DIST	COUNTY	LOCATION CODE	POST MILE TOTAL PROJECT	SHEET No	TOTAL SHEETS
12	Ora	5721		1	6

STATE OF CALIFORNIA

DEPARTMENT OF TRANSPORTATION

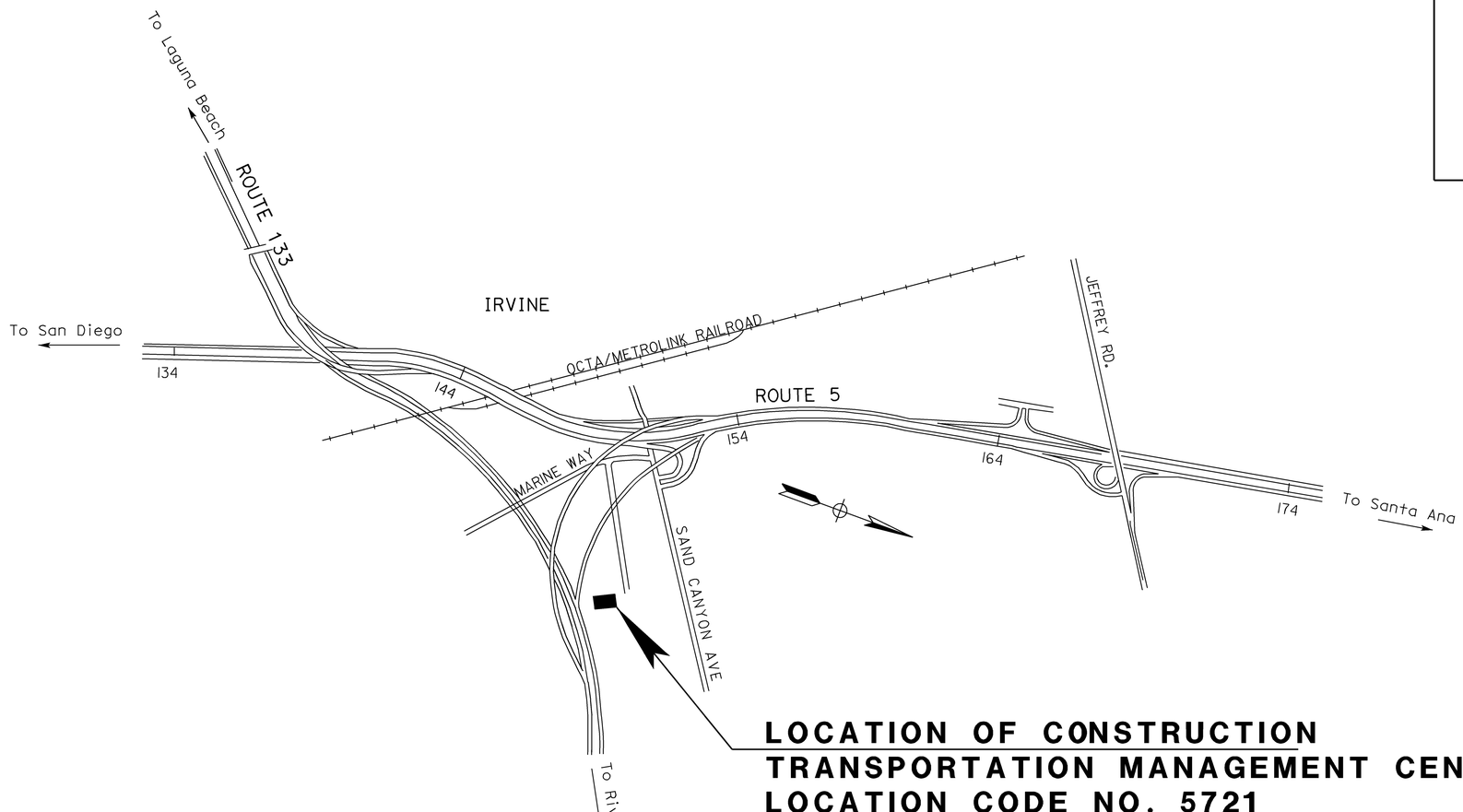
PROJECT PLANS FOR BUILDING CONSTRUCTION IN ORANGE COUNTY IN IRVINE AT THE TRANSPORTATION MANAGEMENT CENTER AT 6681 MARINE WAY

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

INDEX OF PLANS

SHEET NO.	DESCRIPTION
1	TITLE AND LOCATION MAP
	STRUCTURE PLANS
2	GENERAL PLAN AND LEGEND
3-6	ELECTRICAL PLANS

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO BIDDERS AND SPECIAL PROVISIONS BOOK.



