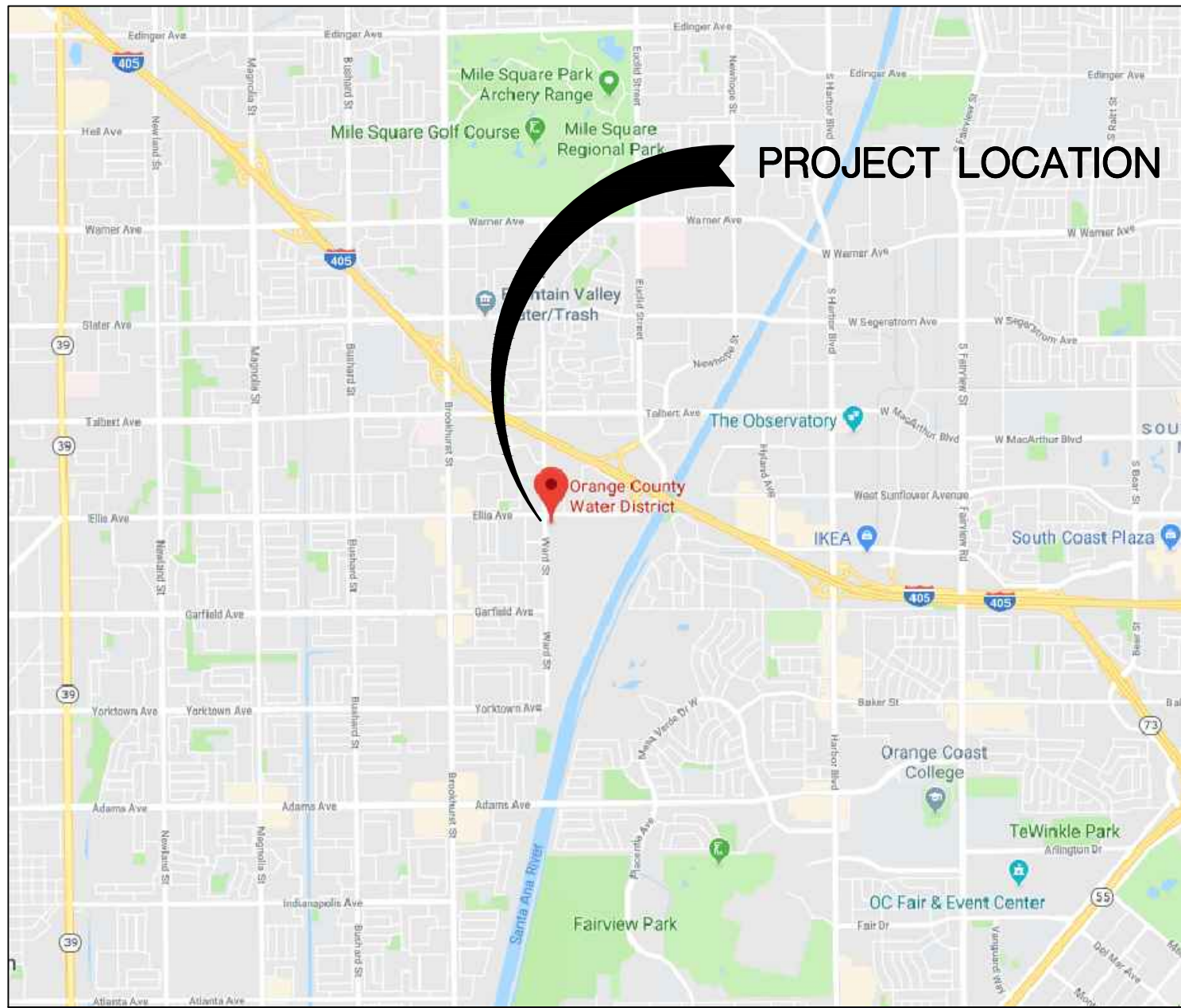
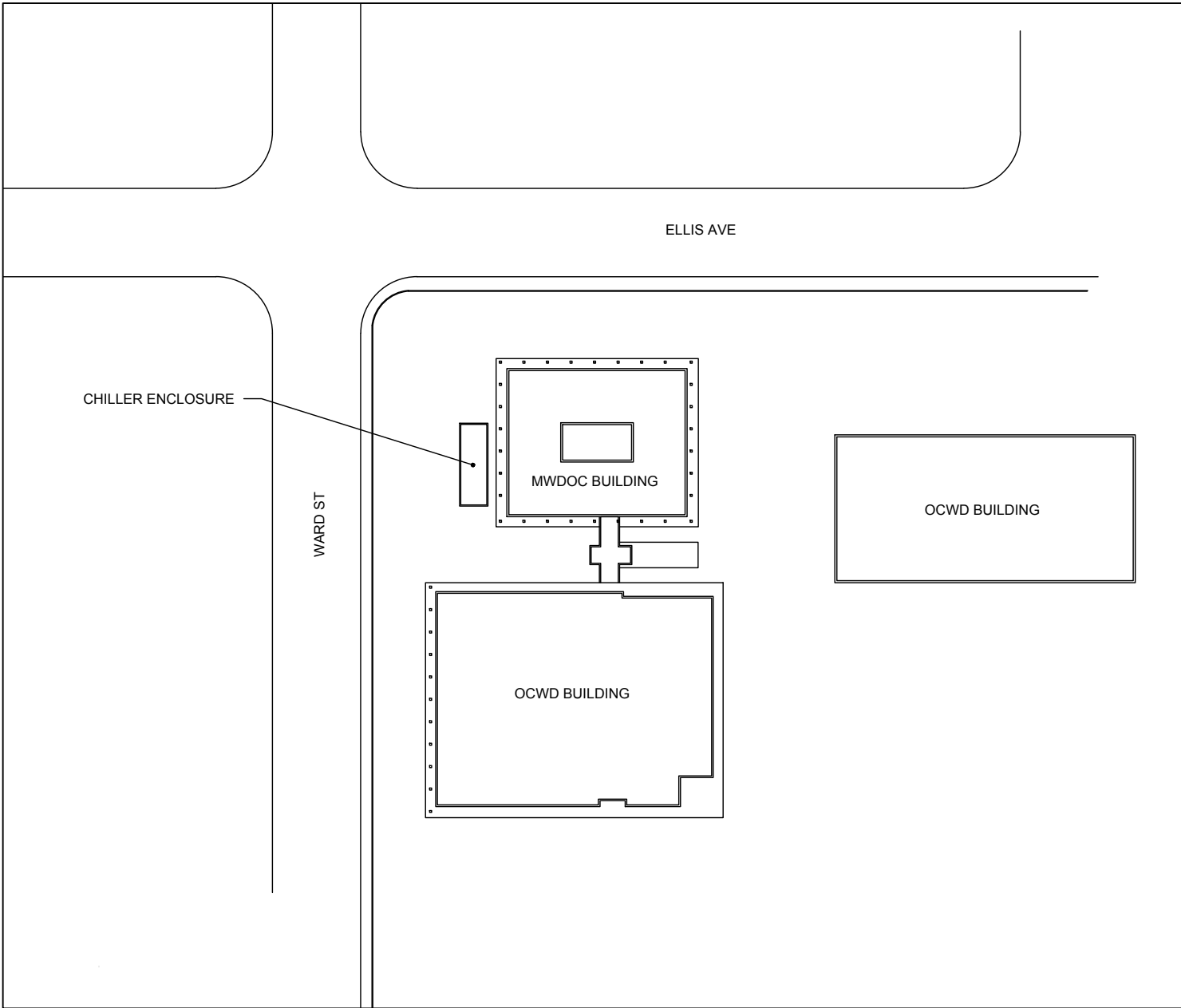


MWDOC ELECTRICAL SYSTEM REHABILITATION PROJECT

18700 WARD STREET, FOUNTAIN VALLEY, CA 92708



VICINITY MAP



LOCATION MAP

GENERAL NOTES

- PROVIDE ALL MATERIALS AND LABOR AS REQUIRED TO ACHIEVE A COMPLETE AND OPERATIONAL SYSTEM.
- COORDINATE AND OBTAIN APPROVALS FROM ALL RESPECTIVE UTILITY COMPANIES AS REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION.
- INSTALL RACEWAY SYSTEMS AS FOLLOWS:
 - USE RIGID GALVANIZED STEEL IN ALL AREAS EXPOSED TO WEATHER OR PHYSICAL DAMAGE.
 - USE FLEXIBLE METALLIC CONDUIT ONLY IN AREAS AS PERMITTED BY LOCAL CODE AUTHORITY. USE SEAL-TITE IN AREAS EXPOSED TO WEATHER.
 - USE STEEL FITTINGS FOR ELECTRICAL METALLIC TUBING WHERE UTILIZED. ZINC DIECAST FITTINGS NOT ALLOWED.
 - USE P.V.C. CONDUIT UNDERGROUND WITH CODE SIZED GROUND. CONDUIT RISERS AND STUBS ABOVE GRADE SHALL BE I.M.C. WITH HALF-LAPPED TAPE COVERING OR P.V.C COATING. ALL NEW WIRING SHALL BE COPPER TYPE "THHN/THWN" – UON.
- CONDUIT FOR ROOF MOUNTED EQUIPMENT SHALL BE ROUTED BELOW THE ROOF WITHIN THE BUILDING.
- ALL FIXTURE, DEVICE, ETC.. LOCATIONS SHALL BE VERIFIED WITH ARCHITECTURAL DRAWINGS AS WELL AS EQUIPMENT SUPPLIER REQUIREMENTS PRIOR TO ANY ROUGH-IN WORK.
- THESE DRAWINGS ARE DIAGRAMMATIC AND REPRESENT THE INTENT OF EQUIPMENT, DEVICES, ETC... TO BE CONNECTED AND THE CIRCUITS TO WHICH THEY ARE TO BE CONNECTED TO. CONTRACTOR SHALL INSTALL ALL CONDUIT, J-BOXES, ETC... AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.
- ALL EXTERIOR EQUIPMENT SHALL BE WEATHERPROOF.
- ELECTRICAL CONTRACTOR SHALL PERFORM ALL WORK IN STRICT ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL GOVERNING CODES.
- ALL EQUIPMENT SHALL BE NEW AND BEAR A "UL" LABEL – U.O.N.
- ELECTRICAL CONTRACTOR SHALL SECURE AND PAY FOR ALL NECESSARY BUILDING PERMITS.
- COMPLETE ELECTRICAL INSTALLATION SHALL BE GUARANTEED IN WRITING FOR A PERIOD OF (1) YEAR – UON.
- ELECTRICAL CONTRACTOR SHALL VISIT SITE PRIOR TO BID DATE, TO VERIFY ALL EXISTING CONDITIONS TO BE ENCOUNTERED IN THE INSTALLATION OF ALL NEW EQUIPMENT, FIXTURES, DEVICES, FEEDERS, ETC.. EXACT INSTALLATION METHOD AND REQUIREMENTS SHALL BE VERIFIED AND DETERMINED PRIOR TO BID DATE. CONTRACTORS SHALL IMMEDIATELY NOTIFY THIS ENGINEER OF ANY REQUIRED MODIFICATIONS WHICH ARE NOT SHOWN ON THESE DRAWINGS. SUBMITTAL OF BID INDICATES CONTRACTOR IS AWARE OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED.
- ALL ELECTRICAL EQUIPMENT CHARACTERISTICS, LOCATIONS, AND CONNECTION REQUIREMENTS SHALL BE VERIFIED PRIOR TO ANY ROUGH-IN WORK.
- ELECTRICAL CONTRACTOR SHALL FURNISH THE FOLLOWING SHOP DRAWINGS FOR PRIOR APPROVAL:
 - ALL ELECTRICAL SERVICE EQUIPMENT, DISTRIBUTION EQUIPMENT AND PANELBOARDS.
 - OTHER ITEMS AS SPECIFICALLY INDICATED.
- THESE ITEMS SHALL BE APPROVED BY THIS OFFICE PRIOR TO ANY COMMENCEMENT OF PLACING ORDERS OR PERFORMING ANY ROUGH-IN WORK.
- COMPLETE ELECTRICAL SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH THE PRESENTLY ADOPTED EDITION OF THE CEC ARTICLE 250.
- PENETRATIONS OF ALL FIRE RATED WALLS OR CEILINGS SHALL BE FIRE RATED IN ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL CODES.
- PROVIDE ENGRAVED PLASTIC NAMEPLATES FOR ALL MAJOR ELECTRICAL EQUIPMENT.
- PROVIDE THE OWNER AND THIS ENGINEER WITH ONE SET OF ELECTRICAL "AS-BUILTS" AT THE COMPLETION OF JOB.
- ALL DISCONNECT SWITCHES TO BE PROVIDED WITH REJECTION TYPE FUSE HOLDERS.
- PROVIDE GREEN EQUIPMENT GROUNDING CONDUCTOR IN ALL FEEDER AND BRANCH CIRCUIT CONDUITS SIZED PER CEC 250.122.
- CONTRACTOR AND ELECTRICAL DISTRIBUTION VENDER (GE, EATON, SIEMENS, SQUARE D) SHALL INCLUDE IN THEIR EFFORTS A NEW STUDY FOR ANY ADJUSTABLE SETTINGS IN THE NEW 600A CIRCUIT BREAKER AT EXISTING TRANSFORMER T-22 AND ANY NEW CIRCUIT BREAKERS INCLUDED IN THIS SCOPE. ADDITIONALLY FOR NEW ELECTRICAL SWITCHBOARDS, TRANSFORMERS, AND PANELS INCLUDE AN ARC-FLASH STUDY TO IDENTIFY AVAILABLE ENERGIES AND INCLUDE ALL NEW WARNING SIGNS AND LABELS.

SCHEDULE OF WORK

- MOBILIZATION/DEMOBILIZATION
- NEW BREAKER AT T-22, AND NEW 600A FEEDER TO MWDOC ADMIN BUILDING.
- PROCUREMENT AND INSTALLATION OF NEW 600A MSB, INCLUDING RE-CONNECTION OF ALL EXISTING FEEDERS. REMOVAL AND DEMOLITION OF OLD 400A SWITCHBOARD, ASSOCIATED DISCONNECT SWITCH AND FEEDERS.
- PROCUREMENT AND INSTALLATION OF NEW 112.5KVA TRANSFORMER, PANEL L, AND ASSOCIATED FEEDER. INCLUDE REMOVAL AND DEMOLITION OF EXISTING 45KVA TRANSFORMER.
- PROCUREMENT AND INSTALLATION OF 600A MANUAL TRANSFER, SWITCH GENERATOR TAP BOX, AND ITS ASSOCIATED FEEDER.
- FINAL TESTING AND COMPLETION OF PUNCH LIST AND ALL NECESSARY TRAINING.

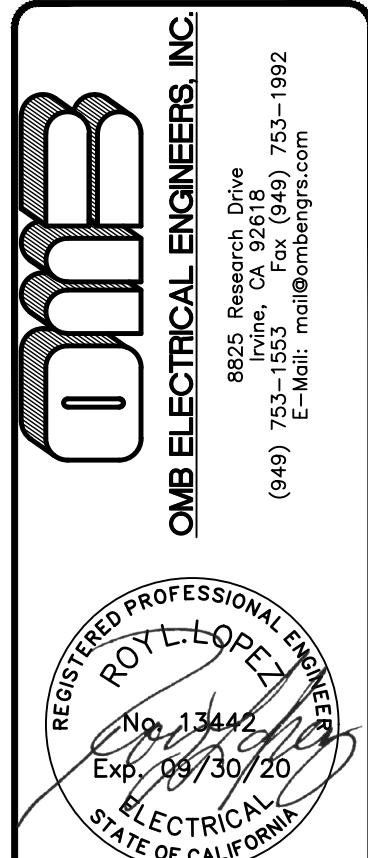
APPLICABLE CODES

- | | |
|------|----------------------------------|
| 2016 | CALIFORNIA BUILDING CODE (CBC) |
| 2016 | CALIFORNIA ELECTRICAL CODE (CEC) |

SHEET INDEX

- | | |
|------|--|
| E000 | TITLE SHEET |
| E001 | ELECTRICAL LEGEND & DETAILS |
| E002 | ELECTRICAL DETAILS |
| E010 | EXISTING SINGLE LINE DIAGRAM |
| E020 | NEW SINGLE LINE DIAGRAM |
| E050 | PANEL SCHEDULE, EXISTING LOADS, & GROUNDING DETAILS |
| E200 | ELECTRICAL SITE PLAN |
| E210 | ELECTRICAL BUILDING PLAN |
| E220 | ENLARGED ELECTRICAL/MECHANICAL ROOM ELECTRICAL PLANS |
| E501 | ELECTRICAL SPECIFICATIONS |
| E502 | ELECTRICAL SPECIFICATIONS |
| E503 | ELECTRICAL SPECIFICATIONS |
| E504 | ELECTRICAL SPECIFICATIONS |

REVISIONS	BY
COUNTER REVIEW	
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RESUBMITTAL	
4-29-19	

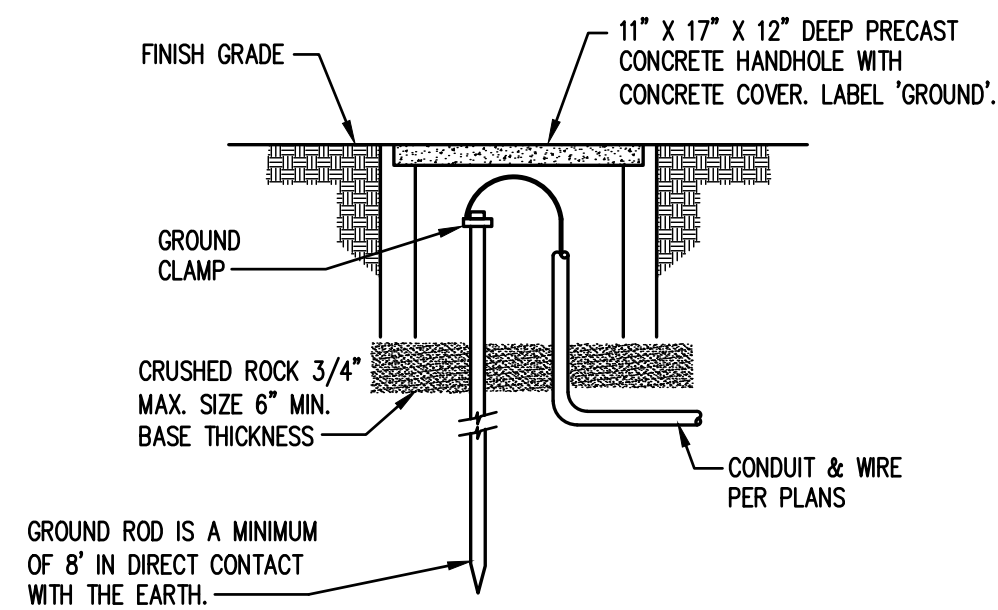


MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT
18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

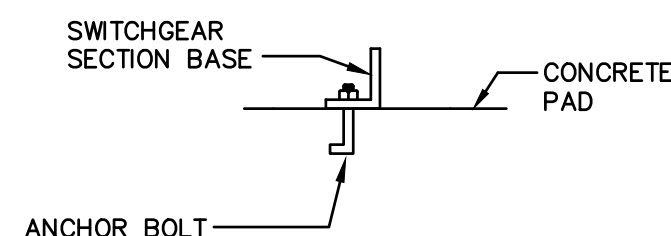
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
















































GROUND WELL DETAIL	SCALE	02
	N.T.S.	

