ELECTRICAL SYMBOLS

	L SYMBOLS OR ABBREVIATIONS ARE USED	
STANDARD MOLU ANNUNCIATOR PANELS (DISPLAY) CONTROLS (TOP OF DEVICE) EXIT SIGNS (WALL MOUNTED TO BOTTOM) FIRE ALARM ANNUNCIATOR PANEL (DISPLAY) FIRE ALARM BELL (EXTERIOR) (CENTERLINE) FIRE ALARM CONTROL PANEL/UNIT (DISPLAY) PULL STATIONS (TOP OF DEVICE) RECEPTACLES (TO BOTTOM) RECEPTACLES (EXTERIOR) RECEPTACLES (GARAGES) RECEPTACLES (BARAGES) RECEPTACLES (ABOVE COUNTER) RECEPTACLES (ABOVE COUNTER) RECEPTACLES IN EQUIPMENT ROOMS REMOTE INDICATING LIGHT (EQUIPMENT ROOM REMOTE INDICATING LIGHT (FINISHED AREAS) SAFETY SWITCHES (TOP OF DEVICE) SWITCHES (TOP OF DEVICE) TELEPHONE, DATA OUTLETS TELEPHONE TERMINAL BOARD (BOTTOM) TELEVISION OUTLETS FIRE ALARM DEVICES (CENTERLINE)	60" 48" 105" 60" 120" 60" 48" 16" 24" 24" 24" 24" 24" 24" 24" 44" 44"	ANNOTATION 1 1 ELECTRICAL OR FIRE ALARM PLAN NOTE CALLOUT 1 PLUMBING EQUIPMENT DESIGNATION. (CONTRACTOR FURNISHED AND INSTALLED). REFER TO PLUMBING FIXTURE OR EQUIPMENT SCHEDULES 1 EQUIPMENT DESIGNATION (OWNER FURNISHED, CONTRACTOR INSTALLED) Image: CU product of the contract of the
USE THE DEFAULT MOUNTING HEIGHTS SHOWN DOCUMENTS. MOUNTING HEIGHTS LISTED ARE FINISHED GRADE (AFG) TO BOTTOM OF OUTLET COMPLIANCE WITH CURRENT ADA AND LOCAL	E ABOVE FINISHED FLOOR (AFF) OR ABOVE T BOX. ALL DEVICES SHALL BE INSTALLED IN	HOMERUN TO PANELBOARD. INFORMATION AT ARROWS ARE CIRCUIT NUMBERS AND PANELBOARD FOR TERMINATION. REFER TO P1-3,5,7 PANELBOARD SCHEDULES FOR BRANCH CIRCUIT CONDUCTOR SIZES.
AF AMPERE FRAME SIZE AFC ABOVE FINISHED CEILING AFF ABOVE FINISHED GRADE AHJ AUTHORITY HAVING JURISDICTION JURISDICTION AHJ AUTHORITY HAVING JURISDICTION AMPERE INTERRUPTING CAPACITY AS AMPERE SWITCH AT AT AMPERE SWITCH AT AMPERE TELEVISION SYSTEM CATO CABLE TELEVISION SYSTEM CAT CATEGORY CAT CATEGORY CAT CABLE TELEVISION SYSTEM CCTV CABLE TELEVISION SYSTEM CCTV CABLE TELEVISION SYSTEM CTC CCONDUIT CATO CANDELA CKT CRECHT CODE APPLICABLE CODE ADOPTED BY JURISDICTION DOUBLE-POLE, DOUBLE-POLE, SINGLE-THROW (E) EXISTING <	MCB MAIN CIRCUIT BREAKER MCC MOTOR CONTROL CENTER MFR MANUFACTURER MIN MINIMUM MLO MAIN LUGS ONLY MOCP MAXIMUM OVERCURRENT PROTECTION MTD MOUNTED N/A NOT APPLICABLE NF NON-FUSED NL NIGHT LIGHT (24HR ON) NRTL NATIONALLY RECOGNIZED TESTING LABORATORY (CSA,ETL,NSF,UL) OS OCCUPANCY SENSOR P POLE PART PARTIAL CIRCUIT PH/Ø PHASE PNL PANEL PNL PANEL PT POTENTIAL TRANSFORMER GTY QUANITY RCPT RECEPTACLE RELO RELOCATE RLA RUNNING LOAD AMPS RTU ROOFTOP UNIT SCCR SHORT-CIRCUIT CURRENT RATING SD SMOCKE DUCT DETECTOR SF SQUARE FEET SPDT SINGLE-POLE, DOUBLE-THROW ST SHUNT TRIP SWBD SWITCHBOARD SWGR SWITCHBOARD SWORS SWITCHBOARD SWGR SWITCHBOARD SWORS SWITCHBOARD SWORS SWITCHBOARD SWORS SWITCHBOARD SWGR SWITCHBOARD SWORS	CIRCUIT CONTINUATION OR PARTIAL CIRCUIT CONDUIT CONCEALED CONDUIT INVUNDER FLOOR/GROUND CONSTRUCTION EXPOSED CONDUIT OVALTAGE CABLE (NOT ROUTED IN CONDUIT) CONDUIT TURNING DOWN CONDUCT TURNING DOWN CONTACT OF THE STATUS OF THE SOUTCH THE FOLLOWING DINCTORE CONDUCT TURNING DOWN CONDUCT TURNING THE PROVIDED CONTACT TO THE RESPONSED CONTROL PREVERSE CONTROL CONTACT OR CONTROL PHOTOCELL (SHADE INDICATES AMING) CONDUCTOR DOWN CONTACT OR CONTROL PHOTOCELL (SHADE INDICATES AMING) CONTACT OR CONTROL PHOTOCELL (SHADE INDICATES AMING) CONTACT OR CONTROL PHOTOCELL (SHADE INDICATES AMING) CONTROL PHOTOCELL (SHADE INDICATES AMING) CONTACT OR CONTROL PHOTOCELL (SHADE I
		LOWER CASE LETTERS DESIGNATE ZONE TO BE CONTROLLED.

POWER	REQUIPMENT & DEVICES	WIRING	G DEVICES & BOXES	ELECT	RICAL ONE-LINE
	ELECTRICAL PANELBOARD (SURFACE OR FLUSH MOUNT)	φ	SIMPLEX RECEPTACLE - NEMA 5-20R, UNO	1 ##A 3P	SWITCH (RATING AS INDICATED)
	CONTROL SYSTEM CABINET (CONTROLS, SECURITY, A/V)	ф	DUPLEX RECEPTACLE - NEMA 5-20R, UNO		
	PLYWOOD TERMINAL BOARD FOR TELEPHONE SYSTEM, UNO. SIZE AS NOTED	-	DOUBLE DUPLEX RECEPTACLE - NEMA 5-20R, UNO	##AS 3P ##AF	FUSED SWITCH (RATING, POLES AND FUSE TYPE AS INDICATED)
	SWITCHBOARD OR MOTOR CONTROL CENTER ON HOUSEKEEPING PAD	Φ	SPECIAL RECEPTACLE - NEMA TYPE AS NOTED		
	ELECTRICAL DISTRIBUTION PANELBOARD	\$	TWIST-LOCK TYPE RECEPTACLE	\$ ##A	CIRCUIT BREAKER (RATINGS AS INDICATED)
Т	TRANSFORMER	$igtarrow$ or $igtarrow^{ ext{GF}}$	CI GFCI TYPE RECEPTACLE*		
Ø	MOTOR	φ	ISOLATED GROUND TYPE RECEPTACLE*		PANELBOARD, SINGLE OR MULTI-SECTION (REFER TO SCHEDULES
200/3/150/3R	DISCONNECT SWITCH - "200/3/150/3R" DENOTES AMPERES/POLE/FUSE/NEMA ENCLOSURE RATING, NF= NON-FUSED,	or $igodot^{\text{EM}}$	EMERGENCY RECEPTACLE*		ISOLATED POWER PANELBOARD W/ INTEGRAL TRANSFORMER (REFER TO SCHEDULES)
	CB= CIRCUIT BREAKER (200/3/CB), NO VALUE (200/3/150) FOR NEMA ENCLOSURE MEANS STANDARD NEMA 1 RATING	Ф	RECEPTACLE INSTALLED ABOVE COUNTER OR BACKSPLASH*		TRANSFORMER (TYPE AND RATINGS AS INDICATED)
30/3/15/1/3R	COMBINATION DISCONNECT (SAFETY) SWITCH AND MOTOR STARTER "30/3/15/1/3R" DENOTES AMPERES/POLE/FUSE/NEMA STARTER	()	RECEPTACLE INSTALLED IN CEILING*		SHIELDED TRANSFORMER (TYPE AND RATINGS AS INDICATED)
42	SIZE/NEMA ENCLOSURE RATING. NF= NON-FUSED, CB= CIRCUIT BREAKER (30/3/CB/1), NO VALUE (200/3/150/1) FOR NEMA ENCLOSURE MEANS STANDARD NEMA 1 ENCLOSURE RATING	Ø	RECEPTACLE INSTALLED IN FLOOR*		
	MAGNETIC MOTOR STARTER, NEMA SIZE AS NOTED. 3-POLE, UNO	¢	RECEPTACLE INSTALLED VIA DROP CORD*	(WIBYPASS)	AUTOMATIC TRANSFER SWITCH (RATINGS AS INDICATED)
\$ ^M	MANUAL MOTOR STARTER DISCONNECT		RECEPTACLE LETTER DESIGNATIONS AS FOLLOWS: C = AUTOMATICALLY CONTROLLED D = DEMOLISHED	┎╺╻┍ ┥╲┥╭┟	AUTOMATIC TRANSFER SWITCH WITH BYPASS (RATINGS AS INDICATED)
VFD	VARIABLE FREQUENCY DRIVE		ER = EXISTING TO BE RELOCATED	##A	GENERATOR (RATINGS AS INDICATED)
R#	RELAY OR CONTACTOR (# = QUANTITY OF RELAYS)		GFCI = GROUND-FAULT CIRCUIT INTERRUPTER H = HORIZONTALLY MOUNTED IG = ISOLATED GROUND		NON-SEPARATELY DERIVED SOURCE
♦	LIGHTING CONTROL PHOTOCELL (SHADE INDICATES AIMING)		R = RELOCATED, NEW LOCATION S = MANUALLY SWITCHED TR = TAMPER RESISTANT TV = TELEVISION		
TS	TIME SWITCH		USB = USB/DUPLEX WP = WEATHER PROOF COVER WR = WEATHER RESISTANT	### AMPS 480Y/277V	
Ю	LOW-VOLTAGE PUSH-BUTTON (AUTO-OPENER / SECURITY)			DIGITAL VM AM	COMBINATION DIGITAL VOLT METER/AMMETER
••	STOP-START PUSH BUTTON CONTROL STATION				CIRCUIT IDENTIFICATION (REFER TO CIRCUIT SCHEDULE)
⊡+⊅	EMERGENCY POWER OFF BUTTON		STRATED WITH DUPLEX RECEPTACLE, WHEN USED IN COMBINATION WITH MEANING IS SIMILAR FOR THOSE DEVICE TYPES.	ST	SHUNT TRIP
\varkappa	OVERHEAD PADDLE FAN	TECHN	IOLOGY DEVICES & BOXES		UTILITY METER (AS REQUIRED BY UTILITY)
		<u>• • • •</u>	MULTI-OUTLET ASSEMBLY	∃	CURRENT TRANSFORMER RATING AS SPECIFIED OR REQUIRED
LIGHTI	NG (REFER TO LIGHT FIXTURE SCHEDULE FOR MORE INFO)		TELEPHONE OUTLET	₹ ⊰⊱	POTENTIAL TRANSFORMER RATING AS SPECIFIED OR REQUIRED
	LIGHT FIXTURE a = SWITCHED BY SWITCH "a"	$\Box \land $	DATA OUTLET		
ΞЮ	A = LIGHT FIXTURE TYPE "A"	₹ ע ע	MULTI-SERVICE OUTLET; TELEPHONE AND DATA	SPD	SURGE-PROTECTIVE DEVICE
	NL = NIGHT LIGHT FITURE		ABOVE COUNTER, TYP	● Iı	GROUND CONNECTION
	\rangle = ARROW INDICATES AIMING DIRECTION		WALL, TYP FLOOR, TYP	•	TEST WELL
\ge	LIGHT FIXTURE CIRCUITED ON BACK-UP POWER (NOT EGRESS)		MULTI-SERVICE POWER POLE WITH TELEPHONE, DATA AND POWER OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND	~~~	HEATER
	EMERGENCY LIGHT FIXTURE WITH EMERGENCY LIGHTING BATTERY PACK OR CONNECTED TO LIFE-SAFETY GENERATOR CIRCUIT		SPECIFICATIONS	\sim	MOTOR
· •	NL = NIGHT LIGHT FIXTURE LIGHT FIXTURE WITH DUAL BALLASTS CIRCUITED SEPARATELY (SHADING IMPLIES EMERGENCY LIGHT FIXTURE)		MULTI-SERVICE FLOOR BOX WITH TELEPHONE, DATA AND POWER OUTLETS A = TYPE, REFER TO PLANS, SCHEDULES AND SPECIFICATIONS	##	
	LIGHTING TRACK WITH LIGHT FIXTURE TYPES AS INDICATED	⊚ [∧]	POKE THROUGH, A = TYPE, REFER TO PLANS, SCHEDULES AND SPECIFICATIONS	× F# × FP#	VOLTAGE DROP SPREADSHEET
∽ ฅ⊐	EXTERIOR SITE PARKING LOT LIGHT FIXTURE	Ø	THERMOSTAT	_	CONNECTION POINT OR EQUIPMENT TERMINATION
Ø	EXTERIOR PEDESTRIAN POST TOP LIGHT FIXTURE		JUNCTION BOX/OUTLET BOX		
0	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 D	DESIGNATIONS AS FOLLOWS:		CENT TO ANY TECHNOLOGY SYMBOL INDICATES TOTAL QUANTITY OF RTS TO BE INSTALLED AT THAT LOCATION.		
D = DEMOLISHEE E = EXISTING		IF A HOME-RUN IS	S USED ON ANY FLOOR-BOX OR MULTI-OUTLET ASSEMBLY, IT INDICATES		
	CY POWER O BE RELOCATED , NEW LOCATION	THAT POWER IS A	ALSO TO BE INSTALLED IN THIS DEVICE.		