LOCATION OF CONSTRUCTION
TRANSPORTATION MANAGEMENT CENTER
LOCATION CODE NO. 5721

NO SCALE

CALIFORNIA STATE FIRE MARSHAL
APPROVED
Approval of this plan does not authorize or approve any omission or deviation from applicable regulations. Final approval is subject to field inspection. One set of approved plans shall be available on the project site at all times.
Reviewed by: JASON D. DeWITT
Approval date: 03-24-10

PHOTOVOLTAIC SYSTEMS
CSFM FILE # 01-30-11-0039

Tommy F. lee 04-19-10
PROJECT ENGINEER DATE
REGISTERED ELECTRICAL ENGINEER

REGISTERED PROFESSIONAL ENGINEER
TOMMY F. LEE
No. 18534
Exp. 12-31-10
ELEC
STATE OF CALIFORNIA

04-19-2010
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

PROJECT MANAGER: SOUSAN MIRZAEI
DESIGN ENGINEER: ALAN TORRES

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

Contract No. 12-0AA014

DIST.	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5721		2	6

Tommy F. Lee 04-19-10
REGISTERED ELECTRICAL ENGINEER — DATE

REGISTERED PROFESSIONAL ENGINEER — TOMMY F. LEE — No. 18534 — Exp. 12-31-10 — ELEC — STATE OF CALIFORNIA

04-19-2010
PLANS APPROVAL DATE

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INDEX OF PLANS

SHEET No.	DESCRIPTION
GP	GENERAL PLAN AND LEGEND
	ELECTRICAL
EE-1	SITE PLAN
EE-2	SINGLE LINE DIAGRAM GRID-TIED PHOTOVOLTAIC SYSTEM
EE-3	ROOF PLAN
EE-4	ELEVATION AND DETAILS

EXISTING BUILDING DATA

1995 CBC

BUILDING/ PORTION	OCCUPANCY GROUP	CONSTRUCTION TYPE	ALLOWABLE AREA	ACTUAL BUILDING AREA	YEAR BUILT
OFFICE	B	II-N TWO STORIES FULLY SPRINKLERED	48,000 SF	21,567 SF	2001

* ALLOWABLE AREA INCREASE PER CBC SECTION 505.1.2, SEPARATION ON THREE SIDES OF MIN 62' = 48,000 SF

BUILDING DATA

BUILDING TYPE: 2007 CBC CHAPTER 6, II-N

OCCUPANCY GROUP:
2007 CBC CHAPTER 3, B

ACTUAL BUILDING AREA: 21,567 SF

PROPOSED BUILDING AREA FOR PV PANELS:
APPROXIMATE 7,834 SF

ROOF DATA
SINGLE PLY ROOFING OVER RIGID INSULATION OVER METAL DECK AND STRUCTURAL STEEL FRAMING

APPLICABLE CODES
2007 California Building Code (CBC) Title 24, Part 2 CCR
2007 California Electrical Code (CEC) Title 24, Part 3 CCR
2007 California Fire Code (CEC) Title 24, Part 9 CCR

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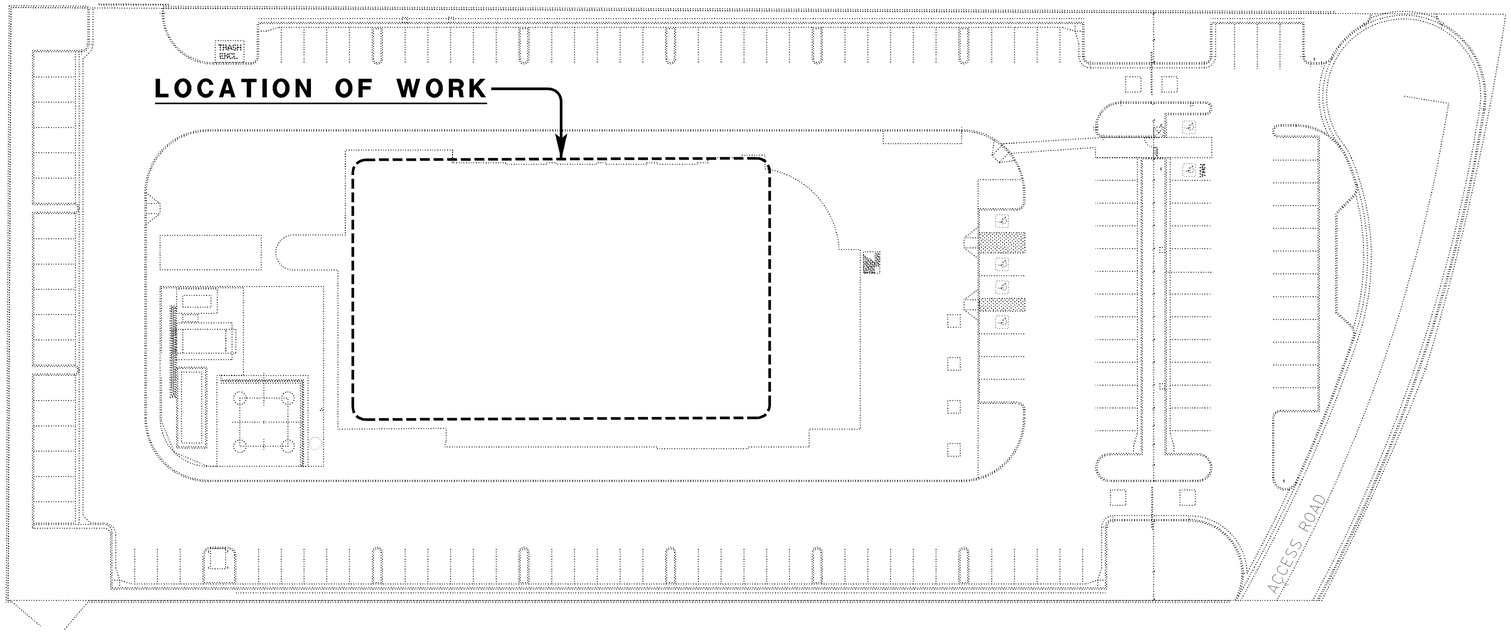

