

ELECTRICAL SYMBOLS

THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED.

STANDARD MOUNTING HEIGHTS	
ANNUNCIATOR PANELS (DISPLAY)	60"
CONTROLS (CENTER OF DEVICE)	48"
EXIT SIGNS (SEE DRAWINGS)	105"
FIRE ALARM ANNUNCIATOR PANEL (DISPLAY)	60"
FIRE ALARM BELL (EXTERIOR) (CENTERLINE)	120"
FIRE ALARM CONTROL PANEL UNIT (DISPLAY)	80"
FULL STATIONS (TOP OF DEVICE)	48"
RECEPTACLES (TO CENTER)	16"
RECEPTACLES (EXTERIOR)	24"
RECEPTACLES (GARAGES)	24"
RECEPTACLES (POOLS)	42"
RECEPTACLES (ABOVE COUNTER)	44"
RECEPTACLES IN EQUIPMENT ROOMS	6"
REMOTE INDICATING LIGHT (EQUIPMENT ROOMS)	48"
REMOTE INDICATING LIGHT (FINISHED AREAS)	CEILING
SAFETY SWITCHES (TOP OF DEVICE)	60"
STARTERS (TOP OF DEVICE)	60"
SWITCHES (TOP OF DEVICE)	48"
TELEPHONE, DATA OUTLETS	SAME AS ADJACENT DEVICE, UNO
TELEPHONE TERMINAL BOARD (BOTTOM)	REFER TO ARCH DRAWINGS
TELEVISION OUTLETS	REFER TO ARCH DRAWINGS
FIRE ALARM DEVICES (CENTERLINE)	84"

ABBREVIATIONS	
A	AMPERE FRAME SIZE
AF	AVAILABLE FAULT CURRENT
AFI	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AIC	AMPERE INTERRUPTING CAPACITY
AS	AMPERE SWITCH SIZE
AT	AMPERE TRIP SETTING
ATS	AUTOMATIC TRANSFER SWITCH
AV	AUDIOVISUAL
B	BUILDING AUTOMATION SYSTEM
BKR	BREAKER
C	CONDUIT
CAT	CATEGORY
CATV	CABLE TELEVISION SYSTEM
CCTV	CLOSED CIRCUIT TELEVISION
CD	CANDELA
CKT	CIRCUIT
CT	CURRENT TRANSFORMER
CTR	CENTER
CV	CUMULATIVE VOLTAGE DROP
D	DEMOLITION
DPDT	DOUBLE-POLE, DOUBLE-THROW
DPST	DOUBLE-POLE, SINGLE-THROW
E	EXISTING TO BE DEMOLISHED
ED	EXHAUST FAN
EM	EMERGENCY
EMS	ENERGY MANAGEMENT SYSTEM
ENT	ELECTRICAL METALLIC TUBING
ENT	ELECTRICAL NON-METALLIC TUBING
ETR	EXISTING TO BE RELOCATED
EW	ELECTRIC WATER COOLER
EX	EXISTING TO REMAIN
F	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FCU	FAN COIL UNIT
FF	FINISHED FLOOR
FLA	FULL LOAD AMPS
FLR	FLOOR
FMC	FLEXIBLE METALLIC CONDUIT
G	GENERAL CONTRACTOR
GC	GROUNDING ELECTRODE
GND	GROUND
I	ISOLATED GROUND
J	JUNCTION BOX
J	JUNCTION BOX
L	LINEAR FEET
LR	LOCKED ROTOR AMPS
LTL	LIGHTING LIGHTS
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
M	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MFR	MANUFACTURER
MIN	MINIMUM
MLO	MAIN LUGS ONLY
MCCP	MAXIMUM OVERCURRENT PROTECTION
MTD	MOUNTED
N	NOT APPLICABLE
N/A	NON-FUSED
NL	NIGHT LIGHT (24HR ON)
NRL	NATIONALLY RECOGNIZED TESTING LABORATORY (CSA, ETL, NSF, UL)
O	OCCUPANCY SENSOR
OS	OCCUPANCY SENSOR
P	POLE
PART	PARTIAL CIRCUIT
PHØ	PHASE
PNL	PANEL
PNLB	PANELBOARD
PROVIDE	FURNISH AND INSTALL
PT	POTENTIAL TRANSFORMER
Q	QUANTITY
QTY	QUANTITY
R	RECEPTACLE
RCPT	RELOCATE
RELO	RELOCATE
RLA	RUNNING LOAD AMPS
RTU	ROOFTOP UNIT
S	SHORT-CIRCUIT CURRENT RATING
SCCR	SMOKE DUCT DETECTOR
SD	SMOKE DUCT DETECTOR
SOFT/SF	SINGLE-POLE, DOUBLE-THROW
SPDT	SINGLE-POLE, SINGLE-THROW
SPST	SINGLE-POLE, SINGLE-THROW
ST	SHUNT TRIP
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
T	TELECOMMUNICATIONS BONDING BACKBONE TO BE DETERMINED
TBB	TELECOMMUNICATIONS BONDING BACKBONE TO BE DETERMINED
TBD	TELECOMMUNICATIONS BONDING BACKBONE TO BE DETERMINED
TGB	TELECOMMUNICATIONS BONDING BACKBONE TO BE DETERMINED
TL	TWISTLOCK
TMGB	TELECOMMUNICATIONS MAIN BONDING BACKBONE TO BE DETERMINED
TX	TRANSFORMER
TYP	TYPICAL
U	UNLESS NOTED OTHERWISE
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTAGE DROP
VD	VOLTAGE DROP
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE
W	WIRE
WI	WITH
WR	WEATHER PROOF
WR	WEATHER RESISTANT
WT	WATERTIGHT
X	EXPLOSION-PROOF
XP	EXPLOSION-PROOF

ANNOTATION	
	ELECTRICAL OR FIRE ALARM PLAN NOTE CALLOUT
	PLUMBING EQUIPMENT DESIGNATION. (CONTRACTOR FURNISHED AND INSTALLED). REFER TO PLUMBING FIXTURE OR EQUIPMENT SCHEDULES
	EQUIPMENT DESIGNATION (OWNER FURNISHED, CONTRACTOR INSTALLED)
	MECHANICAL EQUIPMENT DESIGNATION (CONTRACTOR FURNISHED AND INSTALLED UNLESS NOTED OTHERWISE)
	DETAIL REFERENCE UPPER NUMBER INDICATES DETAIL NUMBER LOWER NUMBER INDICATES SHEET NUMBER
	SECTION CUT DESIGNATION

CIRCUITING & WIRING	
	HOMERUN TO PANELBOARD. INFORMATION AT ARROWS ARE CIRCUIT NUMBERS AND PANELBOARD FOR TERMINATION. REFER TO PANELBOARD SCHEDULES FOR BRANCH CIRCUIT CONDUCTOR SIZES.
	CIRCUIT CONTINUATION OR PARTIAL CIRCUIT
	CONDUIT CONCEALED
	CONDUIT IN UNDER FLOOR/GROUND CONSTRUCTION
	EXPOSED CONDUIT
	LOW VOLTAGE CABLE
	CONDUIT TURNING DOWN
	CONDUIT TURNING UP

LINETYPE LEGEND	
	THROUGHOUT THE DRAWINGS DIFFERENT LINETYPES ARE USED IN COMBINATION WITH THE SYMBOLS TO INDICATE THE STATUS OF ITEMS AS EXISTING, TO BE DEMOLISHED, TO BE INCLUDED AS PART OF NEW WORK, AND/OR ITEMS WHICH ARE ANTICIPATED TO BE PROVIDED IN THE FUTURE. THE STATUS OF ITEMS USING THESE LINETYPES ARE RELATIVE TO THE VIEW IN WHICH THEY APPEAR. PHASING SHOWN IN DRAWINGS IS NOT INTENDED TO FULLY DESCRIBE ALL NECESSARY CONSTRUCTION PHASING, WHICH IS DETERMINED BY THE CONTRACTOR AS PART OF THEIR RESPONSIBILITIES. ANY SUCH PHASING DESCRIBED IN THE CONSTRUCTION DOCUMENTS ARE GENERAL AND ONLY INTENDED TO INDICATE A BROAD ORDER FOR THE SAKE OF DESCRIBING THE PROJECT. THE FOLLOWING LINETYPES MAY BE USED ON ANY DEVICE, EQUIPMENT, NOTE, LINE, SHAPE, ETC.
	EXISTING
	DEMOLISH
	NEW
	FUTURE

LIGHTING CONTROL DEVICES	
	SINGLE POLE SWITCH (NO LETTER DESIGNATION)
	SWITCH LETTER DESIGNATIONS AS FOLLOWS: 2 = TWO POLE 3 = THREE-WAY 4 = FOUR-WAY D = DIMMER DO = DIMMING OCCUPANCY SENSOR F = FAN SPEED CONTROL K = KEYS LV = LOW VOLTAGE O = OCCUPANCY SENSOR P = SPST PILOT LIGHT V = VACANCY SENSOR WP = WEATHER PROOF
	AUTOMATIC LOAD CONTROL RELAY
	BRANCH CIRCUIT TRANSFER SWITCH
	RELAY OR CONTACTOR (# = QUANTITY OF RELAYS)
	LIGHTING CONTROL PHOTOCELL (SHADE INDICATES AIMING)
	TIME SWITCH
	CEILING OCCUPANCY SENSOR DESIGNATIONS: IR = INFRARED DT = DUAL-TECH US = ULTRASONIC MP = MICROPHONE