MESA, AZ, 85204
602-699-6224
PROJECT: ECS180001
EOR: BRETT LORENZEN
PE#: 53437
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	Ν	E

- TI-SECTION (REFER TO SCHEDULES)
- AND RATINGS AS INDICATED)

- ERIVED SOURCE SOURCE
- HBOARD AND/OR DISTRIBUTION
- , RATING, DEVICES AND ACCESSORIES

- NG AS SPECIFIED OR REQUIRED
- TING AS SPECIFIED OR REQUIRED
- SHORT CIRCUIT CURRENT AND
- MENT TERMINATION

GENERAL NOTES:

- 1. FULLY COORDINATE ALL WORK WITH ALL GENERAL CONTRACTOR AND ALL SUBCONTRACTORS ON PROJECT.
- 2. PROVIDE ALL CONTRACTORS A COMPLETE SET OF FULL-SIZE BID DOCUMENTS.
- 3. PRIOR TO SUBMITTING PROPOSAL, BIDDER SHALL EXAMINE ALL GENERAL CONSTRUCTION DRAWINGS AND SHALL HAVE HAD VISITED THE CONSTRUCTION SITE. BIDDER SHALL BE FAMILIAR WITH THE EXISTING CONDITIONS UNDER WHICH THEY WILL HAVE TO OPERATE AND WHICH WILL IN ANY WAY AFFECT THE WORK UNDER THIS CONTACT IN BEHALF OF THE CONTRACTOR FOR ANY ERROR OR NEGLIGENCE ON HIS PART.
- 4. 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 NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY THE ARCHITECT OF ANY CONFLICTS OR DISCREPANCIES AND FOR EXACT LOCATION OF ANY SYSTEM COMPONENTS.
- 5. 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.
- 6. FURNISH TO THE OWNER A COPY OF INSPECTION REPORTS AND APPROVAL CERTIFICATES FROM LOCAL AND STATE INSPECTIONS.
- 7. CLOSELY COORDINATE ELECTRICAL REQUIREMENTS WITH MECHANICAL CONTRACTOR; AND ENSURE THE SUBMITTED EQUIPMENT MATCHES THE ELECTRICAL CONNECTIONS INDICATED PRIOR TO ORDERING RELATED ELECTRICAL EQUIPMENT. ELECTRICAL ENGINEER WILL NOT BE HELD RESPONSIBLE FOR FAILURE TO DELIVER ALL EQUIPMENT SUBMITTALS TO ALL NECESSARY PARTIES.
- 8. FIELD VERIFY AND COORDINATE EXACT LOCATION OF ALL HVAC AND PLUMBING EQUIPMENT WITH OTHER SUBCONTRACTORS.
- 9. PROVIDE DEDICATED GROUND AND NEUTRAL CONDUCTORS ON ALL GFCI PROTECTED CIRCUITS.
- 10. PROVIDE A SEPARATE CODE SIZED GREEN EQUIPMENT GROUND CONDUCTOR IN ALL CONDUITS AND RACEWAYS CONTAINING LINE VOLTAGE CIRCUITS. FOR ALL 20A CIRCUITS, EQUIPMENT GROUND CONDUCTOR SIZE SHALL MATCH PHASE CONDUCTOR SIZE. FOR CIRCUITS UPSIZED FOR VOLTAGE DROP INCREASE EQUIPMENT GROUNDING CONDUCTOR SIZE PER CODE.
- 11. TYPE MC CABLE MAY BE USED WITHIN PARTITION WALLS FOR BRANCH CIRCUIT DROPS AND IN LENGTHS NOT EXCEEDING SIX FEET ABOVE CEILING. CONDUIT AND WIRE SHALL BE USED FOR ALL BRANCH CIRCUIT HOMERUNS.
- 12. ROOM NAMES/NUMBERS SHOWN IN PANELBOARD SCHEDULES ARE PER ARCHITECTURAL FLOOR PLANS.
- 13. CONTRACTOR SHALL PROVIDE FINALIZED PANELBOARD SCHEDULES AT COMPLETION OF PROJECT WITH OWNER PROVIDED ROOM NAMES/NUMBERS.
- 14. VERIFY REQUIREMENTS WITH EQUIPMENT SUPPLIER AND PROVIDE ALL NECESSARY ITEMS TO MEET EQUIPMENT ELECTRICAL INSTALLATION REQUIREMENTS.
- 15. PROVIDE NECESSARY MOUNTING AND SUPPORT HARDWARE FOR LIGHT FIXTURES TO MEET SPECIFIED MOUNTING HEIGHTS COORDINATE ALL LIGHT FIXTURES AND CONDUIT WIRING RUNS WITH STRUCTURAL ELEMENTS. COORDINATE CONDUIT INSTALLATIONS WITH ARCHITECT, STRUCTURAL ENGINEER, STRUCTURAL CONTRACTOR AND GENERAL CONTRACTOR.
- 16. ALL JUNCTION BOXES SHALL BE RIGIDLY ATTACHED TO STRUCTURE OR MILLWORK.
- 17. REFER TO ARCHITECTURAL PLANS AND ELEVATIONS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF WIRING DEVICES. REFER TO ARCHITECTURAL DRAWINGS AND CASEWORK DETAILS FOR MOUNTING INFORMATION AND ADDITIONAL REQUIREMENTS.
- 18. CONFIRM COVER PLATE FINISHES WITH ARCHITECT DURING SHOP DRAWINGS PROCESS AND PRIOR TO ORDERING.
- 19. PRIOR TO SUBMITTING PROPOSAL, BIDDER SHALL EXAMINE ALL GENERAL CONSTRUCTION DRAWINGS AND SHALL HAVE HAD VISITED THE CONSTRUCTION SITE. BIDDER SHALL BE FAMILIAR WITH THE EXISTING CONDITIONS UNDER WHICH THEY WILL HAVE TO OPERATE AND WHICH WILL IN ANY WAY AFFECT THE WORK UNDER THIS CONTACT IN BEHALF OF THE CONTRACTOR FOR ANY ERROR OR NEGLIGENCE ON HIS PART.
- 20. THE CONTRACTOR SHALL EMPLOY QUALIFIED AND EXPERIENCED WORKMEN FOR THIS WORK.

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SHEET TITLE: ELECTRICAL SYMBOLS, GENERAL

ISSUED FOR: DATE:



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DRAWN BY: CHECKED BY: PROJECT NUMBER:

BSL

BSL

17065

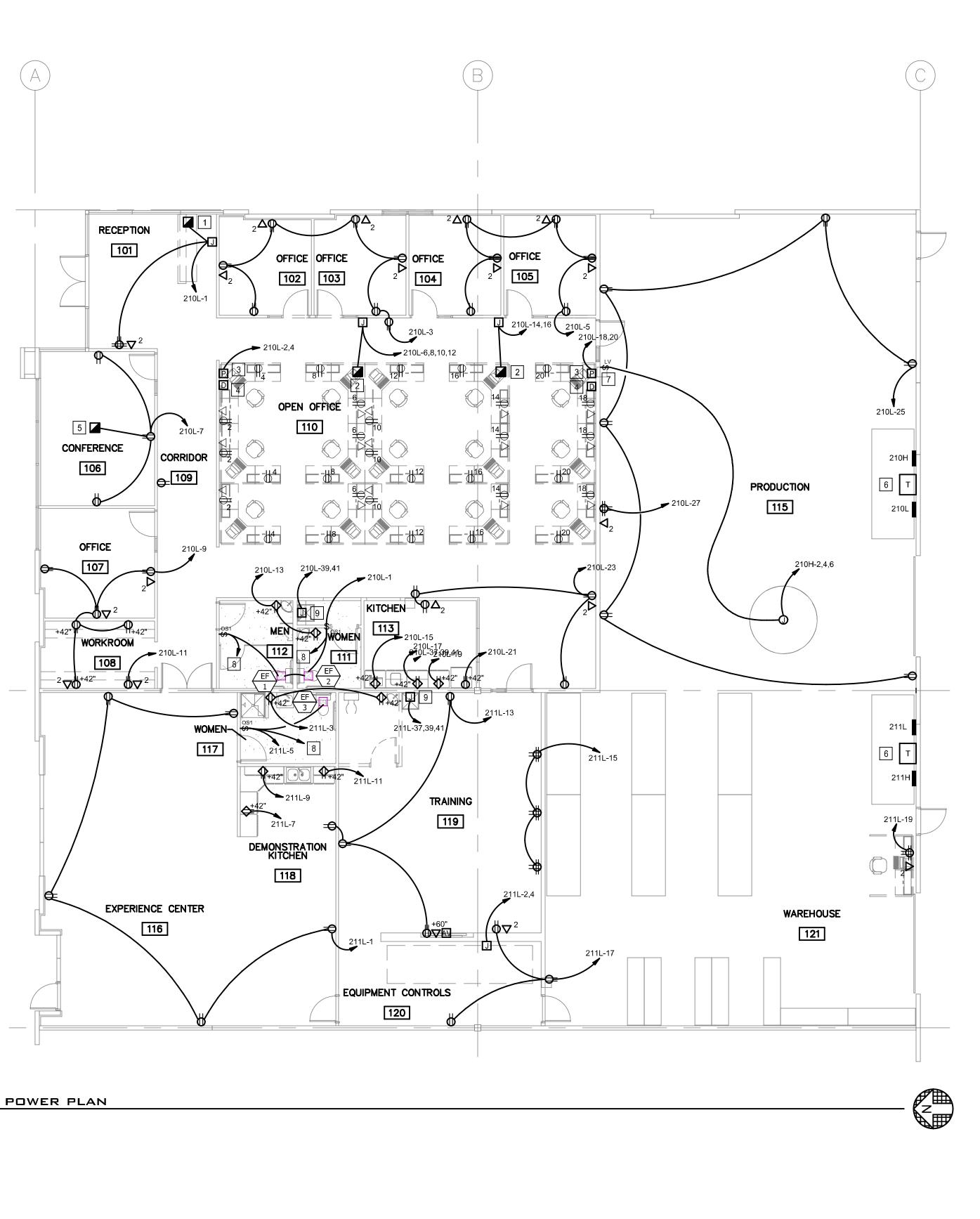
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REVISIONS:

NOTES, ABBREVIATIONS 04/06/18 CITY SUBMITTAL

SHEET

(12) _____ Œ +42" (11)⁻²**VO**^{+42"} (10)LECTRICAL POWER PLAN 1 1/8" = 1



KEYED NOTES

COMBINATION POWER/DATA ON-GRADE FLOOR-BOX WITH (1) DUPLEX POWER RECEPTACLE AND (2) CAT-5e DATA PÓRTS (WIREMOLD - RFB2-OG-FPBTCAL ÓR EQUAL).

COORDINATE OPTIONS WITH TENANT:

- OPTION 1: COMBINATION POWER/DATA ON-GRADE FLOOR-BOX WITH 3 CIRCUIT POWER FEED AND (2) CAT-5e DATA CABLES PER CONNECTED WORKSTATION (WIREMOLD - RFB2-0G-FPFFTCAL). OPTION 2: 4"X4" ALUMINUM POWER POLE EXTENDING FROM FLOOR TO CEILING FOR FINAL CONNECTION OF FURNITURE POWER AND DATA.
- PROVIDE 4" X 4" DEEP JUNCTION BOX FOR FINAL POWER CIRCUIT CONNECTION TO MODULAR FURNITURE.
- PROVIDE 4" X 4" DEEP JUNCTION BOX FOR FINAL DATA CABLING FEED TO MODULAR FURNITURE. PROVIDE (2) CAT-5e DATA CABLES PER CONNECTED WORKSTATION.
- PROVIDE POWER/DATA ON-GRADE FLOOR-BOX WITH (2) DUPLEX POWER RECEPTACLES, (4) CAT-5e DATA CABLING, AND DEDICATED GANG FOR A/V SYSTEMS. COORDINATE A/V REQUIREMENTS WITH TENANT.
- . SEE ONE-LINE DIAGRAM AND PANELBOARD SCHEDULES ON SHEET E4 FOR MORE INFORMATION ON ELECTRICAL INFASTRUCTURE.
- PROVIDE LOW-VOLTAGE SWITCH FROM MANUFACTURER WITH FAN FOR FAN CONTROL AND OPERATION. CONTINUE CIRCUIT TO LIGHTING FIXTURES, ONLY ONE SWITCH IS REQUIRED. SEE LIGHTING PLAN ON SHEET E3 FOR MORE INFORMATION.
- PROVIDE CIRCUIT INDICATED IN 4" X 4" BACK-BOX FOR FINAL CONNECTION BY ELECTRICAL CONTRACTOR TO INSTANTANEOUS HOT-WATER AFTER INSTALLATION.

SHEET NOTES

- A. SEE ONE-LINE DIAGRAM ON SHEET E5 AND PANELBOARD SCHEDULES ON SHEETE6 FOR MORE INFORMATION.
- SEE COVER SHEET FOR ADDITIONAL GENERAL NOTES, SYMBOLS AND ABBREVIATIONS. MECHANICAL EQUIPMENT CIRCUITS WERE DETERMINED FROM LOAD AND VOLTAGE PROVIDED BY MECHANICAL
- ENGINEER, IF ALTERNATE MECHANICAL EQUIPMENT IS PROPOSED, CONTRACTOR SHALL CONFIRM ELECTRICAL REQUIREMENTS WITH ELECTRICAL ENGINEER.

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Ζ TENANT VEME 0 ECS IMPR

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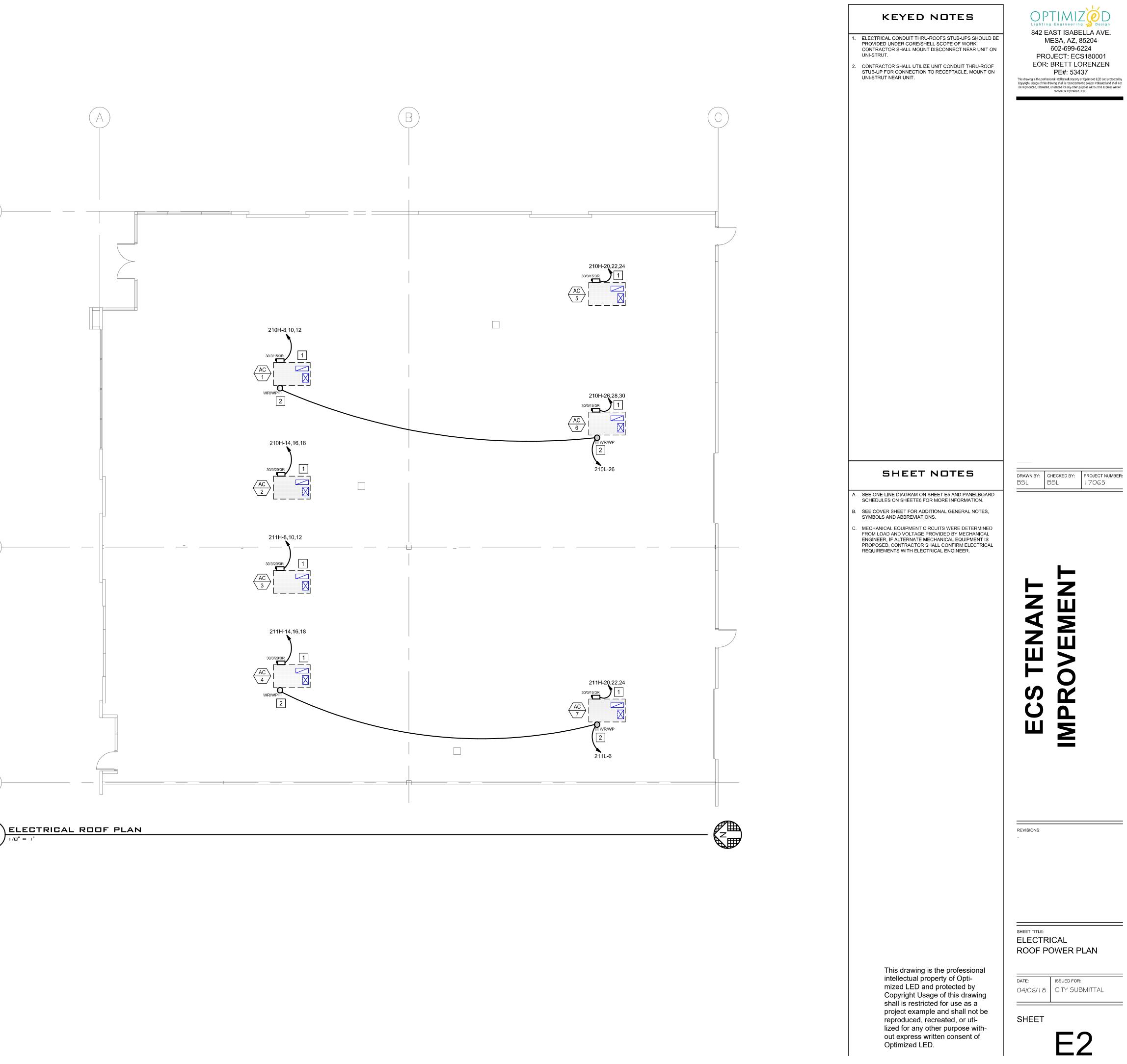
REVISIONS:

SHEET TITLE: ELECTRICAL POWER PLAN DATE: ISSUED FOR: 04/06/18 CITY SUBMITTAL SHEET



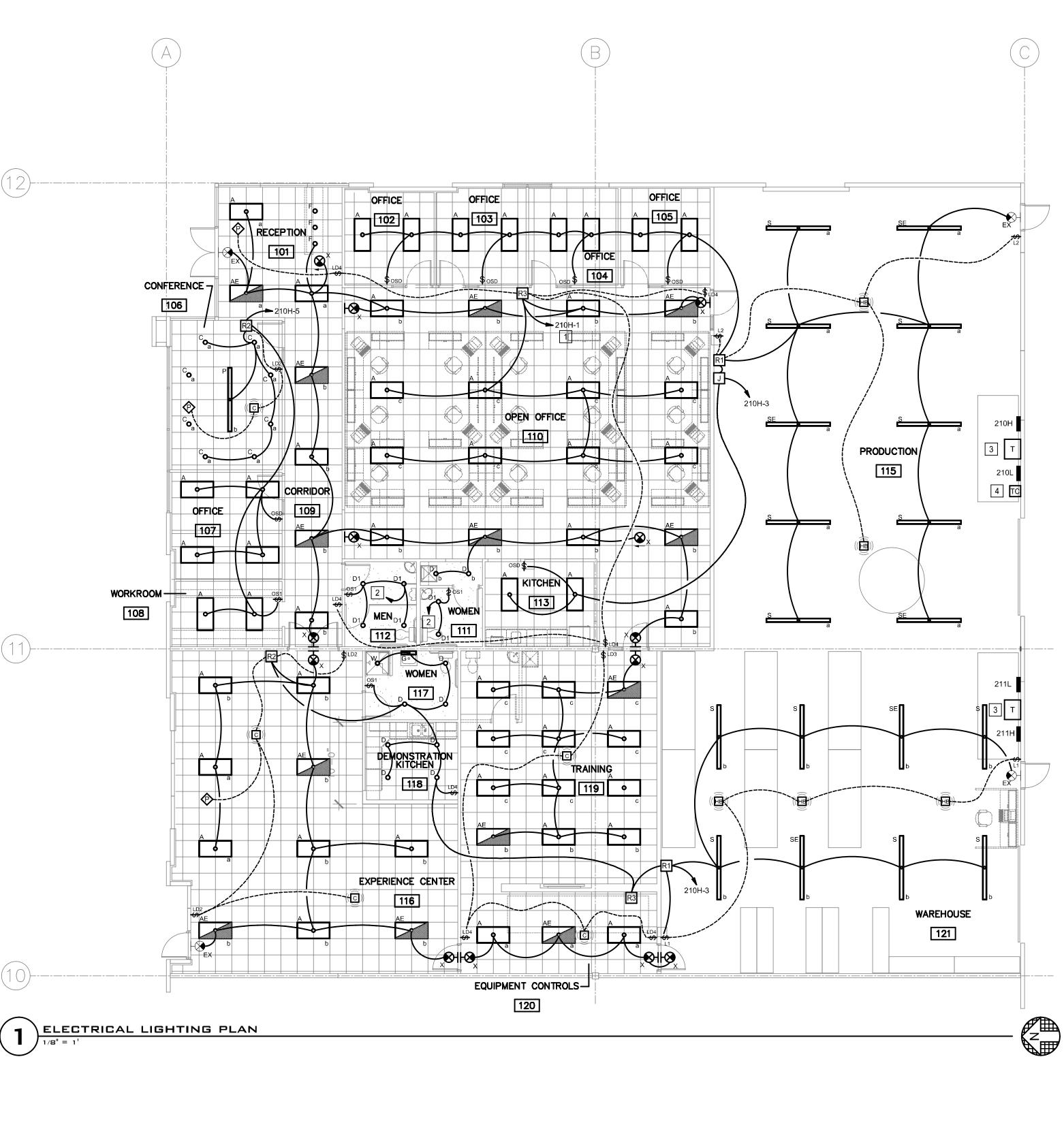
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(12)--(11)

(10)



	842 EAST ISABELLA AVE. MESA, AZ, 85204
THIS SUITE. LIGHTING CIRCUIT FOR THIS ROOM IS SHARED WITH CIRCUIT FOR EXHAUST FAN. SEE SHEET E1 FOR CIRCUIT	602-699-6224 PROJECT: ECS180001 EOR: BRETT LORENZEN
INFORMATION. SEE ONE-LINE DIAGRAM AND PANELBOARD SCHEDULES ON SHEET E4 FOR MORE INFORMATION ON ELECTRICAL	EOR. BRETT LORENZEN PE#: 53437 This drawing is the professional intellectual property of Optimized LED and protected by Copyright. Usage of this drawing shall is restricted to the project indicated and shall not be reproduced, recreated, or utilized for any other purpose without the express written
INFASTRUCTURE. PROVIDE SINGLE ZONE ASTRONOMICAL TIME-CLOCK WITH 7-DAY PROGRAMMABLE SETTINGS AND SEPARATE HOLIDAY SCHEDULE. ROUTE PUBLIC SPACE CIRCUIT VIA THIS TIME-CLOCK.	consent of Optimized LED.
SHEET NOTES	DRAWN BY: CHECKED BY: PROJECT NUMBER: BSL BSL 17065
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KEYED NOTES

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ISSUED FOR: 04/06/18 CITY SUBMITTAL

E3

SHEET

	<i>eck</i> Software Version 4. or Lighting Comp		ertif	icat	e
Project Information					
Energy Code: Project Title: Project Type:	2012 IECC ECS Tenant Improvement New Construction				
Construction Site: 1 East Deer Valley Road Suite 201 & 211 Phoenix, AZ	Owner/Agent:	Designer/C	ontractor:		
Additional Efficiency Pack High efficiency HVAC. Systems that report.	cage(s) at do not meet the performance requirement will be id	entified in the mechan	ical requirem	ents check	list
Allowed Interior Lighting I	Power				
	A Area Category	B Floor Area (ft2)	C Allowed Watts / ft:		D wed Watts (B X C)
1-Tenant Space (Office)		9880	0.90		8892
		To	tal Allowed W	atts =	8892
Proposed Interior Lighting	Power				
riopooda interior Eighting	j i olici			D	Е
	Α	В	С	D	
Fixture ID : Descri	A iption / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	Fixture Watt.	(C X D)
1-Tenant Space (Office)	iption / Lamp / Wattage Per Lamp / Ballast	Lamps/ Fixture	# of Fixtures	Fixture Watt.	
<u>1-Tenant Space (Office)</u> LED 1: A/AE: LED 2X4 VOLUM	iption / Lamp / Wattage Per Lamp / Ballast	Lamps/ Fixture	# of Fixtures	Fixture Watt.	2080
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUM LED 2: C: LED 6" DOWNLIGHT	iption / Lamp / Wattage Per Lamp / Ballast ETRIC: Other: WALLWASH: Other:	Lamps/ Fixture	# of Fixtures	Fixture Watt.	2080 186
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG	iption / Lamp / Wattage Per Lamp / Ballast ETRIC: Other: WALLWASH: Other: BHT: Other:	Lamps/ Fixture	# of Fixtures 65 8 11	Fixture Watt. 32 23 23	2080 186 255
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUM LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA	iption / Lamp / Wattage Per Lamp / Ballast ETRIC: Other: WALLWASH: Other: GHT: Other: TIVE PENDANT: Other:	Lamps/ Fixture 1 1 1 1	# of Fixtures 65 8 11 3	Fixture Watt. 32 23 23 15	2080 186 255 45
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTU	ETRIC: Other: WALLWASH: Other: GHT: Other: TIVE PENDANT: Other: JRE: Other:	Lamps/ Fixture 1 1 1 1 1	# of Fixtures 65 8 11 3 1	Fixture Watt. 32 23 23 15 18	2080 186 255 45 18
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D/DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTU LED 5: P: LED PENDANT AT C	ETRIC: Other: WALLWASH: Other: SHT: Other: ITIVE PENDANT: Other: JRE: Other: ONFERENCE: Other:	Lamps/ Fixture 1 1 1 1	# of Fixtures 65 8 11 3	Fixture Watt. 32 23 23 15	2080 186 255 45
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTU	ETRIC: Other: WALLWASH: Other: SHT: Other: TIVE PENDANT: Other: JRE: Other: ONFERENCE: Other: ONFERENCE: Other:	Lamps/ Fixture 1 1 1 1 1 1 1	# of Fixtures 65 8 11 3 1 1	Sixture 32 23 23 15 18 102	2080 186 255 45 18 102
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTU LED 5: P: LED PENDANT AT C LED 6: S: LED 8' STRIP LIGHT:	ETRIC: Other: WALLWASH: Other: SHT: Other: TIVE PENDANT: Other: JRE: Other: ONFERENCE: Other: ONFERENCE: Other:	Lamps/ Fixture 1 1 1 1 1 1 1 1	# of Fixtures 65 8 11 3 1 1 1 8	Fixture Watt. 32 23 23 15 18 102 52 23	2080 186 255 45 18 102 942 23
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTI LED 5: P: LED PENDANT AT C LED 6: S: LED 8' STRIP LIGHT: LED 7: W: LED 6" DOWNLIGHT	iption / Lamp / Wattage Per Lamp / Ballast ETRIC: Other: WALLWASH: Other: BHT: Other: TIVE PENDANT: Other: JRE: Other: ONFERENCE: Other: : Other: : Other: SHOWER: Other:	Lamps/ Fixture 1 1 1 1 1 1 1 1	# of Fixtures 65 8 11 3 1 1 1 8 1	Fixture Watt. 32 23 23 15 18 102 52 23	2080 186 255 45 18 102 942 23
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTU LED 5: P: LED PENDANT AT C LED 6: S: LED 8' STRIP LIGHT: LED 7: W: LED 6" DOWNLIGHT	ETRIC: Other: WALLWASH: Other: BHT: Other: TIVE PENDANT: Other: JRE: Other: ONFERENCE: Other: Other: SHOWER: Other: Design 59% better than code	Lamps/ Fixture 1 1 1 1 1 1 1 1	# of Fixtures 65 8 11 3 1 1 1 8 1	Fixture Watt. 32 23 23 15 18 102 52 23	2080 186 255 45 18 102 942 23
1-Tenant Space (Office) LED 1: A/AE: LED 2X4 VOLUMI LED 2: C: LED 6" DOWNLIGHT LED 3: D\DE: LED 6" DOWNLIG LED 3 copy 1: F: LED DECORA LED 4: G: LED VANITITY FIXTI LED 5: P: LED PENDANT AT C LED 6: S: LED 8' STRIP LIGHT: LED 7: W: LED 6" DOWNLIGHT Interior Lighting PASSES: Interior Lighting Complian Compliance Statement: The p specifications, and other calcu	iption / Lamp / Wattage Per Lamp / Ballast ETRIC: Other: WALLWASH: Other: GHT: Other: TIVE PENDANT: Other: JRE: Other: ONFERENCE: Other: Other: Other: SHOWER: Other: Design 59% better than code nce Statement roposed interior lighting design represented in lations submitted with this permit application. CC requirements in COM <i>check</i> Version 4.0.8.1 a	Lamps/ Fixture	# of Fixtures 65 8 11 3 1 1 1 1 8 1 Total Propos	Fixture 32 23 23 15 18 102 23 23 ed Watts =	2080 186 255 45 18 102 942 23 3651 ding plans, ave been

Project Title: ECS Tenant Improvement Data filename: Untitled.cck

Report date: 03/23/18 Page 1 of 6

LIGHT FIXTURE SCHEDULE

TYPE	LOCATION	DESCRIPTION	BASIS OF DESIGN	MOUNTING		IGHT ENGINE			DRIVER	
			MANUFACTURER, MODEL		TYPE QTY	TEMP CRI	LUMENS EM LUMENS	TYPE	VOLTAGE	WATTS
	OPEN OFFICE	2'X4' LED VOLUMETRIC LED LAY-IN GRID TROFFER	ACUITY - LITHONIA	ACOUSTICAL GRID CEILING	LED	3500K	4000 LM	ELDO - 0-10V	MVOLT	32
Α	COMMON AREAS		2VTL4 2X4 VTL 40L ADP EZ1 LP835		1	80 CRI		1% DIMMING		
	OPEN OFFICE	2'X4' LED VOLUMETRIC LED LAY-IN GRID TROFFER	ACUITY - LITHONIA	ACOUSTICAL GRID CEILING	LED	3500K	4000 LM	ELDO - 0-10V	MVOLT	32
AE	COMMON AREAS	1400 LUMEN EM BATTERY PACK	2VTL4 2X4 VTL 40L ADP EZ1 LP835 EL14L		1	80CRI	1400 LM	1% DIMMING		
	CONFERENCE ROOM	6" RECESSED LED DOWNLIGHT WITH WALL WASH	ACUITY - GOTHAM	GYP CEILING	LED	3500K	2000 LM	ELDO - 0-10V	MVOLT	23.2
С		LENS	EVO WW 35/20 6AR GWR LS		1	85 CRI		1% DIMMING		
	RESTROOMS	6" RECESSED LED DOWNLIGHT WITH CLEAR TRIM	ACUITY - GOTHAM	GYP CEILING	LED	3500K	2000 LM	ELDO - 0-10V	MVOLT	23.2
D		AND WIDE	EVO 35/20 6AR WD		1	85 CRI		1% DIMMING		
	RESTROOMS	6" RECESSED LED DOWNLIGHT WITH CLEAR TRIM	ACUITY - GOTHAM	GYP CEILING	LED	3500K	2000LM	ELDO - 0-10V	MVOLT	23.2
DE		AND WIDE	EVO 35/20 6AR WD EL		1	85 CRI	623 LM	1% DIMMING		
	RECEPTION	LED - DECORATIVE PENDANT	WAC	ACOUSTICAL GRID CEILING	LED	3000K	1187 LM	0-10V	MVOLT	15
F			ELEMENTUM-PD26611		1	80 CRI		DIMMING		
	RESTROOM VANITY	2' LED VANITY FIXTURE	ACUITY - LITHONIA	CENTERED ABOVE MIRROR . COORDIANTE MOUNTING HEIGHT	LED	3500K	1300 LM	NON DIMING	MVOLT	18
G			FMVCSL 24IN MVOLT 35K 90CRI KR		1	90 CRI				
	CONFERENCE ROOM	8' LINEAR DIRECT/ INDIRECT PENDANT	ACUITY - MARK	AIRCRAFT CABLE SUSPENDED	NICHIA LED	3500K	4132 LM DIR	0-10V	MVOLT	102
Р			S2LID 8FT CRD 1 N 35 2 N 35 EZB 277 WHT		2	80 CRI	5232 LM IND	1% DIMMING		
	PRODUCTION	8' LED STRIP LIGHT	ACUITY - LITHONIA	INSTALLED AT BOTTOM OF JOISTS	LED	3500K	8000 LM	0-10V	MVOLT	52.32
S			CLX L96 8000LM SEF RDL MVOLT EZ1 3500K 80CRI		1	80CRI		DIMMING		
	SHOWER	6" RECESSED DOWNLIGHT AT SHOWER	ACUITY - GOTHAM	GYP CEILIG CENTERED ON SHOWER	LED	3500K	2000 LM	NON	MVOLT	23.2
W			EVO 35/20 6 DFR MVOLT		1	80CRI		DIMMING		
	EGRESS PATH	ILLUMINATED EXIT SIGN WITH NIKEL-CADMIUM	ACUITY - LITHONIA	CEILING AND WALL MOUNTED. REFER TO PLANS FOR	LED	N/A	N/A	N/A	MVOLT	1
Х		BATTERY. BRUSHED ALUMINUM FINISH	TLE 1 G EL N	MOUNTING TYPE AT EACH LOCATION	1					

GENERAL NOTES:

A. BASIS-OF-DESIGN AND ALTERNATE SPECIFICATIONS MAY BE PRICED AND SUPPLIED BY THE APPROVED REGIONAL VENDOR.

B. UNDER NO CIRCUMSTANCES MAY LIGHTING CONTROLS BE PACKAGED WITH THE LIGHTING FIXUTRES. VERIFICATION WILL BE REQUESTED OF THE PROJECT GENERAL AND ELECTRICAL CONTRACTORS. IF PRICING WAS PROVIDED AS A LUMP SUM SUBMITTAL WILL BE REJECTED IN ITS ENTIRETY. C. VERIFY CEILING CONDITIONS AND COORDINATE LIGHT FIXTURE MOUNTING HARDWARE AND TRIMS NEEDED TO SUIT CEILING CONDITIONS PRIOR TO ORDERING. D. VERIFY QUANTITIES, MODEL NUMBERS AND DESCRIPTIONS WITH MANUFACTURER PRIOR TO PLACING ORDER.