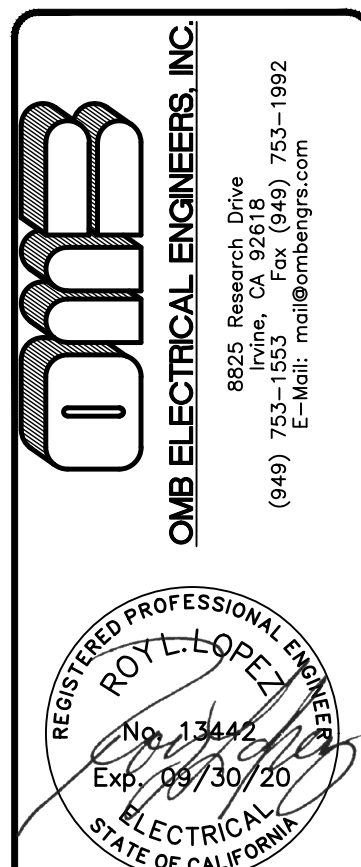
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EQUIPMENT PAD AND ANCHORING DETAIL	SCALE	03
	N.T.S.	

1. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC ONLY. DO NOT SCALE THE ELECTRICAL DRAWINGS TO DETERMINE THE LOCATION OF EQUIPMENT OR OUTLETS.
2. THE EXISTING CONDITIONS SHOWN ARE FROM AVAILABLE RECORD DRAWINGS AND SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL VERIFY ACTUAL EXISTING CONDITIONS AT SITE PRIOR TO SUBMITTING BID. ALL DEMOLITION, ALTERATION, EXTENSION, RELOCATION, REHABILITATION WORK SHALL BE INCLUDED IN CONTRACT. NO ADDITIONAL ALLOWANCE OR CHANGE ORDERS WILL BE ACCEPTED.
3. CONTRACTOR IS RESPONSIBLE TO RELOCATE OR REMOVE FROM WALLS, CEILINGS, FLOOR SPACES, ETC. ANY EXISTING CONDUITS, WIRES, BOXES, FITTINGS, FIXTURES OR OTHER ELECTRICAL EQUIPMENT WHICH INTERFERES WITH PLANNED REMODEL WORK. PROVIDE CIRCUIT CONTINUATION REQUIRED FOR ALL EXISTING OUTLETS, FIXTURES, EQUIPMENT, ETC. SCHEDULED TO REMAIN.
4. NOTIFY THE ENGINEER IMMEDIATELY WHEREVER EXISTING EQUIPMENT IS ENCOUNTERED WHICH MUST BE RELOCATED DUE TO THE NEW CONSTRUCTION, OR NOT INDICATED ON "AS-BUILT" DRAWINGS OR WAS BURIED UNDERGROUND OR EMBEDDED IN STRUCTURE WALLS.
5. CAREFULLY PROTECT ALL WALLS, TRIM, FLOORS, EQUIPMENT, UTILITY LINES AND MATERIALS. WHEN WORKING ON FINISHED SURFACES, LIMIT DAMAGE TO THE SMALLER AREA IF POSSIBLE AND RESTORE TO THE ORIGINAL CONDITION ALL SURFACES WHICH ARE DAMAGED BECAUSE OF THE INSTALLATION OF THIS WORK.
6. EQUIPMENT, MATERIALS AND SUPPLIES TEMPORARILY REMOVED FOR PROTECTION SHALL BE REPLACED IN ORIGINAL LOCATIONS. ANY MATERIALS DAMAGED SHALL BE REPLACED WITH NEW MATERIALS OF LIKE KIND AND QUALITY.
7. DEMOLITION WORK SHALL BE DONE IN A MANNER WHICH WILL NOT CAUSE UNNECESSARY INCONVENIENCE OR DANGER TO USERS OF THE PREMISES AND ADJACENT SITE, AND NOT INTERFERE WITH ITS OPERATION. ANY DEMOLITION WORK TO BE PERFORMED MUST BE PLANNED IN ADVANCE.
8. DO ALL DRILLING, CUTTING, ETC. REQUIRED TO DEMOLISH ELECTRICAL WORK AS INDICATED OR PROVIDE BLANK COVER PLATE ON ALL OUTLETS EXPOSED BY REMOVAL OF FIXTURE OF DEVICES.
9. RESEAL ALL PENETRATIONS OR OPENING THROUGH WALLS, CEILING, FLOORS, ETC., TO MAINTAIN THE RATING OF STRUCTURE.
10. ALL REMOVED MATERIALS AND EQUIPMENT WHICH IS SALVAGED MATERIALS SHALL REMAIN IN THE PROPERTY OF THE OWNER. DELIVER SUCH SALVAGED MATERIALS AND EQUIPMENT ON THE PREMISES AS DIRECTED BY OWNER AND NEATLY PILE OR STORE THEM AND PROTECT FROM DAMAGED. DISPOSE OF ALL HAZARDOUS MATERIAL PER GUIDELINE OF THE STATE OF CALIFORNIA, DEPARTMENT OF HEALTH SERVICES AND OTHER AGENCIES HAVING JURISDICTION.
11. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDUIT/WIRING RUNS, REUSE AS REQUIRE AND REMOVED ALL UNUSED CONDUIT/WIRING, UNUSED CONDUIT IN INACCESSIBLE LOCATIONS (WALLS TO REMAIN) CAN BE ABANDONED IN PLACE. REMOVE UNUSED WIRING.

	DETAIL REFERENCE	EM	EMERGENCY
	KEYNOTE REFERENCE	(ER)	EXISTING TO BE RELOCATED
	KITCHEN EQUIPMENT DESIGNATION	FLA	FULL LOAD AMPS
	FEEDER TAG	G	GROUND
	MECHANICAL EQUIPMENT TAG	GFI	GROUND FAULT INTERRUPTER
A	AMPS	MCB	MAIN CIRCUIT BREAKER
AFC	ABOVE FINISHED COUNTER	MLO	MAIN LUGS ONLY
AFF	ABOVE FINISHED FLOOR	(N)	NEW
C	CONDUIT	OC	ON CENTER
CO	CONDUIT ONLY W/PULL ROPE	(R)	RELOCATED
CU	COPPER	UON	UNLESS OTHERWISE NOTED
(E)	EXISTING TO REMAIN	V	VOLTS
		VL	VERIFY LOCATION
		WP	WEATHERPROOF
		(X)	EXISTING TO BE DEMOLISHED

- | | |
|---|---|
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE SIMPLEX RECEPTACLE MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE QUAD RECEPTACLE MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE FLUSH MOUNTED IN CEILING. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE QUAD RECEPTACLE FLUSH MOUNTED IN CEILING. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE SIMPLEX RECEPTACLE, SWITCHED OR DIMMED (AS NOTED), MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE HALF SWITCHED MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE "GROUND FAULT INTERRUPTER" (G.F.I.) RECEPTACLE MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø ISOLATED GROUND TYPE DUPLEX RECEPTACLE, ORANGE IN COLOR, MOUNTED AT +18" AFF - UON. |
|  | STANDARD 20A, 120V-1Ø ISOLATED GROUND TYPE QUAD RECEPTACLE, ORANGE IN COLOR, MOUNTED AT +18" AFF - UON. |
|  | SPECIAL RECEPTACLE MOUNTED AT +18" AFF - UON. AMPS, VOLTS & PHASE AS INDICATED ON PLANS. VERIFY NEMA CONFIGURATION WITH INSTALLED EQUIPMENT SUPPLIER PRIOR TO PLACING ORDER. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE MOUNTED WITHIN FLUSH FLOOR BOX. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE MOUNTED WITHIN FLUSH FLOOR BOX. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE DUPLEX RECEPTACLE MOUNTED 4" ABOVE COUNTER BACK SPLASH, UON. COORDINATE FINAL HEIGHT WITH ARCHITECT / INTERIOR DESIGNER. |
|  | STANDARD 20A, 120V-1Ø GROUNDING TYPE "GROUND FAULT INTERRUPTER" DUPLEX RECEPTACLE MOUNTED ABOVE 4" ABOVE COUNTER BACK SPLASH, UON. COORDINATE FINAL HEIGHT WITH ARCHITECT / INTERIOR DESIGNER. |
|  | STANDARD 20A, 120V-1Ø ISOLATED GROUND TYPE DUPLEX RECEPTACLE, ORANGE IN COLOR, MOUNTED 4" ABOVE COUNTER BACK SPLASH, UON. COORDINATE FINAL HEIGHT WITH ARCHITECT / INTERIOR DESIGNER. |
|  | JUNCTION BOX, CEILING OR ABOVE CEILING MOUNTED, SIZED BY THE CONTRACTOR PER ACTUAL NUMBER OF CONDUITS AND/OR CONDUCTORS PASSING THRU. |
|  | JUNCTION BOX MOUNTED ON CONDUIT STUB-UP, SIZED BY THE CONTRACTOR PER ACTUAL NUMBER OF CONDUITS AND/OR CONDUCTORS PASSING THRU. JUNCTION BOX FOR SPLICES ONLY AND SHALL CONTAIN NO DEVICES. |
|  | JUNCTION BOX, FLUSH WALL MOUNTED, SIZED BY THE CONTRACTOR PER ACTUAL NUMBER OF CONDUITS AND/OR CONDUCTORS PASSING THRU. |
|  | EPO RED MUSHROOM TYPE PUSH BUTTON MOUNTED AT +45" AFF. |
|  | PUSH BUTTON MOUNTED AT +45" AFF. PROVIDE EDWARDS #821 BUTTON WITH #149-1 STAINLESS STEEL COVER PLATE. |
|  | 6" WALL MOUNTED 120V BELL. PROVIDE EDWARDS #340-6N5 OR EQUAL. |
|  | WALL MOUNTED 120V BUZZER. PROVIDE EDWARDS #1064-N5 OR EQUAL. |
|  | SERVICE ENTRANCE OR DISTRIBUTION EQUIPMENT AS SPECIFIED. |
|  | BRANCH CIRCUIT PANELBOARD, SURFACE MOUNTED. VOLTAGE AND NUMBER OF CIRCUITS PER PANEL SCHEDULE. |
|  | BRANCH CIRCUIT PANELBOARD, FLUSH MOUNTED. VOLTAGE AND NUMBER OF CIRCUITS PER PANEL SCHEDULE. |
|  | CONTROL ENCLOSURE FOR LIGHTING, BUILDING AUTOMATION SYSTEM , EQUIPMENT CONTROL, ETC.. AS INDICATED ON PLANS. |
|  | TRANSFORMER AS SPECIFIED. |
|  | FUSED DISCONNECT SWITCH, AMPS, POLES AND FUSE CLASS (SIZE AS INDICATED).
OPEN - INDICATES NON-FUSED
WP - INDICATES NEMA 3R ENCLOSURE |
|  | MAGNETIC MOTOR STARTER, POLES AND NEMA SIZE AS INDICATED. PROVIDE COMPLETE WITH THERMAL OVERLOAD PROTECTION PER MOTOR NAMEPLATE DATA, 120V CONTROL COIL - UON, AND H.O.A. (HAND-OFF-AUTO) SWITCH. |
|  | COMBINATION DISCONNECT SWITCH/MAGNETIC MOTOR STARTER, AMPS, POLES, FUSE CLASS (SIZE AS INDICATED), AND NEMA SIZE AS INDICATED. PROVIDE COMPLETE WITH THERMAL OVERLOAD PROTECTION PER MOTOR NAMEPLATE DATA, 120V CONTROL COIL - UON, AND H-O-A (HAND-OFF-AUTO) SWITCH.
WP - INDICATES NEMA 3R ENCLOSURE |
|  | MANUAL MOTOR STARTER SWITCH. HORSEPOWER RATED 120V-1Ø - UON. PROVIDE COMPLETE WITH THERMAL OVERLOAD PROTECTION. |
|  | MOTOR OUTLET, HP OR FLA - VOLTS & PHASE AS INDICATED. VERIFY ELECTRICAL CHARACTERISTICS AND CONNECTION REQUIREMENTS WITH INSTALLED EQUIPMENT MANUFACTURER PRIOR TO ANY ROUGH-IN WORK. |
|  | CONDUIT CONCEALED WITHIN BUILDING WALLS OR CEILING SPACE. TICK MARKS INDICATE QUANTITY OF #12 THHN / THWN CONDUCTORS - UON. CONDUIT SHOWN WITH NO TICK MARKS INDICATE 2 #12 THHN / THWN CONDUCTORS - UON. CONDUIT SHALL BE 3/4" MINIMUM - UON. INCLUDE CODE SIZED COPPER BOND CONDUCTOR (NOT SHOWN ON PLAN) IN ALL CONDUIT RUNS. |
|  | CONDUIT ROUTED BELOW FINISHED GRADE AND / OR CONCRETE SLAB. TICK MARKS INDICATE QUANTITY OF #12 THHN / THWN CONDUCTORS - UON. CONDUITS SHOWN WITH NO TICK MARKS INDICATE 2 #12 THHN / THWN CONDUCTORS - UON. CONDUIT SHALL BE 3/4" MINIMUM - UON. INCLUDE CODE SIZED COPPER BOND CONDUCTOR (NOT SHOWN ON PLAN) IN ALL CONDUIT RUNS. |
|  | INDICATES GREEN CODE SIZE EQUIPMENT GROUNDING CONDUCTOR. |
|  | HOMERUN TO DESTINATION AS INDICATED. REFER TO CONDUIT SYMBOL ABOVE. |
|  | INDICATES CONDUIT DROP WITHIN BUILDING WALL. REFER TO CONDUIT SYMBOL ABOVE. |
|  | INDICATES CONDUIT RISER WITHIN BUILDING WALL. REFER TO CONDUIT SYMBOL ABOVE. |
|  | LIGHT LINEWEIGHT REPRESENTS WORK WHICH IS EXISTING TO REMAIN UNDISTURBED. |
|  | HEAVY LINEWEIGHT REPRESENTS WORK TO BE COMPLETED AS PART OF THIS PACKAGE. |
|  | DASHED LINEWEIGHT REPRESENTS WORK WHICH IS EXISTING TO BE DEMOLISHED. |
|  | ELECTRICAL CONTRACTOR TO MATCH EXISTING EQUIPMENT MANUFACTURER A.I.C. RATING (TYP.). |

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**MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT**

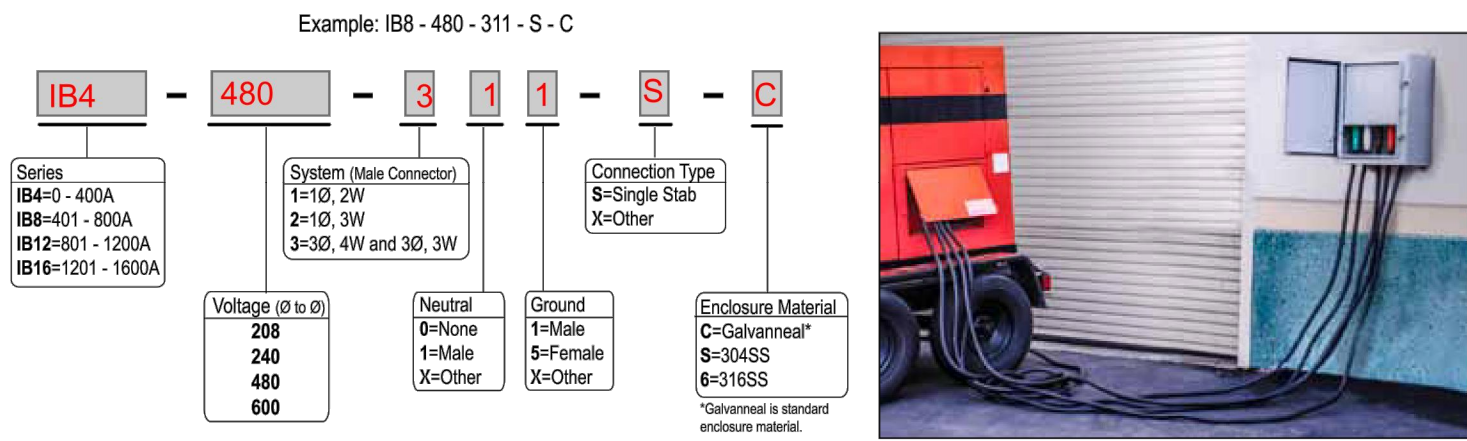
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**ELECTRICAL SYMBOLS AND
DETAILS**