SITE PLAN
SCALE 1" = 30'-0"

GRAPHIC SYMBOLS

SYMBOL	DESCRIPTION
(2) 1/2"C. PVC. 2#12	CONDUCTOR INFO (PER CONDUIT); CONDUIT TYPE; CONDUIT SIZE; NUMBER OF CONDUITS (NO NUMBER INDICATES ONE CONDUIT)
—MC—	CONDUIT, RIGID STEEL, UNDERGROUND
—PVC—	CONDUIT, POLYVINYL CHLORIDE, UNDERGROUND
	CONDUIT, FLEXIBLE
	CONDUIT, TURN UP
	CONDUIT, TURN DOWN
A / EE-2	SECTION/ELEVATION LETTER; SHEET NUMBER
1 / EE-2	DETAIL NUMBER; SHEET NUMBER
—E—E—	EXISTING CONDUIT AND CONDUCTORS-TO REMAIN UNLESS OTHERWISE NOTED
	CONDUIT EXPOSED
BC	INSTALL PULL BOX IN EXISTING CONDUIT RUN.
	CIRCUIT BREAKER, SINGLE POLE
	CIRCUIT BREAKER, DOUBLE POLE
	CONTACT, NORMALLY OPEN
	SWITCH, DOUBLE-POLE
	FUSE
	GROUNDING ELECTRODE
	ENCLOSURE BOND

ABBREVIATIONS

A	AMPERES
AC	ALTERNATE CURRENT
C	CONDUIT
DC	DIRECT CURRENT
E	EXISTING
G	GROUND
JB	JUNCTION BOX
M	METER
MC	METALIC CONDUIT
MIN	MINIMUM
MT	EMPTY CONDUIT
P	POLE
PB	PULL BOX
PTC	PV USA TEST CONDITIONS
PVC	POLYVINYL CHLORINE
PV	PHOTOVOLTAIC
SF, SQ FT	SQUARE FOOT
STC	STANDARD TEST CONDITIONS
TYP	TYPICAL
TTB	TELEPHONE TERMINAL BOARD
V	VOLT

THIS DRAWING ACCURATE FOR ELECTRICAL WORK ONLY

DESIGN SUPERVISOR: Jashwinder to Sandhu	DESIGN	BY Tommy F. Lee	CHECKED Jesse S. Sandhu	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES ELECTRICAL-MECHANICAL-WATER AND WASTEWATER DESIGN
DESIGN ENGINEER	DETAILS	BY Dalf Zhou	CHECKED Tommy F. Lee		
	QUANTITIES	BY Tommy F. Lee	CHECKED Jesse S. Sandhu		

BRIDGE NO. 55M5721 — POST MILE

TRANSPORTATION MANAGEMENT CENTER PHOTOVOLTAIC SYSTEM
GENERAL PLAN AND LEGEND

SHEET **GP**

DOES SD Imperial Rev. 1/07

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12280
EA 0AA011

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY)										SHEET	OF
7/20/09	7/28/09	9/14/09	4/19/10								