E. VERIFY FINISH AND COLOR WITH ARCHITECT PRIOR TO PLACING ORDER.

F. REFER TO ARCHITECTURAL DRAWINGS AND DETAILS FOR EXACT LOCATIONS, MOUNTING HEIGHTS AND ADDITIONAL MOUNTING INFORMATION. CONTACT ARCHITECT IMMEDIATELY IF THERE ARE DISCREPANCIES BETWEEN THE ARCHITECTURAL AND ELECTRICAL LIGHTING PLANS.

G. CATALOG NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND CATALOG NUMBERS ONLY. FIRST READ THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS IN CONJUNCTION WITH THE CATALOG NUMBER TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURES LISTED ARE THE BASIS FOR THE DESIGN. H. CONTRACTOR SHALL PROVIDE ALL LIGHT FIXTURES UNLESS NOTED OTHERWISE.

COMcheck Software Version 4.0.8.1 **Inspection Checklist**

Energy Code: 2012 IECC

Project Title: ECS Tenant Improvement

Data filename: Untitled.cck

Requirements: 100.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR4] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	Complies Does Not Not Observable Not Applicable	Requirement will be met. Location on plans/spec: E4, E7, E8
C406 [PR9] ¹	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	□Complies □Does Not □Not Observable □Not Applicable	Requirement will be met. Location on plans/spec: E3, E4

 1 High Impact (Tier 1)
 2 Medium Impact (Tier 2)
 3 Low Impact (Tier 3)

Report date: 03/23/18

Page 2 of 6

natic controls to shut off all ng lighting installed in all ngs. endent lighting controls installed oproved lighting plans and all al controls readily accessible and e to occupants. ng controls installed to uniformly e the lighting load by at least ght zones provided with dual controls that control the independent of general area ng.	Does Not Not Observable Not Applicable Complies Does Not Not Observable Not Observable Complies	Requirement will be met. Location on plans/spec: E3 Requirement will be met. Location on plans/spec: E3 Requirement will be met. Location on plans/spec: E3
ngs. endent lighting controls installed oproved lighting plans and all al controls readily accessible and e to occupants. ng controls installed to uniformly e the lighting load by at least ght zones provided with dual controls that control the independent of general area	 Not Observable Not Applicable Complies Does Not Not Observable Complies Does Not Does Not Not Observable Not Observable Not Observable Not Applicable Complies Complies 	Requirement will be met. Location on plans/spec: E3 Requirement will be met.
oproved lighting plans and all al controls readily accessible and e to occupants. ng controls installed to uniformly e the lighting load by at least ght zones provided with dual controls that control the independent of general area	Complies Complies Not Observable Complies Observable Not Observable Not Observable Not Applicable Complies	Location on plans/spec: E3 Requirement will be met.
al controls readily accessible and e to occupants. ng controls installed to uniformly e the lighting load by at least ght zones provided with dual controls that control the independent of general area	Not Observable Not Applicable Complies Does Not Not Observable Not Applicable Complies	Requirement will be met.
e the lighting load by at least ght zones provided with dual controls that control the independent of general area	Complies Does Not Not Observable Not Applicable Complies	
ght zones provided with dual controls that control the independent of general area	□Not Observable □Not Applicable □Complies	Location on plans/spec: E3
dual controls that control the independent of general area	Complies	
	Does Not	Requirement will be met.
and the second se	□Not Observable □Not Applicable	Location on plans/spec: E3
ing units have at least one er switch at the main entry door	Complies Does Not	Exception: Requirement does not apply.
ontrols wired luminaires and ned receptacles.	□Not Observable □Not Applicable	
	Complies	Requirement will be met.
	□Not Observable	Location on plans/spec: E3
	Complies	Requirement will be met.
ols.	□Not Observable □Not Applicable	Location on plans/spec: E3
		Requirement will be met.
	□Not Observable □Not Applicable	Location on plans/spec: E3
fic uses installed per approved	□Complies □Does Not	Requirement will be met.
ng plans.	□Not Observable □Not Applicable	
ered lamp configurations that	□Complies □Does Not	Exception: Requirement does not apply.
s mounted) or are within 1 foot to edge (if pendant or surface	□Not Observable □Not Applicable	Location on plans/spec: E3,E5
	Complies	Requirement will be met.
	Not Observable	Location on plans/spec: E5
	Complies	Requirement will be met.
natically controlled and	Not Observable	Location on plans/spec: E3
	pancy sensors installed in red spaces. Any sidelighted areas are ped with required lighting ols. sed spaces with daylight area r skylights and rooftop monitors quipped with required lighting ols. rate lighting control devices for fic uses installed per approved mg plans. escent luminaires with odd wered lamp configurations that ithin 10 feet center to center (if s mounted) or are within 1 foot to edge (if pendant or surface ited) shall be tandem wired. igns do not exceed 5 watts per ional interior lighting power ed for special functions per the oved lighting plans and is natically controlled and rated from general lighting.	pancy sensors installed in red spaces. Part Spaces. Part Spaces. Part Spaces installed in ry sidelighted areas are ped with required lighting ols. Sed spaces with daylight area r skylights and rooftop monitors quipped with required lighting ols. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved ng plans. Part lighting control devices for fic uses installed per approved mot observable Poes Not Part devices for fic uses installed per approved mot observable Poes Not Part devices for fic uses installed per approved mot observable Part devices for fic uses installed per approved Part devices for poes Not Part devices for Part devices for Part devices for Part devices for poes Not Part devices for poes Not Part devices for poes Not P

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C408.2.5. 1 [FI16] ³	Furnished as-built drawings for electric power systems within 30 days of system acceptance.	□Complies □Does Not □Not Observable □Not Applicable	Requirement will be met.
C303.3, C408.2.5. 2 [FI17] ³	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	□Complies □Does Not □Not Observable □Not Applicable	Requirement will be met.
C405.5.2 [FI18] ¹	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	Complies Does Not Not Observable Not Applicable	See the Interior Lighting fixture schedule for values.
C408.3 [FI33] ¹	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	□Complies □Does Not □Not Observable □Not Applicable	Requirement will be met.

 1
 High Impact (Tier 1)
 2
 Medium Impact (Tier 2)
 3
 Low Impact (Tier 3)
 Project Title: ECS Tenant Improvement

Data filename: Untitled.cck

Additional Comments/Assumption

Report date: 03/23/18

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Page 5 of 6

SHEET TITLE: ELECTRICAL

LIGHTING SCHEDULES AND DETAILS

DATE:	ISSUED FOR:
04/06/18	CITY SUBMITTAL

SHEET

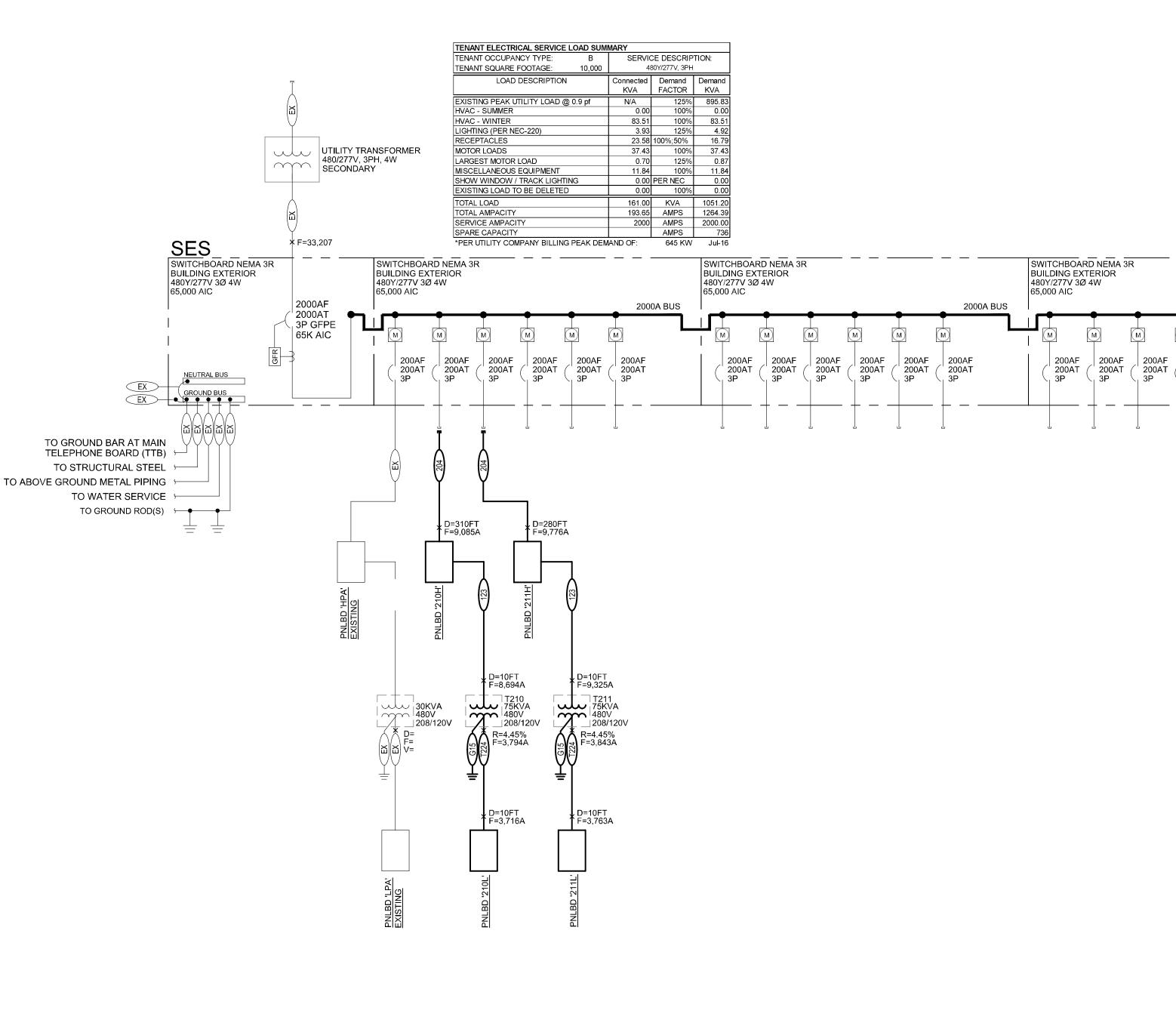
REVISIONS:



842 EAST ISABELLA AVE. MESA, AZ, 85204 602-699-6224 PROJECT: ECS180001 EOR: BRETT LORENZEN PE#: 53437 This drawing is the professional intellectual property of Optimized LED and protected by Copyright. Usage of this drawing shall is restricted to the project indicated and shall not be reproduced, recreated, or utilized for any other purpose without the express written consent of Optimized LED.

DRAWN BY:	CHECKED BY:	PROJECT NUMBER:
BSL	BSL	17065





Fault calculations were completed using the "Point-by-Point" method where: $ISC_{(2)} = ISC_{(1)} \times M_{(1)}$ M= 1/(1+f) ISC $_{(1)}$ = short circuit current at fault point 1

ISC $_{(2)}$ = short circuit current at fault point 2

IP = Primary short circuit current

Vp = Primary voltage IS= Secondary short circuit current

Vs= Secondary voltage L = Length of circuit

E = Line to line volts

C = "C" Factor from Bussman table where "C" = 1 / impedance per linear foot

Feeder Types = NM - Non Magnetic Conduit, M - Magnetic Conduit, FB - Feeder Busway, PB - Plug-in Busway, TX - Transformer

PROVIDED. PLEASE NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION. VOLTAGE DROP (3Ø): XFMR: $f_{(30)} = IP(sca)x Vp x 1.73 x \%Z$ %VD= ((R x cos(arccos(pf)) + X x sin (arccos(pf))) x L/# x I x 1.73) / E $IS_{(sca)} = \underline{Vp \times M \times IP_{(sca)}}$ VOLTAGE DROP (1Ø): 100,000 x KVA Vs XFMR: $f_{(1\emptyset)} = \underline{IP(sca)x Vp \ x \%Z}$ %VD= ((R x cos(arccos(pf)) + X x sin(arccos(pf))) x 2 x L/# x I) / E 100,000 x KVA

X= reactances in ohms per LF

 $f_{(30)} = 1.732 \text{ x L x lsc}$

СхE

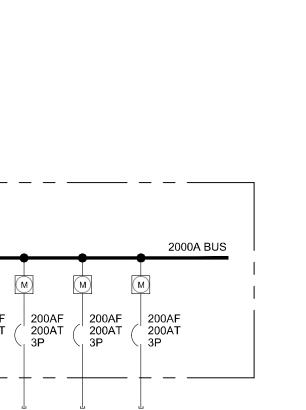
СхE

f _(1Ø)= <u>2 x L x lsc</u>

Feeder:

Feeder:

ANY CONTRACTOR, SUB-CONTRACTOR, AND/OR SUPPLIER IS HEREBY NOTIFIED THAT THIS PROJECT (CONTRACT FOR CONSTRUCTION) MUST COMPLY TO THE ARIZONA SENATE BILL SB1549, PROMPT PAYMENT LEGISLATION, AS IT MODIFIES THE ARIZONA REVISED STATUTES.



	<image/> <text><text><text><text><text></text></text></text></text></text>
SHEET NOTES	DRAWN BY: CHECKED BY: PROJECT NUMBER: BSL BSL 17065
FEEDER LEGEND EXISTING FEEDER TO REMAIN	ECS TENANT IMPROVEMENT
 (3) #1 CU, (1) #6 CU GND, 1-1/2" CONDUIT (4) #3/0 CU, (1) #6 CU GND, EXIST. 2-1/2" NM CONDUIT (4) #4/0 CU, (1) #2 CU GND, 2-1/2" CONDUIT (5) #6 CU GND, 3/4" CONDUIT 	REVISIONS:
This drawing is the professional intellectual property of Opti- mized LED and protected by Copyright Usage of this drawing shall is restricted for use as a project example and shall not be reproduced, recreated, or uti- lized for any other purpose with- out express written consent of	SHEET TITLE: ELECTRICAL ONE-LINE DIAGRAM AND CALCULATIONS DATE: 04/06/18 ISSUED FOR: CITY SUBMITTAL SHEET

FAULT CALCULATIONS HAVE BEEN PERFORMED BASED ON THE INFORMATION PROVIDED BY THE UTILITY COMPANY. STARTING FAULT CURRENT VALUE OF 33,207 AIC HAS BEEN

%VD CUM= Cumulative Voltage Drop from Fault Point 1 to Fault Point # R= resistance in ohms per LF

Optimized LED.