POWER EQUIPMENT & DEVICES	
	ELECTRICAL PANELBOARD (SURFACE OR FLUSH MOUNT)
	CONTROL SYSTEM CABINET (CONTROLS, SECURITY, AV)
	PLYWOOD TERMINAL BOARD FOR TELEPHONE SYSTEM, UNO, SIZE AS NOTED
	SWITCHBOARD OR MOTOR CONTROL CENTER ON HOUSEKEEPING PAD
	ELECTRICAL DISTRIBUTION PANELBOARD
	TRANSFORMER
	MOTOR
	DISCONNECT SWITCH - "200/3/150/3R" DENOTES AMPERES/POLE/FUSE/NEMA ENCLOSURE RATING, NF= NON-FUSED, CB= CIRCUIT BREAKER (200/3/CB), NO VALUE (200/3/150) FOR NEMA ENCLOSURE MEANS STANDARD NEMA 1 RATING
	COMBINATION DISCONNECT (SAFETY) SWITCH AND MOTOR STARTER "30/3/15/13R" DENOTES AMPERES/POLE/FUSE/NEMA STARTER SIZE/NEMA ENCLOSURE RATING, NF= NON-FUSED, CB= CIRCUIT BREAKER (30/3/CB1), NO VALUE (200/3/150/1) FOR NEMA ENCLOSURE MEANS STANDARD NEMA 1 ENCLOSURE RATING
	MAGNETIC MOTOR STARTER, NEMA SIZE AS NOTED, 3-POLE, UNO
	MANUAL MOTOR STARTER DISCONNECT
	VARIABLE FREQUENCY DRIVE
	LOW-VOLTAGE PUSH-BUTTON (AUTO-OPENER / SECURITY)
	STOP-START PUSH BUTTON CONTROL STATION
	EMERGENCY POWER OFF BUTTON
	OVERHEAD PADDLE FAN

WIRING DEVICES & BOXES	
	SIMPLEX RECEPTACLE - NEMA 5-20R, UNO
	DUPLEX RECEPTACLE - NEMA 5-20R, UNO
	DOUBLE DUPLEX RECEPTACLE - NEMA 5-20R, UNO
	SPECIAL RECEPTACLE - NEMA TYPE AS NOTED
	GFCI TYPE RECEPTACLE*
	ISOLATED GROUND TYPE RECEPTACLE*
	EMERGENCY RECEPTACLE*
	RECEPTACLE INSTALLED ABOVE COUNTER OR BACKSPLASH*
	RECEPTACLE INSTALLED IN CEILING*
	RECEPTACLE INSTALLED IN FLOOR*
	RECEPTACLE INSTALLED VIA DROP CORD*
	RECEPTACLE LETTER DESIGNATIONS AS FOLLOWS: C = AUTOMATICALLY CONTROLLED D = DEMOLISHED E = EXISTING EM = EMERGENCY POWER ER = EXISTING TO BE RELOCATED GFCI = GROUND-FAULT CIRCUIT INTERRUPTER H = HORIZONTALLY MOUNTED IG = ISOLATED GROUND R = RELOCATED, NEW LOCATION S = MANUALLY SWITCHED TR = TAMPER RESISTANT TV = TELEVISION USB = USB/DUPLEX WP = WEATHER PROOF COVER WR = WEATHER RESISTANT
	JUNCTION BOX/OUTLET BOX

TECHNOLOGY DEVICES & BOXES	
	MULTI-OUTLET ASSEMBLY
	TELEPHONE OUTLET
	DATA OUTLET
	MULTI-SERVICE OUTLET; TELEPHONE AND DATA
	WALL, TYP (W - HANGING PHONE)
	FLOOR, TYP
	MULTI-SERVICE POWER POLE WITH TELEPHONE, DATA AND POWER OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND SPECIFICATIONS
	MULTI-SERVICE FLOOR BOX WITH TELEPHONE, DATA AND POWER OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND SPECIFICATIONS
	POKE THROUGH, A = TYPE, REFER TO PLANS, SCHEDULES AND SPECIFICATIONS
	THERMOSTAT
	DATA/TECHNOLOGY JUNCTION BOX/OUTLET BOX
	LOW-VOLTAGE CABLE JUNCTION BOX/OUTLET BOX
	LOW-VOLTAGE CONTROL PANEL

LIGHTING (REFER TO LIGHT FIXTURE SCHEDULE FOR MORE INFO)	
	LIGHT FIXTURE
	a = SWITCHED BY SWITCH "a"
	A = LIGHT FIXTURE TYPE "A"
	NL = NIGHT LIGHT FIXTURE
	WALL MOUNT
	ARROW INDICATES AIMING DIRECTION
	LIGHT FIXTURE CIRCUITED ON BACK-UP POWER (NOT EGRESS)
	EMERGENCY LIGHT FIXTURE WITH EMERGENCY LIGHTING BATTERY PACK OR CONNECTED TO LIFE-SAFETY GENERATOR CIRCUIT NL = NIGHT LIGHT FIXTURE
	LIGHT FIXTURE WITH DUAL BALLASTS CIRCUITED SEPARATELY (SHADING IMPLIES EMERGENCY LIGHT FIXTURE)
	LIGHTING TRACK WITH LIGHT FIXTURE TYPES AS INDICATED
	EXTERIOR SITE PARKING LOT LIGHT FIXTURE
	EXTERIOR PEDESTRIAN POST TOP LIGHT FIXTURE
	EXTERIOR LIT BOLLARD LIGHT FIXTURE
	EXIT SIGN - CEILING / WALL MOUNTED, ARROWS AS INDICATED, FACE HATCHED
	EMERGENCY LIGHTING UNIT EQUIPMENT WITH BATTERY PACK - CEILING/WALL MOUNTED

ADDITIONAL LETTER DESIGNATIONS AS FOLLOWS:	
D	DEMOLISHED
E	EXISTING
EM	EMERGENCY POWER
ER	EXISTING TO BE RELOCATED
R	RELOCATED, NEW LOCATION

ELECTRICAL ONE-LINE	
	SWITCH (RATING AS INDICATED)
	FUSED SWITCH (RATING, POLES AND FUSE TYPE AS INDICATED)
	CIRCUIT BREAKER (RATINGS AS INDICATED)
	PANELBOARD, SINGLE OR MULTI-SECTION (REFER TO SCHEDULES)
	ISOLATED POWER PANELBOARD W/ INTEGRAL TRANSFORMER (REFER TO SCHEDULES)
	TRANSFORMER (TYPE AND RATINGS AS INDICATED)
	SHIELDED TRANSFORMER (TYPE AND RATINGS AS INDICATED)
	AUTOMATIC TRANSFER SWITCH (RATINGS AS INDICATED)
	AUTOMATIC TRANSFER SWITCH WITH BYPASS (RATINGS AS INDICATED)
	GENERATOR (RATINGS AS INDICATED)
	NON-SEPARATELY DERIVED SOURCE OR SEPARATELY DERIVED SOURCE
	SWITCHGEAR, SWITCHBOARD AND/OR DISTRIBUTION PANELBOARD (TYPE, RATING, DEVICES AND ACCESSORIES AS INDICATED)
	COMBINATION DIGITAL VOLT METER/AMMETER
	CIRCUIT IDENTIFICATION (REFER TO CIRCUIT SCHEDULE)
	GROUND FAULT RELAY
	PHASE FAILURE RELAY
	KIRK-KEY INTERLOCK
	SHUNT-TRIP RELAY
	AMMETER, RANGE AS SPECIFIED OR REQUIRED
	VOLTMETER, RANGE AS SPECIFIED OR INDICATED
	UTILITY METER (AS REQUIRED BY UTILITY)
	CURRENT TRANSFORMER RATING AS SPECIFIED OR REQUIRED
	POTENTIAL TRANSFORMER RATING AS SPECIFIED OR REQUIRED
	TRANSIENT VOLTAGE SURGE SUPPRESSOR
	GROUND CONNECTION
	GROUND CONNECTION WITH TEST WELL
	GROUND CONNECTION AND GROUND ROD
	OPEN / CLOSED CONTACTORS
	HEATER
	MOTOR
	BLOCK LOAD KW OR KVA
	FAULT POINT REFERENCED IN SHORT CIRCUIT CURRENT AND VOLTAGE DROP SPREADSHEET
	CONNECTION POINT OR EQUIPMENT TERMINATION

SHEET LIST	
E0.0	ELECTRICAL COVER SHEET
E1.1	ELECTRICAL SITE AND AREA PLAN
E2.1	ELECTRICAL POWER PLAN
E4.1	ELECTRICAL ONE-LINE DIAGRAM AND CALCULATIONS
E5.1	ELECTRICAL SPECIFICATIONS 1
E5.2	ELECTRICAL SPECIFICATIONS 2

PROJECT SCOPE	
THIS PROJECT SCOPE IS TO UPGRADE AND REPAIR THE ELECTRICAL DISTRIBUTION SYSTEM TO 13 RV SPACES AT RANCHO SONORAN INN AND RV PARK NEAR FLORENCE, AZ, PERMITTING IS COMPLETED BY PINAL COUNTY AND UTILITY CONNECTIONS SHALL BE COMPLETED BY SAN-CARLOS IRRIGATION PROJECT.	
<p>PROJECT NOTES</p> <ol style="list-style-type: none"> PROVIDE ALL CONTRACTORS A COMPLETE SET OF FULL-SIZE CONSTRUCTION DOCUMENTS AND FULLY COORDINATE REQUIRED WORK WITH PROJECT TRADES. 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 REPRESENT THE GENERAL SCOPE OF THE WORK AS IT PERTAINS TO THE ENGINEERED SYSTEMS AT HAND. PRIOR TO PURCHASING ANY PANELS, PROTECTIVE DEVICES, SWITCHES, STARTERS, FUSES, CONDUIT, WIRE, ETC. TO FEED ANY PIECE OF EQUIPMENT VERIFY THE VOLTAGE, PHASE, AND LOAD OF THAT ITEM IN THE FIELD AND CONTACT ENGINEER IF THERE ARE ANY INCONSISTENCIES. VERIFY EXACT LOCATIONS AND ELEVATION OF ALL EQUIPMENT IN THE FIELD WITH THE OWNER PRIOR TO ROUGH-IN. FINAL CONNECTIONS OF EQUIPMENT SHALL BE PER MANUFACTURERS RECOMMENDATIONS. ALL MATERIALS REQUIRED TO PROVIDE FINAL CONNECTION TO THE EQUIPMENT SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. ALL WORK SHALL CONFORM TO THE LATEST EDITIONS OF LOCAL, STATE, AND NATIONAL CODES AND ORDINANCES. DRAWINGS AND SPECIFICATIONS GOVERN WHERE THEY EXCEED CODE REQUIREMENTS. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT ALL PEOPLE AND STRUCTURES FROM DAMAGE, HARM, OR INJURY THROUGHOUT THE COURSE OF CONSTRUCTION. ANY SITE DAMAGES SHALL BE REPAIRED IN KIND WITH NO COST TO THE OWNER. THE CONTRACTOR SHALL EMPLOY QUALIFIED AND EXPERIENCED TRADESPEOPLE FOR THIS WORK. FURNISH ALL LABOR, MATERIALS, TOOLS, ACCESSORIES, ETC. REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM. PROVIDE ALL CIRCUITS WITH AN NEC SIZED GREEN EQUIPMENT GROUNDING CONDUCTOR IN ALL LINE-VOLTAGE RACEWAYS, UPSIZE GROUNDING CONDUCTOR FOR VOLTAGE DROP PER NEC. CABLE LENGTHS WHEN INDICATED ARE APPROXIMATE AND USED FOR ENGINEERING CALCULATIONS ONLY. CONTRACTOR SHALL NOT UTILIZE FOR MATERIAL TAKE-OFFS. MAINTAIN WORKING CLEARANCES AROUND ALL ELECTRICAL EQUIPMENT PER NEC ARTICLE 110. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS, OMISSIONS, AND/OR DISCREPANCIES WITH CONTRACT DOCUMENTS INCLUDING BUT NOT LIMITED TO: DRAWING SHEETS, PUBLISHED SCOPE OF WORK, SPECIFICATIONS, AND/OR CODE REQUIREMENTS. 	
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GENERAL NOTES