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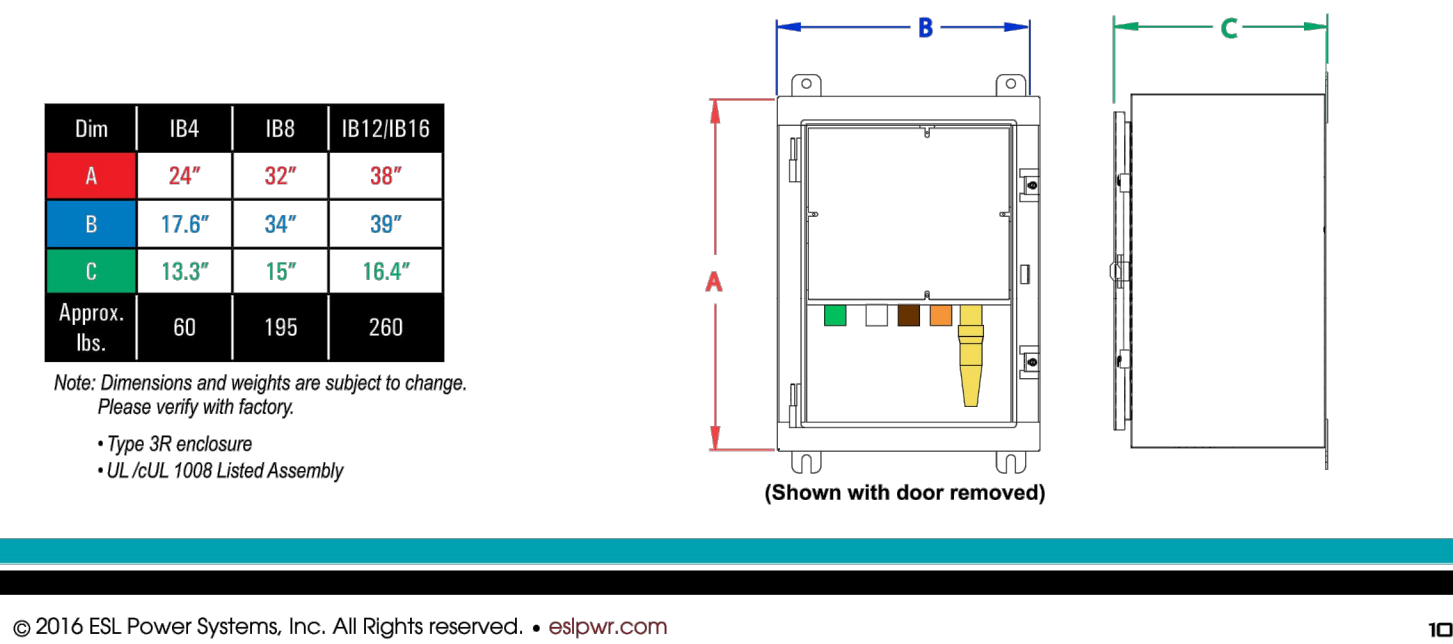
Product Selection Information:
400A – 1600A • Wall Mount



Typical Configurations • 400A - 1600A • Wall Mount • Up to 600VAC

Max Current Rating (Amps)	Model	Load Terminals Per Phase & Neutral	Ground Lug (Wire Range)	Receptacle Size Per Phase & Neutral (Amps)	Ground Receptacle Size (Amps)	Max Current Withstand Rating (KA)
400	IB4	(1) 1/2 - 13x7/8" stud	(1) #6-250	(1) 400	(1) 400	22 (Single PH) 42 (3 PH)
800	IB8	Copper pad with (6) 0.53" holes on 1.34" V x 1" H	(1) #6-250	(2) 400	(1) 400	42
1200	IB12	Copper pad with (4) 0.53" holes on 1.34" V x 2" H; (2) 0.44" holes on 1.38" V	(1) #6-250	(3) 400	(1) 400	42
1600	IB16	Copper pad with (4) 0.53" holes on 1.34" V x 2" H; (2) 0.44" holes on 1.38" V	(1) #6-250	(4) 400	(1) 400	42

Other options available - consult the factory.



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ASCO® SERIES 386 Non-Automatic Power Transfer Switches

User-Initiated Control

ASCO 386 non-automatic transfer switches are generally used in applications where operating personnel are available and the load is not an emergency type requiring automatic transfer of power. The power-switching mechanism and controller is the same hardware used on the highly reliable ASCO Series 300 transfer switches. ASCO 386s are furnished as standard with a momentary-type selector switch to initiate transfer and retransfer. They can also be arranged for remote control via ASCO's connectivity products.



Fig. 14: ASCO 386 400 Amp Type 1 Enclosure w/Optional Accessories 9C, 9D Source Availability Lights

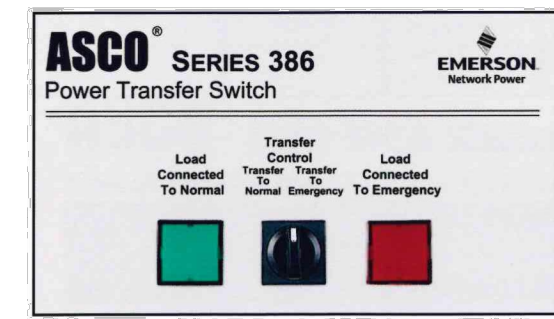


Fig. 15: Control and Display Panel

Electrical Features:

- Listed under UL 1008, CSA certified:
- UL listed through 480 VAC.
- CSA certified through 600 VAC.
- Door-mounted selector switch for local, manually initiated electrical control.
- Sizes from 30 through 3000 amps.
- Available to 600 VAC, 50 or 60 Hz.
- Rated for all classes of load transfer.
- 100% tungsten load ratings through 400 amps.
- Designed for emergency and standby applications.
- Same withstand and close-on rating as Series 300.

Standard Selectable Control Features:

- Inphase monitor to transfer motor loads between live sources, without any intentional off time, to prevent inrush currents from exceeding normal starting levels.
- Selective load disconnect, double-throw contact to operate at an adjustable 0 to 20 second time delay prior to transfer and reset 0 to 20 seconds after transfer.
- High/Low nominal voltage setting. Allows user to adjust for source low reduced voltage conditions in remote areas.
- 60 Hz or 50 Hz selectable switch.
- Single/Three-phase selectable switch.

Control Features:

- Switch position indicating signal lights.
- One auxiliary contact closed when transfer switch is connected to normal and one closed on emergency, standard feature 14A/14B.

Optional Accessories:

- 6Q Key-operated, momentary source selector switch furnished instead of the standard selector switch.
- 9C, 9D Source availability lights to provide operator with a local indication of power source availability.
- Accessory 14AA/14BA auxiliary contacts to indicate position of main contacts. Two (2) for normal position and two (2) for emergency position (one set is standard).
- 72A Serial module (5110) is used to allow local or remote communications with ASCO PowerQuest™ VPI or SiteWeb™ connectivity products.
- Special Enclosures (Specify by appropriate code in catalog number):
Type 3R: Raintight
Type 4: Weatherproof
Type 12: Oil Tight
- 72E Connectivity Module 5150 is used to bring several different serial devices that communicate at different baud rates and with different protocols to a common Ethernet media.

9

ASCO® SERIES 300 & 386 Transfer Switch Ordering Information

To order an ASCO Series 300 Power Transfer Switch, complete the following catalog number:

Product	Neutral Code	Poles	Ampere	Voltage Code	Controller	Options	Enclosure	Optional Accessories	Specific Volt & Fre
300	Blank Solid Neutral Switched Neutral	2 poles, 1Ø 3 poles, 3Ø	Continuous rating 30, 70, 104, 150, 200", 230, 260", 400, 600, 800, 1000, 1200, 1600, 2000 2600, 3000"	A ¹ 115 B ¹ 120 C 208 D 220 E 230 F 240 G 240 H 380 J 400 K 415 L 440 M 450 N 480 Q 575 R 600	1	Insert "X" if optional accessories are required	Blank Open Type C Type 1 (Standard) F Type 3R Enclosure G Type 4 Enclosure H Type 4X Enclosure L Type 12 Enclosure M Type 3R Enclosure N Type 4 Secure Enclosure	118G, Programmable Engine Exerciser 14AA/14BA Auxiliary Contacts (2 sets) 44A, 44G Strip Heater w/Thermostat 72A Serial Module 72E Connectivity Module 72J Window Kit	This information is necessary to allow correct control settings prior to shipment

To order an ASCO Series 386 Transfer Switch, complete the following catalog number:

Product	Neutral Code	Phase Poles	Ampere	Voltage Code	Controller	Options	Enclosure	Optional Accessories	Specific Volt & Fre
386	Blank Solid Neutral Switched Neutral	2 poles, 1Ø 3 poles, 3Ø	Continuous rating 30, 70, 100, 150, 200", 230, 260", 400, 600, 800, 1000, 1200, 1600, 2000, 3000"	A ¹ 115 B ¹ 120 C 208 D 220 E 230 F 240 G 240 H 380 J 400 K 415 L 440 M 450 N 480 Q 575 R 600		Insert "X" if optional accessories are required	Blank Open Type C Type 1 (Standard) F Type 3R Enclosure G Type 4 Enclosure H Type 4X Enclosure L Type 12 Enclosure M Type 3R Enclosure	6Q Key-Operated 9C/9D Source Availability Lights 14AA/14BA Auxiliary Contacts 72A Serial Module All Accessories 72E Connectivity Module	This information is necessary to allow correct control settings prior to shipment

Note: 1. Specify neutral code "C" for 260 and 400 amperes only.
2. Available 36, 100, and 1600 amps. Use Type 3R for 1200, 2000, 2600 and 3000 amp applications.
3. 115-120 volt available 30-400 amps only. For other voltages contact ASCO.
4. 200 and 230 amp rated switches for use with copper cable only.
5. Secure 3R type provided as standard for 2500-3000 amp when outdoor enclosure is required.

Extended Warranties for Series 300 Transfer Switches

Catalog No.	Description
2EXW300	Two-Year Extended Warranty (Parts & Labor)
3EXW300	Three-Year Extended Warranty (Parts & Labor)
4EXW300	Four-Year Extended Warranty (Parts & Labor)
5EXW300	Five-Year Extended Warranty (Parts & Labor)

10

GENERATOR DOCKING STATION

SCALE
N.T.S. 01

REV	DESCRIPTION	BY	DATE						
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SWITCHBOARD GENERAL NOTES - SERIES 2

PRODUCT DESCRIPTION & RATINGS

Power System Data

480Y/277V 3PH 4W 60Hz / 3 Phase Wye
Solidly Grounded
System Short Circuit Current Rating: 35KA RMS
Incoming Section 1 Cable Through the Bottom Left of Lineup

Bus System Data

600A Silver Plated Copper Main Bus
(2) .25x1.50 IN/6x38 mm Cu Bus Bar Per Phase
(1) .25x3.25 IN/6x83 mm Cu Bus Bar Per Neutral
(1) .25x.875 IN/6x22 mm Cu Ground Bus

Enclosure Data

Type 3R Free Standing
Exterior Paint Color: ANSI 49
Front Accessibility Only Required
Handling: Rollers
Rodent barriers
1.5H Corrosion Resist Base Channels

Estimated Shipping Weight

Shipping Split 1 747.00 lbs / 338.84 kgs
Shipping Split 2 925.00 lbs / 419.58 kgs
Complete Lineup 1672.00 lbs / 758.42 kgs

Code Standards

U.L. Deadfront and suitable for use as Service Entrance when not more than six (6) disconnecting means are provided.

Rating Nameplates

ST1- Service Entrance - Section Bus 600A
ST2- Deadfront - Section Bus 600A

PRODUCT INFORMATION

Wiring

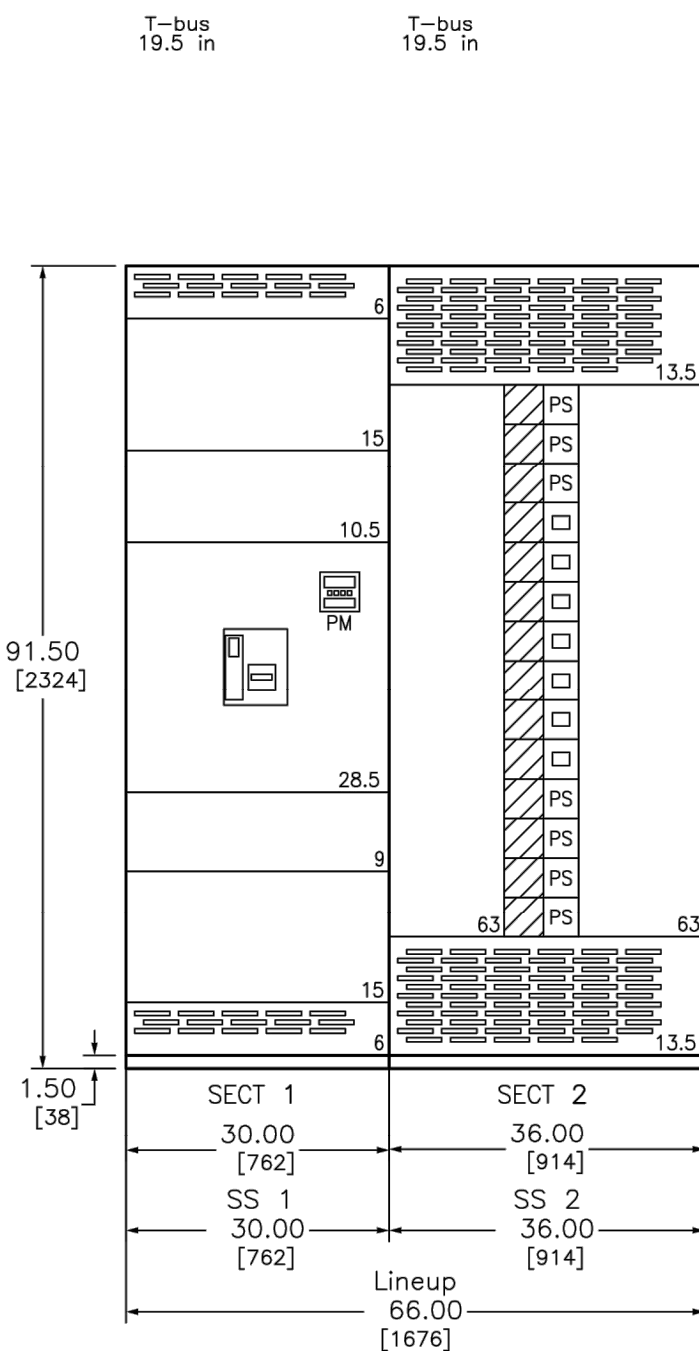
All wiring to be Machine Tool Wire type

Instruction Bulletins

Reference 80043-055 For Handling, Installation, Anchoring, Inspection And Maintenance Information

Product Accessories/Options

Seismic Qualified



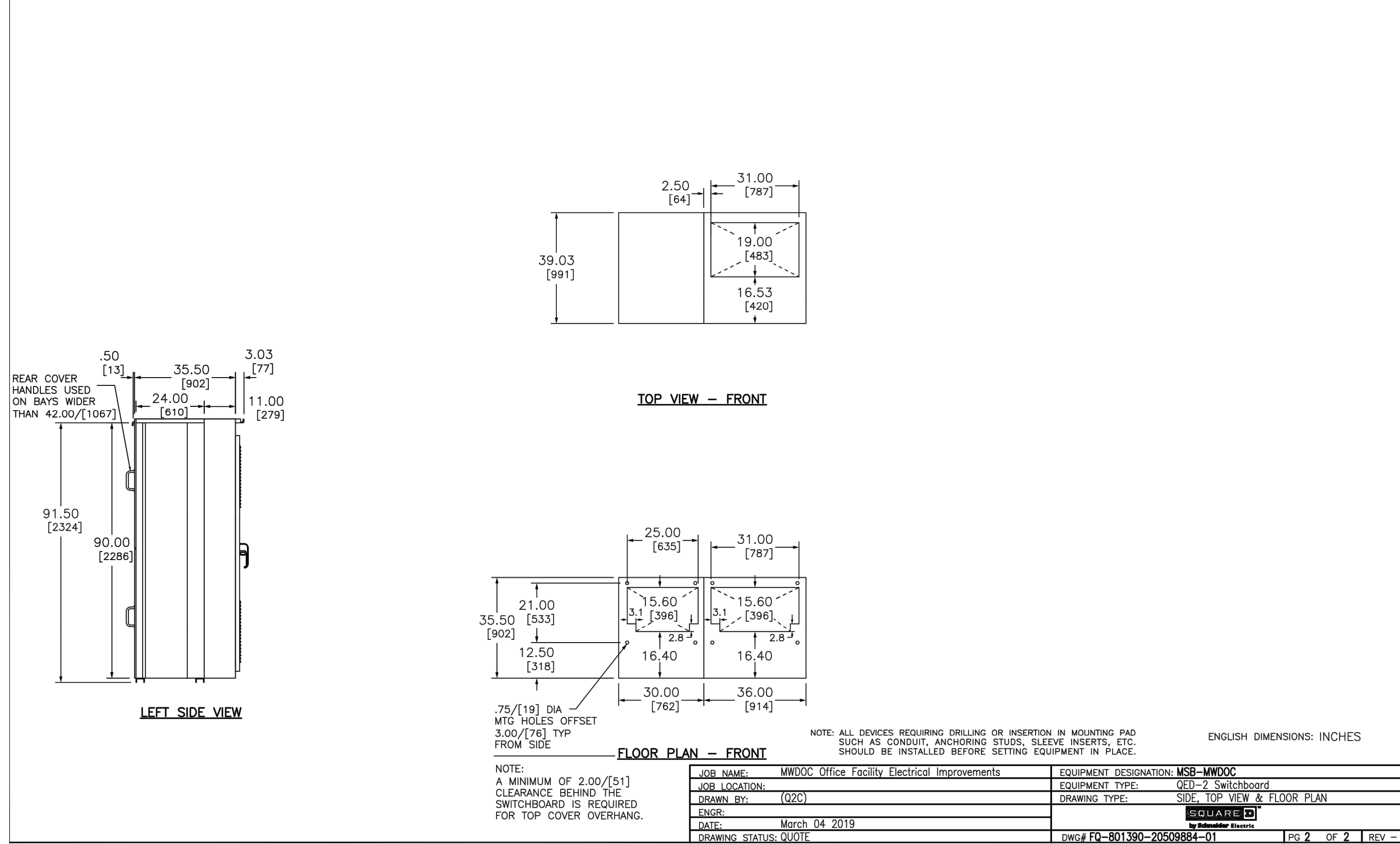
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JOB NAME: MWDOC Office Facility Electrical Improvements	EQUIPMENT DESIGNATION: MSB-MWDOC
JOB LOCATION: (02C)	EQUIPMENT TYPE: QED-2 Switchboard
DRAWN BY: ENGR	DRAWING TYPE: GENERAL NOTES
DATE: March 04 2019	SCALE: SQUARE 1/4"
DRAWING STATUS: QUOTE	DWG# FQ-801390-20509884-01 PG 1 OF 2 REV --