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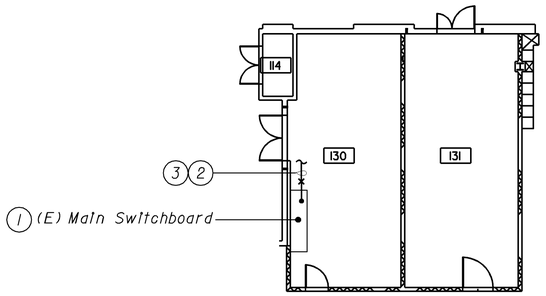
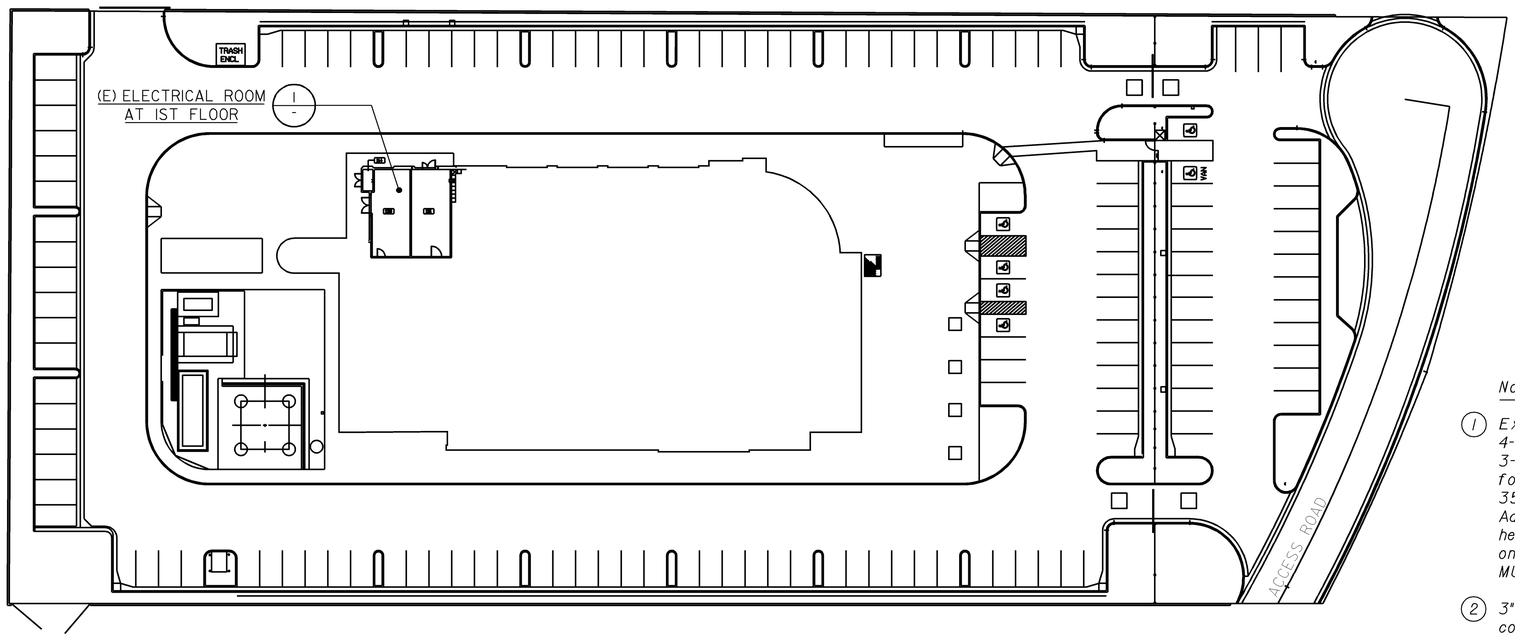


1 ENLARGED PLAN
SCALE 1'' = 10'-0''



SITE PLAN
SCALE 1'' = 30'-0''

CALIFORNIA STATE FIRE MARSHAL
APPROVED
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Reviewed by: JASON D. DeWITT
Approval date: 03-24-10

DIST.	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5721		3	6

Tommy F. Lee 04-19-10
REGISTERED ELECTRICAL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
TOMMY F. LEE
No. 18534
Exp. 12-31-10
ELEC
STATE OF CALIFORNIA

04-19-2010
PLANS APPROVAL DATE

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General Notes:

A. *The Contractor shall verify true north prior to installation of PV system.*

B. *All AC/DC feeder conductors and equipment grounding conductors shall be sized to meet or exceed the following:*
   - *Total net voltage drop of the PV system from PV source to the existing Switchboard shall not exceed 2%.*
   - *Upon occurrence of any kind of fault at any point in the system, over current protective devices shall trip within ½ cycle.*

C. *Not all electrical/mechanical equipment and conduit systems are shown.*

D. *Location of all existing equipment and conduit systems as shown are approximate only. Contractor shall verify the exact location of all equipment and conduit systems in the field where required.*

E. *Sawcut existing paved surfaces at places where required for installation of underground conduit system and repair disturbed surfaces to match existing.*

F. *For photovoltaic system single line diagram, see sheet EE-2.*

G. *For graphic symbols and abbreviations, see sheet GP.*

H. *Provide conduit flashing as required for penetration through roofing.*

Notes:

(1) *Existing Main Switchboard is General Electric, Spectra Series, 480/277-volt, 3-phase, 4-wire, switchboard with 1600 ampere main circuit breaker. Install 75-ampere, 3-pole molded case circuit breaker, in the lowest available space of distribution section, for connecting PV system. New circuit breaker shall have interrupting capacity (AIC) of 35,000-ampere symmetrical at 480 volts.*
Adjacent to the new 3-pole circuit breaker, install screw on type nameplate with letter height of ¼'' to read ''PHOTOVOLTAIC SYSTEM''. Install screw on type sign on existing Main Switchboard with letter height of ½" to read "THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)".

