PULLMAN & COMLEY 100 YEARS

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August 30, 2019

VIA U.S. MAIL AND ELECTRONIC MAIL
Melanie Bachman
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Petition 1313 – Petition of DWW Solar II, LLC for a Declaratory Ruling that no Certificate of Environmental Compatibility and Public Need is Required for a 26.4 Megawatt AC Solar Photovoltaic Electric Generating Facility in Simsbury, Connecticut

Dear Ms. Bachman:

I am writing on behalf of my client, DWW Solar II, LLC ("DWW"), in connection with the above-referenced Petition. As you are aware, on March 29, 2019, the Council approved DWW's D&M Plan. When it did so, it provided four conditions for the Project to meet. This letter is intended to provide the Council with the information requested in these conditions.

The first of the four conditions stated that DWW should provide the Council with "the total number of solar panels by output and associated solar panel specification sheets, slected post and racking equipment design/specification sheets, and inverter specification sheets." In response to this condition, DWW states that the Project will use 38,116 395 watt solar panels and 86,086 400 watt panels. Specification sheets for the panels, post and racking equipment and the inverters are included with this letter.

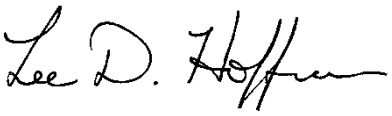
The Council then requested that the Project provide a copy of the Spill Prevention, Control and Countermeasures Plan for the Project, and a copy of that Plan is also included in this letter. In reviewing that Plan, the Council will note that Appendix 2 and Appendix 4 of the Plan indicate the sole location for the Project's temporary fuel storage, which addresses the third condition of the Council's approval.

The Council's fourth and final condition for approval was for the project to provide the Council with "information regarding access to the stormwater basins for post-construction maintenance." In response to that condition, the Project proposes to retain 15 of the 18 sediment trap/basins as permanent features throughout the lifespan of the Project to assist with water quality treatment.

Four of the 15 permanent basins are proposed under the array of solar panels adjacent to the interior side of the perimeter road and the remaining 11 are proposed immediately adjacent to the perimeter access road outside the limits of the array. Due to the 6-foot clear row spacing between solar panels upon the completion of construction, sediment will need to be removed by hand or small equipment capable of navigating the area without damaging panels for the four interior basins. For the 11 permanent basins which are located outside of the perimeter fence, it is proposed to install gates along the perimeter road which will allow for vehicles to access the basins for maintenance and cleaning.

If you have any questions concerning this submittal, please contact the undersigned at your convenience. I certify that copies of this submittal have been submitted to the Service List for this Petition.