MANUAL TRANSFER SWITCH

SCALE
N.T.S. 02

REV	DESCRIPTION	BY	DATE						
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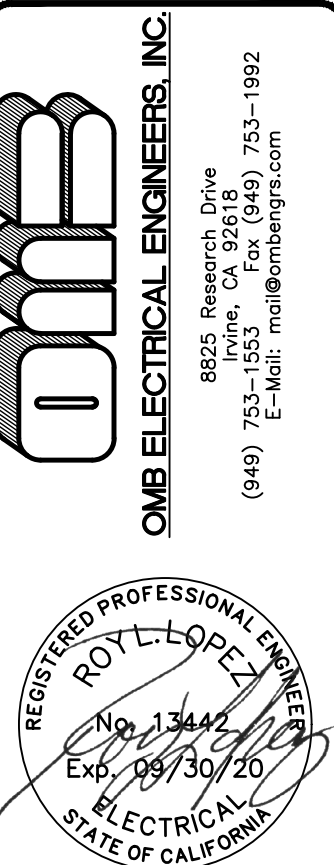
ENGLISH DIMENSIONS: INCHES

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JOB LOCATION: (02C)	EQUIPMENT TYPE: QED-2 Switchboard
DRAWN BY: ENGR	DRAWING TYPE: SUB-TOP VIEW & FLOOR PLAN
DATE: March 04 2019	SCALE: SQUARE 1/4"
DRAWING STATUS: QUOTE	DWG# FQ-801390-20509884-01 PG 2 OF 2 REV --

SWITCHGEAR DETAIL

SCALE
N.T.S. 03

REVISIONS	BY
COUNTER REVIEW	
3-7-19	
RESUBMITTAL	
4-29-19	

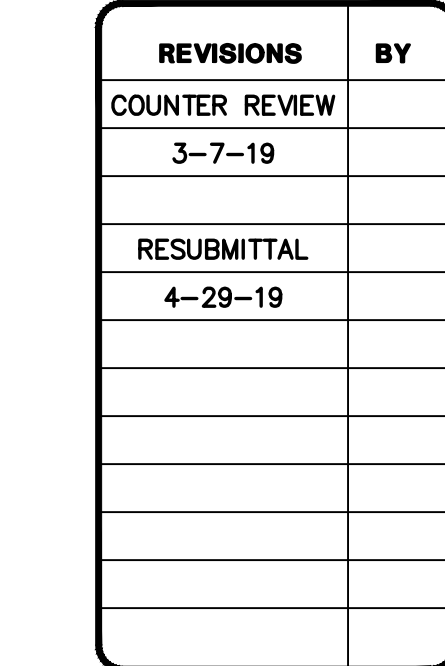


MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT
18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:
ELECTRICAL DETAILS

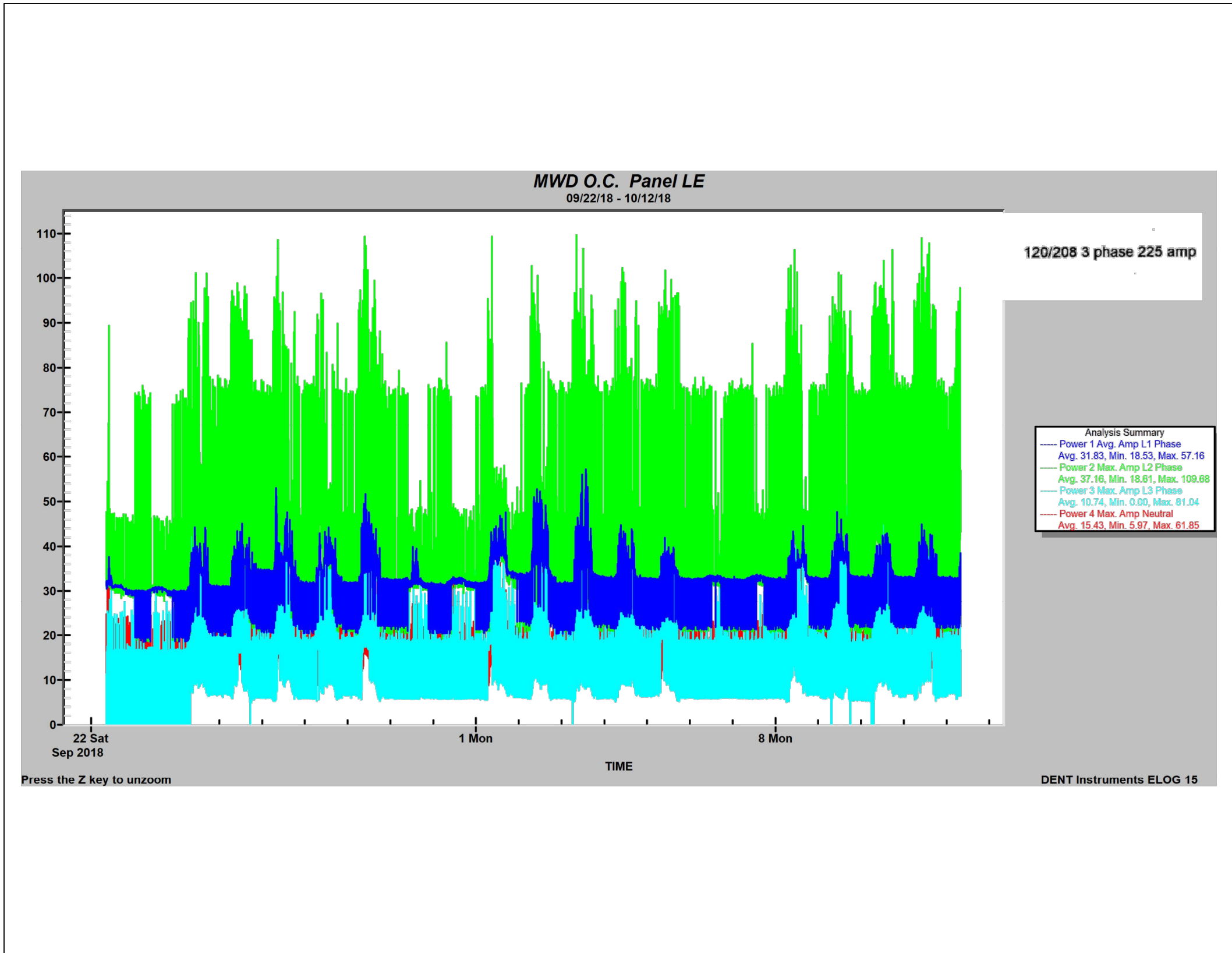
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DATE	4-29-19
SCALE	
JOB NO.	18154
SHEET	

E002
OF SHEETS



DRAWN CRR
CHECKED
SEK
DATE 4-29-19
SCALE
JOB NO. 18154
SHEET
E010
OF SHEETS

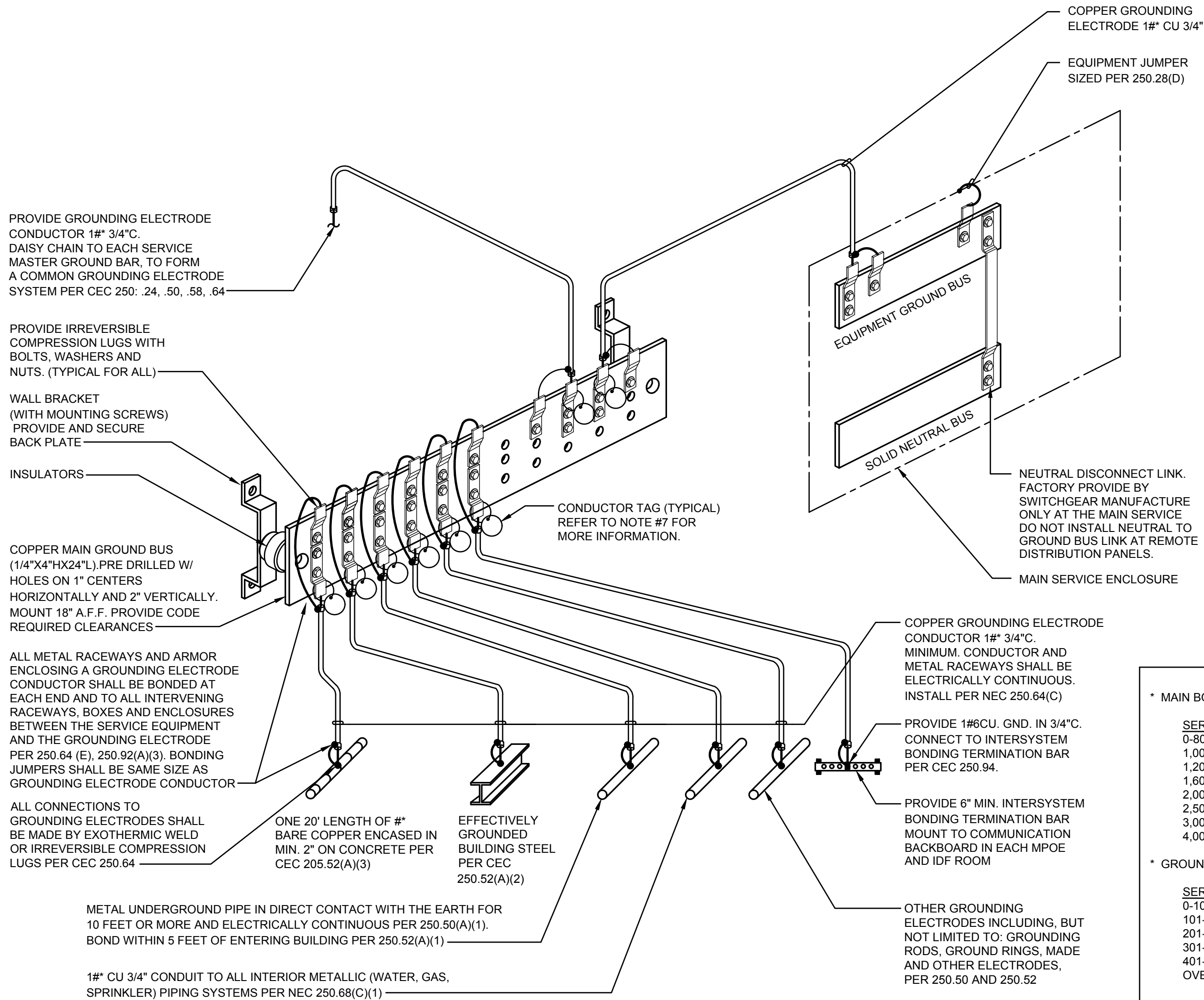
PANEL 'LE' LOAD RECORDINGS



MOUNTING: SURFACE		PANEL L														BUS: 400A															
A.I.C. RATING: 10,000 AMPS (minimum)		208 / 120 VOLTS, 3 PHASE, 4 WIRE														MAIN: 400A															
LOCATION:																Fed From:															
NOTE	DESCRIPTION	Volt-Amps				Ltg	Rec	Misc	Ckt Brkr	Ckt No	A	B	C	Ckt No	Ckt Brkr	Misc	Rec	Ltg	Volt-Amps				DESCRIPTION	NOTE							
		Ø AN	Ø BN	Ø CN	Ø AN														Ø BN	Ø CN											
	FUTURE EOC LOADS	1500						1	20/1	1				2	20/1	1				1500			FUTURE EOC LOADS								
	FUTURE EOC LOADS		1500					1	20/1	3				4	20/1	1					1500			FUTURE EOC LOADS							
	FUTURE OUTDOOR A/C UNIT FOR DATA SERVER			2558				1	50	5				6	15	X						364			FUTURE INDOOR A/C UNIT FOR DATA SERVER						
	---	2558							2	7				8	2							364			---						
	SWITCHBOARD SERVICE RECEPTACLE		180					1	20/1	9				10																	
	FUTURE EOC LOADS			1500				1	20/1	11				12	20/1	1						1500			FUTURE EOC LOADS						
	FUTURE EOC LOADS	1500						1	20/1	13				14	20/1	1					1500			1500		FUTURE EOC LOADS					
	SPARE								20/1	15				16	20/1											SPARE					
	SPARE								20/1	17				18	20/1											SPARE					
	SPARE								20/1	19				20	20/1											SPARE					
	SPARE								20/1	21				22	20/1											SPARE					
	SPARE								20/1	23				24	20/1											SPARE					
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	SPARE								20/1	79				80	150/					6840											
	SPARE								20/1	81				82		1					13200				PANEL "LE"						
	SPARE								20/1	83				84	3							9720									
PANEL CALCULATION		Ø AN				Ø BN				Ø CN				Ø A + Ø B + Ø C																	
CONNECTED LOAD		CONNECTED LOAD:				15,762 VA				16,380 VA				15,642 VA				47,785 VA													
		CONNECTED BALANCED LINE CURRENT = 132.7 A												HIGH LINE CURRENT (ØB) = 136.5 A																	
DEMAND LOAD		CONNECTED RECEPTACLE LOAD:				- VA				180 VA				- VA				180 VA													
		OTHER NON LCL LOAD @ 100%:				15,762 VA				16,200 VA				15,642 VA				47,605 VA													
		DEMAND LOAD:				15,762 VA				16,380 VA				15,642 VA				47,785 VA													

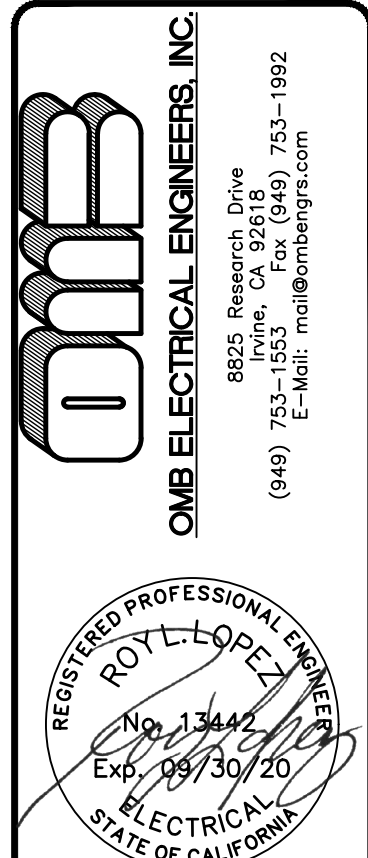
- NOTES:
- ALL GROUNDING SHALL COMPLY WITH ARTICLE 250.
 - ALL GROUNDING CONDUCTORS AND BONDING JUMPERS SHALL BE CONNECTED BY EXOTHERMIC WELDING, LISTED PRESSURE CONNECTORS, LISTED CLAMPS, OR OTHER LISTED MEANS.
 - ALL CONDUCTORS SHALL BE COPPER.
 - ELECTRICALLY CONDUCTIVE MATERIALS, SUCH AS METAL WATER PIPING, METAL GAS PIPING AND STRUCTURAL STEEL SHALL BE BONDED TO THE MAIN GROUND BUS.
 - ALL GROUNDING CONDUCTORS AND BONDING JUMPERS SHALL BE ROUTED TO ENSURE SHORTEST POSSIBLE CONDUCTOR LENGTH.
 - TRANSFORMERS WITHIN THE ELECTRICAL ROOM SHALL BE GROUNDED TO THE MAIN GROUND BUS.
 - PROVIDE IDENTIFICATION TAGS AT BOTH ENDS OF THE GROUNDING AND BONDING CONDUCTORS TERMINATED ON TO THE GROUND BAR. ONE AT THE GROUND BAR AND ONE AT THE POINT OF CONNECTION TO THE ASSOCIATED EQUIPMENT.
 - IDENTIFY BOND CONDUCTORS AS "WATER BOND", "GAS BOND", ETC.
 - IDENTIFY GROUNDING CONDUCTORS AS "WATER ELECTRODE", "UFER", "GROUND ROD", ETC.
 - THIS DETAIL IS DIAGRAMMATIC AND FOR REFERENCE ONLY. COORDINATE WITH ACTUAL FIELD CONDITIONS AND SINGLE LINE DIAGRAM.
- THE TAGS SHALL BE 1 1/2" IN DIAMETER AND BE EITHER STAMPED COPPER, STAMPED ALUMINUM, OR ENGRAVED PLASTIC.
- ATTACHED TAGS USING A SMALL CHAIN TO PREVENT INADVERTENT REMOVAL.