1AIN	AMPS: 250A SIZE/TYPE: 200A MCB FS/PHASE: 480Y/277V, 3PH, 4	H (NI	,			AIC R	ating	:	100	00						
	TION: 1	4 V V														
кт	DESCRIPTION		VOL	TAMPS/PH	HASE	WIRE	BKR	Ρ	Р	BKR	WIRE	VOL	TAMPS/PH	HASE	DESCRIPTION	CI
NO.			A	В	С	NO.	AMP			AMP	NO.	А	В	С	1	N
1	LTG-OPEN SPACE 101, 110	о С	861			12	20	1				640				
3	LTG-OFF/KIT 102,102-5, 115			850		12	20	1	3	15	12		640		IF-1 - HIGH VELOCITY FAN	4
5	LTG-CONF 106, OFFICE 10				588			1	1					640	1	(
7	SPARE							1				3,324				8
9	SPARE							1	3	15	12		3,324		AC-1 (ROOFTOP)	1
11	SPARE							1						3,324		1
13	SPARE							1				4,156				1
15	SPARE							1	3	20	12		4,156		AC-2 (ROOFTOP)	1
17	SPARE							1						4,156		1
19	SPACE							1				3,324				2
21	SPACE							1	3	15	12		3,324		AC-5 (ROOFTOP)	2
23	SPACE							1						3,324		2
25	SPACE							1				3,049				2
27	SPACE							1	3	15	12		3,049		AC-6 (ROOFTOP)	2
29	SPACE							1						3,049		3
	SPACE							1	1						SPACE	3
33	SPACE							1	1						SPACE	3
35	SPACE							1	1						SPACE	3
37			8,880						1							3
	PANELBOARD '210L'			17,880	40.040	OL	125	3	1							4
41					16,940	1			1							4
	SUBTOTAL		9,741	18,730	17,528							14,493	14,493	14,493	SUBTOTAL	
		,234	LOAD		CONN. V	A	DF		LO			(CONN. VA		_	
		87	COOLING				0			FRIG				1.00	_	
		3,223	HEATING		40,008		1.00			SN/DIS				1.25	-	
		120	LIGHTING		2,419		1.25			CHEN				1.00	_	
		2,021	RECEPT		18,900		1.0/.5			ISTING				1.00		
		16	MOTORS		21,671		1.00			G MOT				1.25	TOTAL DEMAND	
		08	MISC EQ	UIP	6,480		1.00			g ira	СК			1.00	103	3 A
	TOTAL PNLBD - VA 89	9,478 108	SUPP HE MISC EQI	AT	6,480		1.00 1.00		SH	OW W G TRA	/NDW			1.25 1.00	85,633	

	BUS / MAIN VOLT	NELBOARD: 210L AMPS: 225A SIZE/TYPE: MLO "S/PHASE: 208Y/120V, 3PH, 4W FION: 1				AIC R	ATING	:	100	000					EQUIPMENT GROUN	ID BUS
	CKT	DESCRIPTION		TAMPS/P	HASE	WIRE	BKR	Р	Р	BKR	W/IRE	VOL	TAMPS/PH	IASE	DESCRIPTION	СК
	NO.		A	В	C	NO.	AMP	'	l'	AMP	NO.	A	B	C		NO
Ē		REC - RECEPTION 101	720			12	20	1	2	20	12	1,080			WRK STN - OPEN OFF 110	2
ŀ		REC - OFFICE 102,103	120	1,260		12	20	1	1			1,000	1,080		NORTHEND	4
ŀ		REC - OFFICE 104,105		.,	1,080	12	20	1	2	20	12		.,	1.080	WRK STN - OPEN OFF 110	6
F		REC - CONF 106	900		.,	12	20	1				1,080		.,	NORTH CENTER	8
Ē		REC - OFFICE 107, WK RM 108		1,080		12	20	1	2	20	12	.,	1.080		WRK STN - OPEN OFF 110	10
		REC - COPIER, WK RM 108		.,	1,080	12	20	1	1				.,	1.080	NORTH CENTER	12
F		REC - RSTRM 111, 112	360		,	12	20	1	2	20	12	1,080		,	WRK STN - OPEN OFF 110	14
	15	MICRO - KITCHEN 113		1,500		12	20	1	1			,	1,080		SOUTH CENTER	16
F	17	TOASTER - KITCHEN 113		, í	1,500	12	20	1	2	20	12		,	1,080	WRK STN - OPEN OFF 110	18
	19	COFFEE - KITCHEN 113	1,500			12	20	1	1			1,080			SOUTHEND	20
3F	21	REFRIG - KITCHEN 113		900		12	20	1	1	20					SPARE	2:
	23	CONV REC - OPN OFF 110			720	12	20	1	1	20					SPARE	24
Γ	25	CONV REC - PROD. 115	1,080			12	20	1	1	20	12				REC. ROOFTOP	20
Γ	27	DED. REC - PROD. 115		900		12	20	1	1						SPACE	28
	29	LTG/EX. FAN 1,2 - RSTRM 111,12			320	12	20	1	1						SPACE	30
	31	SPARE						1	1						SPACE	3
	33	SPARE						1	1						SPACE	34
	35	SPARE						1	1						SPACE	30
		SPARE						1	1						SPACE	38
кL	39	WATER HEATER WH-1		9,000		6	50	2	1						SPACE	40
	41				9,000				1						SPACE	42
		SUBTOTAL	4,560	14,640	13,700							4,320	3,240	3,240	SUBTOTAL	
		TOTAL PHASE A - VA 8,880	LOAD		CONN. V	A	DF		LO.	AD		(CONN. VA	DF		
		AMPS 74	COOLING				0		RE	FRIG				1.00]	
		TOTAL PHASE B - VA 17,880	HEATING	i	18,000		1.00		SIG	SN/DISI	P			1.25		
		AMPS 149	LIGHTING	3	120		1.25		KIT	CHEN				1.00		
L		TOTAL PHASE C - VA 16,940	RECEPT	ACLES	18,900		1.0/.5		EX	ISTING	i			1.00		
L		AMPS 141	MOTORS	3	200		1.00		LR	g Mot	OR			1.25	TOTAL DEMAND	
		TOTAL PNLBD - VA 43,700	SUPP HE				1.00			OW W				1.25	39,280 V	
		AMPS 121	MISC EQ	UIP	6,480		1.00		LT(G TRA	CK			1.00	109	А
		ELBOARD NOTES GROUND FAULT CIRCUIT BREAK	FR													
		PROVIDE LOCK-OFF DEVICE AT I														

Λ			
•			

BUS MAIN VOLT	NELBOARD: 211H (I AMPS: 250A I SIZE/TYPE: 200A MCB IS/PHASE: 480Y/277V, 3PH, 4W TION: 1	NEVV)			AIC R	ATING	:	100	000					EQUIPMENT GROUNI	D BUS
СКТ	DESCRIPTION	VOL	TAMPS/PI	HASE	WIRE	BKR	Ρ	Р	BKR	WIRE	VOL	TAMPS/PH	IASE	DESCRIPTION	СКТ
NO.		А	В	С	NO.	AMP			AMP	NO.	А	В	С		NO.
1	ALL SUITE LIGHTING	1,434			12	20	1	1						SPACE	2
3	SPARE						1	1						SPACE	4
5	SPARE						1	1						SPACE	6
7	SPARE						1				3,956				8
9	SPARE						1	3	20	12		3,956		AC-3 (ROOFTOP)	10
11	SPARE						1						3,956		12
13	SPACE						1				3,956				14
15	SPACE						1	3	20	12		3,956		AC-4 (ROOFTOP)	16
17	SPACE						1						3,956		18
19	SPACE						1				3,049				20
21	SPACE						1	3	15	12		3,049		AC-7 (ROOFTOP)	22
23	SPACE						1						3,049		24
25	SPACE						1	1						SPACE	26
27	SPACE						1	1						SPACE	28
29	SPACE						1	1						SPACE	30
31	SPACE						1	1						SPACE	32
33	SPACE						1	1						SPACE	34
35	SPACE						1	1						SPACE	36
37		13,840						1						SPACE	38
39	PANELBOARD '211L'		12,760		OL	125	3	1						SPACE	40
41				10,600				1						SPACE	42
	SUBTOTAL	15,274	12,760	10,600						[10,961	10,961	10,961	SUBTOTAL	
	TOTAL PHASE A - VA 26,235	LOAD		CONN. V	A	DF		LO	AD		(CONN. VA	DF		
	AMPS 95	COOLING	3			0			FRIG				1.00	1	
	TOTAL PHASE B - VA 23,721	HEATING		43,506		1.00		SIG	GN/DIS	P			1.25	-	
í	AMPS 86	LIGHTING		1,514		1.25			CHEN				1.00	1	
	TOTAL PHASE C - VA 21,561	RECEPT		4,680		1.0/.5			ISTING				1.00	1	
	AMPS 78	MOTORS		16,457		1.00			G MOT				1.25	TOTAL DEMAND	٦
	TOTAL PNLBD - VA 71,517	SUPP HE				1.00				/NDW			1.25	71,896 V	A
	AMPS 86	MISC EQ		5,360		1.00			G TRA				1.00	86,	
	ELBOARD NOTES			, ,										•	

PANELBOARD: 211L (NEW)

BUS	AMPS: 225A	,			AIC R	ATING	:	100	000						
MAIN	SIZE/TYPE: 225A MCB														
VOL	[S/PHASE: 208Y/120V, 3PH, 4W														
SEC	TION: 1														
СКТ	DESCRIPTION	VOL	TAMPS/PI	HASE	WIRE	BKR	Ρ	Р	BKR	WIRE	VOL	TAMPS/PH	IASE	DESCRIPTION	СКТ
NO.		А	В	С	NO.	AMP			AMP	NO.	А	В	С	1	NO.
1	REC - EXP. CENTER 116	1,080			12	20	1	2	20	12	1,600			EQUIPMENT CONTROLS	2
3	REC - RSTRMS		360		12	20	1					1,600			4
5	LTG/EX. FAN 3 - WOMEN 117			160	12	20	1	1	20	12				REC - ROOFTOP	6
7	DED CNTR REC DEM. KIT 118	720			12	20	1	1						SPACE	8
9	DED CNTR REC DEM. KIT 118		720		12	20	1	1						SPACE	10
11	DED CNTR REC DEM. KIT 118			720	12	20	1	1						SPACE	12
13	REC - KIT 118, TRAIN 119, TV	1,080			12	20	1	1						SPACE	14
15	REC - TRAINING TABLES 119		1,080		12	20	1	1						SPACE	16
17	REC - EQ. CNTRLS 120			720	12	20	1	1						SPACE	18
19	REC - DESK WREHSE 121	360			12	20	1	1						SPACE	20
21	SPARE						1	1						SPACE	22
23	SPARE						1	1						SPACE	24
25	SPARE						1	1						SPACE	26
27	SPARE						1	1						SPACE	28
29	SPARE						1	1						SPACE	30
31	SPACE						1	1						SPACE	32
33	SPACE						1	1						SPACE	34
35	SPACE						1	1						SPACE	36
37		9,000						1						SPACE	38
39	WATER HEATER WH-2		9,000		6	50	3	1						SPACE	40
41				9,000				1						SPACE	42
	SUBTOTAL	12,240	11,160	10,600							1,600	1,600		SUBTOTAL	
	TOTAL PHASE A - VA 13,840	LOAD		CONN. V	Ą	DF		LO	AD		(CONN. VA	DF		
	AMPS 115	COOLING	}			0		RE	FRIG				1.00		
	TOTAL PHASE B - VA 12,760	HEATING		27,000		1.00	1	SIC	GN/DIS	Ρ			1.25	1	
	AMPS 106	LIGHTING	;	80		1.25	1	КΠ	ICHEN				1.00	1	
	TOTAL PHASE C - VA 10,600	RECEPT	ACLES	4,680		1.0/.5	1	ΕX	ISTING	3			1.00	1	_
	AMPS 88	MOTORS	;	80		1.00		LR	G MOT	FOR			1.25	TOTAL DEMAND	1
	TOTAL PNLBD - VA 37,200	SUPP HE	AT			1.00	1	SH	IOW W	/NDW			1.25	37,220 VA	
	AMPS 103	MISC EQ	UIP	5,360		1.00		LT(G TRA	СК			1.00	103 A	
PAN	ELBOARD NOTES														
LK	PROVIDE LOCK-OFF DEVICE AT F	PANEL													
``															

OPTIMIZ
842 EAST ISABELLA AVE.
MESA, AZ, 85204
602-699-6224
PROJECT: ECS180001
EOR: BRETT LORENZEN
PE#: 53437

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AIC RATING:	10000
AIC RATING.	10000

EQUIPMENT GROUND BUS

AIC	RATING:	1000

DRAWN BY: CHECKED BY: PROJECT NUMBER: BSL BSL 17065



REVISIONS: -

SHEET TITLE: ELECTRICAL PANELBOARD SCHEDULES



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GENERAL INSTRUCTIONS

A. GENERAL REQUIREMENTS

1. All requirements under the architects general and supplementary conditions apply to this section.

- 2. Where the requirements of this section and division exceed those of the general and supplementary conditions, the requirements of this section take precedence
- 3. Become thoroughly familiar with all of its contents as to requirements that affect this section.
- 4. 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.
- 5. 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
- 6. 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:
 - 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."
- 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. 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.
- 8. 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.
- 9. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
- 10. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other project requirements but may offer advantage to Contractor or Owner.
- 11. 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.

A. PRE-BID SITE VISIT

- 1. Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done
- 2. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain extra compensation over and above the contract price.
- D. 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
 - 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 numbers.
 - 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 the following quality grade(s) for all materials and equipment: a. Commercial specification grade:
 - 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 specified.
 - 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".
- C. MANUFACTURERS
 - 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.

D. COORDINATION

- 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. 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.
- 3. 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.
- 4. Figured dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at the building, as variations may occur.
- 5. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection.
- 6. Provide materials with trim that will properly fit the types of ceiling, wall, or floor finishes actually installed.
- 7. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.
- 8. Make all offsets required to clear equipment, beams, and other structural members, and to facilitate concealing raceways in the manner anticipated in the design.

F. ORDINANCES AND CODES

1. Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction.

- 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
- 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 a

G. 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 temp
- store inside in conditioned spaces.
- 3. For other materials and equipment, cover with waterproof, tear-resistant, heavy tarp or polyet required to protect from plaster, dirt, paint, water, or physical damage.
- 4. Equipment and material damaged by construction activities shall be rejected, and Contractor 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 con
- 6. Conduit, equipment, etc. shall have a neat and clean appearance at the termination of the wo
- 7. Plug or cap open ends of conduits while stored and installed during construction when not in entrance of debris into the systems.