- A. REFER TO E0.0 ELECTRICAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES FOR ADDITIONAL INFORMATION BEFORE ESTIMATING OR CONSTRUCTION FROM THIS SHEET.
- B. SEE SHEET E4.1 FOR ONE-LINE DIAGRAM AND ELECTRICAL CALCULATIONS.
- C. PROTECT EXISTING FACILITIES AND EQUIPMENT FROM HARM AND/OR UNAUTHORIZED ACCESS WITH TEMPORARY CONSTRUCTION BARRIERS DURING WORK.

KEYED NOTES

- 1. EXISTING SAN CARLOS IRRIGATION PROJECT (SCIP) OVERHEAD UTILITY POWER DISTRIBUTION LINES.
- 2. EXISTING BELOW GRADE SAN CARLOSE IRRIGATION PROJECT (SCIP) UTILITY POWER DISTRIBUTION.
- 3. LOCATION OF EXISTING SAN CARLOS IRRIGATION PROJECT (SCIP) METER AND DISCONNECT SWITCH.
- 4. LOCATION OF EXISTING SAN CARLOS IRRIGATION PROJECT (SCIP) DISTRIBUTION PANELBOARD AND UTILITY TRANSFORMER.

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PROJECT:

RANCHO SONORAN RV PARK
RV PARK AND MOTEL ELECTRICAL UPGRADES

CLIENTS:

RANCHO SONORAN RV PARK

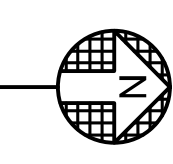
REVISIONS:

DATE: 02/19/2020 ISSUED FOR: PERMIT/CONSTRUCTION

SHEET NAME
ELECTRICAL
SITE AND AREA PLAN

SHEET NUMBER

E1.1





1 ELECTRICAL - POWER PLAN EXISTING
1/16" = 1'-0"



2 ELECTRICAL - POWER PLAN NEW
1/16" = 1'-0"

GENERAL NOTES

- A. SEE ONE-LINE DIAGRAM ON SHEET E4.1 FOR FEEDER WIRE AND CONDUIT SIZES, AS WELL AS ADDITIONAL INFORMATION.
- B. REFER TO E00 'ELECTRICAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES' FOR ADDITIONAL INFORMATION BEFORE ESTIMATING OR CONSTRUCTION FROM THIS SHEET.
- C. PROTECT BUILDINGS, PEOPLE, AND EQUIPMENT FROM HARM AND/OR UNAUTHORIZED ACCESS WITH TEMPORARY CONSTRUCTION BARRIERS DURING WORK.
- D. PROVIDE ALL NECESSARY ITEMS TO MEET THE INSTALLATION REQUIREMENTS AND PROVIDE A FULLY OPERATIONAL SYSTEM.
- E. COMPLY WITH ALL SPECIFICATIONS OUTLINED ON SHEET E5.1, E5.2, AND E5.3.

KEYED NOTES

- 1. EXISTING 50A, 120/240V, 1PH, 3-WIRE, PAD-MOUNTED SAN CARLOS IRRIGATION PROJECT (SCP) UTILITY TRANSFORMER CONNECTED TO THE SECONDARY SIDE OF CAMPUS METER LOCATION. SEE SHEET SITE PLAN ON SHEET E1.1 FOR ADDITIONAL INFORMATION.
- 2. EXISTING ELECTRICAL PANELBOARD 'PANEL B' INSTALLED ON A FABRICATED 'H' FRAME. SEE PANELBOARD SCHEDULES ON SHEET E4.1 AND ONE-LINE DIAGRAM ON SHEET E4.1 FOR ADDITIONAL INFORMATION.
- 3. EXISTING RV PEDESTAL WITH A 50A, 30A, AND 20A RECEPTACLE, BREAKERS FOR EACH RECEPTACLE, AND LOCAL kWh CUSTOMER METER TO REMAIN.
- 4. EXISTING RV PEDESTAL WITH A 30A, AND 20A RECEPTACLE, BREAKERS FOR EACH RECEPTACLE, AND LOCAL kWh CUSTOMER METER TO BE DEMOLISHED.
- 5. EXISTING ELECTRICAL FEEDER TO RV PEDESTALS TO BE DEMOLISHED.
- 6. EXISTING BELOW GRADE ELECTRICAL FEEDER TO RV PEDESTALS TO REMAIN, IF NOT INSTALLED WITHIN CONDUIT, HAS HIGH RESISTANCE, OR IS IN POOR CONDITION, REMOVE AND REPLACE WITH NEW FEEDER INDICATED IN THE ONE-LINE DIAGRAM ON SHEET E4.1.
- 7. EXISTING 20A CIRCUIT TO WIFI ANTENNA MOUNTED ON TELEPHONE POLE TO REMAIN.
- 8. EXISTING 20A CIRCUIT TO LOW-LEVEL SITE LIGHTING FIXTURES TO REMAIN.
- 9. EXISTING LOW-LEVEL SITE LIGHTING WITH PHOTOCELL ON/OFF CONTROL TO REMAIN.
- 10. PROVIDE NEW ELECTRICAL FEEDER PER ONE-LINE DIAGRAM A MINIMUM OF 18" BELOW GRADE TO EXISTING RV PEDESTALS INDICATED. SEE ONE-LINE DIAGRAM ON SHEET E4.1 FOR ADDITIONAL INFORMATION.
- 11. NEW 50A RV PEDESTAL WITH A 50A, 30A, AND 20A RECEPTACLE, BREAKERS FOR EACH RECEPTACLE, AND LOCAL kWh CUSTOMER METER.

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PROJECT:

RANCHO SONORAN RV PARK
RV PARK AND MOTEL ELECTRICAL UPGRADES

CLIENTS:

RANCHO SONORAN RV PARK

REVISIONS:

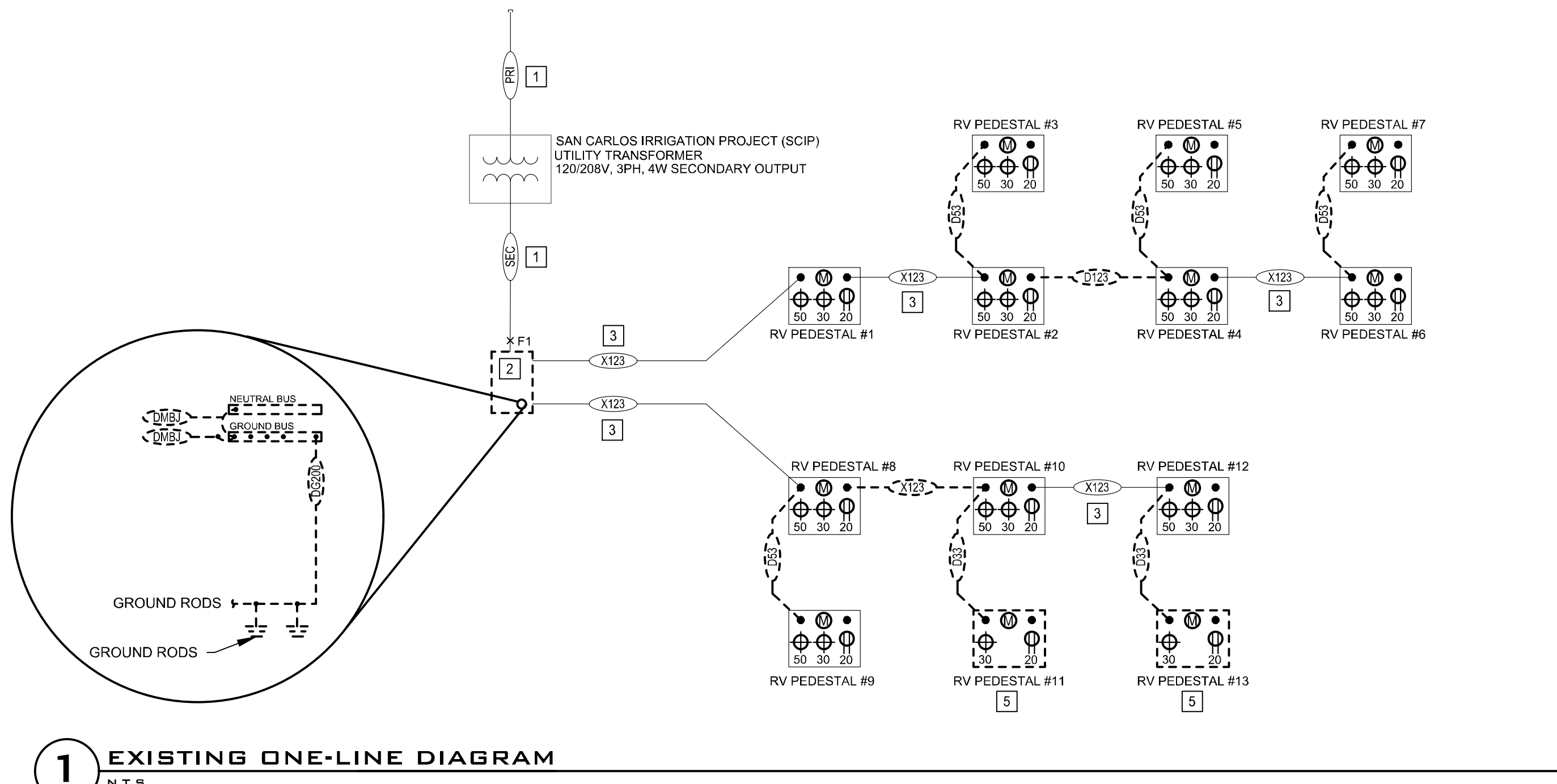
DATE: 02/19/2020
ISSUED FOR: PERMIT/CONSTRUCTION