* MAIN BONDING JUMPER SHALL BE SIZED AS FOLLOWS:		
SERVICE SIZE	MAIN BONDING JUMPER SIZE	
0-800A	#3/0	COPPER
1,000A	#3/0	COPPER
1,200A	#250kcmil	COPPER
1,600A	#300kcmil	COPPER
2,000A	#500kcmil	COPPER
2,500A	#500kcmil	COPPER
3,000A	#500kcmil	COPPER
4,000A	#750kcmil	COPPER
* GROUNDING ELECTRODE CONDUCTOR SHALL BE SIZED PER 250.66 AS FOLLOWS:		
SERVICE SIZE	GROUNDING ELECTRODE CONDUCTOR SIZE	
0-100A	#6	COPPER
101-200A	#4	COPPER
201-300A	#2	COPPER
301-400A	#1/0	COPPER
401-600A	#2/0	COPPER
OVER 601A	#3/0	COPPER



1 MAIN GROUNDING SYSTEM DETAIL
SCALE: NONE

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3-7-19	
RESUBMITTAL	
4-29-19	

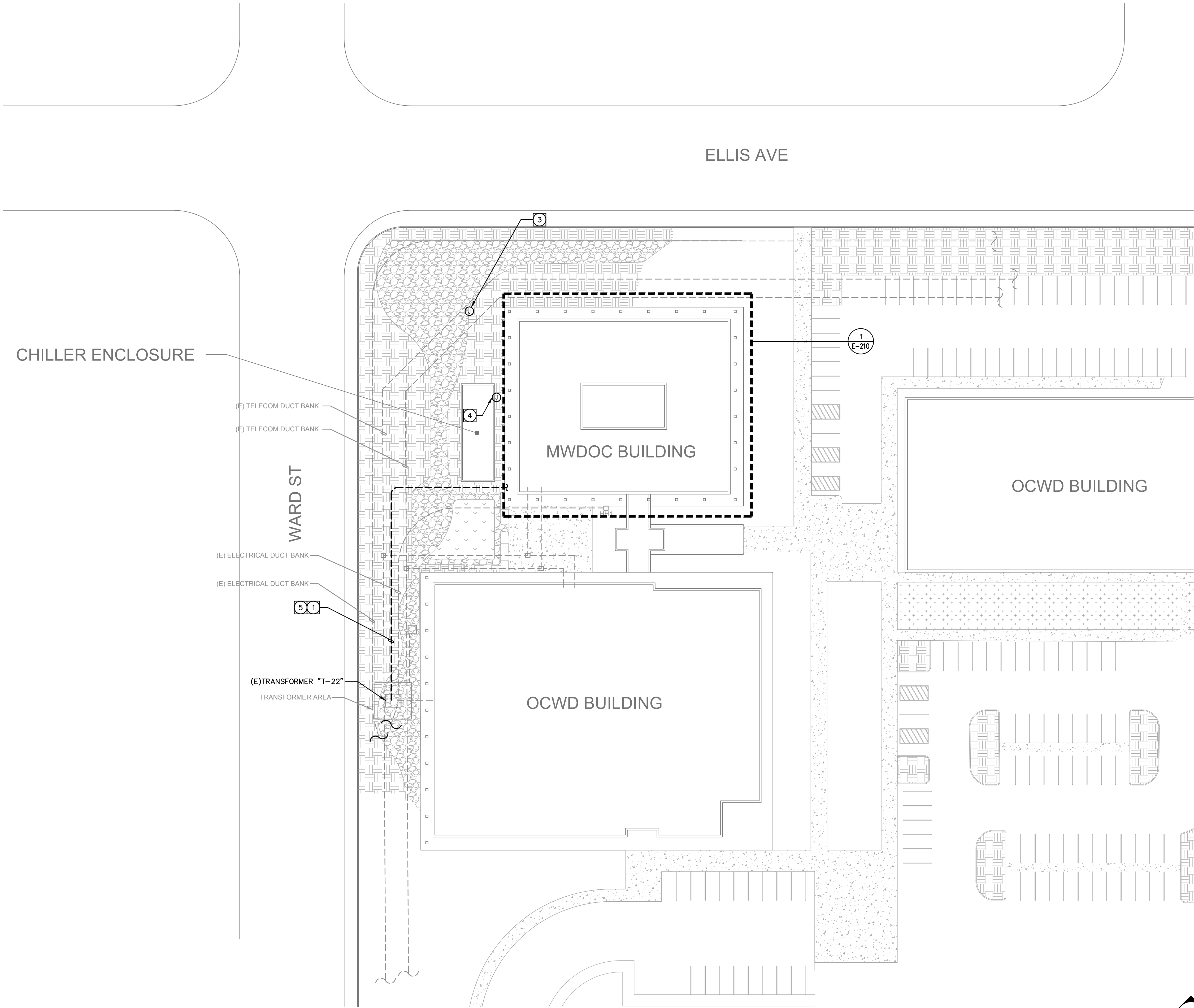


MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT
18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:
PANEL SCHEDULES + EXISTING
LOADS + GROUNDING DETAILS

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DATE	
4-29-19	
SCALE	
JOB NO.	18154
SHEET	

E050
OF SHEETS



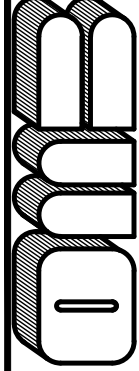
SHEET NOTES

- 1 REFER TO SINGLE LINE DIAGRAM, SHEET E020 FOR CONDUIT AND CONDUCTOR SIZES AND QUANTITIES.
- 2 NOT USED.
- 3 PROVIDE GROUND WELL FOR CONNECTION TO PORTABLE GENERATOR. PROVIDE GROUND CONNECTION TO UFER GROUND OF CONCRETE PAD.
- 4 PROVIDE GROUNDING ELECTRODE ROD FOR MAIN ELECTRICAL SERVICE IN ACCORDANCE WITH CEC ARTICLE 250. INCLUDE SUPPLEMENTARY GROUND RODS AS REQUIRED.
- 5 CONTRACTOR TO INCLUDE ALL CUTTING AND PATCHING OF EXISTING HARDSCAPE AND LANDSCAPE FOR ROUTING OF NEW UNDERGROUND CONDUIT AND TRENCHING.

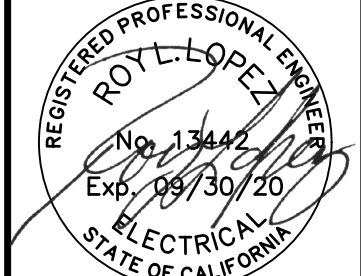
GENERAL NOTES

- 1. KNOWN EXISTING UNDERGROUND COMPONENTS SHOWN FOR REFERENCE ONLY. CONTRACTOR TO COORDINATE WITH MWDOC FOR FIELD IDENTIFICATION OF ALL EXISTING UNDERGROUND UTILITIES AND ALSO UTILIZE DIG ALERT PRIOR TO COMMENCING WITH ANY SITE WORK.
- 2. ALL TRENCHING FOR NEW UNDERGROUND UTILITY RUNS SHALL BE HAND DUG.
- 3. ALL HARDSCAPE AND LANDSCAPING SHALL BE REPAIRED OR REPLACED TO MATCH THE ORIGINAL CONDITION.

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3-7-19	
RESUBMITTAL	
4-29-19	



OMB
OMB ELECTRICAL ENGINEERS, INC.
8825 Garfield Ave
Irvine, CA 92618
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E-Mail: omb@ombengr.com



REGISTERED PROFESSIONAL ENGINEER
ROY L. LOPEZ
No. 13442
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT
18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:
ELECTRICAL SITE PLAN

DRAWN
CRR

CHECKED
SEK

DATE
4-29-19

SCALE

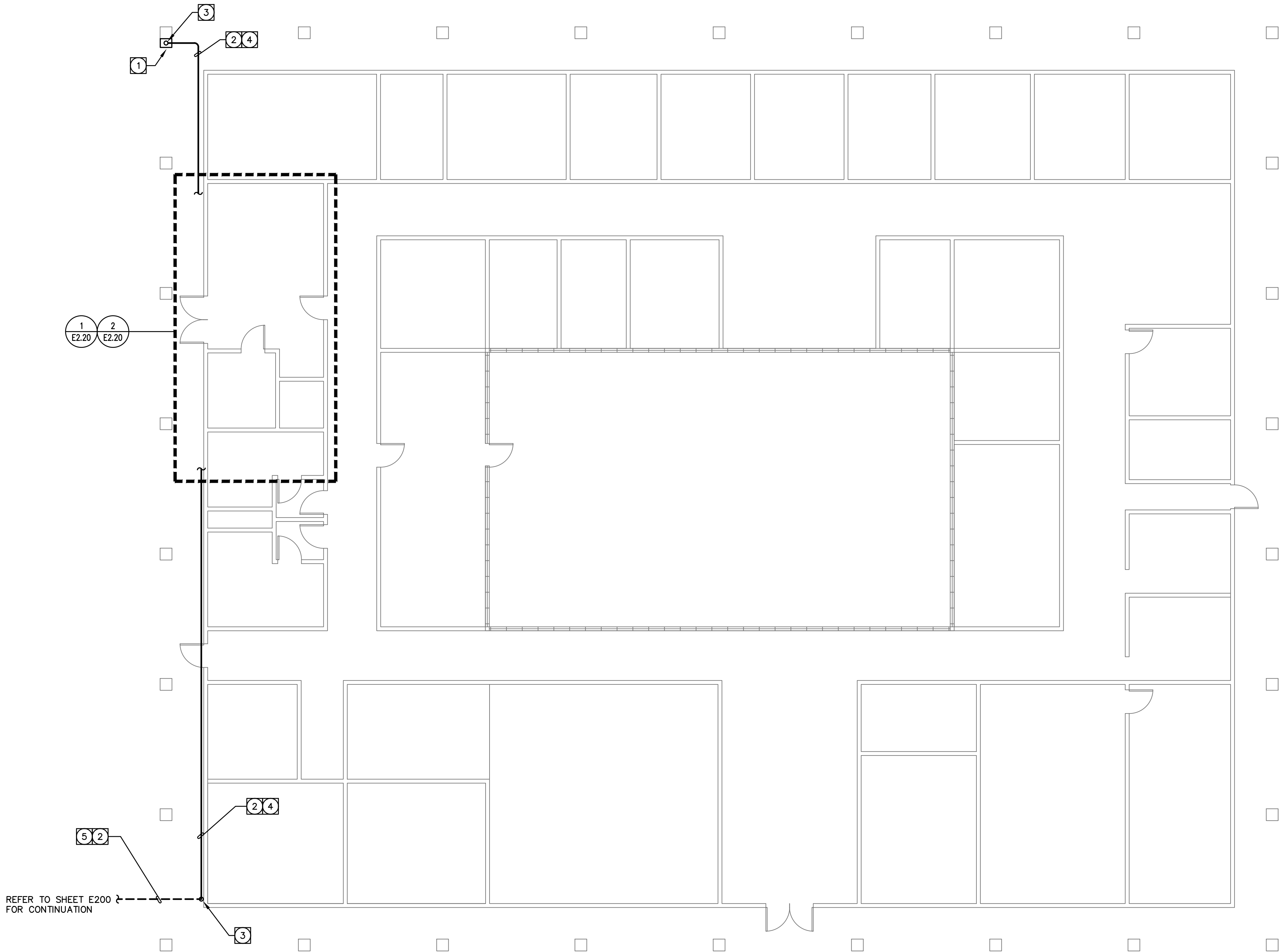
JOB NO.
18154

SHEET

E200

OF SHEETS

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REFER TO SHEET E200
FOR CONTINUATION

SHEET NOTES

1. GENERATOR CONNECTION BOX. REFER TO SINGLE LINE DIAGRAM SHEET E020 FOR DETAILS.
2. REFER TO SINGLE LINE DIAGRAM SHEET E020 FOR CONDUIT AND CONDUCTOR SIZES AND QUANTITIES.
3. CONDUIT STUB UP.
4. RUN CONDUIT EXPOSED ON CEILING, RUNNING ALONG THE FACE OF THE EXTERIOR WALL. CONDUIT, FITTINGS, AND SUPPORTS SHALL BE PAINTED TO MATCH THE EXISTING FINISH OF THE SURFACE THEY ARE MOUNTED TO.
5. CONTRACTOR TO INCLUDE ALL CUTTING AND PATCHING OF EXISTING HARDSCAPE AND LANDSCAPE FOR ROUTING OF NEW UNDERGROUND CONDUIT AND TRENCHING.

GENERAL NOTES

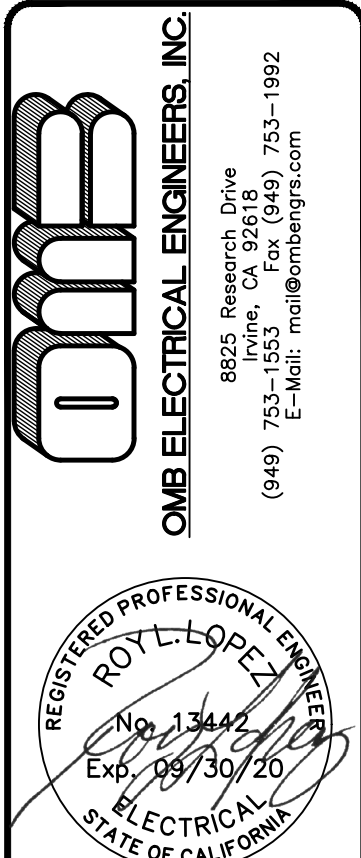
1. NOT USED.

ELECTRICAL FLOOR PLAN

SCALE
1/8" = 1'-0"

1

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COUNTER REVIEW	
3-7-19	
RESUBMITTAL	
4-29-19	



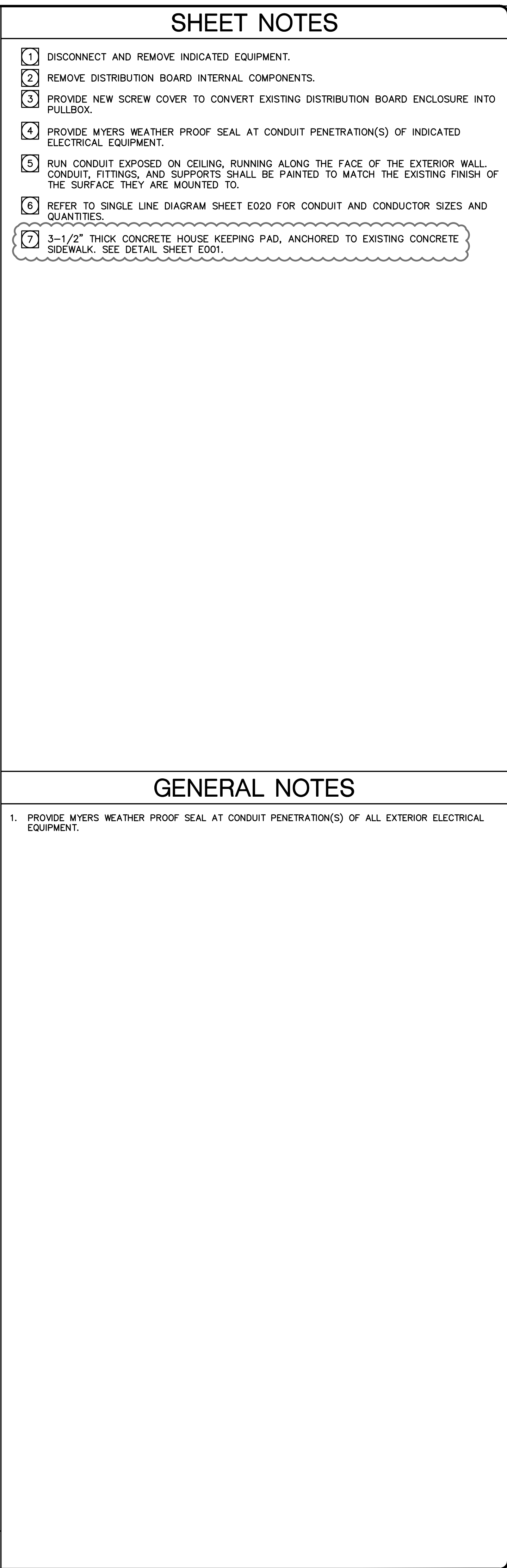
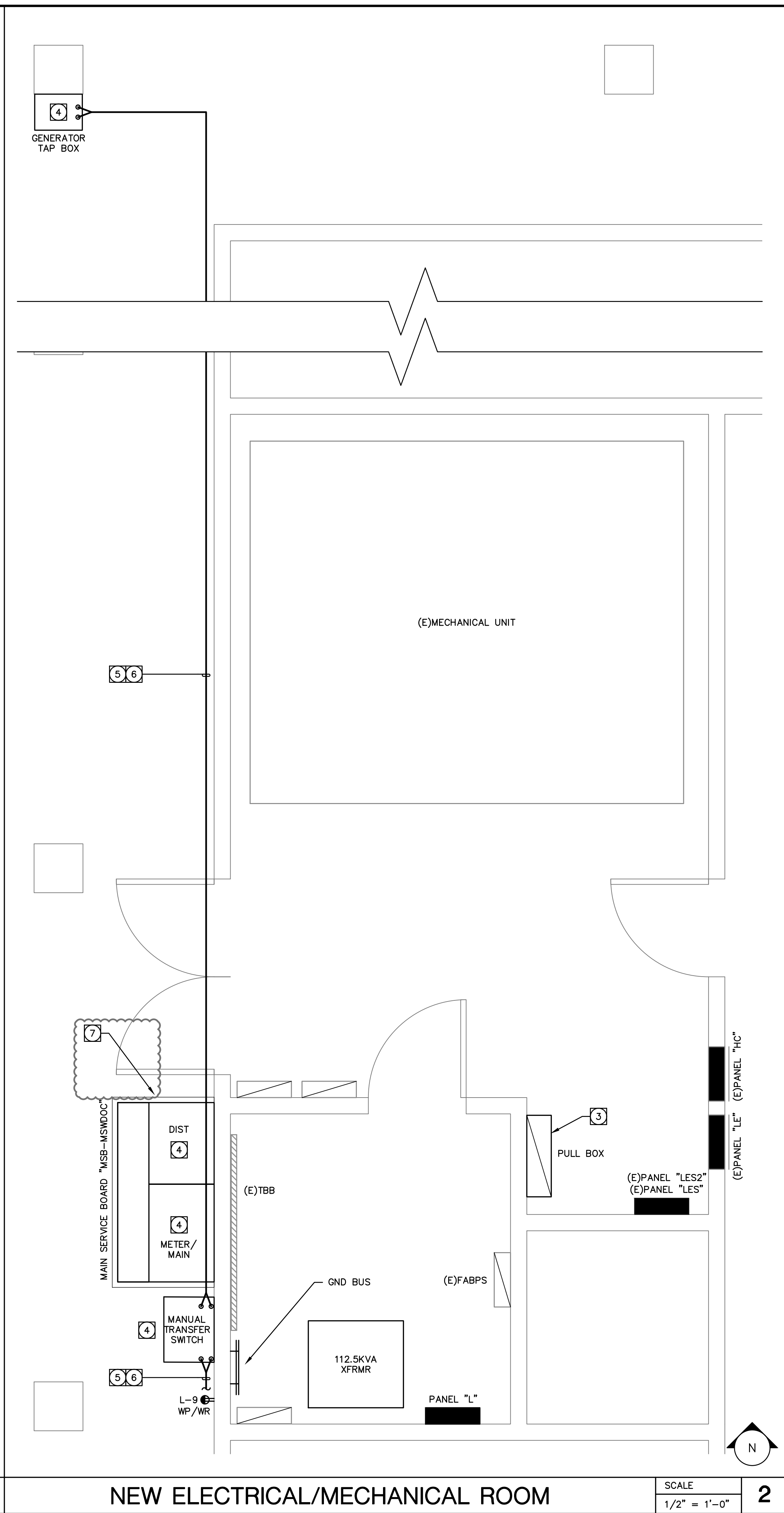
MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT
18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:
ELECTRICAL FLOOR PLAN