(2) *3"C, MC, five conductors; three phase, one neutral and one equipment grounding conductor, to 3-pole circuit breaker for PV system at distribution section.*

(3) *Core drill through existing wall and use ''LB'' type conduit body for conduit penetration.*

THIS DRAWING ACCURATE FOR ELECTRICAL WORK ONLY

DESIGN	BY Tommy F.Lee	CHECKED Jesse S.Sandhu	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES ELECTRICAL-MECHANICAL-WATER AND WASTEWATER DESIGN	BRIDGE NO. 55M5721 POST MILE
DETAILS	BY Dali Zhou	CHECKED Tommy F.Lee			
QUANTITIES	BY Tommy F.Lee	CHECKED Jesse S.Sandhu		CU 12280 EA 0AA011	

TRANSPORTATION MANAGEMENT CENTER PHOTOVOLTAIC SYSTEM
SITE PLAN

SHEET **EE-1**

DOES SD Imperial Rev.1/07

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY)										SHEET	OF
7/2/09	7/15/09	9/14/09	4/19/10								

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DIST.	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5721		4	6

Tommy F. lee 04-19-10
REGISTERED ELECTRICAL ENGINEER — DATE

REGISTERED PROFESSIONAL ENGINEER
TOMMY F. LEE
No. 18534
Exp. 12-31-10
ELEC
STATE OF CALIFORNIA

04-19-2010
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Photovoltaic Module

PV modules shall be minimum 185 (STC) watt, polycrystalline silicon cell type module with interconnection connectors rated for 90°C. PV modules shall be UL 1703 listed with a maximum system voltage of 600 VDC. PV module manufacturer shall be one of those manufacturers listed as eligible California Solar Initiative (CSI) PV module manufacturer.

Photovoltaic Array Circuit Combiner Box

PV array circuit combiner box shall be factory assembled, 600 VDC rated combiner box with fused input circuits, two isolated DC bus bars, ground bus bar, all enclosed inside NEMA 3R lockable hinged cover enclosure. The combiner box shall be UL 1741 listed.

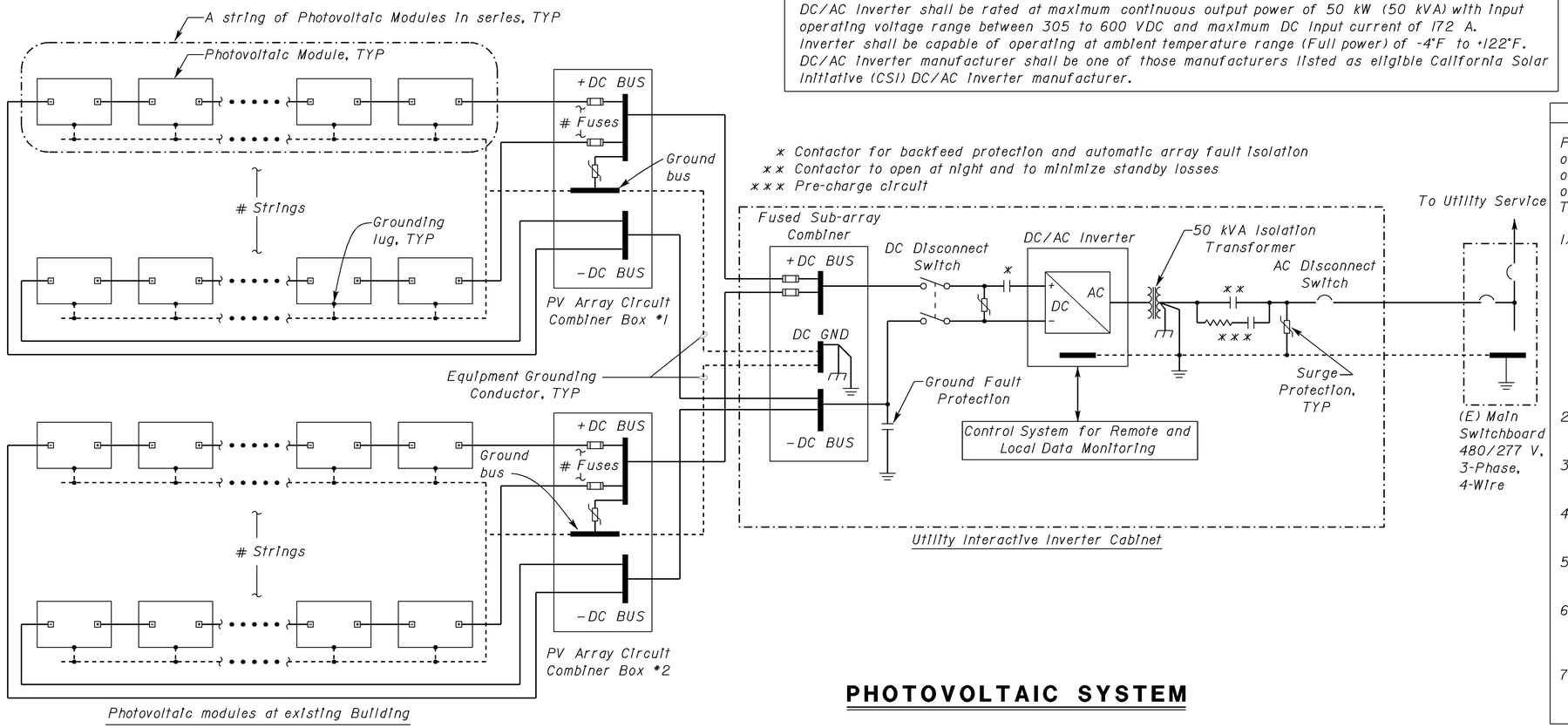
PV array circuit combiner box shall have the following components:
- DIN Rail mounted touch safe fuse holders with fuse.
- Positive DC bus bar, Negative DC bus bar and ground bus bar.
- DIN rail mounted Grid-Tie surge arrestor: .The surge arrestor shall be rated to withstand 40 kA (8/20 micro second) induced transient surge type and compatible to use with grounded PV arrays.