SHEET NAME
ELECTRICAL
POWER PLAN

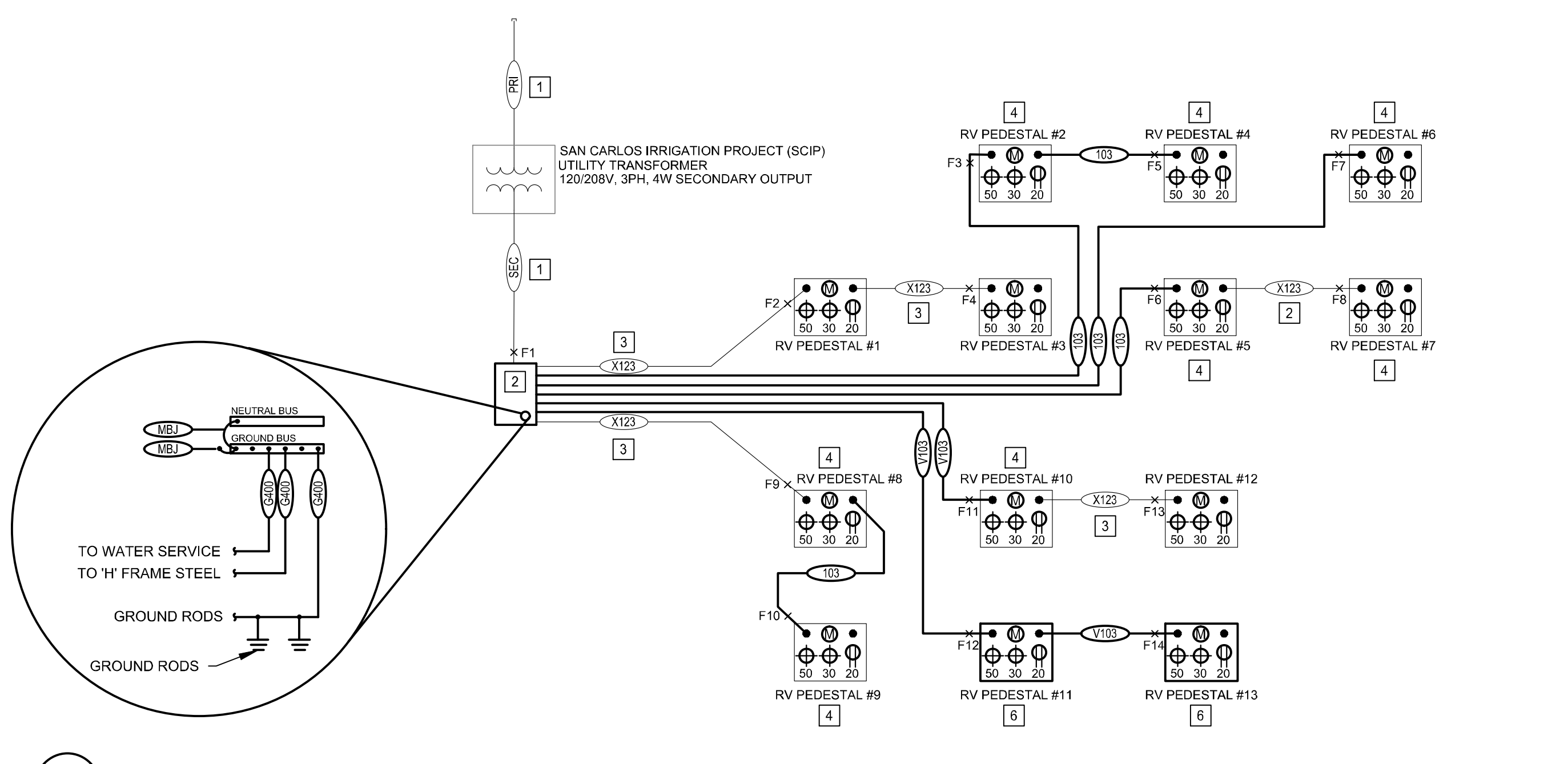
SHEET NUMBER

E2.1

ELECTRICAL PANEL SCHEDULE												EXISTING	
PANEL: A												35,000 AIC	
AMPS:	400	BUS TYPE:		COPPER		LOCATION:		SITE		AIC RATING:			
VOLTS:	2	MAIN SIZE:		400		MOUNTING:		H' FRAME		RATING TYPE:		FULLY-RATED	
PHASEWIRE:	1-PHASE, 3-WIRE	MAIN TYPE:		BREAKER		NEMA RATING:		NEMA 3R					
LOAD TYPE	EMT	COPPER	PHASE	CIRCUIT	CIR	LOAD	PHASE	CIR	CIRCUIT	PHASE	COPPER	EMT	LOAD
DESCRIPTION	CONDUIT	GROUND	NEUTRAL	BREAKER	NO.	AMPS	B	NO.	BREAKER	NEUTRAL	GROUND	CONDUIT	DESCRIPTION
PANEL	OL	OL	OL	1	1	100.0			2	0	OL	OL	PANEL
RV PEDESTAL 1 & 3	OL	OL	OL	3	3	100.0			4	0	OL	OL	RV PEDESTAL 2 & 4
PANEL	OL	OL	OL										PANEL
RV PEDESTAL 5 & 7	OL	OL	OL										RV PEDESTAL 6
PANEL	OL	OL	OL	0	7	100.0			8	0	OL	OL	PANEL
RV PEDESTAL 8 & 9	OL	OL	OL	0	9	100.0			10	0	OL	OL	RV PEDESTAL 10 & 11
PANEL	OL	OL	OL	0	11	100.0			12	0	OL	OL	PANEL
MISCELLANEOUS	OL	OL	OL	0	13	10.0			14	0	OL	OL	RV PEDESTAL 11 & 14
WIFI ANTENNA	OL	OL	OL	0	15	50.0			16	0	OL	OL	PANEL
EXTERIOR LIGHTING	OL	OL	OL	0	17	0.0			18	0			
SITE LIGHTING	OL	OL	OL	0	19	0.0			20	0			
				0	21	0.0			22	0			
				0	23	0.0			24	0			
				0	25	0.0			26	0			
				0	27	0.0			28	0			
				0	29	0.0			30	0			
				0	31	0.0			32	0			
				0	33	0.0			34	0			
				0	35	0.0			36	0			
				0	37	0.0			38	0			
				0	39	0.0			40	0			
				0	41	0.0			42	0			
				0	42	0.0							
AMPS PER PHASE (CONNECTED LOAD)						660.0		655.0	PANELBOARD FEATURES				
TOTAL CONNECTED LOAD						657.5			OL	SEE ONE-LINE DIAGRAM FOR INFORMATION			
LOAD TYPE						DIVERSITY FACTOR							
INTERIOR LIGHTING	0	1.25	CONTINUOUS LOAD		0.0								
EXTERIOR LIGHTING	600	1.25	CONTINUOUS LOAD		750.0								
SHOW WINDOW	0	1.25	CONTINUOUS LOAD		0.0								
RECEPTACLES	0	10,000 @ 1.00 / REST AT .50		0.0									
MECHANICAL	0	1.00	CONNECTED LOAD		0.0								
MOTORS	0	1.00	CONNECTED LOAD		0.0								
LARGEST MOTOR	0	1.25	LARGEST MOTOR		0.0								
MISCELLANEOUS	1200	1.00	CONNECTED LOAD		1200.0								
KITCHEN	0		ARTICLE 220.56		0.0								
EXISTING	0	1.25	SAFETY FACTOR		0.0								
PANEL (RV PEDESTAL)	156000	0.48	ARTICLE 551.73		74880.0								
TOTAL CODE VA						76830.0							
TOTAL CODE AMPS						320.1							
MOTOR LOAD AS A % OF TOTAL													



1 EXISTING ONE-LINE DIAGRAM
N.T.S.



1 EXISTING ONE-LINE DIAGRAM
N.T.S.

Short-Circuit and Voltage Drop Calculations

Distances are for calculation purposes only and shall not be used for contractor takeoffs nor bidding - Contractor shall notify Engineer of any field condition that results in a change of 10% or greater circuit distance