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JOB NO.	18154
SHEET	

E210
OF SHEETS

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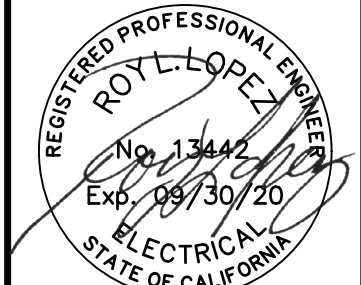


REVISIONS	BY
COUNTER REVIEW 3-7-19	
RESUBMITTAL 4-29-19	

omb

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Irvine, CA 92618
(949) 751-1553 Fax (949) 753-1392
E-Mail: mail@ombengrs.com



**MMWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT**

**18700 WARD STREET
FOUNTAIN VALLEY, CA 92708**

SHEET TITLE:
**ELECTRICAL/MECHANICAL ROOM
ELECTRICAL FLOOR PLAN**

DRAWN
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CHECKED
SEK
DATE
4-29-19
SCALE
JOB NO.
18154
SHEET

E220

OF SHEETS

DIVISION 26 00 00 - ELECTRICAL SPECIFICATIONS

PART 1 – GENERAL CONDITIONS

1.01 SUMMARY

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Division, complete, as shown on the drawings and/or specified herein. The work includes, but is not limited to:
- Examine all divisions for related work required to be included as work under this Division.
 - General provisions and requirements for electrical work.

1.02 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, apply to these Specifications.
- B. In addition, the products covered in this Specification, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:
- ANS – American National Standards Institute
 - ASTM – American Society for Testing and Materials
 - IEEE – Institute of Electrical and Electronics Engineers
 - NEC – National Electrical Code (NFPA 70)
 - NECA – National Electrical Contractors Association: "Standard of Installation"
 - NEMA – National Electrical Manufacturers Association
 - NFPA – National Fire Protection Association
 - UL – Underwriters Laboratories, Inc.

1.03 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. General: Submit the following in accordance with the Conditions of the Contract and Division 01 Specification Sections, and these Specifications.
- B. Product Data: Submit product data for each type of product specified.
- C. Shop Drawings: Submit shop drawings for the following:
- Switchboards.
 - Transformers.
 - Panelboards.
 - Manual transfer switches
 - Generator Tap Box

1.04 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in these Specifications with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.
- F. Electrical contractor shall perform all work in strict accordance with all local, state, and national governing codes.

1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to the site in accordance with the General and Supplementary Conditions, Division 01 Specification Sections, and these Specifications.
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.06 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.02 RACEWAYS

A. Metal Conduit and Tubing:

- Rigid Metal Conduit: Steel, hot-dipped galvanized including the threads, with an outer coating of zinc bichromate, complete with one coupling and one end thread protector, manufactured in accordance with ANSI C80.1 and UL 6. Fittings: threaded, hot-dipped galvanized, manufactured in accordance with ANSI C80.4.
 - Where indicated, provide galvanized rigid steel conduit and fittings with polyvinyl chloride (PVC) coating of nominal .020 inch (20 mil) thickness conforming to NEMA RN-1, Type A, Robroy Industries, or equal.
- Intermediate Metal Conduit: Hot-dipped galvanized steel including the threads, manufactured in accordance with UL 1242.
- Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing, manufactured in accordance with ANSI C80.3 and UL 797. Maximum size: 2". Fittings: steel type – (zinc die cast fittings not allowed); gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney.
- Flexible Metal Conduit: Hot-dipped galvanized steel interlocking, single strip type manufactured in accordance with UL1. Connectors: squeeze type, malleable iron, cadmium plated, straight and angle connectors for all sizes and twist-in connectors for 1/2" and 3/4" flexible metal conduit.
- Liquidtight Flexible Conduit: Hot-dipped galvanized steel strip core with extruded liquid-tight polyvinyl jacket. Use O-Z/Gedney Type UAG, or equal. Liquid-tight fittings. ANSI/NEMA FB 1. Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integral cast external ground lug, O-Z/Gedney.

B. Nonmetallic Conduits:

- Rigid Nonmetallic Conduit: NEMA TC 2 and UL 651, Schedule 40. Polyvinyl chloride (PVC) heavy-wall conduit, with tapered sleeve couplings, rated and labeled for use with 90°C rated conductors, manufactured in accordance with ANSI C33.91. Fittings: NEMA TC-3, cemented type, from the same manufacturer as the conduit.
- PVC and ABS Plastic Fittings: NEMA TC 9-1. Match to conduit type and material.
- Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.

- C. Conduit Bodies: Provide types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion resistant screws. For metallic conduit and tubing, use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.

- D. Wireways and Auxiliary Gutters: Provided electrical wireways and gutters shall be of types, sizes, and number of channels as indicated. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway or gutter as required for complete system. Where specifications are not indicated, select to fulfill wiring requirements complying with applicable provisions of NEC. Use sheet steel wireways with screw-on covers and corrosion resistant hardware. For dry locations coat with rust inhibitor and finish with gray baked enamel. For wet locations use hot-dipped galvanized material finished with gray baked enamel, provide gaskets for covers.

E. Surface Raceway:

- Provide sizes and channels as indicated. Provide fittings that match and mate with raceway.
- Surface metal raceway: Construct of galvanized steel with snap-on covers, with 1/8" mounting screw knockouts in base approximately 8" O.C.. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required. Provided by Hoffman Engineering Co., the Wiremold Co., or approved equal.
- Surface Nonmetallic Raceway: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color. Raceway and system components shall meet UL 94 requirements for nonflammable, self-extinguishing characteristics. Provided by Hubbell, Inc., Panduit Corp., The Wiremold Co., or approved equal.

F. Accessories:

- General: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron of the shape and dimension best suited for the application.
- Seals for Walls and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney Type FSK, or equal.
- Fire Seals: Heat activated intumescent material, elastomeric sealing ring, socket head cap screws, steel pressure discs and flange, O-Z/Gedney Type CFSF, Nelson Flame Seal, or equal.
- End bells: Hot-dipped galvanized, threaded malleable iron, O-Z/Gedney Type THS, or equal.
- Bushings 1-1/4" and smaller: High-impact thermo-setting phenolic, 150°C, O-Z/Gedney Type "A", or equal. Bushings 1-1/2" and larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150°C, O-Z/Gedney Type "B", or equal.
- Locknuts 1-1/2" and smaller: Zinc plated heavy stock steel, O-Z/Gedney, or equal. Locknuts 2" and larger: Cadmium plated malleable iron, O-Z/Gedney, or equal.
- Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney, or equal.
- Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers. Linear: O-Z/Gedney Type AX and TX, or equal. Linear, with deflection: O-Z/Gedney Type AXDX, or equal.
- Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10, or equal.

2.03 WIRE AND CABLE

- A. Provide wire and cable suitable for the temperature, conditions, and location where installed, except as otherwise indicated.

- Conductor: Copper. Provide solid conductor for #12 AWG and smaller. Provide stranded conductors for sizes #10 AWG and larger.
 - Use stranded conductors at motors and other applications where subject to vibration, and for control circuits.
- Minimum Size Conductor: #12 AWG, except as otherwise indicated.
 - Control circuits: #14 AWG.
- Insulation voltage rating: 600 volts.

- B. Building wire and cable: Single conductor insulated wire. Insulation: ANSI/NFPA 70, Type XHHW-2, rated 90°C in wet & dry locations.

- C. Connectors: Provide UL Listed factory fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

- D. Pull Cord: 1/8" polypropylene or nylon.

2.04 BOXES AND FITTINGS

- A. Provide indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and accessories required for the intended use. Provide gaskets for units in damp or wet locations.

- Materials and Finishes:
 - Sheet steel: Flat rolled, code gauge, galvanized steel.
 - Fasteners for general use: Corrosion resistant screws and hardware, including cadmium and zinc plated items.
 - Fasteners for wet or damp locations: Stainless steel screws and hardware.
 - Cast metal for boxes, enclosures and covers: Copper-free aluminum except as otherwise indicated.
 - Exterior finish: Gray-baked enamel for items exposed in finished locations except as otherwise indicated.
 - Painted interior finish: Where indicated, white baked enamel.
 - Fittings for boxes, cabinets, and enclosures: Conform to UL 514B. Malleable iron or zinc-plated steel for conduit hubs, bushings and box connectors.

B. Metal outlet, device, and small wiring boxes:

- General: Conform to UL 514A and UL 514B. Boxes shall be of type, shape, size, and depth to suit each location and application.
- Steel Boxes: NEMA OS 1. Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.
- Cast Aluminum Boxes: Copper-free aluminum with gasketed covers, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices and closure plugs.

C. Pull and junction boxes:

- General: Conform to UL 50, for boxes over 100 cubic inches in volume. Boxes shall have bolted-on covers of material same as box, and shall be of the size and shape to suit the application.
- Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing.
- Hot-Dip Galvanized Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing. Hot-dip galvanize after fabrication. Cover shall be gasketed.

2.05 WIRING DEVICES

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Coordinate color selection, prior to ordering materials, with Architect/Engineer.

- B. Receptacles: UL 49B and NEMA WD 6. Straight blade, two-pole, three-wire grounding type, as indicated below:

- Duplex: 20Amps, 125V, NEMA 5-20R, Heavy Duty – Hubbell #5362
- Duplex, GFCI [1]: 20Amps, 125V, NEMA 5-20R, Heavy Duty – Hubbell #GF5362
- Simplex: 20Amps, 125V, NEMA 5-20R, Heavy Duty – Hubbell #5361
- Simplex: 20Amps, 250V, NEMA 6-20R, Heavy Duty – Hubbell #5461
- Simplex, Locking [2]: 20Amps, 125V, NEMA L5-20R, Heavy Duty – Hubbell #2310

Notes:

- GFCI receptacles shall protect downstream receptacles on same circuit.
- Provide locking receptacle with black nylon face, except as indicated otherwise.

- C. Wall Plates: Single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which they are attached, and are from the same manufacturer. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Provide wall plate color to match wiring devices except as otherwise indicated. Provide wall plates with engraved legend where indicated. Conform to requirements for electrical identification.

- Interior Areas: Smooth, high-impact resistant plastic, of the same manufacturer as the device.
 - Surface mounted outlet boxes: Zinc coated sheet steel rounded edges, same size as outlet box
- Exterior areas: Weatherproof, corrosion-resistant type, die cast aluminum with self-closing gasketed cover. For duplex receptacles, use Hubbell 5206-WO or equal; for wall switches, use Hubbell 7420 or equal; for GFI receptacles, use manufacturer's listed plate.

2.06 GROUNDING AND BONDING

- A. Materials: All materials shall be copper. Provide types indicated and sizes and ratings required to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

- B. Wire and cable conductors shall be as follows, except as otherwise indicated:

- Equipment grounding conductor: Green insulated copper.
- Grounding electrode conductor: Stranded copper cable.
- Bare copper conductors: Shall conform to the following:
 - Solid Conductors: ASTM B 3.
 - Assembly of Stranded Conductors: ASTM B 8.
 - Tinned Conductors: ASTM B 33.

C. Connector products:

- General: Listed and labeled as grounding connectors for the materials used.
- Pressure Connectors: High-conductivity plated units.
- Bolted Clamps: Heavy-duty units listed for the application.
- Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

D. Grounding electrodes:

- Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten-welded to core. Size: 3/4" diameter by 10 feet long.
- Plate Electrodes: Copper plates, minimum 0.10 inch thick, size as indicated.

- E. Test (ground) wells: Precast concrete, 12" round x 18" deep open bottom valve box, with cast iron grate cover plate marked "GROUND".

2.07 SUPPORTING DEVICES

- A. Supports: Individual conduits shall be rigidly supported and clamped with one hole malleable iron conduit clamps, conduit beam clamps, conduit hangers, or wall brackets, as necessary for the type of construction and as indicated. The use of perforated flat steel straps or wire for supporting conduits will not be permitted.

- B. Support Attachments: Kwik-bolt, sleeve anchors, wedge anchors, toggle bolts, and hollow all anchors, as manufactured by Hilti or Red Head.

- C. Light steel framing: Light steel framing members for conduit hangers and other supports shall be formed from 12 gauge (minimum) steel, unless otherwise indicated.

- Finish: Hot-dipped galvanized steel for light steel framing members and fittings and all hardware, such as hanger rods, couplings, bolts, nuts, etc., shall be electro-galvanized, unless otherwise indicated.

Acceptable manufacturers: B-Line, Superstrut, Unistrut, or equal.

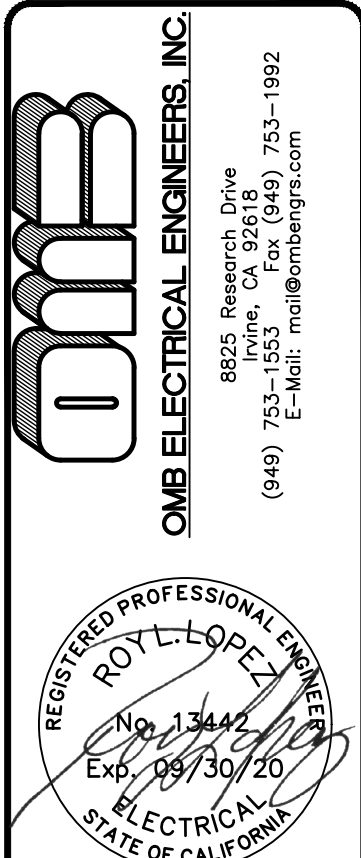
2.08 ELECTRICAL IDENTIFICATION

- A. Manufacturers: Brady, Ideal Industries, Markal, Panduit, Thomas & Betts.

