

i. 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115

i. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150

a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when

i. One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5

a. Transformers 75 kVA and larger shall be floor mounted unless indicated otherwise.

c. Floor mounted transformers securely to a 4 inch house keeping pad with vibration

e. Wall mounts must be by same manufacturer as and provided with transformer

b. Core and coil encapsulated within resin compound, drip-proof, fabricated of heavy

d. Damp or wet locations shall be ventilated with weather shields, NEMA 250 Type 3R.

9. Make final conduit connections to transformers with flexible conduit, with at least 6 inches of

10. Provide energy-efficient transformers complying with federal regulation 10 CFR 431.192

e. Corrosive locations shall be totally enclosed, non-ventilated, NEMA 250 Type 4X,

slack in all directions. Minimum flexible conduit length shall be 2 feet.

b. Transformers 45 kVA and smaller shall be floor or wall mounted where construction is

d. Wall mounted or suspended transformers shall have a means of isolating vibration from

same manufacturer and type as the existing panelboard/switchboard circuit breakers.

2. Short circuit current interrupting rating of any new breaker shall be the larger of the existing

b. Permanently labeled as suitable for use as service entrance equipment.

c. Provisions for bolt-in fuses as appropriate for the fuses specified.

2. All grounding shall meet or exceed the requirements of NFPA.

DISTRIBUTION AND CONTROL EQUIPMENT

A. SERVICE ENTRANCE SWITCH: FUSIBLE, 200A-400A

a. Site Plan

b. One-Line Diagram

c. Load calculations

e. Load readings

efficient manner.

on the Drawings.

1. Fusible Switch:

conductor

2. Manufacturers:

a. Square D

d Siemens

C. DRY-TYPE TRANSFORMERS

system that used letters.

3. Phases, Voltages, and Sizes:

5. Full-Capacity Primary Taps:

b. Above 500 kVA

7. Mounting:

a. As indicated on the drawings.

2. Insulation Class:

Sound Level:

b. Eaton

c. G.E.

B. GROUNDING

d. Load calculation forms

f. Submittal documentation

drawings shall take precedence.

of conductors indicated.

2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

3. Manufacturer shall agree to repair and or replace components and associated auxiliary components that fail in materials or workmanship for a period of at least 5 years from substantial completion.

4. Generator shall be of the proper size, phase, and assembly to provide the specified parameters on the one-line diagram in this set of drawings.

5. General Requirements

j. Warranty

a. Comply with ASME B15.1.

b. Provide nameplates on each major system component. c. Fabricate on a mounting frame with attachments to resist generator movement during seismic activity.

6. Operating Conditions a. Ambient temperature of 120 deg

b. Relative humidity of 90% c. Elevation of 2000ft

Parameters Diesel fuel.

b. Oil lubricated.

c. Closed loop liquid cooled with factory mounted radiator.

d. Electric-immersion type factory installed coolant jacket heater complying with NFPA 110. e. Adjustable isochronous governor with speed sensing.

f. Factory installed base mounted fuel-oil tank complying with UL2085. g. Fuel shall provide 24 hours at 100% of rated output power.

h. Muffler and exhaust piping complying with ASTM A 53/A 53M i. Air intake with engine mounted replaceable dry -filter element.

j. 35A continuous rated battery charging alternator k. Heavy duty cranking starter

I. Current limiting automatic equalizing and float charging type battery charger in compliance with UL1236.

m. Comply with NEMA MG1 performance requirements.

Enclosure

a. Exterior rated to withstand wind up to 100mph. b. Access panels shall be lockable and operable without tools.

c. Painted galvanized steel, metal-clad, integral structural steel frame on concrete pad. d. Sound attenuated.

e. Louver ventilated panels with bird screens. f. Manufacturers standard enamel coating

9. Factory installed generator control panel and remote annunciator alarm panels shall be installed and supprt the following indicating and protective devices

 a. AC voltmeter b. AC ammeter

c. AC frequency meter

d. DC voltmeter e. Engine coolant temperature gauge f. Engine lubricating oil pressure

g. Running time meter h. Ammeter-voltmeter phase selector

 Generator voltage adjustment j. Start/stop switch

k. Over-speed shutdown device Coolant high-temperature shutdown

m. Coolant low-temperature shutdown n. Oil low-pressure shutdown

 Generator overload p. Remote emergency shut-down switch

the following notifications and shall continue until alarm has been addressed: a. Engine high-temperature shutdown