Utility Interactive Inverter Cabinet

Utility Interactive Inverter Cabinet shall be Indoor/outdoor type, factory assembled system consisting of the following equipment:
- NEMA 3R Enclosure.
- 50 kW/50 kVA, 480/277 V, 3-phase, 4-wire at a power factor of 0.99 or greater.
- Fused Sub-array Combiner with minimum of 4 array inputs for positive DC, negative DC, and DC ground bus bars. Positive array inputs fuse size to match loading.
- Built-In DC and AC disconnect switches size to match loading.
- Integrated 50 kVA, 480/277 V, 3-phase, 4-wire, output isolation type transformer.
- Anti-Islanding Protection
- Ground Fault Protection.
- Integrated AC and DC Surge Protections.
- Integrated AC and DC contactors.
- Pre-charge circuit.
- Human Machine Interface (HMI). AC/DC Inverter's HMI shall be equipped with LCD and keypad displaying main menu. HMI main menu shall display system monitoring, status and faults and operation. Monitoring menu shall display system status, metering, daily, weekly and monthly energy production. Status and faults menu shall display status messages, system output, and number of faults. Operation menu shall display control and settings.
- Local and remote monitoring systems capabilities.
- AC Ground bus bars.

Enclosure shall be NEMA 3R, 14-Gauge, and powder-coated standard factory finish steel enclosure. All screws, latches, hinge pins and similar hardware shall be stainless steel. HMI, AC and DC disconnect switches, and equipment rating labels shall be mounted on the exterior door. Exterior door shall have interlock switch and be lockable with a padlock. The cabinet shall have MEV13 rated filtered, top entry forced air cooling system with one fan, sloped roof, and shall be suitable for seismic zone 4 compliance.

DC/AC Inverter shall be rated at maximum continuous output power of 50 kW (50 kVA) with input operating voltage range between 305 to 600 VDC and maximum DC input current of 172 A. Inverter shall be capable of operating at ambient temperature range (Full power) of -4°F to +122°F. DC/AC Inverter manufacturer shall be one of those manufacturers listed as eligible California Solar Initiative (CSI) DC/AC Inverter manufacturer.



PHOTOVOLTAIC SYSTEM

General Notes:

A. Provide and Install all necessary warning labels/markings per Article 690 of California Electrical Code (CEC) and the State Fire Marshal's guideline for solar PV Installation.

B. Solar PV Installation shall comply with the latest guideline from California Department of Forestry & Fire Protection, Office of the State Fire Marshal and latest Program Handbook from California Solar Initiative (CSI) unless otherwise noted.

C. For graphic symbols and abbreviations, see GP.

Photovoltaic System Requirements

Photovoltaic System complete design and Installation details inclusive of all Engineering calculations shall be signed by an Professional Engineer of the respective field (both Electrical and Civil Engineering) in the State of California shall be submitted for approval by the Contractor. The PV design shall meet or exceed the following requirements:

1) Total designed capacity of photovoltaic system at existing Transportation Management Center Building shall be minimum 40.4 kW of the CEC-AC rating. Number of PV module per string shall be arranged in a manner to meet or exceed the following:
   - Maximum system voltage based on lowest excepted ambient temperature at the site (Voc maximum on coldest day) shall be no less than 1% of the Inverter's maximum Input DC voltage range.
   - Maximum system power voltage based on average high ambient temperature at the site (Vmp on warmest day) shall be 20% greater than the Inverter's minimum Input DC voltage range.

2) Photovoltaic system module row spacing shall be designed to prevent shading from adjacent module.

3) All wiring except at module Interconnection shall be concealed inside conduit system.

4) Photovoltaic system modules structural support system shall be designed to withstand wind forces of 85-mile per hour.

5) Photovoltaic system wiring and protective devices shall meet or exceed the requirements of all applicable codes.

6) PV Array Circuit Combiner Boxes locations as shown are arbitrary only. Contractor shall Install the combiner boxes at locations that best suit the photovoltaic system strings layout.

7) PV modules Installed on different slopes and/or orientation shall not be part of the same string except PV modules Installed on flat roof.