I. SUBSTITUTIONS

- 1. Materials, products, equipment, and systems described in the Bidding Documents establish a function, dimension, appearance and quality to be met by the proposed substitution.
- 2. The base bid shall include only the products from manufacturers specifically named in the dra specifications.
- 3. To request a substitution, request the Substitution Request Form from the Architect or Engine the Substitution Request From for each material, product, equipment, or system that is propo
- 4. The burden of proof of the merit of the proposed substitution is upon the proposer.
- 5. Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the and Owner the following:
 - a. Proposed substitution has been fully investigated and determined to meet or e Work in all respects unless stated otherwise in the substitution request.
 - b. Proposed substitution is consistent with the Contract Documents and will prod including functional clearances, maintenance service, and sourcing of replace
 - c. Proposed substitution has received necessary approvals of authorities having
 - d. Same warranty will be furnished for proposed substitution as for specified Wo e. If accepted substitution fails to perform as required, Contractor shall replace s
 - system with that originally specified and bear costs incurred thereby.
 - f. Coordination, installation and changes in the Work as necessary for accepted complete in all respects.
- 6. No substitutions will be considered unless the Substitution Request Form is completed and at appropriate substitution documentation.
- No substitution will be considered prior to receipt of bids unless written request for approval t by the Engineer at least ten (10) calendar days prior to the date for receipt of bids.
- 8. If the proposed substitution is approved prior to receipt of bids, such approval will be stated in
- 9. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be give
- 10. No substitutions will be considered after the contract is awarded unless specifically provided i documents.
- 11. Provide factory generated point-by-point calculations for all exterior light fixtures (photometric engineer can generate a point-by-point do not suffice for the point-by-point calculations). Prov point-by-point calculations at the discretion of the engineer.

L. SUBMITTALS

- 1. Assemble and submit for review shop drawings, material lists, manufacturer product literature furnished, and items requiring coordination between contractors under this contract.
- 2. Provide submittals in sufficient detail so as to demonstrate compliance with these Contract D design concept.
- 3. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible wit intended use, will fit the available space, and maintain manufacturer recommended service cl
- 4. If the size of equipment furnished makes necessary any change in location or configuration, s showing the proposed layout.
- 5. Transmit submittals as early as required to support the project schedule. Allow two weeks for
- plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if red

6. Only resubmit those sections requested for resubmittal or that were modified in any other way

- Submittals shall contain:
 - a. The project name
 - 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,
 - drawings and specifications, and is coordinated with other trades. f. Manufacturer product literature shall include:
 - a. Shop drawings
 - b. product data

- c. performance sheets
- d samples

	ed under this division and all electrical equipment roper operation. ETA ATS (latest edition) and all additional electric, indicating the name of the equipment, i the specifications: e with the equipment finish. sive. ifacturers of the equipment to which the ert other color] letters for Normal Power; t other color] letters for Emergency Power.	<image/> <text><text><text><text></text></text></text></text>
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 autrance of dobisis into the systems. autrance of dobisis into the systems. autrance of dobisis into the systems. TUTION: autrance of dobisis into the systems. builting progress of the work in the division. Contractor shall maintain an accurate (sec.) with an ascurate (sec.) with an ascu	t other color] letters for Emergency Power.	
As products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, equipment, and systems described in the Bidding Documents establish a standard of required A. External products, excerption products, excerpti	s].	
1. Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. n. RECORD DRAWINGS n. RECORD DRAWINGS n. Record Drawings 2. Protease bid shall include only the products from manufacturers specifically named in the drawings and specifications. n. N. Record Drawings n. 3. Provide access doors for al concealed equipment the Architect or Engineer. Complete and send 1. Perform the following prior to starting up the electrical systems: 3. To request the substitution, request the substitution request the substitution request the substitution request the substitution accurately transfer all record information to three identical sets of the apprived sets of the apprive	s].	
2. The base bid shall include only the products from manufacturers specifically named in the drawings and specifically named in the drawings and specifically named in the drawings and the system. 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. 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. 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. 1. Provide access doors for all concealed equipment where indicated or as required, except where above lay-in contractor shall maintain an accurately transfer all record information to three identical sets of the approved shop 1. Provide access doors for all concealed equipment where indicated or as required, except where above lay-in contractor shall contractor shall upbricate item 3. To request the Substitution, request the Substitution, Request Form from the Architect or Engineer. Complete and send 2. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop 3. Check all components and devices and lubricate item		
1. Provide access doors for all concealed equipment where indicated or as required, except where above lay-in 1. Perform the following prior to starting up the electrical systems: 3. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and send 2. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop a. Check all components and devices and lubricate item		
3. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and send 2. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop		
	ns accordingly.	
the Substitution Request From for each material, product, equipment, or system that is proposed to be substituted. 2. Access doors shall be adequately sized for the devices served with a minimum size of 18 inches x 18 inches. torque-tightening values. If manufacturer's torque values.		
4. The burden of proof of the merit of the proposed substitution is upon the proposer. O. OPERATION AND MAINTENANCE INSTRUCTIONS UL 486A and UL 486B. 3. Access doors must be of the proper construction for the type of construction in which it is installed. c. Adjust taps on each transformer for rated secondary versions and transformer for rated secondary versions and the proper construction in which it is installed.	voltage when the transformer is at minimum	
5. Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, 1. During the course of construction, collect and compile a complete brochure of equipment furnished and installed on		
and Owner the following: a. Proposed substitution has been fully investigated and determined to meet or exceed the specified a. Proposed substitution has been fully investigated and determined to meet or exceed the specified b. Check and record building's service entrance voltage, and proper phasing.	, grounding conditions, grounding resistance,	DRAWN BY: CHECKED BY: PROJECT NUMBER: BSL BSL 17065
Work in all respects unless stated otherwise in the substitution request. 2. Include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, screwdriver-operated cam lock, and anchor straps. e. Replace all burned-out lamps and lamps used for tem b. Proposed substitution is consistent with the Contract Documents and will produce indicated results, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment fixtures.	porary construction lighting in permanent light	· · · · · · · · · · · · · · · · · · ·
including functional clearances, maintenance service, and sourcing of replacement parts. f. After all systems have been inspected and adjusted, of authorities having jurisdiction. c. Proposed substitution has received necessary approvals of authorities having jurisdiction. f. After all systems have been inspected and adjusted, of authorities having jurisdiction.		
d. Same warranty will be furnished for proposed substitution as for specified Work. 3. Include an inside cover sheet that lists the project name, date, Owner, Architect, Engineer, General Contractor, b. Karp Associates		
e. If accepted substitution fails to perform as required, Contractor shall replace substitute material or Sub-Contractor, and an index of contents. 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 4. Submit a copy of literature bound in approved binders with index and tabs separating equipment types to the complete in all respects. 4. Architect, for Engineer's review, at the termination of the work.		
f. Zum.		►
6. No substitutions will be considered unless the Substitution Request Form is completed and attached with the 5. Include Record Drawings as described above. appropriate substitution documentation. T. PENETRATIONS		
P. WARRANTIES 1. Coordinate sleeve selection and application with selection and application of fire-stopping specified in Division 07		
by the Engineer at least ten (10) calendar days prior to the date for receipt of bids. 1. Warrant each system and each element thereof against all defects due to faulty workmanship, design, or material for		
8. If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. 2. Roofs: 8. If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. 2. Roofs:		
g. Coordinate all roof penetrations with Engineer, Owner, and as applicable, the roofing contractor providing a roof warranty. 9. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. 2. Remedy all defects occurring within the warranty period(s) as stated in the General Conditions and Division 01.		Щ Ш
h. Keep all raceway penetrations within mechanical equipment curbs wherever possible. Coordinate with Division 01.		<u> </u>
10. No substitutions will be considered after the contract is awarded unless specifically provided in the contract 3. Warranties shall include labor and material, including travel expenses. i. Flash and counterflash all openings through roof, and/or provide pre-fabricated molded seals documents. compatible with the roof construction installed, or as required by the Engineer, Owner, or roofing		
4. Make repairs or replacements without any additional costs to the Owner, and to the satisfaction of the Owner, and the satisfacting the satisfaction of the owner, and		S M
engineer can generate a point-by-point do not suffice for the point-by-point calculations). Provide interior point-by-point calculations at the discretion of the engineer.		
5. Perform the remedial work promptly, upon written notice from the Engineer or Owner. a. Steel Pipe Sleeves for Raceways and Cables: ASTM A53/A53M, Type E, Grade B, Schedule 40,		
6. Also warrant the following additional items: b. Cast Iron Pipe Sleeves for Raceways and Cables: Cast or fabricated "wall pipe," equivalent to		ШZ
1. Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be a. All raceways are free from obstructions, holes, crushing, or breaks of any nature. 1. Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be b. All raceway seals are effective. 1. furnished, and items requiring coordination between contractors under this contract. b. All raceway seals are effective.		
c. The entire electrical system is free from all short circuits and unwanted open circuits and grounds. waterstop, unless otherwise indicated.		
 Provide submittals in sufficient detail so as to demonstrate compliance with these Contract Documents and the Gleves for Rectangular Openings: Galvanized sheet steel with minimum 0.052 [0.138] inch Gleves for Rectangular Openings: Galvanized sheet steel with minimum 0.052 [0.138] inch The time of Substantial Completion, deliver to the Owner all warranties, in writing and properly executed, including 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.		
3. Prior to transmitting submittais, very that the equipment submittais, very that the equipment submittais is mutually compatible with and suitable for the interview of the second		
 a. Lach warrang instrument share be addressed to the Owner and state the commencement date and term. b. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies a. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing b. Teach warrang instrument share be addressed to the Owner and state the commencement date and term. b. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies b. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies b. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies 		
showing the proposed layout. GENERAL MATERIALS AND INSTALLATION 2. Manufacturers:		REVISIONS:
5. Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time, A. ROUGH-IN		
plus to/from mailing time via the Architect, plus a duplication of this time for resubmittals, if required. 1. Coordinate without delay all roughing-in with other divisions. Conceal all conduit and raceways except in unfinished c. Specified Technologies Inc		
 Only resubmit those sections requested for resubmittal or that were modified in any other way. areas and where otherwise indicated on the drawings. United States Gypsum Company 		
e. 3M corp. 7. Submittals shall contain: B. CONCRETE BASES		
a. The project name b. Applicable specification section 1. Provide concrete bases (e.g., housekeeping pads) for equipment where indicated on the drawings and as specified 1. Provide concrete bases (e.g., housekeeping pads) for equipment where indicated on the drawings and as specified floor rating, and installation drawing for each penetration fire stop system.		
c. Submittal data		
d. Equipment identifications acronym as used on the drawings e. Contractors review stamp. 2. Concrete bases shall have chamfered edges.		SHEET TITLE: ELECTRICAL
a. The stamp shall certify that the submittal has been checked by the Contractor, complies with the Include qualifications data for testing agency.		SPECIFICATIONS SHEET 1
	This drawing is the professional	·
a. Shop drawings	intellectual property of Opti- mized LED and protected by	
a. Minimum 28-day, 4000-psi concrete Institute Standard Building 5. Provide necessary equipment and accessories that are not provided by the equipment supplier or Owner to	Copyright Usage of this drawing shall is restricted for use as a	04/06/18 CITY SUBMITTAL
d. samples both.	project example and shall not be	
proposed. 6. Equipment and accessories not provided by the equipment supplier may include, but not be limited to, flexible cords	reproduced, recreated, or uti- lized for any other purpose with-	SHEET
h. General product catalog data not specifically noted to be part of the specified product will be rejected c. Exposed exterior concrete shall contain 5 to 7 percent air entrainment.	out express written consent of Optimized LED.	F7



A.METALLIC CONDUIT AND TUBING 1. Types

RACEWAYS

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.

- 2. Liquidtight Flexible Metal Conduit (LFMC): Flexible steel conduit with PVC jacket, UL 360; fittings: NEMA FB 1. 3. Hot-dip Galvanized Rigid Steel Conduit (GRS): ANSI C80.1, UL 6.
- 4. Plastic-Coated IMC, RMC, and Fittings: NEMA RN 1, NRTL listed. Coating thickness of 0.04 inches minimum.
- 5. IMC and RMC Fittings: NEMA FB 1; compatible with conduit type and material, NRTL listed. 6. Manufacturers:
- Western Tube and Conduit Wheatland Tube Tyco International
- d. Allied Tube and Conduit
- e. Republic Raceway
- B. NON-METALLIC CONDUIT AND TUBING
- 1. Types: Rigid Nonmetallic Conduit (RNC): Schedule 40 PVC, 90 deg C rated, D. Electrical Nonmetallic Tubing (ENT): NEMA TC 13, NRTL listed.
- Liquidtight Flexible Nonmetallic Conduit (LFNC): UL 1660. d. ENT and LFNC Fittings: Compatible with conduit/tubing type and material, NRTL listed.
- a. NEMA TC 3, TC 6; UL 651, compatible with conduit/tubing type and material, NRTL listed.
- 3. Manufacturers: Amco
- b. Cantex
- c. Certainteed d. Prime Conduit
- f. Thomas and Betts. RACEWAY INSTALLATION
- A. General requirements
- 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

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

6. Securely fasten raceways in place with approved straps, hangers, and steel supports as required. Attach raceway supports to the building

the Engineer in advance. Make other bends smooth and even and without flattening raceway or flaking galvanizing or enamel. Radii of bends

structure. Hang single raceways for feeders with supports spaced not more than 10 feet. Securely clamp vertical feeder raceways to structural

8. Ream raceway ends, thoroughly clean raceways before installation, and keep clean after installation. Plug or cover openings and boxes as

9. 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

11.Protect all raceway installations against damage during construction. Repair all raceways damaged or moved out of line after roughing-in to

13.Install approved expansion/deflection fittings where raceways pass through (if embedded) or across (if exposed) expansion joints, and when

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.

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

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

1. Provide GRS installed below grade with a corrosion-resistant bonded-plastic or approved mastic coating. This shall include the 90-degree

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

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

hing and locknut on the inside and a locknut or ar

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

vibration, or noise. Provide all FMC and LFMC with an insulated green or bare copper bonding ground conductor.

12. Align and install true and plumb all raceway terminations at panelboards, switchboards, motor control equipment, and junction boxes.

using RNC or RAC in exposed environments in accordance with NFPA 70 and expansion/contraction properties of RNC or RAC.

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

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

14. Install a pull wire in each empty raceway that is left for installation of conductors or cables under other divisions or contracts. Use

required to keep raceways clean during construction and fish all raceways clear of obstructions before pulling conductor wires.

steel members attached to structure. Install cable clamps for support of vertical feeders where required. Add raceway supports within 12 inches

CONDUCTORS AND CABLES INSTALLATION

b. System Voltage:

c. Receptacles WIRING DEVICES

shall be as long as possible and never shorter than the corresponding trade elbow.

10. Homeruns containing more than one branch circuit shall not be less than 3/4-inch in size.

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

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

of all bends, on both sides of the bends.

otherwise on Drawings.

B. ABOVE GROUND RACEWAY USE:

indicated.

all conduit over 2". C.UNDERGROUND RACEWAY USE:

D. EQUIPMENT CONNECTIONS

E. bushings and locknuts

Rigidly te

CONDUCTORS AND CABLES

3. Copper Conductor Manufacturer:

4 Aluminum Conductor Manufacturer

A conductors

General Cable

d. American Wire and Cable

Advance Wire and Cable

11. Control Wiring:

12. Flexible Cords and Cables

b. Stranded copper conductors for all, unless noted otherwise.

unless the correct pressure has been applied.

Replace all joints or splices indicating excessive heating.

2. Aluminum or galvanized steel interlocked armor

3. THHN- or XHHW-insulated conductors

4. MC Cable manufacturers: AFC Cable Systems

Encore Wire Corporation

5. May be used:

ceiling. Lengths may not exceed six feet

b. For vertical drops in stud walls.

Where exposed to view.

Where exposed to damage.

When restricted otherwise.

vii. When specifically disallowed by the local AHJ.

ix. Circuits supplied by an emergency or standby power source

viii. When specifically disallowed by the landlord.

Hazardous locations.

Wet locations.

. Take measurements with a non_contact type infrared thermometer.