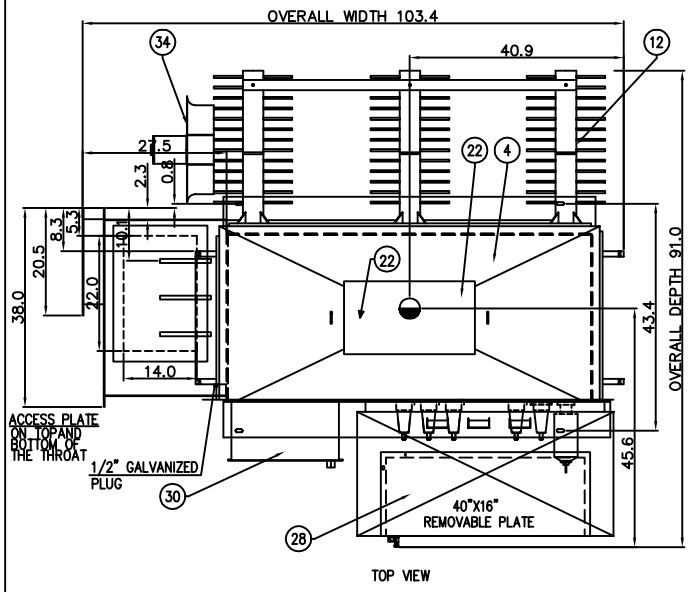
Sincerely,



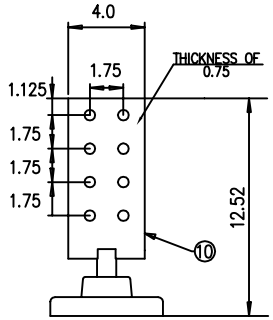
Lee D. Hoffman

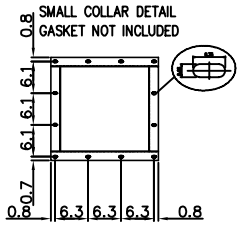
Enclosures

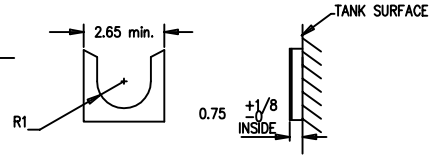
FUSES	CAT No.	MANUFACTURER
EXP	4038361C04	COOPER
CLF	CBUC15150D100	COOPER



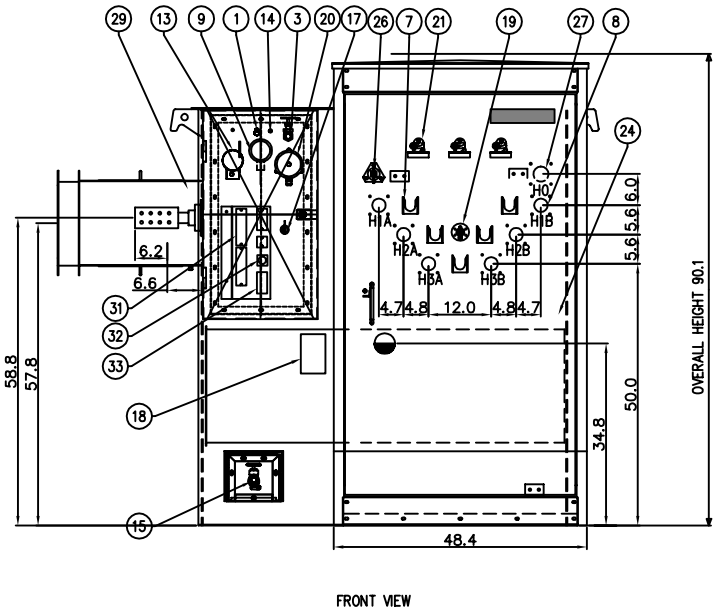
TOP VIEW



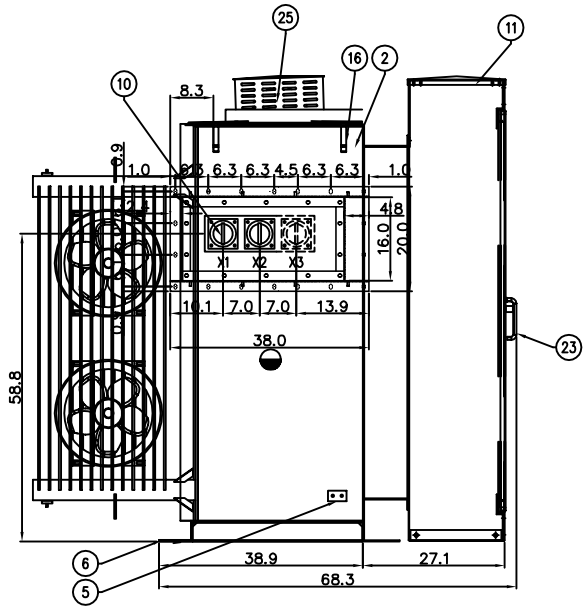




PARKING STAND DETAIL



FRONT VIEW



SIDE VIEW

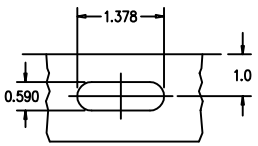
1	PRESSURE RELIEF VALVE, QUALITROL 202-032-01 50 SCFM
2	TANK (MILD STEEL)
3	FILTER PRESS VALVE
4	TANK COVER
5	GROUND PADS
6	BASE (MILD STEEL)
7	PARKING STAND
8	HV INTEGRATED BUSHING 25kV CLASS, 125kV BIL, 600A
9	LIQUID LEVEL GAUGE WITH ALARM CONTACTS (SET AT LOW LEVEL)
10	LV BUSHING 8 HOLE BLADE SUPPORTED 45KVBIL 4515A
11	CABINET (MILD STEEL)
12	RADIATORS (MILD STEEL)
13	PRESSURE VACUUM GAUGE WITH ALARM CONTACTS SET AT -7 PSIG TO 7.5 PSIG
14	SHRADDER VALVE
15	1" DRAIN VALVE WITH 3/8" SAMPLER HJ DV1000-001-FB
16	LIFTING LUGS
17	(1) 2 POSITION RADIAL SWITCH 300 AMP
18	ANODIZED ALUMINUM NAMEPLATE
19	TAP CHANGER
20	THERMOMETER WITH ALARM CONTACTS (SET AT 85 C AND 105 C)
21	BAYONET FUSE HOLDER WITH DRIP CUP
22	HAND HOLE 14"X25"
23	DOOR HANDLE WITH PROVISION FOR PADLOCK
24	HV DOOR W/PENTA HEAD BOLT
25	MECHANICAL PRESSURE RELIEF DEVICE SET AT 10PSI (QUALITROL 208-60E)