b. Lube-oil low-pressure shutdown c. Over-speed shutdown

d. Remote emergency stop shutdown e. Engine high-temp pre-alarm

f. Lube-oil low-pressure pre-alarm g. Fuel-low alarm

h. Low coolant alarm

Over-crank shutdown

j. Coolant low temperature alarm

k. Battery low-voltage alarm o. Fuel tank derangement alarm

p. Fuel tank high-level shutdown alarm

10. Factory installed generator control panel and remote annunciator alarm panel shall provide

11. Provide the following tests before shipment and comply with NFPA 110 and IEEE 115:

 a. Full-load run b. Maximum power

c. Voltage regulation

d. Transient and steady-state covering e. Single-step load pickup

f. Safety shutdown

B. GENERATOR OUTPUT CIRCUIT BREAKER

1. Molded case, thermal-magnetic type, 100% rated compplying with NEMA AB1 and UL489.

2. Shall be specifically designed for use with generator assemblies

3. Trip rating shall be set for generator rating.

4. Mount integral to generator enclosure.

5. Number of phases and ratings of switch and fuses shall be provided as indicated on the

6. Provide with integral and separate neutral and ground assemblies, suitable for the sizes of

7. Do not double-lug any terminations not specifically listed as suitable for more than one

C. MANUAL TRANSFER SWITCH

1. Description:

a. Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Manual transfer switch shall have main contacts and operating mechanism.

2. Indicated Voltage and Current Ratings: a. Apply as defined in UL 1008 for continuous loading and total system transfer, including

tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless b. Voltage ratings shall be consistent with applications from 115 volts AC to 600 volts and single or three phase as required by the application.

c. Current ratings and the number of poles shall be as indicated on the plans.

b. Where transfer switch includes internal fault-current protection, rating of switch and trip

unit combination shall exceed indicated fault-current value at installation location.

3. Fault-Current Closing and Withstand Ratings: a. Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

4. Resistance to Damage by Voltage Transients: a. Components shall meet or exceed voltage-surge withstand capability requirements

when tested according to IEEE C62.41.

b. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

5. Comply with requirements for Level 1 equipment according to NFPA 110.

the transfer switch.

7. Transfer switch shall include the following features: a. 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

b. Transfer switch shall be 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. c. Operation of the bypass/isolation switch shall be allowed regardless of the position of

switch section shall be isolated from the Bypass Isolation Switch section by means of

a. Factory-installed copper bus bars; plated at connection points and braced for the

d. Switch operation shall provide for positive and complete sequencing of all contact motion and shall prevent any form of intermediate stop or delayed motion.

8. Legend:

a. Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.

9. Maintainability:

a. Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors. b. If the unit is constructed such that removal of components is not allowed, the transfer

insulated barriers. 10. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches:

indicated available short-circuit current

separate arcing contacts.

11. Switch Characteristics:

a. Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

b. Switch action shall be double throw; mechanically held in both directions. c. Contacts shall be silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have

12. Factory Wiring:

a. Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. All factory wiring shall be accessible from the equipment front.

c. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated. Power terminals shall be rated for 90

b. Designated terminals shall be pressure type, suitable for types and sizes of field wiring

a. General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless

d. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

14. Bus and Wiring:

15. Cable Entry:

13. Enclosures:

a. All Bus and cable /control wire shall be copper.

of the manual transfer switch rating.

degree C and copper or aluminum cable.

a. Cable entry shall be from the top.

otherwise indicated.

16. Generator Connection Receptacles: a. Provide in face of manual transfer switch CAM-lock connections for portable generator

14. Transfer Switch Output Breakers

a. Provide output circuit breakers within manual transfer switch assembly to feed separate loads as indicated on construction drawings.

b. CAM locks shall be supplied in the proper quantity and type to support the full ampacity

15. Manufacturers:

a. Coffman; Steady Power

 b. Caterpillar; Engine Div. c. Eaton Electrical Inc.; Cutler-Hammer

d. Emerson; ASCO Power Technologies, LP.

g. Onan/Cummins Power Generation; Industrial Business Group.

e. GE Zenith Controls. f. Kohler Power Systems; Generator Division.

h. Russelectric, Inc. i. Spectrum Detroit Diesel.

16. Installation

c. Provide equipment label with Name, Voltage, and Ampacity.

a. Floor-Mounting Switch: Anchor to floor by bolting

b. Provide 4 inches high, reinforced concrete bases with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch.

17. Connections a. Ground equipment according to 'Grounding and Bonding.'

18. Factory Tests:

a. The Automatic Transfer Switch and Bypass Isolation Switch shall be factory tested to

b. Connect wiring according to 'Low-Voltage Electrical Power Conductors and Cables.

verify compliance with these specifications and ensure proper operation.

19. Field Quality Control: a. Perform tests and inspections and prepare test reports.

b. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. c. Measure insulation resistance phase-to-phase and phase-to-ground with

insulation-resistance tester. Use test voltages and procedure recommended by

manufacturer. Comply with manufacturer's specified minimum resistance.

d. Check for electrical continuity of circuits and for short circuits. e. Inspect for physical damage, proper installation and connection, and integrity of barriers

emergency source with normal source available.

covers, and safety features. f. Verify that manual transfer warnings are properly placed.

g. Perform manual transfer operation.

a. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times. b. Simulate power failures of normal source to automatic transfer switches and of

c. Test bypass/isolation unit functional modes and related transfer switch operations.

d. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.

MESA, AZ, 85204 602-699-6224 PROJECT: AHS180015A EOR: BRETT LORENZEN PE#: 53437 consent of Optimized LED.

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ELECTRICAL SPECIFICATIONS 2