DESIGN	BY Tommy F.Lee	CHECKED Jesse S.Sandhu	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF ENGINEERING SERVICES ELECTRICAL-MECHANICAL-WATER AND WASTEWATER DESIGN	BRIDGE NO. 55M5721 POST MILE	TRANSPORTATION MANAGEMENT CENTER PHOTOVOLTAIC SYSTEM SINGLE LINE DIAGRAM GRID-TIED PHOTOVOLTAIC SYSTEM	SHEET EE-2
DETAILS	BY Dall Zhou	CHECKED Tommy F.Lee					
QUANTITIES	BY Tommy F.Lee	CHECKED Jesse S.Sandhu		CU 12280 EA 0AA011			

DOES SD Imperial Rev. 1/07

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

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DIST.	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
12	Ora	5721		5	6

Tommy F. Lee 04-19-10
REGISTERED ELECTRICAL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
TOMMY F. LEE
No. 18534
Exp. 12-31-10
ELEC
STATE OF CALIFORNIA

04-19-2010
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Reviewed by: JASON D. DeWITT
Approval date: 03-24-10

Note:

(1) *3"C, MC, five conductors; three phase, one neutral and one equipment grounding conductor, to 3-pole circuit breaker for PV system at distribution section. For continuation, see sheet EE-1.*

(2) *2" C, MC, with DC conductors and equipment grounding conductor from PV Array Circuit Combiner Box to Utility-Interactive Inverter Cabinet located inside Penthouse.*

General notes:

A. *Provide and install approved conduit support on top of the roof to support conduit system and junction boxes. Conduit support shall be one-piece and non metallic type. For conduit support details, see detail 1 on sheet EE-4.*

B. *All exposed conduits shall be galvanized rigid steel, with minimum size ¾".*

C. *Size conduits to allow for 50% future capacity.*

D. *No DC wiring except at the module connector shall be exposed.*

E. *Use type CGB connectors at conduit terminations to exposed conductors.*

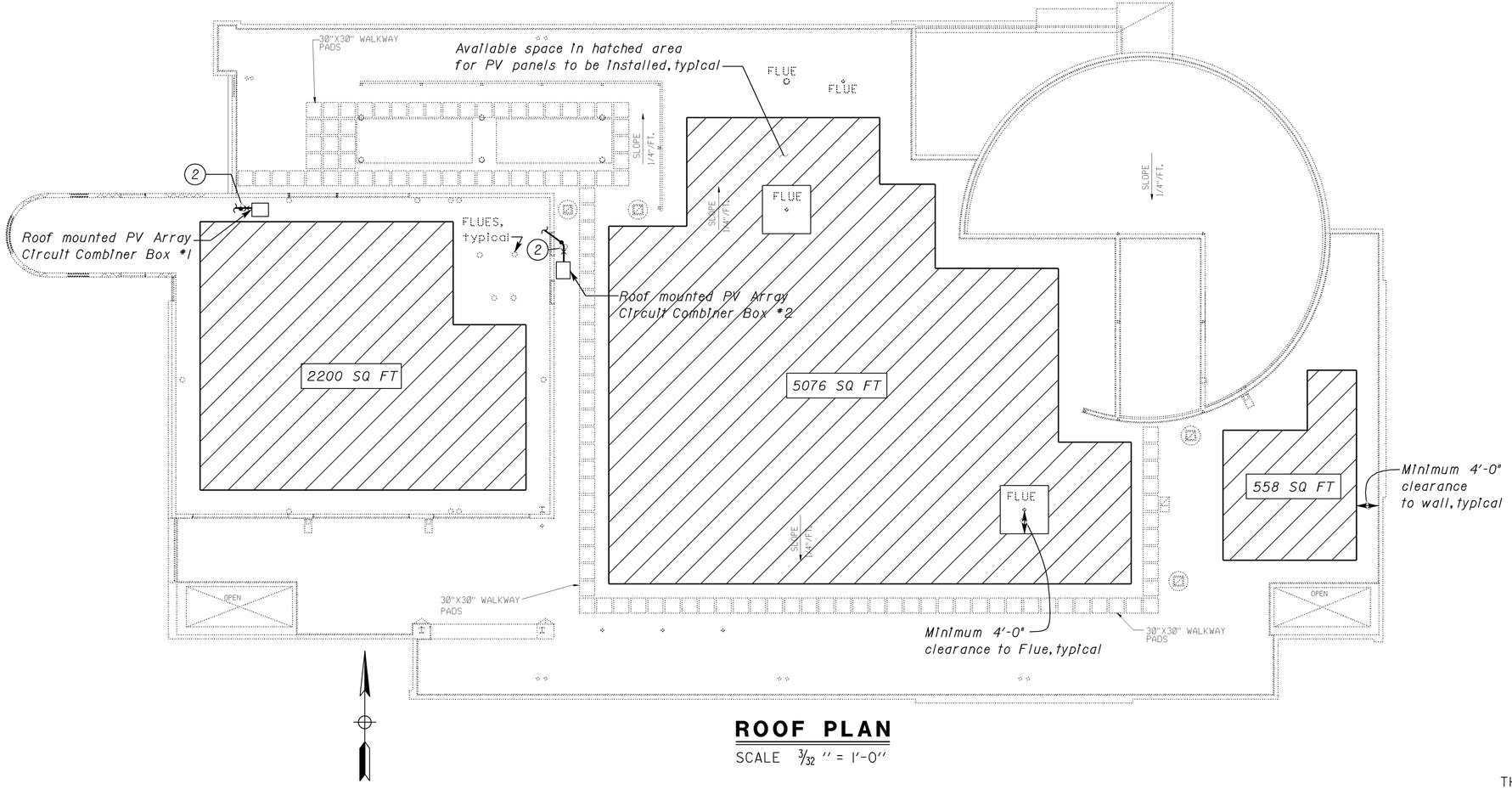
F. *DC conduit/conductors between PV modules and PV Array Circuit Combiner Boxes are not shown.*