26	GROUND SHIELD BUSHING
27	HO PORCELAIN BUSHING (3 HOLE BLADE)
28	REMOVABLE BASE PLATE
29	LV THROAT
30	ACCESORIES BOX
31	TERMINAL BLOCK
32	FAN CONTROL SWITCH (MAN-AUTO)
33	FAN CONTACTOR
34	(2) FANS 120 V 1PH, 1/2 H.P.

Note: Overall Dimensions are nominal with tolerance of +/- 0.5 all other dimensions have a tolerance of +/- 0.1

http://www.prolecge.com

TRANSFORMER WEIGHTS

CORE & COIL	6 572 LBS
TANK AND FITTINGS	4 064 LBS
519 GALLONS OF OIL	3 894 LBS
TOTAL WEIGHT	14 530 LBS



ANCHORING DETAIL

CENTER OF GRAVITY

COLOR: SAND WHITE DIC 583

DESIGNED TO OPERATE BELOW 3300.0 FEET ABOVE SEA LEVEL

Rev.3: Drawing was updated 03/15/2019 FISG

Rev.2: LV bushing BIL was modified 03/13/2019 FISG

Rev.1: HV bushing was modified 03/13/2019 FISG

Draftman	AUDI
REV: FISG	
App: FISG	
Scale:	1:32
Dimensions in	inch
Date:	03/08/2019
Rev:	3

Customer: TMEIC CORPORATION

REQ. NO. :

Title: OUTLINE DRAWING
2650 kVA, 3 PHASE, 60 HERTZ, 23000GrdY/13279.5-630Y VOLT
65°C, WYE - WYE COOLING ONAN

PROLEC GE

Drawing No. RHZ348B801

PROLEC GE

3 PHASE PADMOUNTED TRANSFORMER CLASS ONAN/ONAF

65°C RISE 60HERTZ MFG DATE SER

kVA 2650/3360

HV 23000GrdY/13279.5

LV 630Y

PERCENT IMPEDANCE AT RATED VOLTS AT 2650 KVA %

PERCENT IMPEDANCE AT RATED VOLTS AT 3360 KVA %

ORDER NUM RHZ348	

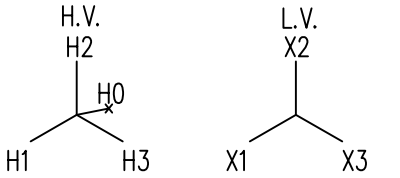
BIL HV 125 BIL LV 45 MAT HV Al MAT LV Al