The following calculations are based on the "Point-by-Point" method where:

$$ISC_{(3)} = ISC_{(1)} \times M_{(1)}$$

$$ISC_{(1)} = \text{short circuit current at fault point 1}$$

$$ISC_{(2)} = \text{short circuit current at fault point 2}$$

$$M = 1/(1+f)$$

$$\text{Feeder: } f_{(30)} = \frac{1.73 \times L \times I_{sc}}{C \times E}$$

$$\text{Feeder: } f_{(10)} = \frac{2 \times L \times I_{sc}}{C \times E}$$

$$\text{XFMR: } f_{(30)} = \frac{IP \times I_{sc} \times V_p \times 1.73 \times \%Z}{100,000 \times KVA}$$

$$\text{XFMR: } f_{(10)} = \frac{IP \times I_{sc} \times V_p \times \%Z}{100,000 \times KVA}$$

$$IS_{(30)} = \frac{V_p \times M \times IP_{(30)}}{V_s}$$

VOLTAGE DROP (3Ø):

$$\%VD = ((R \times \cos(\arccos(pf))) + X \times \sin(\arccos(pf))) \times L \times I \times 1.73 / E$$

VOLTAGE DROP (1Ø):

$$\%VD = ((R \times \cos(\arccos(pf))) + X \times \sin(\arccos(pf))) \times 2 \times L \times I / E$$

%VD CUM= Cumulative Voltage Drop from Fault Point 1 to Fault Point #

R= resistance in ohms per LF

X= reactances in ohms per LF

Fault Point (F#)	Bus/Feeder Description	Source (Fault Point)	Phase	Source I _{sc} (amps)	Conduit Type/ TX	Material	Feeder Quantity of Parallel Sets and Bus/Phase & Neutral Size	Conductor 'C' Value	Busway 'C' Value	L-L Voltage (E)	Circuit Length (L)	Load Power Factor (pf)	Circuit Load (Amperage)	Conductor			Transformer				f	M	Fault Current (amps)	Voltage Drop (%VD)	Cumulative Drop (%VD)	Fault Point (F#)	
														Resistance (R)	Reactance (X)	Arccos (pf) (Radians)	Type	Degree Rise	kVA	New X _{tr} Z							Existing X _{tr} Z
1	Utility Service Point	28,539																								1	
2	Motor Contribution	100 The connected full load motor amps (includes compressors) on the system																									
3	Pedestal 1	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	60	0.9	90	0.000160	0.000043	0.451027											2
4	Pedestal 2	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	80	0.9	50	0.000160	0.000043	0.451027											3
5	Pedestal 3	2	1	9727	NM	AL	1 Set(s) of 1 AWG	4678	--	240	30	0.9	50	0.000250	0.000046	0.451027											4
6	Pedestal 4	3	1	7960	NM	AL	1 Set(s) of 1 AWG	4678	--	240	50	0.9	90	0.000250	0.000046	0.451027											5
7	Pedestal 5	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	120	0.9	50	0.000160	0.000043	0.451027											6
8	Pedestal 6	1	1	29139	NM	AL	1 Set(s) of 1 AWG	4678	--	240	150	0.9	90	0.000250	0.000046	0.451027											7
9	Pedestal 7	6	1	5838	NM	AL	1 Set(s) of 1 AWG	4678	--	240	50	0.9	90	0.000250	0.000046	0.451027											8
10	Pedestal 8	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	220	0.9	50	0.000160	0.000043	0.451027											9
11	Pedestal 9	9	1	3504	NM	AL	1 Set(s) of 1 AWG	4678	--	240	30	0.9	90	0.000250	0.000046	0.451027											10
12	Pedestal 10	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	240	0.9	50	0.000160	0.000043	0.451027											11
13	Pedestal 11	1	1	29139	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	260	0.9	90	0.000160	0.000043	0.451027											12
14	Pedestal 12	11	1	3244	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	50	0.9	50	0.000160	0.000043	0.451027											13
15	Pedestal 13	12	1	3020	NM	AL	1 Set(s) of 2/0 AWG	7301	--	240	75	0.9	50	0.000160	0.000043	0.451027											14



1 RV PEDESTAL
N.T.S.

GENERAL NOTES

- ALL TERMINATIONS SHALL BE RATED FOR THE SAME TEMPERATURE AND MATERIAL AS THE CONDUCTOR.
- REFER TO E0.0 ELECTRICAL SYMBOLS, ABBREVIATIONS, AND GENERAL NOTES FOR ADDITIONAL INFORMATION BEFORE ESTIMATING OR CONSTRUCTION FROM THIS SHEET.
- COMPLY WITH ALL SPECIFICATIONS OUTLINED ON SHEET ES.1, ES.2, AND ES.3.
- PROVIDE ALL NECESSARY ITEMS TO MEET THE INSTALLATION REQUIREMENTS AND PROVIDE A FULLY OPERATIONAL SYSTEM.

FEEDER LEGEND

- FRI** EXISTING PRIMARY ELECTRICAL UTILITY SERVICE LATERAL WITH UTILITY INSTALLED CONDUCTORS
- SEC** EXISTING SECONDARY ELECTRICAL SERVICE CONDUCTORS IN EXISTING 2" CONDUIT MAINTAINED BY SAN CARLOS IRRIGATION PROJECT (SCIP)
- MBJ** EXISTING MAIN BONDING JUMPER TO BE DEMOLISHED
- GE** EXISTING GROUNDING ELECTRODE CONDUCTOR TO BE DEMOLISHED
- 30A** EXISTING 30A, (3) #10 AL, (1) #10 GROUND IN 3/4" SCHEDULE 40 PVC CONDUIT TO BE DEMOLISHED
- 50A** EXISTING 50A, (3) #2 AL, (1) #6 GROUND IN 1-1/4" SCHEDULE 40 PVC CONDUIT TO BE DEMOLISHED
- 125A** EXISTING 125A, (3) #2/0 AL, (1) #4 GROUND IN 2" SCHEDULE 40 PVC CONDUIT TO BE DEMOLISHED
- X123** EXISTING 125A, (3) #2/0 AL, (1) #4 GROUND IN 2" SCHEDULE 40 PVC CONDUIT
- MBJ** NEW MANUFACTURER INSTALLED MAIN BONDING JUMPER
- G400** NEW #1/0 COPPER GROUNDING ELECTRODE CONDUCTOR
- 123** NEW 100A, (3) #1 AL, (1) #6 GROUND IN 1-1/4" SCHEDULE 40 PVC CONDUIT OR NEW 100A, (3) #3 CU, (1) #6 GROUND IN 1-1/4" SCHEDULE 40 PVC CONDUIT
- X123** NEW 100A, (3) #2/0 AL, (1) #4 GROUND IN 1-1/2" SCHEDULE 40 PVC CONDUIT OR NEW 100A, (3) #1 CU, (1) #6 GROUND IN 1-1/2" SCHEDULE 40 PVC CONDUIT UPSIZED FOR VOLTAGE DROP

KEYED NOTES

- PRIMARY AND SECONDARY UTILITY TRANSFORMER CONNECTIONS ARE INSTALLED, MAINTAINED, AND THE RESPONSIBILITY OF THE SERVING UTILITY (SAN-CARLOS IRRIGATION PROJECT - SCIP). CONTRACTOR SHALL COORDINATE AND PROVIDE THESE DRAWINGS TO THE SERVING UTILITY FOR REVIEW AND APPROVAL. CONTRACTOR SHALL RECEIVE INSPECTION AND APPROVAL FROM THE SERVING UTILITY PRIOR TO DISCONNECTING OR SUPPLYING POWER TO THE ELECTRICAL SYSTEM.
- REMOVE EXISTING 200A, 120/240V, 1-PHASE, 3-WIRE, 24 CIRCUIT, NEMA 3R ELECTRICAL PANELBOARD. REPLACE WITH NEW 400A, 120/240V, 1-PHASE, 3-WIRE, 42 CIRCUIT, NEMA 3R ELECTRICAL PANELBOARD. SEE PANELBOARD SCHEDULE ON THIS SHEET FOR ADDITIONAL INFORMATION.
- CONTRACTOR SHALL VERIFY SIZE, CONDITION, AND INSTALLATION OF EXISTING CONDUCTORS TO ENSURE IT MEETS THE REQUIREMENTS OUTLINED IN THE FEEDER SCHEDULE ABOVE, IF IT DOES NOT REPLACE WITH NEW FEEDER (103).
- NEW FEEDERS HAVE BEEN SIZED USING ALUMINUM AND COPPER CONDUCTORS. CONTRACTOR SHALL VERIFY METAL COMPATIBILITY WITH LUGS IN RV PEDESTAL PRIOR TO ORDERING WIRE OR TERMINATING.
- EXISTING 50A RV PEDESTAL WITH A 30A, AND 20A RECEPTACLE, BREAKERS FOR EACH RECEPTACLE, AND LOCAL kWh CUSTOMER METER TO BE DEMOLISHED.
- NEW 50A RV PEDESTAL WITH A 50A, 30A, AND 20A RECEPTACLE, BREAKERS FOR EACH RECEPTACLE, AND LOCAL kWh CUSTOMER METER. ELECTRICAL COMPONENTS OF RECEPTACLE SHALL BE AT LEAST 24" ABOVE FINISHED GRADE. SEE DETAIL 3 ON THIS SHEET FOR ADDITIONAL DETAILS.

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PROJECT:

RANCHO SONORAN RV PARK

RV PARK AND MOTEL ELECTRICAL UPGRADES

CLIENTS:

RANCHO SONORAN RV PARK

RV PARK AND MOTEL ELECTRICAL UPGRADES

REVISIONS:

DATE: 02/19/2020 ISSUED FOR: PERMIT/CONSTRUCTION

SHEET NAME
ELECTRICAL
ONE-LINE DIAGRAM AND
CALCULATIONS

SHEET NUMBER

E4.1

GENERAL ELECTRICAL REQUIREMENTS

A. General Requirements

- All requirements under the architects general and supplementary conditions, if provided, apply to this section.
- Where the requirements of this section and division exceed those of the general and supplementary conditions, the requirements of this section take precedence
- Become thoroughly familiar with all of its contents as to requirements that affect this section.
- 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 reasonably inferred to be necessary to facilitate the function of the system and design intent.
- 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
- In the event of discrepancies between specifications and drawings, notify the engineer and request clarification prior to proceeding with the work involved.
- Limitations to drawings:
 - Drawings are graphic representations of the work upon which the contract is based. Drawings show the materials and their relationship to one another, including sizes, shapes, locations, and connections.
 - Drawings 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.
 - 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, which when installed per manufacturers' requirements, will ensure a complete, coordinated, and properly operating system.
 - Exact location of any component shall be confirmed and/or dimensioned by architect prior to rough-in. Do not rely on engineer to provide any exact locations.