B. Electrical identification products:

- Adhesive Marking Labels for Raceway and Metal-clad Cable: Pre-printed, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Power, Lighting, Air Conditioning, Voice and Data Communications, Control, Fire Alarm and Detection, Public Address (Paging), Electronic Security).
- Label Size, as follows:
 - Raceways 1" and Smaller: 1-1/8" high by 4" long.
 - Raceways Larger than 1": 1-1/8" high by 8" long.
- Color: Black legend on orange background.
- Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1" to 2" in width.
- Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the raceway or cable.
- Underground line marking tape: Permanent, bright-colored, continuous printed, plastic tape compounded for direct burial service not less than 6" wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- Wire/cable designation tape markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letters
- Aluminum, wraparound, cable marker bands: Bands cut from 0.014" thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.
- Plasticized card stock tags: Vinyl cloth with preprinted and field printed legends to suit the application. Orange background, except as otherwise indicated, with eyelet for fastener.
- Aluminum-faced card stock tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002" thick, and laminated with moisture-resistant acrylic adhesive. Pre-print legend to suit the application, and punch for tie fastener.
- Brass or aluminum tags: Metal tags with tamped legend, punched for fastener. Dimensions: 2" by 2" by 19 gauge.
- Engraved, plastic-laminated labels, signs, and instruction plates: Engraving stock melamine plastic laminate, 1/16" minimum thick for signs up to 20 square inches, or 8" in length; 1/8" thick for larger sizes. Engraved legend in white letter on black face and punched for mechanical fasteners.
- Warning and caution signs for indoor use: Shall be minimum 18 gauge steel, white porcelain enamel finish, with red lettering, punched for fasteners, with colors, legend, and size appropriate to the location. Lettering to read, "Danger – High Voltage", unless otherwise indicated.
- Exterior metal-backed butyrate warning and caution signs: Weather-resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gauge, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4" grommets in corners for mounting.
- Fasteners for plastic-laminated and metal signs: Self-tapping stainless steel screws or #10-32 stainless steel machine screws with nuts and flat lock washers.
- Cable ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18" minimum width, 50 lb minimum tensile strength, and suitable for a temperature range from minus 50°F to 350°F. Provide ties in specified colors when used for color coding.

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4-29-19	



MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT

18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:
ELECTRICAL SPECIFICATIONS
(1 OF 4)

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JOB NO.
18154
SHEET

E501

OF SHEETS

DIVISION 26 00 00 - ELECTRICAL SPECIFICATIONS

2.09 SWITCHBOARDS

A. Manufacturers: Eaton, General Electric, Siemens or Square D.

B. Materials:

1. Main Switchboard: Provide a totally enclosed, dead front, safety type switchboard designed for voltage and service ampacity as indicated on drawings and mounted on 2-1/2" thick concrete pad.
2. Provide a switchboard consisting of the required number of vertical sections bolted together to form one metal enclosed, rigid switchboard with the following features:
 - a. The sides, top and rear covered with removable screw-on code gauge steel plates.
 - b. Include all protective devices and equipment as listed on drawings with necessary interconnections.
 - c. Bus bars mounted on supports of high impact nontracking insulation material braced to withstand mechanical forces exerted during 100,000 AMPS RMS symmetrical short circuit conditions, or as required by serving utility.
3. Chemically clean steel surfaces and treat to aid bonding between paint and metal surfaces. Provide high tensile strength hardware on conductors and suitable protective finish.
4. Provide full length copper ground bus. Secure a ground bus to each vertical section of structures and extend it the entire length of the switchboard.
5. Provide switchboard with adequate lifting means, capable of being rolled or moved into installation position and bolted directly to the floor without the use of floor sills.
6. Use A-B-C type bus arrangement, left-to-right, top-to-bottom and front-to-rear throughout. Switchboard shall be entirely accessible from the front, including cable and bus connections, unless specifically noted otherwise.
7. Provide group mounted, quick-break protective devices with bar connection straps, with device line and load connections accessible from the front. Where "spaces" are scheduled furnish entire bus except device connecting straps. Provide full height wiring gutter covers for quick access to wiring terminals.
8. The switchboard frame work shall be made of formed steel angles securely bolted or riveted together. Adjacent to each switch unit provide a lamacoid plastic name plate engraved with proper circuit designation, screw-on type only.
9. At top of switchboard and supported on the frame, there shall be provided a pull box for termination of the conduits to the board. It shall not be less than 12" in height and shall be built as an integral part of the switchboard. The front of the pull box shall be removable. The entire exterior of the switchboard and pull box enclosures shall be light gray per ANS -61 .
10. Switches shall be quick-make, quick-break of capacity and number of poles indicated.
11. Main busses shall be silver or tin plated copper sized on the basis of a current density to hold temperature rise to 50°C above 40°C ambient. The bus structure shall be braced to withstand the mechanical forces exerted during a fault as shown on the drawings.
12. The switchboard shall bear the label of approval of the underwriter's laboratories and shall be built to NEMA and IEEE standards. Shop drawings of the proposed board shall be furnished to comply with these specifications.
13. Circuit Breakers:
 - a. Resettable, quick-make, quick-break, bolt-in place type, trip-free, with separate trip position from on and off positions.
 - b. Multiple pole breakers with common trip and one operation handle.
 - c. Wire with sequence phasing.
14. Furnish record drawings providing the following information;
 - a. Complete rating.
 - b. Short circuit withstand-ability of bus and lowest rated device.
 - c. Overall outline dimensions including space available for conduits.
 - d. Circuit schedule showing circuit number.
 - e. Device description.
 - f. Feeder circuit identification.
 - g. Conductor ratings and one-line diagram with each circuit device numbered.
15. Provide switchboards meeting U.L. Standard #UL891 and NEMA Standard PB-2. The U.L. label shall appear on all switchboard sections which contain U.L. listed devices.
16. Provide ground fault protection on each main devices, rated 480/277 ground wye, 1000 amps or larger, as follows:
 - a. U.L. listed ground sensor relay system equal to General Electric GSR. Provide ground break components for each system with coordinated ground sensor (CR) and integral test winding. Provide with solid state relay to operate shunt trip circuit on the switch and monitor panel.
- b. Use time relay with the following features:
 - 1) Continuously adjustable current pick-up settings of 100 to 1200 amperes.
 - 2) Continuously adjustable time delay setting from instantaneous (.03 seconds) to one second.
 - 3) Memory function to recognize and initiate tripping on intermittent ground faults.
- c. Install panel which:
 - 1) Indicates relay operation.
 - 2) Provides means for testing the system with or without interruption of electrical service.
 - 3) Does not permit the ground fault system to be inadvertently left in an inactive or "off" state.
- d. Use ground sensor for zero sequence arrangement on the main service entrance devices.
17. Provisions for padlocking the circuit breakers or disconnect in the "on" and "off" positions.
18. Provide full rated bussing (no cascading).

2.10 DISCONNECT (SAFETY) SWITCHES

A. Disconnect switches shall be rated 600 volts A.C., NEMA Type HD heavy duty, horsepower-rated, quick-make/quick-break, non-fusible or fusible, Class "R", with the number of poles and ampere rating as shown. Enclosure shall be NEMA Type 1, lockable. Maximum voltage, current and horsepower rating shall be clearly marked on the switch enclosure. Switches equipped with dual-element time-delay fuses shall be permanently labeled with fuse type and rating.

1. For outdoor locations, or shown as "WP" (weatherproof), the enclosure shall be NEMA Type 3R, unless otherwise indicated.

2.11 TRANSFORMERS

A. Manufacturers: Eaton, General Electric, International Transformer Company, Siemens or Square D.

B. Material and Construction:

1. Dry type, rated as shown. Provide transformer cooled by natural convection of air with:
 - a. Steel enclosure.
 - b. Class K insulation.
 - c. Transformers: Insulation temperature rise over 40°C ambient not to exceed 115°C at full load for 185°C insulation system.
 - d. Suitable for indoor or outdoor installation as required or indicated on the drawings.
 - e. Compartment located where primary and secondary connections can be made.
 - f. Secure cover plates secured with captive type hardware.
 - g. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hygroscopic, thermosetting varnish.
 - h. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed, and finished with a GRAY, baked enamel.
 - i. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.
 - j. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.
 - k. Provide transformer rated 30 kVA and less with two 5 percent full capacity taps below rated voltage in primary.
 - l. Provide transformers rated greater than 30 kVA with four 2-1/2 percent full capacity taps below and two 2-1/2 percent above rated voltage in primary.
2. The average audible sound level shall not exceed 45 DB for transformers rated at 75 kVA and below, not 55 DB for transformers rated above 75 kVA, when measured in accordance with NEMA Standard TRI-2.068.

2.12 PANELBOARDS

A. Manufacturers: Eaton, Siemens, General Electric, or Square D.

B. Materials:

1. Branch circuit panelboards:
 - a. Provide factory assembled, enclosed panelboards in dead front cabinets, with doors, surfaced mounted or recessed as indicated, not less than 20" wide and 5-3/4" deep. Height will depend on the number of breakers and spaces.
 - b. Where a control compartment is indicated, provide an integral compartment with a separate hinged lockable door held with captive screws.
 - c. Provide feeder terminal lugs for both main lugs only and main breakers rated for use with copper or aluminum conductors.
 - d. Provide three phase, 4 wire, solid neutral design with sequence bussing, full capacity neutral and full length copper bussing including areas indicated as space only. Bussing shall be braced for maximum available fault.
 - e. Provide copper neutral bus where neutral bus is indicated. Neutral bus shall be sized for minimum twice the current carrying capacity of line bus.
 - f. Key all door locks alike. Provide a type written directory of circuit index card holder mounted behind the door in framed card slot with plastic see through window.
 - g. Provide full size copper equipment ground bus.
 - h. All breakers shall be bolt-on type molded case. No tie handle is accepted for multi-pole breaker.
 - i. Provide pad lock off devices on all breakers serving appliances, motor operated equipment, HVAC equipment and other circuit as indicated on panel schedules.
 - j. 120/208V, 3 Phase, 4 Wire Panelboards: General Electric Co. type NLAB, Square D Co. type NQOB, or Cutler-Hammer type POW-R-LINE1.
 - k. 277/480V, 3 Phase, 4 Wire Panelboards: General Electric Co. type NHB, Square D Co. type NEHB, ITE, Inc. type NHB, Sylvania Co. type NH1B or Cutler-Hammer type POW-R-LINE2.
 - l. All equipment shall be listed to meet or exceed the available fault current indicated on drawings.
 - m. Provide main lugs only unless scheduled otherwise.
 - n. Construct in accordance with U.L. and NEMA Standards.
2. Distribution Panelboards:
 - a. Provide circuit breaker type distribution panelboards with fully rated copper bus, lockable molded case breakers for mains and feeders. Provide nameplates for all circuit breakers.
 - b. Bussing shall be braced to withstand maximum available fault current indicated on drawings.
 - c. Provide copper neutral bus where indicated. Neutral bus shall be sized for minimum twice the current carrying capacity of line bus.
 - d. Provide full size copper ground bus adequate for number of grounded circuits.
 - e. General Electric Co. type NCP and type CCB, or Square D Co. types HCN and HCM, or Cutler-Hammer type POW-R-LINE3 and POW-R-LINE4B.
3. Circuit breakers:
 - a. Resettable, quick-make, quick-break, bolt-in place type, trip-free, with separate trip position from on and off positions.
 - b. Multiple pole breakers with common trip and one operation handle.
 - c. If handle ties are required, install only handle ties provided by circuit breaker Manufacturer.
 - d. Wire with sequence phasing.
 - e. Circuit breakers shall be rated to meet or exceed the available fault current indicated on drawings.

2.13 OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers:

1. Circuit Breakers:
 - a. General Electric
 - b. Square D
 - c. Siemens
 - d. Eaton
2. Fuses: Bussmann only.

B. Materials and fabrication:

1. Circuit Breakers: Molded case, quick-make, quick-break, thermal-magnetic, trip-free with individual inverse time tripping mechanism on each pole. Terminal lugs rated for copper and aluminum conductors. Minimum 10,000 amperes interrupting capacity, RMS symmetrical short circuit rating shall be as required. All breakers shall meet or exceed the maximum available fault current as indicated on single line diagram.
 - a. Use magnetic-only circuit breakers for motor applications.
 - b. Provide Class A (5ma sensitivity) breakers where GFI type breakers are required.
 - c. Provide "HACR" type circuit breakers for HVAC loads. Ratings shall be as indicated on the drawings.
 - d. No tie handle on multi-pole circuit breaker is accepted.
 - e. Provide ambient compensated type breaker where the breaker is installed in the ambient in excess of 40°C (104°F).

2.13 OVERCURRENT PROTECTIVE DEVICES

1. Fuses, as follows, unless otherwise indicated:

- a. Class RK1:
 - 1) 250V; LPN-RK, Lowpeak
 - 2) 600V; LPS-RK
- b. Class L: KRP-C, Hi-Cap

2.14 MOTOR CONTROLLERS

A. Manual motor controllers: NEMA ICS 6. AC general purpose Class A manually operated, full voltage controller with thermal overload element. Also provide red pilot light, auxiliary contacts: 2 N.O. and 2 N.C., and push button operator. Enclosure: NEMA ICS 6, Type 1 except as otherwise shown.

B. Magnetic motor controllers: Provide full voltage, non-reversing, across the line, magnetic controller, except where another type is indicated.

1. Control Circuit: Control circuit shall be 120 volts, except as otherwise indicated. Provide control power transformer integral with controller where no other supply of 120 volt control power is indicated. Provide control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.
2. Combination Controller:
 - a. Circuit Breaker Type: NEMA AB 1. Motor circuit protector; molded-case circuit breaker type with magnetic only trip element calibrated to coordinate with the actual locked rotor current of the connected motor and the controller overload relays. Provide breakers that are factory assembled with the controller, interlocked with unit cover or door, and arranged to disconnect the controller. Provide motor circuit protectors with field adjustable trip elements as specified in "Overcurrent Protective Devices."
 - b. Fuse Type: NEMA KS 1. Enclosed knife switch with externally operable handle. Fuse interrupting rating: 200,000 rms amperes. Fused or non-fused as indicated; quick-make, quick-break switch; factory assembled with controller and arranged to disconnect it. For fused switches, provide rejection-type fuse clips and fuses rated as indicated. Interlock switch with unit cover or door.

A. Multispeed motor controllers: Match controller to motor type, application, and to number of speeds. Conform to the requirements for magnetic motor controllers. Provide auxiliary devices as indicated. Provide auxiliary switches, 2 N.O. and 2 N.O., except as otherwise indicated. Provide all required relays factory installed in controller enclosure.

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REGISTERED PROFESSIONAL ENGINEER
No. 13442
Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

MWDOC ELECTRICAL SYSTEM
REHABILITATION PROJECT

18700 WARD STREET
FOUNTAIN VALLEY, CA 92708

SHEET TITLE:

ELECTRICAL SPECIFICATIONS
(2 OF 4)

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18154

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E502

OF SHEETS

DIVISION 26 00 00 - ELECTRICAL SPECIFICATIONS

PART 3 – EXECUTION

3.01 INSTALLATION

A. General: The electrical installation shall conform to the requirements of NFPA 70, "National Electrical Code," and to the requirements specified herein.

B. Wiring Method: The wiring method shall be as follows, except as otherwise noted.

1. Exterior:

a. Exposed: Rigid steel conduit.

b. Concealed: Rigid steel conduit.

1) In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.

2) Underground: Rigid nonmetallic conduit. Use Schedule 40 PVC. Provide concrete encasement as indicated.

c. Connection to vibrating equipment, including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: Liquidtight flexible metal conduit, maximum length 18".

2. Interior:

a. Exposed: Electrical metallic tubing.

1) Areas where exposed conduit may be subject to physical damage: Rigid metal conduit.

2) Damp or wet locations: Rigid metal conduit.

3) Classified locations: Rigid metal conduit.

b. Concealed: Electrical metallic tubing.

1) In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.

2) In slab, above grade: Rigid nonmetallic conduit Schedule 40 PVC. Maximum size conduit in slab: 1".

c. Connection to vibrating equipment, including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: Flexible metal conduit, maximum length 18".

1) For moist or humid locations or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: Liquidtight flexible metal conduit.

d. Connection to lighting fixtures located in suspended acoustical or metal ceilings: Flexible metal conduit, maximum length 72".

e. Final connections to lighting fixtures which have isolated junction boxes: Flexible metal conduit.

1) Damp locations: Liquidtight flexible conduit.

C. Grounding and Bonding:

- General: Grounding shall be provided in accordance with all applicable codes and regulations and the local authorities having jurisdiction.
- An equipment grounding conductor shall be provided in all raceway containing phase conductors.
- The maximum resistance to ground shall not exceed 5 ohms.

D. Raceway Installation:

- General Requirements: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows.

a. Minimum size: 3/4" unless otherwise indicated.

b. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be installed into the conduit.

c. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings. Remove burrs, and swab inside conduits before conductors are pulled in.

d. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.

e. Install minimum 1/8" polypropylene pull cords from end-to-end in all empty raceways, tagged with the identification of service intended and location of opposite end. Leave at least 24" of pull cord at each end.

f. Restore wall, ceiling, and floor penetrations to the requirements of the Authority Having Jurisdiction.

g. Communications/Signal System Raceways 2" Trade Size and Smaller: In addition to the above requirements, install raceways 2" and smaller trade size in maximum lengths at 150'-0" and with a maximum of two, 90° bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

h. Provide code sized green grounding conductor in all conduit.

- Perform excavating, trenching, backfilling, and compacting as shown, and as specified in Division 02 which prescribes excavation, backfilling and compacting for utilities. Minimum cover for runs below finished grade outside buildings: 24" except where noted.

- Complete installation of electrical raceways before starting installation of conductors within raceways.

a. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.

- Install all conduits at elevations and locations to avoid interference with grading or other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry structural members.

a. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".

1) Minimum separation from uninsulated hot water pipes, steam pipes, heater flues or vents: 6". Avoid running conduit directly under water lines.

2) Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.

- Conceal conduit, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least six 6" away from parallel runs of flues and steam or hot water pipes. Install raceway level and square and at proper evaluations.

a. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.

b. Run conduits embedded in structural slabs in the middle of the slab below the top and above the bottom reinforcing steel. Minimum cover for conduit in concrete floors, walls or roof: 1/3 thickness of slab, but in no case less than 1-1/2" cover except where penetration is made. Do not install conduit larger than 1" in slabs. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Where nonmetallic conduit is used, raceways must be converted to Schedule 80 or rigid steel conduit before rising above the floor.

c. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.: Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps. Expansion fittings installed in concrete shall be water tight, concrete tight, deflection/expansion type.

d. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

- Install and neatly rack exposed conduits parallel with and perpendicular to building walls. Do not install exposed diagonal conduit runs.

a. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.

b. Use blockouts for concentrations of conduits in a confined area.

c. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices.

d. Install exposed raceways parallel and perpendicular to nearby surfaces of structural members and follow the surface contours as much as practical.

e. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.

- Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other penetrations must be approved by the Structural Engineer prior to installation.

a. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.

b. Use blockouts for concentrations of conduits in a confined area.

2. Interior:

a. Exposed: Electrical metallic tubing.

1) Areas where exposed conduit may be subject to physical damage: Rigid metal conduit.

2) Damp or wet locations: Rigid metal conduit.

3) Classified locations: Rigid metal conduit.

b. Concealed: Electrical metallic tubing.

1) In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.

2) In slab, above grade: Rigid nonmetallic conduit Schedule 40 PVC. Maximum size conduit in slab: 1".

c. Connection to vibrating equipment, including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: Flexible metal conduit, maximum length 18".

1) For moist or humid locations or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: Liquidtight flexible metal conduit.

d. Connection to lighting fixtures located in suspended acoustical or metal ceilings: Flexible metal conduit, maximum length 72".

e. Final connections to lighting fixtures which have isolated junction boxes: Flexible metal conduit.

1) Damp locations: Liquidtight flexible conduit.

C. Grounding and Bonding:

- General: Grounding shall be provided in accordance with all applicable codes and regulations and the local authorities having jurisdiction.
- An equipment grounding conductor shall be provided in all raceway containing phase conductors.
- The maximum resistance to ground shall not exceed 5 ohms.

D. Raceway Installation:

- General Requirements: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows.

a. Minimum size: 3/4" unless otherwise indicated.

b. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be installed into the conduit.

c. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings. Remove burrs, and swab inside conduits before conductors are pulled in.

d. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.

e. Install minimum 1/8" polypropylene pull cords from end-to-end in all empty raceways, tagged with the identification of service intended and location of opposite end. Leave at least 24" of pull cord at each end.

f. Restore wall, ceiling, and floor penetrations to the requirements of the Authority Having Jurisdiction.

g. Communications/Signal System Raceways 2" Trade Size and Smaller: In addition to the above requirements, install raceways 2" and smaller trade size in maximum lengths at 150'-0" and with a maximum of two, 90° bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

h. Provide code sized green grounding conductor in all conduit.

- Perform excavating, trenching, backfilling, and compacting as shown, and as specified in Division 02 which prescribes excavation, backfilling and compacting for utilities. Minimum cover for runs below finished grade outside buildings: 24" except where noted.

- Complete installation of electrical raceways before starting installation of conductors within raceways.

a. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.

- Install all conduits at elevations and locations to avoid interference with grading or other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry structural members.

a. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".

1) Minimum separation from uninsulated hot water pipes, steam pipes, heater flues or vents: 6". Avoid running conduit directly under water lines.

2) Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.

- Conceal conduit, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least six 6" away from parallel runs of flues and steam or hot water pipes. Install raceway level and square and at proper evaluations.

a. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.

b. Run conduits embedded in structural slabs in the middle of the slab below the top and above the bottom reinforcing steel. Minimum cover for conduit in concrete floors, walls or roof: 1/3 thickness of slab, but in no case less than 1-1/2" cover except where penetration is made. Do not install conduit larger than 1" in slabs. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Where nonmetallic conduit is used, raceways must be converted to Schedule 80 or rigid steel conduit before rising above the floor.

c. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.: Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps. Expansion fittings installed in concrete shall be water tight, concrete tight, deflection/expansion type.

d. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

- Install and neatly rack exposed conduits parallel with and perpendicular to building walls. Do not install exposed diagonal conduit runs.

a. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.

b. Use blockouts for concentrations of conduits in a confined area.

c. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices.

d. Install exposed raceways parallel and perpendicular to nearby surfaces of structural members and follow the surface contours as much as practical.

e. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.

- Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other penetrations must be approved by the Structural Engineer prior to installation.

a. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.

b. Use blockouts for concentrations of conduits in a confined area.

- Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

- Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

f. Make no bends with a radius less than 12 times the diameter of the cable it contains nor more than 90°. Make field bends with tools designed for conduit bending. Heating of metallic conduit to facilitate bending is not permitted.

g. Bends and offsets in 1" and smaller conduits may be done with approved bending devices. Do not install conduits which have had their walls crushed and deformed and their surface finish damaged due to bending.

c. Run conduits parallel to and at right angles to building lines.

d. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for application.

10. Surface Raceway:

a. Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle of fixture ground terminals.

b. Select each surface raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.

c. Where a surface raceway is used to supply a lighting fixture having central stem suspension with a backplate and a canopy, with or without extension ring, the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.

d. Provide surface raceway outlet box, in addition to the backplate and canopy, at the feed-in location of each lighting fixture having end stem suspension.

e. Where a surface raceway extension is made from an existing outlet box on which a lighting fixture is installed, provide a backplate slightly smaller than the fixture canopy, and no additional surface mounted outlet box need be installed.

f. Surface raceways shall be securely fastened to the mounting surface. Use expansion type anchors in concrete.

- Do not run conduits exposed on the roof unless approval is obtained from the Owner prior to installation.

12. Other Requirements:

a. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, transformers, and other equipment and devices which are subject to vibration and which require adjustment with liquidtight flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection. Use external bonding jumpers on sizes 1-1/2" and above.

b. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire seals on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors, or use standard galvanized steel pipe sleeves; diameters 12" greater than the outside diameter of the sleeved conduit and fill the annular space with mastic or caulk with lead.

c. Raceway for panelboards:

1) All homeruns shown shall be run to the panel indicated independently of all other homeruns. Provide pull points so as not to exceed total bends of 270°.

2) Run a minimum of one 3/4" empty conduit for every three single pole spare circuit breakers, spaces or fraction thereof and not less than two 3/4" conduits from every flush mounted panel to an accessible space above the ceiling and below the floor.

e. Make conduit projections from covered areas to areas exposed to the weather watertight by proper flashing. Extend flashing a minimum of 6" in all directions from conduit.

f. Cap conduits indicated to be stubbed-out underground using glued on PVC caps intended for this purpose.

g. Install a coupling flush with the floor on all conduits stubbed-up through the floor slab.

h. Do not penetrate walls with flexible conduit where subject to physical damage. Use recessed box with extension ring for transition from interior to exterior of wall.

i. Terminations:

1) Where raceways are terminated with locknuts and bushings, align the raceway to

enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

2) Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.

3) At switchboards, manholes and floor standing distribution panelboards, provide insulated throat bushings or bell ends on all non-metallic conduit entries and bushings on all metallic conduit entries.

4) Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs.

5) Install end bells on conduits stubbed through slabs and foundations into electrical enclosures.

j. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL Listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1) Where conduits enter or leave hazardous locations.

2) Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air conditioned spaces.

3) Where required by the NEC.

k. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6" above the floor. Where equipment connections are not made under this contract, install screwdriver operated threaded flush plugs flush with floor.

l. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so that curved portion of bends is not visible above the finished slab.

l. Flexible Connections: Use short length (maximum of 6'-0") of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet locations. Install separate ground conductor across flexible connections.

m. PVC Coated Rigid Steel Conduit:

1) Do not store conduit in direct sunlight.

2) Use pipe straps, no pipe wrenches or channel wrenches, when tightening connections to avoid damaging PVC coating.

3) Patch all gouges or cuts in the PVC coating after installing conduit. Use manufacturer's recommended patching paste. Build up area to be patched to full mil thickness of coating and feather out paste on sides of damaged area a minimum of 1/2" to provide a completely bonded seal.

4) Field bend conduit with shoes for a mechanical bender sized for the next larger size conduit.

5) Bends used in or below concrete slabs shall be, rigid steel type elbows, use for all stub-ups with flush floor coupling at transitions.

n. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated.

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REGISTERED PROFESSIONAL ENGINEER
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Exp. 09/30/20
ELECTRICAL
STATE OF CALIFORNIA

**MWDC ELECTRICAL SYSTEM
REHABILITATION PROJECT**

**18700 WARD STREET
FOUNTAIN VALLEY, CA 92708**

SHEET TITLE:
**ELECTRICAL SPECIFICATIONS
(3 OF 4)**

DRAWN CRR
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DATE
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SCALE
JOB NO. 18154
SHEET

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OF SHEETS

DIVISION 26 00 00 - ELECTRICAL SPECIFICATIONS

PART 3 – EXECUTION (cont)

3.01 INSTALLATION (cont)

I. Underground Duct Banks:

1. Exercise care in excavating, trenching and working near existing utilities. Trenching and backfill:
- a. Contractor shall trench underground duct path and manhole location with utmost care in order to avoid existing underground facilities. Trench size shall be kept to a minimum. No oversized trench shall be made unnecessarily.
- b. All trench excavations by the Contractor shall be backfilled by same in accordance with this specification.
- c. All material excavated during underground electrical work is not pre-qualified for backfill.
- d. All fill must be placed in layers not exceeding 8" in depth and hand tamped or machine compacted to at least 95% of its maximum dry density as computed by the ASTM method of performing a compaction test (D-1557-70).
- e. All compacted fill will be under continuous inspection by the Inspector. Compaction tests will be arranged for by the Inspector in cooperation with the Contractor.
- i. Pudding or water-flooding for settling backfill will not be permitted except in landscaped areas. The addition of water shall be limited to achieving optimum moisture content for tamp procedures.
- f. Where Contractor trenches crosses any finished road (paved or gravel), he shall be responsible for restoring the road to its original condition. Repaving shall be with the same surrounding material and to a quality equal or exceeding its surround.
- g. Do not backfill for a period of at least 24 hours after pouring concrete. Upon receipt of the Inspector's approval proceed with backfill. Backfill with 1 sack slump concrete and repair of surface to be completed within 24 hours of approval. Provide wet sand backfill in landscape areas.
- h. Survey slope of trenches and ducts between terminations to provide drainage. No pockets shall be permitted.
2. Underground Duct with Concrete Encasement:
- a. Underground ductbanks lines shall be constructed of individual conduits encased in concrete. Conduit shall be of PVC Schedule 40. The kind of conduit used shall not be mixed in any one duct bank. PVC ducts shall not be smaller than 2" in diameter unless otherwise indicated. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3" of concrete outer encasement for ducts. Conduit shall be separated by a minimum concrete thickness of 2".
- b. The top of the concrete envelope shall not be less than 30" below grade, except that under roads and pavement it shall be not less than 36" below grade.
- c. Ductbanks shall have a continuous slope downward toward manholes with a pitch of not less than 1-1/2" in 100'-0". Except at conduit risers, changes in direction of runs exceeding a total of 10', either vertically or horizontally, shall be accomplished by long sweep bends having a minimum radius of curvature of 25'-0". Sweep bends may be made of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 24" for use with conduits of less than 3" in diameter and a minimum radius of 48" for ducts of 3" in diameter and larger.
- d. PVC conduits shall terminate in end-bells where duct lines enter pullboxes or manholes. Separators shall be of precast concrete, high-impact polystyrene, steel, or any combination of these. The joints of the conduits shall be staggered by rows and layers so as to provide a duct line having maximum strength.
- e. During construction, partially completed duct lines shall be protected from the entrance of debris such as mud, sand, concrete and dirt by means of suitable conduit. As each section of a duct line is completed, a testing mandrel not less than 12" long with a diameter 1/4" less than the size of the conduit shall be drawn through each conduit, after which a brush having the diameter of the duct and having stiff bristles shall be drawn through the conduit until it is clear of all particles of earth, sand, or gravel. Conduit plugs shall then be immediately installed.
- f. Locate spacers no greater than 5'-0" center to center, along entire length of ductbank.
- g. Duct couplings may be placed side by side horizontally, but staggered at least 6" vertically.
- h. Make conduit joints in accordance with manufacturer's recommendations. In the absence of specific recommendations, make the joints as follows:
- 1) Brush a plastic solvent cement on the inside of the coupling and on the outside of the duct ends.
- 2) Slip duct and fitting together with a quick one-quarter turn to set the joints.
- i. Follow ductbank sections on the drawings for size, arrangement and spacing of ducts.
- j. Secure ducts and spacers to prevent movement during placement of concrete.
- k. At connection to existing manhole, dowel the concrete encasement with one #4 reinforcing bar 36" long per duct. (Minimum of two required.)
- l. Provide a #2/0 soft bare copper ground conductor throughout the continuous length of ductbanks containing conductors having more than 150 volts to ground.
- m. Concrete; in accordance with the following:
- 1) Provide #4 rebar dowels at each concrete joint/pour transition. A minimum of 8'-0" long #4 rebar dowel, one per conduit in ductbank.
- 2) Provide rebar and tie-downs to prevent conduits from floating to top of concrete during curing.
- 3) Make ductbank construction monolithic top to bottom and side to side.
- 4) Do not exceed the outside dimension of the completed ductbank by more than 1" in the vertical or 4" in the horizontal from dimensions indicated.
- 5) Use plastic film to retain moisture for proper curing.
- n. Ductbank concrete may be poured without forming, provided trench walls are firm and will not cave in during installation. Unless noted otherwise, encase the raceway on all sides with a minimum of 3" of concrete.
- o. Where conduits are stubbed out for future connection, stop concrete 12" from end of conduit. Provide a waterproof cap on the end of the conduit.
- p. The top of the concrete ductbank shall be as shown on the drawings, or as otherwise required by code and as required to coordinate with other underground obstructions.
3. Connections to Existing Ducts: Where connections to existing duct lines are indicated, excavate the lines to the maximum depth necessary. Cut off the lines and remove loose concrete from the conduits before installing new concrete encased ducts. Provide a reinforced concrete collar, poured monolithically with the new duct line, to take the shear at the joint of the duct lines. Remove existing cables which constitute interference with the work.
4. Connection to Existing Handholes and Manholes: For duct line connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and band out to tie into the reinforcing of the duct line encasement. Chip out the structure wall to form a key for the duct line encasement.
5. Connections to Existing Concrete Pads: For duct line connections to concrete pads break an opening in the pad out to the dimensions required and preserve steel in pad. Cut the steel and bend out to tie into the reinforcing of the duct line encasement. Chip out the opening in the pad to form a key for the duct line encasement.
6. Removal of Ducts: Where duct lines are removed from existing manholes, close openings and waterproof manhole. Chip out the wall opening to provide a key for the new section of wall.
7. Precast pullboxes shall be of sizes required.

F. Installation of boxes and fittings:

1. Outlet boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each locations and in conformance with the following requirements, except as otherwise indicated:
- a. Interior dry locations: NEMA type 1, sheet steel.
- 1) In dry walls for single and two gang outlets provide 4S and 4D boxes, for 3 or more outlets use masonry boxes.
- 2) In block and masonry walls provide masonry boxes of depths required for wall thickness.
- 3) In poured concrete and plastered walls provide 4S and 4D boxes for single gang outlets and 2G and 3G-5075 boxes for multiple ganged outlets.
- 4) In concrete ceilings provide OCR rings. In other ceilings provide 40 and 40D boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.
- b. Locations exposed to weather or dampness: Cast metal, NEMA type 3R.
- c. Wet locations: NEMA type 4 enclosures.
- 1) In exposed work, exterior of buildings, in wet location, and flush in non-waterproofed walls below grade provide FS and FD boxes.
- d. Corrosive locations: NEMA type 4X enclosures.
- e. Hazardous (Classified) locations: Cast metal, UL 886, NEMA type listed and labeled for the location and class of hazard indicated.
2. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types as follows, except as otherwise indicated:
- a. Interior dry locations: NEMA type 1, sheet steel.
- b. Locations exposed to weather or dampness: NEMA type 3R, sheet steel.
- c. Wet locations: NEMA type 4 enclosures.
- d. Corrosive locations: NEMA type 4X enclosures.
- e. Hazardous (Classified) locations: Cast metal, UL 886, NEMA type listed and labeled for the location and class of hazard indicated.
3. Floor Boxes: In slabs on grade and wet locations: Use NEMA type 4 boxes. At other locations in slabs, use concrete-tight NEMA 1 boxes.
- a. Provide floor boxes with quantity of gangs as required for power, communication or control as indicated. Use boxes with barriers where required. Provide carpet flanges in carpeted areas.
4. Hinged Door Enclosures: NEMA type 12, except as indicated.
5. Hinged Door Enclosures Outdoors: NEMA type 3R, with drip hood, factory tailored to individual units.
6. Hinged Door Enclosures in Corrosive Locations: NEMA type 4X metal enclosure.
7. Cabinets: Flush mounted, NEMA type 1, except as otherwise indicated.
- 3.02 FIELD QUALITY CONTROL
- G. Examine surfaces to which conduits are to be secured for:
1. Defects which will adversely affect the execution and quality of work.
2. Deviations from allowable tolerances for the building material.
- B. Do not start work until defects and deviations are corrected.
- 3.03 CLEANING
- A. Upon completion of installations of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.
- 3.04 PROTECTION OF FINISHED WORK
- A. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose.
- B. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- 3.05 GROUNDING
- A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box, or enclosure.
- 3.06 CLEANING AND FINISH REPAIR
- A. Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks. Clean surfaces to be painted.
- B. Galvanized finish: Repair damage using a zinc-rich paint recommended by the manufacturer.
- C. Painted finish: Repair damage using matching corrosion-inhibiting touch-up coating.

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SHEET TITLE:
ELECTRICAL SPECIFICATIONS
(4 OF 4)

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Last plotted by chrisr Layout1 P: \\2018\\18514\\Cad\\18154E504 Specifications.dwg 04/29/2019 09:38