STEP–UP OPERATION

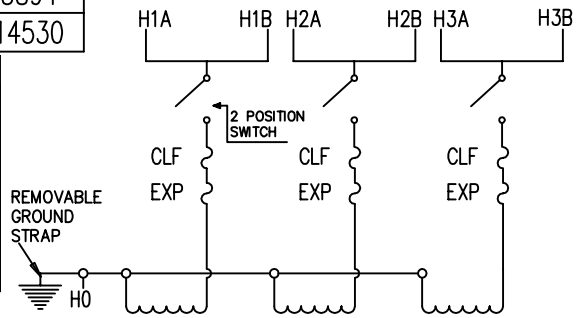
GALLONS OF OIL TYPE II	519

MASS	kg	pounds
CORE & COIL UNTANKING (HEAVIEST PIECE)	2982	6572
TANK	1844	4064
LIQUID OIL TYPE II	1767	3894
TOTAL WT	6593	14530

TAP CHANGER			
TAP POS	VOLTAGE	ONAN/65°C AMPS	ONAF/65°C AMPS
1/A	24150	63.4	80.3
2/B	23575	64.9	82.3
3/C	23000	66.5	84.3
4/D	22425	68.2	86.5
5/E	21850	70.0	88.8



PHASOR DIAGRAM



CONNECTION DIAGRAM

UL LISTED LIQUID FILLED DISTRIBUTION TRANSFORMER E79

MAXIMUM OPERATING PRESSURES OF LIQUID PRESERVATION SYSTEM: 48kPa (7 lbf/in2) POSITIVE AND 34 kPa (5 lbf/in2) NEGATIVE
TANK DESIGNED FOR 48kPa (7 lbf/in2) VACUUM FILLING
LIQUID LEVEL BELOW TOP SURFACE OF THE HIGHEST POINT OF THE HIGHEST HANDHOLE FLANGE AT 25°C IS 200 mm (7.9 in)
LIQUID LEVEL CHANGES 10 mm (0.4 in) PER 10°C CHANGE IN LIQUID TEMPERATURE
PERCENT IMPEDANCE STATED ABOVE AT RATED VOLTS AT 2650 KVA
CAUTION BEFORE OPERATING READ INSTRUCTION GEI–79025M
CONTAINS NO DETECTABLE LEVEL OF PCB (LESS THAN 1 PPM) AT THE TIME OF MANUFACTURE

MADE IN MEXICO PROLEC GE INTERNACIONAL S. DE R.L. DE C.V. www.prolecge.com

IMPEDANCE MEETS ANSI STANDARDS
WITH TOLERANCE OF +/–7.5%
ACTUAL TESTED IMPEDANCE WILL BE
STAMPED ON NAME PLATE

REV.		
1	HV BIL was modified 03/13/19	FISG
2	LV BIL was modified 03/13/19	FISG

Draftman : AUDI

Review: FISG

App: FISG

Sheet 1 of 1

Rev. 2

Customer/Project Name : TMEIC CORPORATION

Title : NAMEPLATE

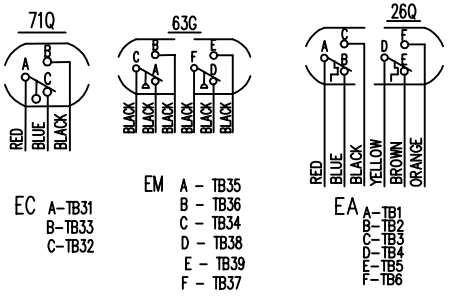
Description : 2650/3360 kVA, 3 PHASE, 60 HERTZ, 23000GrdY/13279.5–630Y VOLT
65°C WYE – WYE, COOLING ONAN/ONAF