B. Definitions

- Abbreviations/Acronyms:
 - AHJ (Authority Having Jurisdiction):** The local code and/or inspection agency (Authority) Having Jurisdiction over the Work.
 - EPDM:** Ethylene-Propylene-Diene-Terpolymer Rubber, used as a highly effective chemical and insulating material and vibration isolator.
 - NBR:** Acrylonitrile-Butadiene Rubber
 - 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.
 - PCF:** Pounds per Cubic Foot
- Trade/Industry Terminology:
 - Architect:** Registered design professional responsible for the overall structural concept of the facility constructed under this scope of work. In addition the Architect is typically the central authority for full design team and is the primary point of contact for coordination with the design team. Coordination of exact placement of any product or item associated with the division 26 specifications shall be coordinated with the Architect.
 - Approved equal:** Used synonymously with Equivalent and/or Equal, 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 and/or Architect assigned to this project.
 - 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, Contractor, and/or Owner. 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.
 - Furnish:** "to supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."
 - Furnished by Owner 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."
 - Header:** "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."
 - 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."
 - Provide:** "to furnish and install."
 - 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.
 - Value Engineering:** A systematic method to improve the "value" of goods and services by using an examination of function. Value, as defined, is the ratio of function to cost. Value can therefore be increased by either improving the function or reducing the cost. The goal of VE is to achieve the desired function at the lowest overall cost consistent with required performance.

C. Material and Workmanship

- Unless indicated otherwise on the Drawings, provide all material and equipment new, of the best quality and design, free from defects and imperfections and with markings or a nameplate identifying the manufacturer and providing sufficient reference to establish quality, size and capacity. Provide all material and equipment of the same type from the same manufacturer whenever practicable.
- 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 numbers. Vendors shall confirm product with submittals prior to ordering.
- 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 specified.
- Unless specified otherwise, manufactured items of the same types specified within this Division shall have been installed and used, without modification, renovation, or repair for not less than one year prior to date of bidding for this Project.
- Install all Work in strict conformance with all manufacturers' requirements and recommendations, unless these Documents exceed those requirements.
- Install all equipment and materials in a neat and professional manner, aligned, leveled, and adjusted for satisfactory operation, in accordance with NECA 1 (latest edition), "Standard Practices for Good Workmanship in Electrical Construction".
- All workmanship shall be of the finest possible by experienced mechanics of the proper trade. In general, provide Industrial Specification Grade for all materials and equipment.
- 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.

D. Coordination

- Visit the site and ascertain the conditions to be encountered in installing the Work under this Division, verify all dimensions and locations before purchasing equipment or commencing work, and make due provisions for same in the bid. Failure to comply with this requirement shall not be considered justification for omission, alteration, and incorrect or faulty installation of any of the Work under this Division or for additional compensation for any Work covered by this Division.
- Maintain an Electrical Foreman at the job site to coordinate electrical work with the following:
 - Construction Drawings and Specification Sections of other trades
 - Relevant equipment drawings, shop drawings, and submittal documents to determine the extent of clear spaces.
 - Make all offsets required to clear equipment, beams and other structural members, and to facilitate concealing conduit in the manner anticipated in the design.
 - Ensure various system components are installed at the proper time, fit the available space, and allow proper service access.
 - Products are ordered and provided with necessary trim to properly fit the types of ceiling, wall, or floor finishes actually installed.
- 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.
- Figured dimensions by the Architect shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building to confirm, as variations may occur.
- Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection.
- Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.
- Products shall be ordered and provided with necessary trim to properly fit the types of ceiling, wall, or floor finishes actually installed.
- Unless otherwise indicated, the General Contractor shall provide chases and openings in building construction required for installation of the systems specified herein. Contractor shall furnish the General Contractor with information where chases and openings are required.

E. Ordinances and Codes

- Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction.
- 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 amendments and standards as set forth by the following:

a.	IBC	International Building Code
b.	IECC	International Energy Conservation Code
c.	ADA	Americans with Disabilities Act
d.	ANSI	American National Standards Institute
e.	ASTM	American Society of Testing Materials
f.	IES	Illuminating Engineering Society
g.	NEC	National Electrical Code, NFPA 70
h.	NECA	National Electrical Contractors Association
i.	NEMA	National Electrical Manufacturers' Association
j.	NFPA	National Fire Protection Association
k.	OSHA	Occupational Safety and Health Act
l.	UL	Underwriter's Laboratories

- In addition to code sections listed above, Contractor shall comply with rules and regulations of public utilities or municipal departments affected by connection of services, as well as any other local or national codes where applicable.
- Where the contract documents exceed the requirements of the referenced codes, standards, etc., the contract documents shall take precedence.
- Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent.
- Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer for final resolution.
- Procure and pay for permits and licenses required for the accomplishment of the work herein described. **Contractor will be held responsible for any violation of the law.**
- Obtain timely inspections by the constituted authorities having jurisdiction; and, upon final completion of the Work, obtain and deliver to the Owner executed final certificates of acceptance from these authorities having jurisdiction.
- Perform all electrical work in compliance with applicable safety regulations, including OSHA regulations. All safety lights, guards, and warning signs required for the performance of the electrical work shall be provided by the Contractor.

F. Protection of Equipment and Materials

- Store and protect from damage equipment and materials delivered to job site.
- For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces.
- For other materials and equipment, cover with waterproof, tear-resistant, heavy tarp or polyethylene plastic as required to protect from plaster, dirt, paint, water, or physical damage.
- Equipment and material damaged by construction activities shall be rejected, and Contractor shall furnish new equipment and material of a like kind at his own expense.
- Keep premises broom clean of foreign material created during work performed under this contract.
- Conduit, equipment, etc. shall have a neat and clean appearance at the termination of the work.
- 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.

G. Submittals

- Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contractors under this contract.
- Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the design concept.
- 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 manufacturer recommended service clearances.
- If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.
- Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time, plus to/from mailing time via the Architect, plus a duplication of this time for re-submittals, if required.
- Update submittals to verify upon approval of substitution requests all required components will accommodate the substituted product.
- Submittals shall contain:
 - The project name
 - Applicable specification section
 - Submittal data
 - Equipment identifications acronym as used on the drawings
 - Contractors review stamp to certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades.
 - Shop drawings
 - Product data
 - Performance sheets
 - Highlight, mark, list, or indicate the materials, performance criteria, and accessories that are being proposed.
- Requirements to prevent submittal rejection:
 - Submittals and shop drawings shall not contain firm name, logo, the seal, or signature of the Engineer.
 - They shall not be copies of the work product of the Engineer.
 - Separate submittals according to individual specification sections
 - Illegible submittals will be rejected and returned without review
 - Catalog data shall be properly bound, identified, indexed and tabbed
 - 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.
- Electronic Submittals:
 - Contractor shall notify the Architect and Engineer that the submittals have been posted.
 - Contractor shall include the website, user name, and password information needed to access the submittals.
 - For submittals sent by e-mail, Contractor shall copy the designated representatives of the Architect and Engineer.
 - Contractor shall allow two weeks for the Engineer review time as specified above.
- 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 written acceptance from the Engineer and Architect prior to implementing any deviation.
- Review of submittals are considered the Engineers last opportunity to provide final verification that elements represented on contract documents are accurate. Rarely Engineer may request coordination with contractor to implement a product not originally specified in the contract documents. This adjustment shall not incur additional fees beyond the change in 'product' cost only not 'product and labor' cost.
- If Contractor fails to provide submittals prior to ordering or installing any specified or substituted products, he/she they waives and releases the engineer from any and all responsibility for the proper fit, performance, and/or safety of the specified product.

H. Substitutions

- Materials, products, equipment, and systems described in the Bidding Documents are specified as a "Basis of Design" and establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution.
- The burden of proof of the proposed substitution is solely upon the proposer. Reviewer retains the right to request any information deemed necessary to approve the proposed equivalent.
- Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and/or Owner the following:**
 - 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.
 - Proposed substitution is consistent with the Contract Documents and will produce indicated results, including functional clearances, maintenance service, and sourcing of replacement parts.
 - Proposed substitution has received necessary approvals of authorities having jurisdiction.
 - Same warranty will be furnished for proposed substitution as for specified Work.
 - If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that originally specified and bear costs incurred thereby.
 - Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects at contractors expense.

I. Electronic Drawing Files

- Electronic drawing files are the intellectual property of the design professional stated on IED drawings and are covered under United States Copyright Laws.
- Requests for electronic drawing files will be considered on a case by case basis.

- Optimized-LED retains the right to charge for additional usage of the company's intellectual property outside of the original contractual agreement.
- Request shall be made in writing to utilize electronic drawing files for any reason. Email is considered an acceptable form of written request.

J. Record Drawings (As-built Documents)

- During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system.
- Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings.
- If requested in project contract, Contractor may be requested to submit as-built drawings to Engineer to be incorporated into a CAD produced As-Built set.

K. Warranties

- 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 documents or manufacturer's standard warranty exceeds 12 months.
- Remedy all defects occurring within the warranty period(s).
- Warranties shall include labor and material, including travel expenses.
- Make repairs or replacements without any additional costs to the Owner, and to the satisfaction of the Owner, Architect, and Engineer.
- Perform the remedial work promptly, upon written notice from the Owner.
- Also warrant the following additional items:
 - All raceways are free from obstructions, holes, crushing, or breaks of any nature.
 - All raceways seals are effective.
 - The entire electrical system is free from all short circuits and unwanted open circuits and grounds.
- At the time of Substantial Completion, deliver to the Owner all warranties, in writing and 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.
- Each warranty instrument shall be addressed to the Owner and state the commencement date and term.