G. *Existing Transportation Management Center building roof height is approximately 36'-0" and Penthouse roof height is approximately 54'-0".*

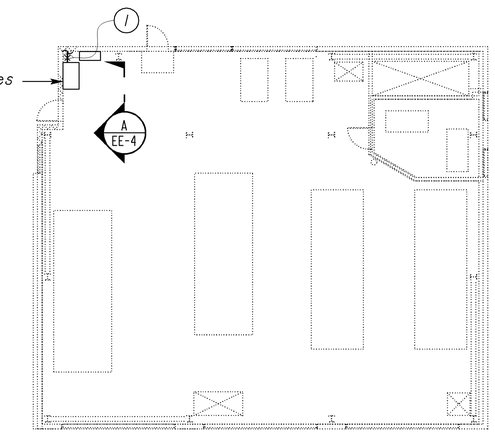
H. *For graphic symbols and abbreviations, see GP.*

I. *For PV rack mounting, see roof attachment detail 2 on sheet EE-4.*

J. *Provide and install all necessary warning labels/markings per Article 690 of California Electrical Code (CEC) and the State Fire Marshal's guideline for solar PV installation.*



ROOF PLAN
SCALE 3/32 '' = 1'-0''



PENTHOUSE PLAN
SCALE 3/32 '' = 1'-0''

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DETAILS	BY Dall Zhou	CHECKED Tommy F.Lee				SHEET EE-3
QUANTITIES	BY Tommy F.Lee	CHECKED Jesse S.Sandhu		CU 12280 EA 0AA011		

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ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

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Tommy F. lee 04-19-10
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REGISTERED PROFESSIONAL ENGINEER
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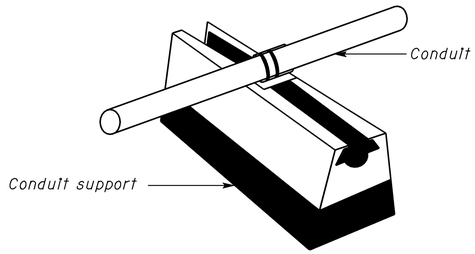
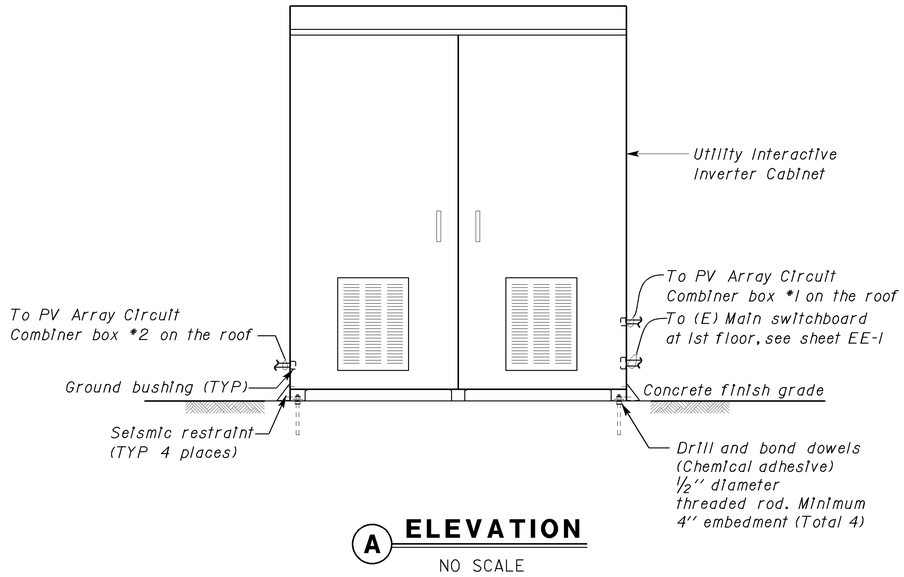


ROOF MOUNTED CONDUIT SUPPORT
1
NO SCALE

Note:
This conduit support can also be used for supporting combiner boxes.



A ELEVATION
NO SCALE

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DETAILS	BY Dali Zhou	CHECKED Tommy F.Lee			
QUANTITIES	BY Tommy F.Lee	CHECKED Jesse S.Sandhu			

TRANSPORTATION MANAGEMENT CENTER PHOTOVOLTAIC SYSTEM
ELEVATION AND DETAILS

SHEET **EE-4**

DOES SD Imperial Rev.1/07

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 12280
EA 0AA011

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REVISION DATES (PRELIMINARY STAGE ONLY): 7/1/09, 7/16/09, 9/14/09, 10/15/09, 4/19/10

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