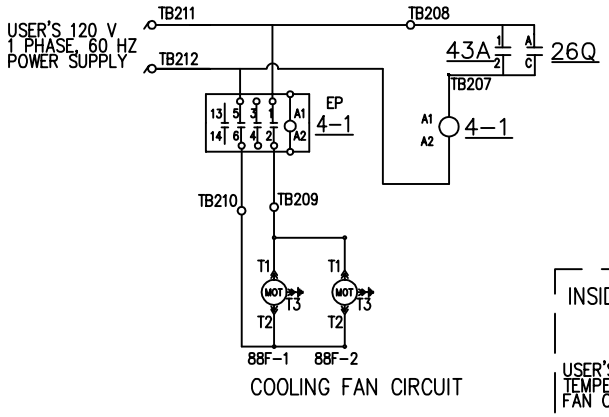
Cat. Number :

PROLEC GE

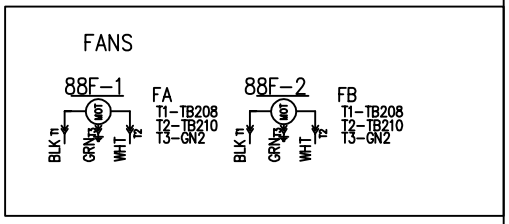
DRAWING NUMBER: RHZ348C0A

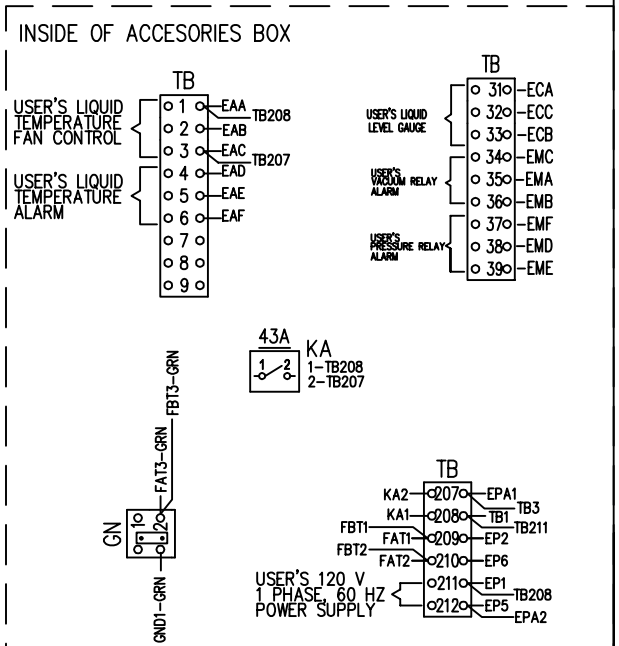
LEGEND	
26Q	LIQUID TEMPERATURE GAUGE WITH ALARM CONTACTS CONTACT # 1 SET AT 85°C, CONTACT ALARM #2 SET AT 105°C
88F-1, 88F-2	FAN, SINGLE PHASE, 120 V, 60 HZ. 1/2 HP , FLA 6.4 A PER FAN
43A	FAN CONTROL SWITCH (MAN-AUTO)
71Q	LIQUID LEVEL GAUGE WITH ALARM CONTACTS
63G	PRESSURE VACUUM SWITCH WITH CONTACTS SET AT -7 +7.5 PSIG
4-1	CONTACTOR





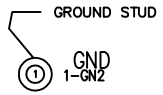
COOLING FAN CIRCUIT





NOTE:
IF USE:
GRN = GREEN GROUNDING CONDUCTOR
WHT = WHITE NEUTRAL CONDUCTOR

THIS DRAWING SHOWS ELECTRICAL CONNECTIONS ONLY. THE EXACT LOCATION OF DEVICES MUST NOT BE READ FROM IT.



Rev.1: Drawing was updated 03/15/2019 FISG

Draftman: FISG	Customer: TMEIC CORPORATION		
Review: FISG	Title: WIRING DIAGRAM		
Checked by: FISG Date: 03/11/2019		DWG NO. RHZ348WSH	REV 1
	SCALE NO SCALE		SHEET 2

PROLEC GE

TMEIC

4GAG1488

SOLAR WARE
Grid-Support Utility Interactive Photovoltaic Inverter Instruction Manual

(UL1741, IEEE1547, UL1741 Supplement SA)

Model: PVH-L3360GR-GS
PVH-L3360GR-EGS
PVH-L3360GR-E7S

NOTICE

IMPORTANT SAFETY INSTRUCTIONS / SAVE THESE INSTRUCTIONS

- Make sure that this instruction manual is delivered to the end user of this product.
- Read this manual before installing or operating this product. Keep it in a safe place for future reference.