26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

A. Excavation and Backfilling

- General:
 - Perform excavation of every description, of whatever substance encountered and to the depth required in connection with the installation of the work under this Division.
 - Excavation shall be in conformance with applicable Divisions and sections of the Specifications.
 - Erect barricades around excavations, for safety, and place an adequate number of amber lights on or near the work and keep those burning from dusk to dawn. Be responsible for all damage that any parties may sustain in consequence of neglecting the necessary precautions in prosecuting the work.
 - Install sediment and erosion control measures in accordance with local codes and ordinances.
 - Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
 - Continue all such "home run" wiring to the designated panelboard, as though "circuit runs" were indicated in their entirety.
 - At contractor's discretion circuits may be combined to multi-wire branch circuits (i.e., shared neutral). In these instances, they shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point the branch circuit originates. Multi-pole breakers or 3 single-pole breakers with a handle tie are acceptable means.
 - When multiple home runs are combined into a single raceway the total circuits shall not exceed three and total current carrying conductors including the neutral shall not exceed 4. Unless specifically indicated on the drawings.
- GFCI Protected Circuits:
 - Provide a dedicated neutral and not be shared.
 - Limit the one-way conductor length to 100 feet between the panelboard and the most remote receptacle or load on the GFCI circuit.
- MC Cable
 - Secure and support cable per NFPA 70 Article 330. Secure cable within 12 inches of every box or fitting.
 - Securing and supporting intervals shall not exceed six feet. Maintain consistent spacing to avoid derating due to bundling per NFPA 70 Section 310.15.
 - Utilize steel cable hangers, Arlington SMC series or equivalent, to support wherever possible so cables can be routed in a neat and workmanship like manner.
- Backfill and Compaction
 - Backfill excavations after completion of the following:
 - Inspection, testing, approval, and locations have been recorded.
 - Removal of concrete formwork.
 - Removal of shoring and bracing, and backfilling of voids.
 - Removal of trash and debris.
 - Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
 - Support raceways from permanent structures or undisturbed earth at no less than 10-foot intervals, while placing backfill materials, so that raceways are not deflected, crushed, broken, or otherwise damaged by the backfill placement.
 - Where soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
 - Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557 for cohesion soils and the following percentages of relative density, in accordance with ASTM D 2049 for cohesionless soils:
 - Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
 - Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 95 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

B. Cutting and Patching

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

C. Coincidental Damage

- Repair streets, sidewalks, drives, paving, walls, finishes, and other facilities damaged in the course of this Work.
- Repair materials shall generally match existing construction.
- Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the satisfaction of the Architect.
- Repair work shall be thoroughly first class.

26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. General Requirements

- Provide wiring products for the completion of the work by a manufacturer which complies with the specification requirements of this section.
- Sizes of conductors and cables indicated or specified are in American Wire Gauge (AWG - Brown and Sharpe).
- If no conductor size is indicated on the Drawings for a branch circuit, contact engineer.

B. Conductors

- Single Phase Insulated Conductors
 - Annealed (soft) copper complying with ICEA S-95-658/NEMA WC70 and UL standards 44 or 83 as applicable.
 - Conductor Insulation Types: 90-degree C-rated, Type THHN/THWN-2 or XHHW-2 complying with ICEA S-95-658/NEMA WC70.
 - All feeder and branch circuit conductors No. 8 AWG and larger: Stranded.
 - All conductors, No. 10 AWG and smaller: Solid copper.
 - All Branch Circuit Wiring: Not smaller than No. 12 AWG, except where specifically

- specified in residential projects.

C. Control Wiring

- Stranded copper conductors, 600V insulation
 - Type, size, and number as required to accomplish specified function.
 - Minimum size: No. 14 AWG, unless noted otherwise.
- Flexible Cords and Cables:
 - Stranded copper conductors for all, unless noted otherwise.

D. Terminations

- Tinned, mechanical type only; NRTL-listed for copper and aluminum conductors at 75 degrees C minimum.
- Where aluminum conductors terminate using 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.
- 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.
 - Replace all joints or splices indicating excessive heating.
 - Take measurements with a non_contact type infrared thermometer.

D. Conductor Installation

- General Requirements
 - Install all wiring in approved raceway and enclosures, except:
 - Properly rated low-voltage wiring
 - Where type MC cable is indicated or specified as acceptable.
 - Install all conductors and cables continuous without taps or splices between accessible boxes.
 - 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.
 - 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.
 - At a minimum provide a junction box or accessible location every 360 degrees of conduit bends for pulling and splicing conductors.
 - 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.
 - Voltage drop in branch circuits shall not exceed 3 percent.
 - Home Run:
 - In general, the direction of branch circuit "home run" routing is indicated on the drawings, complete with circuit numbers and panelboard designation.
 - Continue all such "home run" wiring to the designated panelboard, as though "circuit runs" were indicated in their entirety.
 - At contractor's discretion circuits may be combined to multi-wire branch circuits (i.e., shared neutral). In these instances, they shall be provided with a means that will simultaneously disconnect all ungrounded conductors at the point the branch circuit originates. Multi-pole breakers or 3 single-pole breakers with a handle tie are acceptable means.
 - When multiple home runs are combined into a single raceway the total circuits shall not exceed three and total current carrying conductors including the neutral shall not exceed 4. Unless specifically indicated on the drawings.
 - GFCI Protected Circuits:
 - Provide a dedicated neutral and not be shared.
 - Limit the one-way conductor length to 100 feet between the panelboard and the most remote receptacle or load on the GFCI circuit.
 - MC Cable
 - Secure and support cable per NFPA 70 Article 330. Secure cable within 12 inches of every box or fitting.
 - Securing and supporting intervals shall not exceed six feet. Maintain consistent spacing to avoid derating due to bundling per NFPA 70 Section 310.15.
 - Utilize steel cable hangers, Arlington SMC series or equivalent, to support wherever possible so cables can be routed in a neat and workmanship like manner.

26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

A. General Requirements

- Provide raceways, 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 drawings.
- 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.

B. Metallic Conduit and Tubing for Electrical Systems

- Types:
 - Electrical Metallic Tubing, Couplings, and Fittings (EMT): ANSI C80.3, UL 797. Only steel products allowed. Reduced wall EMT is not allowed.
 - Flexible Metal Conduit (FMC): Zinc-coated steel or aluminum, UL 1. Reduced-wall FMC is not allowed.
 - Intermediate Metal Conduit (IMC): Hot-dip Galvanized Rigid Steel Conduit, ANSI C80.6, UL 1242.
 - Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, UL 360; fittings: NEMA FB 1.
 - Hot-dip Galvanized Rigid Steel Conduit (GRS): ANSI C80.1, UL 6.
 - Plastic-Coated IMC, RMC, and Fittings: NEMA RN 1, NRTL listed. Coating thickness of 0.04 inches minimum.
 - IMC and RMC Fittings: NEMA FB 1; compatible with conduit type and material, NRTL listed.

C. Non-Metallic Conduit and Tubing for Electrical Systems

- Types:
 - Rigid Nonmetallic Conduit (RNC): Schedule 40 PVC, 90 deg C rated.
 - Electrical Nonmetallic Tubing (ENT): NEMA TC 13, NRTL listed.
 - Liquidtight Flexible Nonmetallic Conduit (LFNC): UL 1660.
 - ENT and LFNC Fittings: Compatible with conduit/tubing type and material, NRTL listed.
- Fittings:
 - NEMA TC 3, TC 6; UL 651, compatible with conduit/tubing type and material, NRTL listed.

D. Outlet Boxes

- Galvanized steel knock-out boxes, suitable in design to the purpose they serve and the space they occupy.
- Size as required for the specific function or as required by NFPA 70, whichever is larger.
- Set all outlet boxes in walls, columns, floors, or ceilings so they are flush with the finished surface, accurately set, and rigidly secured in position. Provide plaster rings, extension rings and/or masonry rings as required for flush mounting.
- Provide approved cast outlet boxes with hubs and weatherproof covers in all areas subject to damp, wet, or harsh conditions.
- Coordinate locations of outlet boxes prior to rough-in, consult architect for exact locations.
- Applications:
 - Light fixture
 - Switch
 - Receptacles

E. Junction and Pull Boxes

- Small sheet metal pull and junction boxes: NEMA OS 1
- Cast-Metal Pull and Junction Boxes
 - NEMA FB1
 - Cast [Iron] Aluminum with gasketed cover

F. Installation

1. Raceways

- 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.
- 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.
- 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.
- 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.
- Homeruns containing more than one branch circuit shall not be less than 3/4-inch in size.
- 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.
- Align and install true and plumb all raceway terminations at panelboards, switchboards, motor control equipment, and junction boxes.
- Install approved expansion/deflection fittings where raceways pass through (if embedded) or across (if exposed) expansion joints, and when using RNC or RAC in exposed environments in accordance with NFPA 70 and expansion/contraction properties of RNC or RAC.
- 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.

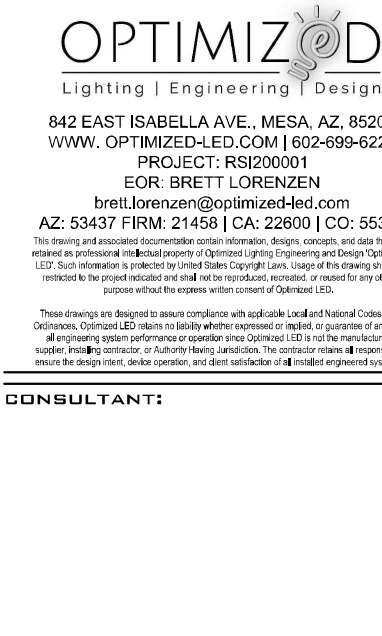
- Make all joints and connections in a manner that will ensure mechanical strength and electrical continuity.

2. Above Ground Raceways

- Install raceways parallel and perpendicular to building lines.
- 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.
- Install all circular raceways concealed above suspended ceilings or concealed in walls or floors wherever possible except where otherwise indicated.
- Provide GRS for all conduits exposed to any forms of damage, physical, chemical, or weather related.
- 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. Do not support raceways from suspended ceiling components.