May not be used (examples may include but are not limited to): Homeruns to panelboards (refer to Section 26: Definitions).

building is occupied and in operation for a minimum of two weeks.

1. 600V, unjacketed; UL Standard 83, 1569, and 1685; NFPA 70 Article 330.

14 AWG, unless noted otherwise.

B. terminations

C.MC Cable

c. Southwire.

Southwire US Wire and Cable

Cable USA

Okonite

Encore Wire

a. General Cable

7. Do not support raceways from suspended ceiling components.

meet Engineer's approval without additional cost to the Owner.

elbow below grade and the entire vertical transition to above grade.

approved hub on the outside. Conduit shall enter the enclosure squarely.

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

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

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

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

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

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

Aluminum conductor option (conductors 1/0 or larger): Compact stranded, aluminum alloy (AA-8000 series), complying with ICEA S-95-658/NEMA WC70.

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

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.

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

Stranded copper conductors, 600V insulation, of the proper type, size, and number as required to accomplish specified function. Minimum size: No.

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

3. Measure the temperature of all conductors at all splices and terminations. Make each test under typical building load Conditions after the

a. In lieu of flexible conduit and wiring from light fixtures located in accessible ceilings to junction boxes attached to building structure directly above the

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

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

			A.LIGHT FIXTURE LOCATIONS
	1. Install all wiring in approved raceway and enclosures, except where specified or indicated for low-voltage wiring or where type MC cable is	 b. Wall-mounted Telephone (Public): One at 48 inches above finished floor and one at 36 inches above finished floor. c. For other than wiring devices, refer to paragraphs, articles, sections, divisions, or drawings to obtain mounting heights for specific equipment or 	1. Light fixtures shown on the drawings represent general arrangements only
	indicated or specified as acceptable.	systems.	2. Refer to architectural drawings and coordinate with architect for exact locations.
	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.	ELECTRICAL SERVICE AND GROUNDING	
	 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. 		3. Coordinate location with all other trades before installation to avoid conflicts.
		A. GROUNDING	4. Coordinate light fixture locations in mechanical rooms with final installed piping and ductwork layouts.
	4. 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.	1. Permanently and effectively ground and bond the electrical installation in a thorough and efficient manner.	B. LIGHT FIXTURES
	5. At contractor's discretion circuits may be combined to multi-wire branch circuits (i.e., shared neutral). In these instances, they shall be provided	2. All grounding shall meet or exceed the requirements of NFPA.	1. Provide light fixtures as scheduled on drawings, including any lamps, and necessary accessories for a complete and operational system
	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.	3. Where grounding on plans indicates grounding above minimum code requirements, drawings shall take precedence.	2. Light fixture model numbers scheduled on the drawings are complete and current according to the latest information available at the time of
	6. When multiple home runs are combined into a single raceway the total circuits shall not exceed three and total current carrying conductors	4. Use bare or green insulated conductors as specified herein, and other materials indicated on the Drawings.	specification. Model number shall be confirmed with description by providing vendor.
	including the neutral shall not exceed 4. Unless specifically indicated on the drawings.		3. Provide material and labor to securely hang, clean, and make light fixtures completely ready for use.
a.	7. GFCI Circuits: Provide a dedicated neutral and not be shared.	DISTRIBUTION AND CONTROL EQUIPMENT	4. Provide all hangers, supports, and miscellaneous hardware required to install light fixtures, proper trim to fit each ceiling condition actually
h.	Limit the one-way conductor length to 100 feet between the panelboard and the most remote receptacle or load on the GFCI circuit.	A.LIGHTING AND APPLIANCE PANELBOARDS	encountered, and additional tie wires connected to structure to conform to seismic requirements where required by the applicable building code.
ν.		1. Panelboards:	
	8. Label all conductors with vinyl stick-on circuit markers equating to the corresponding circuit number.	 a. Complete with bolt-on thermal magnetic, molded case circuit breakers b. Dead-front finished cabinet 	Packaging of light fixtures and controls is not acceptable and will be strictly enforced. Packaged price will be confirmed with contractor and failure to provide separate line items will result in complete submittal rejection.
	 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. 	c. Fully-rated and with the integrated short circuit current ratings indicated on the drawings	6. Where the Light Fixture Schedule indicates an allowance for a specific light fixture, the price is a Contractor price. Include all additional costs
	10. Voltage drop in branch circuits shall not exceed 3 percent.	 All two- and three-pole breakers shall be of the common trip type. Typewritten card directory indicating exactly what each circuit breaker controls fully-rated and with the integrated short circuit current ratings indicated 	for freight, lamps, and installation of light fixture and lamps.
	11. Cable Color:	on the drawings	7. Install fluorescent light fixtures hung in continuous rows on channel struts specifically designed for this purpose.
	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 y, in which case the colors are to match the existing system. In larger sizes where properly colored insulation is not available, use vinyl plastic	2. Type SWD Circuit Breakers:	8. Install all light fixtures located in areas without ceilings immediately below the roof-framing members, or suspended from chain hangers suital
elect	ical tape of the appropriate color around each conductor at all termination points, junctions, and pull boxes.	a. Use when breaker serves as a switch for 120V or 277V lighting circuits.	in length to provide the indicated mounting height.
b.	System Voltage:	 GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip). Use as indicated on drawings. 	9. Through-wiring of recessed light fixtures in suspended ceilings is not permitted. Connect each light fixture by a whip to a junction box. Provide
x.	240V and under: Phase A: Black.		cable whips of sufficient lengths to allow for relocating each light fixture within a 5-foot radius of its installed location, but not exceeding 6 feet unsupported lengths.
xi.	Phase B: Red. Phase C: Blue.	4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers:a. Class B ground-fault protection (30-mA trip). Use as indicated on drawings.	C.EMERGENCY LIGHTING UNITS AND EXIT SIGNS
xiii.	Reutral: White. Equipment Ground: Green.	5. Handle Clamp:	
	Isolated Ground: Green with yellow stripe.	a. Loose attachment for holding circuit breaker handle in "on" position	1. Self-contained units complying with UL 924.
	480V and 480Y/277V:	 Use for all circuits containing emergency lighting loads, fire alarm loads, and as indicated on drawings Breakers serving fire alarm loads must have a permanently-affixed red label stating "FA" in white letters adjacent to the circuit breaker. 	2. Battery:
i. ii.	Phase A: Brown Phase B: Orange	6. Handle padlocking device:	a. Sealed, maintenance-free, lead-acid type
iii. iv.	Phase C: Yellow Neutral: Gray	a. Fixed attachment for locking circuit breaker handle in "on" or "off" position. Use as indicated on drawings.	b. Suitable rating and capacity to supply and maintain at not less than 87-1/2 percent of the nominal battery voltage for the total lamp load associated with the unit for a period of at least 90 minutes
v.	Equipment ground: green.	7. Manufacturers:	c. Equipment shall supply and maintain not less than 60 percent of the initial emergency illumination for a period of at least 90 minutes.
	D.MC Cable	a. Square D b. Eaton	3. Charger:
	 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 	c. G.E.	a. Fully automatic, solid-state type with sealed transfer relay.
	310.15.	d. Siemens.	4. Operation:
	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.	B. DISCONNECT (SAFETY) SWITCHES	 Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below Automatically disconnects from battery when voltage approaches deep-discharge level
elect	ical boxes and cabinets	1. Disconnect (Safety) Switches:	c. When normal voltage is restored, relay disconnects from battery, and battery is automatically recharged and floated on charger.
	A. general requirements	 a. Heavy-duty, fused or non-fused (as indicated on drawings or required) NEMA KS1, externally operated, visible-blade safety switches b. NEMA enclosure type indicated on the drawings or suitable for the environment in which installed. 	5. Test Push Button:
	1. Provide junction boxes, pull boxes, cabinets, and wireways wherever necessary for proper installation of various electrical systems according to	c. Based on fusible switch and fuse sizes indicated, include Class R, J, or L fuse provisions as applicable.	a. Push-to-test type, in unit housing, simulates loss of normal power, and demonstrates unit operability.
	NFPA 70 and where indicated on the drawings.	 Where indicated, provide fusible switches permanently labeled as suitable for use as service entrance equipment Provide integral and separate neutral and ground assemblies, suitable for the sizes of conductors indicated 	6. LED Indicator Light:
	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.	 From the final and separate neutral and ground assemblies, suitable for the sizes of conductors indicated f. Do not double-lug any terminations not specifically listed as suitable for more than one conductor. 	a. Indicates normal power on. Normal glow indicates trickle charge, and bright glow indicates charging at end of discharge cycle.
	the environment installed.	2. Provide switches where not furnished with the starting equipment, at all other points required by NFPA 70, and where indicated on the	D.LAMPS
a.	Appleton	drawings.	
р. с.	Cooper Erikson Electrical	3. Manufacturers:	1. LED Lamps and Luminaires: a. Comply with ANSI C78.377 for white light LED color range
d. e.	Hoffman Killark Electric	a. Square D b. Eaton	b. Minimum CRI of 80 unless noted otherwise
f. g.	Raco, Robroy Industries	c. G.E. d. Siemens.	 LED binning specification tolerance to be within 3 macadam ellipses of rated values All LEDs used for same fixture type throughout the project must originate from the same production bin
ĥ. i	Thomas and Betts Steel City		 Minimum average rated life of 20,000 hours for LED lamps and 50,000 hours for LED luminaires Rohs compliant.
	3. Outlet boxes	J. FUSES	g. LED lamp manufacturers:
		1. Provide each circuit and set of fuse clips throughout the work with sizes and types as required or indicated.	i. Bridgelux ii. Cree
	1. galvanized steel knockout boxes, suitable in design to the purpose they serve and the space they occupy.	2. All fuses larger than 600A:	iii. Nichia iv. Osram
	2. Size as required for the specific function or as required by NFPA 70, whichever is larger.	a. UL Class L, similar to type KRP-C Bussmann Low Peak or equal.	v. Philips
	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.	3. Fuses used to protect motors:	
	4. Provide approved cast outlet boxes with hubs and weatherproof covers in all areas subject to damp, wet, or harsh conditions.	a. UL Class RK5, Bussmann Fusetron or equal.	E. Drivers
	5. Coordinate locations of outlet boxes prior to rough-in, consult architect for exact locations.	4. Fuses used to protect all other electrical equipment: a. UL Class RK1, dual element, Bussmann LPS/LPN or equal.	1. General Requirements:
	6. Applications:		 a. Sound levels not exceeding Class A ambient noise levels b. Line transient withstand ratings as defined in ANSI/IEEE C62.41, Category A; lamp current crest factor of 1.7 or less; 95-percent power factor or
a. b.	Light fixture Switch	5. All fused devices shall be labeled as to type and size of fuse required.	greater; low heat type; thermally protected against overheating.
c.	Receptacles	6. 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.	2. LED Drivers:
WIRI	NG DEVICES		 a. Comply with NRTL requirements and ANSI C82.77 b. Designed for type and guantity of lamps served
	A. general requirements	7. Manufacturers: a. Bussmann	c. Total harmonic distortion less than 20 percent
	1. The catalog numbers listed for wiring devices are generally for 20A rated devices.	b. Edison Fuse c. Mersen/Ferraz Shawmut	 d. Tolerate sustained open circuit and short circuit output conditions without damage e. Shall not over-drive LEDs at a current or voltage above LED rated values
	2. Where 15A rated devices are indicated on the drawings or required for circuit rating limitations, provide wiring devices equivalent to those	d. Littlefuse.	f. ROHS compliant; meets EN610000 requirements for input harmonics
	specified for 20A, but rated for 15A.	K. DRY-TYPE TRANSFORMERS	F. DIMMABLE LIGHT FIXTURES
	3. All receptacles located outdoors or in damp or wet locations: Listed as 'weather Resistant', designated by a 'WR' on the faceplate.		1. For dimmable light fixtures provide both control and power wiring between light fixture and control device and between light fixtures
	4. Minor changes relative to the location of electrical equipment may be made to comply with structural and building requirements as determined	 Transformers: General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 	
	4. 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.	a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561.	2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations
	4. Minor changes relative to the location of electrical equipment may be made to comply with structural and building requirements as determined	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. 	
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a. b. c. d.	 4. 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. 5. 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 Architect [Engineer]. 3. wiring devices Shall be commercial grade Manufacturers: Cooper Hubbell Legrand Leviton. C.Floor Boxes UL 514A listed for scrub water exclusion. For slab on grade - Watertight, Class 1, and fully adjustable cast iron box. 	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. b. For three-phase transformers less than 15 kVA and all single-phase: i. 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 15 kVA and larger: i. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 3. Phases, Voltages, and Sizes: a. As indicated on the drawings. 4. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. 5. Full-Capacity Primary Taps: a. For three-phase below 25 kVA and all single-phase i. One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5 percent taps (2 above, 4 below) b. Above 500 kVA 	 2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls A.manufacturers 1. Basis of Design: a. Lutron Ecosystem 2. Approved Equals: a. Wattstopper b. Encellium c. Wattstopper d. Acuity Brands
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a. b. c. d.	 4. 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. 5. 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 Architect [Engineer]. 3. wiring devices Shall be commercial grade Manufacturers: Cooper Hubbell Legrand Leviton. C.Floor Boxes UL 514A listed for scrub water exclusion. For slab on grade - Concrete-tight, fully adjustable cast iron box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. Floor box shape, quantity of gangs, type and quantity of devices, finish, and flange type per drawings. 	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. For three-phase transformers less than 15 kVA and all single-phase: 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. For three-phase transformers 15 kVA and larger: 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. For three-phase transformers 15 kVA and larger: 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 3. Phases, Voltages, and Sizes: As indicated on the drawings. Sound Level: Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. 5. Full-Capacity Primary Taps: For three-phase below 25 kVA and all single-phase One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5 percent taps (2 above, 4 below) Above 500 kVA Four 2.5 percent (2 above, 2 below). 6. Transformer Core and Coil Assemblies: 	 2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls A.manufacturers 1. Basis of Design: 2. Approved Equals: a. Vattstopper b. Encellium c. Wattstopper d. Acuity Brands e. Crestron B.general 1. Description:
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a. b. c. d.	 4. 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. 5. 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 Architect [Engineer]. 3. wiring devices Shall be commercial grade Manufacturers: Cooper Hubbell Legrand Leviton. 2. For slab on grade - Watertight, Class 1, and fully adjustable cast iron box. 3. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. 4. Floor box shape, quantity of gangs, type and quantity of devices, finish, and flange type per drawings. 5. Manufacturers: 	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. b. For three-phase transformers less than 15 kVA and all single-phase: i. 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 15 kVA and larger: i. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 15 kVA and larger: i. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 3. Phases, Voltages, and Sizes: a. As indicated on the drawings. 4. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. 5. Full-Capacity Primary Taps: a. For three-phase below 25 kVA and all single-phase i. One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5 percent taps (2 above, 4 below) b. Above 500 kVA i. Four 2.5 percent (2 above, 2 below). 6. Transformer Core and Coil Assemblies: a. Mounted on integral vibration-absorbing pads. 7. Mounting: 	 Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls A.manufacturers
a. b. c. d.	 4. 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. 5. 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 Architect [Engineer]. 8. wiring devices Shall be commercial grade Manufacturers: Cooper Hubbell Legrand For slab on grade - Watertight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. 	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. b. For three-phase transformers less than 15 kVA and all single-phase: 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 15 kVA and larger: 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 3. Phases, Voltages, and Sizes: a. As indicated on the drawings. 4. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. 5. Full-Capacity Primary Taps: a. For three-phase below 25 kVA and all single-phase i. One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5 percent taps (2 above, 4 below) b. Above 500 kVA i. Four 2.5 percent (2 above, 2 below). 6. Transformers 75 kVA and larger: i. Transformers 75 kVA and larger: i. Floor mounted unless indicated otherwise. 	 2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls A.manufacturers Basis of Design: Lutron Ecosystem Approved Equals: Lutron Ecosystem Pacellium Wattstopper Encellium Crestron B.general Description: Web-accessible, network-connected programmable lighting control system that receives digital signals from addressable input devices. Signals addressed by at central signal processor and distributes operating signals to control devices to provide changes. Ectoronic power switching and dimming modules and relays process signals and effect circuit changes On/off switching Emergency switching On/off switching On/off switching
a. b. c. d. b. c. d.	 4. 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. 5. 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 Architect [Engineer]. 3. wiring devices Shall be commercial grade Manufacturers: Cooper Hubbell Legrand Leviton. 2. Floor Boxes UL 514A listed for scrub water exclusion. For slab above grade - Concrete-tight, fully adjustable cast iron box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. Floor box shape, quantity of gangs, type and quantity of devices, finish, and flange type per drawings. S. Manufacturers: Hubbell Legrand Kanufacturers: Kanufacturers: 	 a. General purpose, NRTL listed/labeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. b. For three-phase transformers less than 15 kVA and all single-phase: i. 185 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 15 kVA and larger: i. 220 degrees C, NRTL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. 3. Phases, Voltages, and Sizes: a. As indicated on the drawings. 4. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. 5. Full-Capacity Primary Taps: a. For three-phase below 25 kVA and all single-phase i. One 5 percent tap above and one 5 percent tap below; 25 kVA to 500 kVA, six 2.5 percent taps (2 above, 4 below) b. Above 500 kVA i. Four 2.5 percent (2 above, 2 below). 6. Transformer Core and Coil Assemblies: a. Mounted on integral vibration-absorbing pads. 7. Mounting: a. Transformers 75 kVA and larger: 	2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls A.manufacturers 1. Basis of Design: 2. Approved Equals: 2. Approved Equals: 3. Wattstopper b. Encellium Crestron B.general 1. Description: 3. Veb-accessible, network-connected programmable lighting control system that receives digital signals from addressable input devices. Signals addressed by at central signal processor and distributes operating signals to control devices to provide changes. Contoff switching Electronic power switching and dimming modules and relays process signals and effect circuit changes On/off switching Emergency switching On/off switching System Components: System Components: System Components: System Components: System Components: Set Control Components: System Components: Set Control Components: System Components: Set Control Components: Set Control Components: Set Control Components: System Components: Set Control
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a. b. c. d. b. c. d. SWIT	 4. 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. 5. Contractor shall provide all wining 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 Architect [Engineer]. 3. Wring devices Shall be commercial grade Manufacturers: Cooper Hubbel Legrand Leviton. 2. Floor Boxes U. L 514A listed for scrub water exclusion. For slab on grade - Watertight, Class 1, and fully adjustable cast iron box. For slab on grade - Watertight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For slab above grade - Concrete-tight, fully adjustable, stamped galvanized steel box. For box shape, quantity of gangs, type and quantity of devices, finish, and flange type per drawings. Manufacturers: Hubbel Legrand Manufacturers: Hubbel Legrand statistical requirements Contractor shal provide cover plates by the same manufacturer as the wiring devices; complying with NFPA 70 ARTICLES 406.9 (A) or (B). Rundoor dry applications Colored, smooth nylon Sub desire colors with Architect before installation. May desire colors with Architect before installation. Indegrad of switches under one ganged-plate, usually horizontally; or, where required by detalls, vertically. Set all cover plates plumb, parallel, and finished flush with the wall. 	 a. General purpose, NRTL listeditabeled. Comply with NEMA ST 20 and UL 1561. 2. Insulation Class: a. NRTL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. b. For three-phase transformers leves than 15 N/A and all single-phase. c. For three-phase transformers leves and larger: 2. 20 degrees C, NRTL-component-recognized insulation system with a maximum of 115 degree C rise above a 40 degree C ambient temperature. c. For three-phase transformers 16 K/A and larger: a. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. s. Full-Capacity Primary Taps: a. For three-phase transformers 26 K/A and larger; b. To three-phase transformers 26 K/A and larger; a. For three-phase transformers 26 K/A and larger; b. Four transformer Core and Coil Assemblies: c. Transformer Core and Coil Assemblies: a. Mounting: c. Transformer Core and Coil Assemblies: c. Foor mounted unless indicated otherwise. c. Foor mounted transformers i. Sound transformers i. Sound transformers i. Sound transformers i. Sound transformers i. Source transformers i. Source transformers i. Source transformers i. Foor source with the valit construction is suitable for the load c. Foor mounted transformers i. Source transformers<	 2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light fixture and control device dimming types for compatibility. digital networked lighting controls Annanufacturers 1. Basis of Design: 1. Basis of Design: 2. Approved Equals: 3. Watistopper 4. Opported Equals: 3. Watistopper 5. Coeffiant 6. Crestron B. general 1. Description: 1. Description: 1. Description: 2. Option dimming modules and relays process signals and effect dircuit changes 3. Only withing 3. System Components: 4. System Components: 3. System Components for a complete and fully operational system. 2. Occupancy sensors 3. Solve all necessary components for a complete and fully operational system. C. Elepting control panets 3. Provide all necessary components for a complete and fully operational system. 2. Cliphting control panets 3. Provide all necessary components for a complete and fully operational system.
a. b. c. d. b. c. d. SWIT	 4. 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 censtruction, but do not move more than 12° horizontally. 5. Contractor shall provide all wiring devices of the same manufacturer and not mixed on the project, to the maximum extent possible. Provide color of togets and receptates as requested by the Architect [Engineer]. 3. wiring devices 1. Shall be commercial grade 2. Manufacturers: Cooper Hubbell Legrand Legrand Legrand For slab one grade - Watertight, Class 1, and fully adjustable cast iron box. 3. For slab above grade - Concrete-light, fully adjustable, stamped galvanized steel box. 4. For slab above grade - Concrete-light, fully adjustable, stamped galvanized steel box. 5. Foor box shape, quantity of gangs, type and quantity of devices, finish, and flange type per drawings. 5. 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For three-phase transformers 16 kV and all single-phase: a. Xa indicated on the drawings. c. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. b. For three-phase transformers and the drawings. c. Sound Level: a. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to IEEE C57.12.91. b. Full-Capacity Primary Taps: a. For three-phase tead w25 kVA and all single-phase i. One spontaus below 25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase i. For three-phase tead w25 kVA and all single-phase j. Transformer Core and Coil Assemblies: a. Transformer for early blevel with three-phase transformer j. Transformer sind kad otherwise. j. Transformer sis kVA and larger i. Floor	 2. Quantity of low voltage and line voltage wiring and wire type shall be per manufacturer's recommendations 3. Coordinate light future and control device dimming types for compatibility. digital networked lighting controls Amanufacturers 1. Basis of Design: 3. Approved Equals: 3. Approved Equals: 4. Wattstopper B. Encellium Output: Status proves Acaity Brands Costrolino: Description: 1. Description: 3. Description: 4. Status proves 4. Status proves 5. 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Provide with a 204 [120] [277]V breaker protected branch circuit for operation power. Provide with a 204 [120] [277]V breaker protected branch circuit for operation power. Provide with a 204 [120] [277]V breaker protected branch circuit for operation power. Provide wit
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For slab above grade - Concrete leght, fully adjustable, starped galvanized steel box.<!--</td--><td> General purpose, NPTL istachished. Compty with NEMA ST 20 and LL 1661. I. Insulation Class: I. NRL-component-recognized insulation system replaces the UL 1446 insulation rating system that used letters. For inves-phase transformers less than 15 kVA and all angle-phase. I. 205 degree C. NRL-component-recognized insulation system with a maximum of 150 degree C rise above a 40 degree C ambient temperature. S. Phases, Voltages, and State: As insistants on the drawings. As insistants on the drawings. As insistants on the drawings. Not exceeding 3 dBa less than NEMA ST 20 standards for the sizes indicated when factory tested according to JEEE CS7.12.91. For three-phase below 25 KVA and all single-phase. Four 2.5 percent trap above and coll Assemblate: Four 2.5 percent as a darge and coll assemblate: Four and an angle y distants. Four and angle y distants and angle y distants. 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3. Communication devices:

LIGHT FIXTURES, LAMPS AND BALLASTS

ANY CONTRACTOR, SUB-CONTRACTOR, AND/OR SUPPLIER IS HEREBY NOTIFIED THAT THIS PROJECT (CONTRACT FOR CONSTRUCTION) MUST COMPLY TO THE ARIZONA SENATE BILL SB1549, PROMPT PAYMENT LEGISLATION, AS IT MODIFIES THE ARIZONA REVISED STATUTES.

	 b. Positive air-gap c. Phase independent channels d. Non-volatile power failure memory e. Lifetime rated for minimum 500,000 switching cycles f. 120/277V, 60Hz i. 1/2HP motor at 120V iii. 1HP motor at 120V 	OPTIMIZED Lighting Engineering Design 842 EAST ISABELLA AVE.
	 ii. 1HP motor at 277V g. Withstand 6kV/3kA surge per IEC 61000-4-5 and ANSI/IEEE C62.41-1991 h. UL Listed, FCC Part 15 8. Power Supply: 	MESA, AZ, 85204 602-699-6224 PROJECT: ECS180001 EOR: BRETT LORENZEN
	a. 24V regulated power supply with fuse-protection E. SYSTEM ACCESSORIES	PE#: 53437 This drawing is the professional intellectual property of Optimized LED and protected by
ete and operational system mation available at the time of	 Remote Keypad Controls: Field-configurable remote keypad Replaceable, engravable, programmable buttons in number indicated LED indication lights. 	Copyright, Usage of this drawing shall is restricted to the project indicated and shall not be reproduced, recreated, or utilized for any other purpose without the express written consent of Optimized LED.
ach ceiling condition actually ed by the applicable building	 d. Fits in standard single-gang box e. Configurable for 2 to 8 single action pushbuttons. f. Finish shall be selected by architect g. Operates on 24V power from control system bus 	
confirmed with contractor and	 Occupancy Sensor Interface Device: Integrates occupancy sensors and related sensors with control network. In separate enclosure Four wire bus providing 24 VDC power to network devices, with two independent sensing inputs. Photocell Sensor: 	
rice. Include all additional costs se.	 a. Continually monitor daylight entering window or skylight. b. Equipped with 3-wire interface for direct connection to control system. c. Operates on 24V power from control system bus d. Easily programmable with handheld device 	
ended from chain hangers suitable	 Mounted to ceiling not extending more than 1" beyond ceiling plane F. CONDUCTORS AND CABLING 	
a whip to a junction box. Provide acation, but not exceeding 6 feet in		
	 c. Comply with UL 444 and NFPA 70 2. Communication control cable: a. Plenum Rated b. 22 AWG stranded copper twisted pair for data 	
or the total lamp load associated	 b. 22 AWG stranded copper twisted pair for data c. 18 AWG stranded copper twisted pair for power d. Type CMP complying with NFPA 262 e. Replaceable, engravable, programmable buttons in number indicated f. LED indication lights. 	
least 90 minutes.	 g. Fits in standard single-gang box h. Configurable for 2 to 8 single action pushbuttons. i. Finish shall be selected by architect j. Operates on 24V power from control system bus 	
w	lighting control installation	
d on charger.	A. general requirements 1. Furnish and install all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein	
	2. System setup information shall include each devices load type, assigning each device to a control zone, and defining operational control functions	
arge cycle.	3. Do not install network power controls until space is enclosed, HVAC systems are running, and overhead and wet work in space are complete 4. Install network power switching controls in accordance with manufacturer's instructions, product data, technical bulletins, product catalog,	
	installation instructions, submittal sketches and drawings, and product carton instructions 5. Provide electrical grounding in accordance with NFPA 70	
	6. Provide typed panelboard schedule in pocket provided in panel doors	
	 Install in strict accordance with all local and pertaining codes or regulations Utilize an installer with demonstrated experience in projects of similar size and scope 	
	9. Equipment shall be in ready to use condition at end of installation	
	10. Schedule system commissioning by factory-authorized personnel in accordance with manufacturer's required lead times and written instructions	
	 Touch up, repair, or replace damaged components before substantial completion Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of equipment. Remove construction debris 	DRAWN BY: CHECKED BY: PROJECT NUMBER:
	from equipment area and dispose of debris 13. Clean integral air filters, heat sinks, grills, and fans before substantial completion and commissioning services	BSL BSL 17065
s; 95-percent power factor or	B. SOFTWARE	
	 Install and program software to meet the Owner's requirements Provide current licenses and backup copies of the software for the Owner's records 	
	C.SYSTEM STARTUP	
	1. Provide manufacturer's system startup and adjustment	
between light fixtures	 Switch each load on and off with manual line test feature of the power switching module before installing processors Perform operational testing to verify compliance with Specifications. Adjust as required. 	L
	D. ADJUSTING	\vdash
	1. Within 12 months of the date of Substantial Completion provide onsite service to adjust the system to account for actual occupied conditions. E. DEMONSTRATION	ŻШ
	1. Factory authorized service representative to instruct owner's staff to adjust, operate and maintain network power switching systems; and provide instruction using the system software.	<u> </u>
	miscelaneous electrical A. WIRING OF MECHANICAL EQUIPMENT	ZШ
	 Provide all raceways and power wiring for all Division 23 equipment requiring electrical connections, including but not limited: Pumps Water heaters HVAC equipment 	
ssable input devices. Inges.	 d. Line-voltage control and interlock wiring not provided under Division 23. 2. Connect per manufacturers' wiring diagrams 3. Coordinate with mechanical contractor for disconnects and variable frequency drives (VFD) furnished with equipment 	
	 Provide all disconnect switches and final connections as required If VFD is separate or does not have an integral disconnect feature, provide disconnect switch with auxiliary contact such that motor will be 	Ü H
	 6. Provide VFD cable, Belden or approved equivalent, for connection of VFD to motor when required 	ШZ
	 After installing wiring, verify that each motor load has the correct phase rotation. Verify the actual "Maximum Overcurrent Protection" (MOCP) device ratings and "Minimum Circuit Ampacity" (MCA) conductor sizing for 	
	mechanical equipment from the equipment nameplat 9. Verify actual electrical requirements with mechanical equipment submittals and nameplates prior to rough-in. Provide properly sized electrical wiring and equipment without extra cost to the Owner. Notify the Engineer of all changes required in the electrical installation due to equipment vortigence so that the offects on feedors, branch signific pageboards fuess and signific transport on the block of prior to purchasing and	
	variances so that the effects on feeders, branch circuits, panelboards, fuses and circuit breakers can be checked prior to purchasing and installation. 10. Contractor is responsible for coordinating with mechanical contractor to verify the actual ampacities and correct sizes of all conductors and overcurrent protective devices for all equipment.	
	B. WIRING OF THERMOSTATS, TIME AND TEMPERATURE CONTROLS	
	 Provide all raceways, power wiring, and line-voltage control and interlock wiring not provided under Division 23, for all thermostats, temperature control devices, and controls, including, but not limited to, night-stats, water heater interlocks, time switches and override timers 	REVISIONS:
	2. See mechanical drawings for locations and temperature control diagrams.	
	 Low-voltage conductors for thermostats and temperature control system may be run exposed above finished accessible ceilings, if approved and listed for this purpose. low-voltage systems 	
	A.DATA SYSTEM PROVISIONS	
	Provide flush mounted data outlet boxes with 1 inch conduit stub-up with pull-string concealed to accessible ceiling space at locations as indicated on the drawings.	

SHEET TITLE: ELECTRICAL SPECIFICATIONS SHEET 2

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SHEET

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