4. Junction and Outlet Boxes

- Solidly mount all junction boxes to structural elements.
 - Concrete Block Walls: As long as ADA requirements are maintained, dimensions above may be adjusted slightly as required to compensate for variable joint dimensions such that bottom or top of boxes, as applicable, are at block joints.
 - Set all outlet boxes in walls, columns, floors, or ceilings so they are flush with the finished surface, accurately set, and rigidly secured in position. Provide plaster rings, extension rings and/or masonry rings as required for flush mounting.
 - Unless noted otherwise, install wiring devices vertically aligned at height indicated on construction drawings.
- Equipment Connections
 - 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.
 - Bushings and Locknuts
 - 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.
 - Provide bushings and locknuts made of galvanized malleable iron with sharp, clean-cut threads.
 - Where EMT enters a box, provide approved EMT compression connectors.
 - Use insulated, grounding, or combination bushings wherever connection is subject to vibration or moisture, when required by NFPA 70.



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PROJECT:

CLIENTS:

REVISIONS:

DATE:

ISSUED FOR:

SHEET NAME

ELECTRICAL

SPECIFICATIONS 1

SHEET NUMBER

E5.1

26 20 00 - LOW-VOLTAGE ELECTRICAL DISTRIBUTION

26 21 00 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

A. General Requirements

- See one-line diagram for the following information:
 - Equipment Type
 - Size
 - Voltage
 - Phase
 - NEMA Ratings
 - Existing or New Equipment
- Site voltage verification:
 - Coordinate with the serving utility to ensure that provided voltage at project site is within acceptable limits (+/- 2.5%).
 - Arrange correcting means with the serving utility prior to installation to provide proper regulation voltage to the project site.
 - Submit to the Owner a report of maximum and minimum voltage and a copy of the recording voltmeter chart.

B. Connection to Serving Utilities

- Contractor shall provide and install all required raceways, terminations, and miscellaneous equipment as required for electrical service connection by the serving utility.
- Contractor shall become fully acquainted with serving utility installation guide, applicable codes in the jurisdiction, and install in strict compliance with such guidelines.
- Contractor shall fully understand the division of work between the installing contractor and the utility prior to commencing work on-site.
- Contractor shall initiate a new service contract with providing electrical utility within two weeks of notice to proceed.
- Contractor shall pay all applicable charges required by the serving electrical utility.
- Contractor shall complete and provide necessary information to the utility company without delay. If concern about missing information arises contact the electrical engineer. Required information may include but is not limited to:
 - Site Plan
 - One-Line Diagram
 - Load calculations
 - Load calculation forms
 - Load readings
 - Submittal documentation
- Contractor shall order electrical service with proper metering provisions that meet the requirements of the serving electrical utility.

C. Grounding

- Permanently and effectively ground and bond the electrical installation in a thorough and efficient manner.
- All grounding shall meet or exceed the requirements of NFPA.
- Where grounding on plans indicates grounding above minimum code requirements, drawings shall take precedence.
- Use bare or green insulated conductors as specified herein, and other materials indicated on the Drawings.

D. POWER DISTRIBUTION PANELBOARDS - CIRCUIT BREAKER

- Panelboards:
 - Dead-front distribution panelboards with number and sizes of circuit breakers as indicated on the drawings.
 - Provide meter connections and meter compliant with serving utility company.
 - Number and sizes of circuit breakers as indicated on the drawings.
 - Where required, equipment permanently label as suitable for use as service entrance equipment
 - Fully-rated for the available fault current indicated on the drawings
 - Hinged, lockable front door that covers the circuit breaker handles.
 - Short circuit interrupting and bracing rating shall exceed the maximum calculated fault-current value indicated on the drawings.
 - Provide card holder for circuit identification at each feeder overcurrent protection device. Label according to one-line diagram.
 - Propagate with quantity and type of overcurrent protection devices indicated on the drawings and in accordance with specification section "LOW-VOLTAGE PROTECTIVE DEVICES".
 - Label equipment and overcurrent protection devices in accordance section "EQUIPMENT LABELING".
- Circuit breakers:
 - Quick-make, quick-break, Bolt-on type
 - Engraved nameplates for circuit identification of each circuit breaker.

26 27 00 - LOW-VOLTAGE DISTRIBUTION EQUIPMENT

A. Wiring Devices

- General Requirements
 - The catalog numbers listed for wiring devices are generally for 20A rated devices.
 - Where 15A rated devices are indicated on the drawings or required for circuit rating limitations, provide wiring devices equivalent to those specified for 20A, but rated for 15A.
 - All receptacles located outdoors or in damp or wet locations: Listed as 'weather Resistant', designated by a 'WR' on the faceplate.
 - Minor changes relative to the location of electrical equipment may be made to comply with structural and building requirements as determined in the course of construction, but do not move more than 12" horizontally.
 - Contractor shall provide all wiring devices of the same manufacturer and not mixed on the project, to the maximum extent possible. Provide color of toggles and receptacles as requested by the Engineer.
- Receptacles
 - General Duplex Receptacle
 - General Quadplex Receptacle
 - GFCI Duplex Receptacle
 - GFCI Double Duplex Receptacle
 - Arc-Fault Receptacle
 - Wireless Control Receptacle
 - Tamper Resistant Receptacle
 - Water Resistant Receptacle
 - 30A 3 pin receptacle
 - 50A 4-pin receptacle

B. Cover Plates

- General Requirements
 - Contractor shall provide cover plates by the same manufacturer as the wiring devices; complying with NFPA 70 ARTICLES 406.9 (A) or (B).
- Outdoor Wet Applicaitons
 - Provide GFCI receptacles for designated weatherproof receptacles, unless indicated otherwise on the drawings.
 - In-use, NEMA 3R, recessed or flush mount, NRTL labeled plates molded from a clear high impact ultraviolet stabilized polycarbonate material for easy verification that cords are plugged in and that the GFCI is functioning.
 - Back box must be suitable for conduit connecting. Coordinate back box with wall depth.
 - Basis of Design: Intermatic WP1000RC/HRC or equal.

H. Installation

- General Requirments

- Solidly mount all junction boxes to structural elements.
 - Concrete Block Walls: As long as ADA requirements are maintained, dimensions above may be adjusted slightly as required to compensate for variable joint dimensions such that bottom of top of boxes, as applicable, are at block joints.
- Outlet Boxes
 - Set all outlet boxes in walls, columns, floors, or ceilings so they are flush with the finished surface, accurately set, and rigidly secured in position. Provide plaster rings, extension rings and/or masonry rings as required for flush mounting.
 - Unless noted otherwise, install wiring devices vertically aligned at height indicated on construction drawings.

J. Mounting

- See Electrical Cover Sheet for specific mounting heights if not called out elsewhere in the drawings.
- Receptacles:
 - Unless indicated otherwise, install vertically with the ground slot mounted at the bottom.
 - Where installed horizontally, install with the neutral slot mounted at the top.
 - Above counter: mount vertically aligned.
 - Mechanical and electrical equipment rooms and janitors closets: mount vertically aligned.
 - Garages: mount vertically aligned.
 - Weatherproof exterior receptacles: vertically aligned.
 - GFCI receptacles: Same as general receptacles.
 - Isolated ground receptacles: Same as general receptacles.

26 28 00 - LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES

A. Circuit Breakers

- General Requirements
 - Comply with:
 - UL 489
 - NEMA AB1
 - NEMA AB3
 - Short Circuit Interrupting capacity shall exceed the value indicated on the drawings
 - Engraved nameplates for circuit identification of each circuit breaker in accordance with specification section "IDENTIFICATION OF ELECTRICAL SYSTEMS".
- Molded-Case Thermal Magnetic breakers:
 - Quick-make, quick-break, Bolt-on type
 - Standard frame, trip, and number of poles
 - inverse time-current element for low-level overloads
 - Magnetic trip element for short circuits
 - Magnetic element shall be adjustable for breakers over 250A.
- Types:
 - SWD Circuit Breakers:
 - Use when breaker serves as a switch for 120V or 277V lighting circuits.
 - GFCI Circuit Breakers:
 - Single- and two-pole configurations with Class A ground-fault protection (6-mA trip). Use as indicated on drawings.
 - Standard frame, trip, and number of poles
 - Class A ground fault 6mA trip
 - Ground-Fault Equipment Protection (GFEP) Circuit Breakers:
 - Class B ground-fault protection (30-mA trip). Use as indicated on drawings.
 - Arc-Fault (AF) Circuit Breakers:
 - Provide arc-fault hazard circuit breaker where indicated in panelboard for residential projects.
- Accessories
 - Handle Tie
 - Kirk-Key Device
 - Circuit Hold-On Device
 - Circuit Lock-Off Provisions
- Circuit Breakers in Existing Panelboards/Switchboards
 - Provide new circuit breakers for installation in existing panelboards of the same manufacturer and type as the existing panelboard circuit breakers
 - Short circuit current interrupting rating of any new breakers shall be the larger of the existing panel rating or the available fault current indicted on the drawings.

B. Fuses

- General Requirements
 - Provide each circuit and set of fuse clips throughout the work with sizes and types as required or indicated.
 - All fused devices shall be labeled as to type and size of fuse required.
 - Furnish three spare fuses of each size and type used on the project (except for main switch fuses, furnish one spare), neatly contained in a properly labeled cabinet.
- Types
 - Fuses larger than 600A
 - UL Class L, similar to type KRP-C Bussmann Low Peak or equal.
 - Fuses used to protect motors:
 - UL Class RK5, Bussmann Fusetron or equal.
 - Fuses used to protect all other electrical equipment:
 - UL Class RK1, dual element, Bussmann LPS/LPN or equal.

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PROJECT:

RANCHO SONORAN RV PARK
RV PARK AND MOTEL ELECTRICAL UPGRADES

CLIENTS:

RANCHO SONORAN RV PARK

REVISIONS:

DATE:	ISSUED FOR:
02/19/2020	PERMIT/CONSTRUCTION

SHEET NAME
ELECTRICAL
SPECIFICATIONS 2

SHEET NUMBER

E5.2