Feb 2019

Toshiba Mitsubishi-Electric Industrial Systems Corporation

Rev. B

1. About This Manual

Thank you for purchasing the grid-support utility-interactive photovoltaic inverter (hereafter the inverter) by Toshiba Mitsubishi-Electric Industrial System Corporation (TMEIC). This inverter is an apparatus which efficiently converts the DC energy generated by photovoltaic modules into AC energy.

This instruction manual describes basic functions of the inverter and gives guidance for operation and maintenance. For installation of the inverter, see “Installation Manual.” For detailed internal circuit and settings, see “Schematic Diagram.” If any of them are missing, please contact your local TMEIC sales or service representative.

Before using the inverter, read this instruction manual carefully in order to operate it correctly and safely. Improper use of the inverter can result in death or serious injury. Use this equipment only after completely understanding all safety precautions and fundamental knowledge regarding this equipment. Save this instruction manual in a safe place for reference. This manual must be accessible to service and maintenance personnel at any time. Do not store this manual inside the inverter.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for the inverter that shall be followed during installation of the inverter.

2. Special Precautions

This equipment is designed to be used in specific countries. The use of this equipment in a different location may cause failure, abnormal operation, smoke emission, or combustion due to differences in voltage and environmental conditions.

The warranty does not cover the damages to customer’s properties due to the failure of this equipment.

> This instruction manual has been prepared for a qualified electrical engineer responsible for the installation, operation and management of this equipment. When performing installation and wiring work, read this manual carefully and follow the instruction given by the electrical engineer responsible for the installation work.

3. List of abbreviations and symbols

Name	Descriptions
ACB	Air Circuit Breaker
AVR	Automatic Voltage Regulator
CB	AC side circuit breaker
DS	DC side load break switch
GFDI	Ground Fault Detector/Interrupter
HCT	Hall-effect Current Transducer (current sensor)
IGBT	Insulated Gate Bipolar Transistor; semiconductor switch used in the main power train
INV	Inverter
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCCB	Molded Case Circuit Breaker
MPPT	Maximum Power Point Tracking
OC	Over Current
OFR	Over Frequency Relays; AC over frequency protection function
OV	Over Voltage
OVR	Over Voltage Relays; AC overvoltage protection function
PCB	Printed Circuit Board
PDR	Phase Jump Detection Relay
PWB	Printed Wiring Board = PCB
PV	Photovoltaic
SCADA	Supervisory Control And Data Acquisition
SPD	Surge Protecting Device
TMEIC	Toshiba Mitsubishi-Electric Industrial systems Corporation
UFR	Under Frequency Relay; AC under frequency protection function
UVR	Under Voltage Relay; AC under voltage protection function
UPS	Uninterruptible Power Supply

4. Safety Precautions

This instruction manual as well as markings and labels in the inverter contain very important instructions to prevent harm or injury to workers and operators when installing, operating or servicing the inverter.
Read this document after fully comprehending the meaning of the following marking and symbols. Observe the instructions given in the document.

4.1. Explanation of markings and symbols

■ Explanation of markings

Marking	Meaning of marking
⚠ DANGER	Indicates that improper use or handling will result in death or serious injury.
⚠ WARNING	Indicates that improper use or handling may lead to death or serious injury.
⚠ CAUTION	Indicates that improper use or handling may lead to injury to persons(*1) or may cause damage to property(*2).

(*1): “injury to persons” refer to injuries, burns, electric shocks and other injuries that will not require hospitalization or long periods of medical treatment.

(*2): “damage to property” refers to wide-ranging damage to assets and materials.

■ Meaning of symbols

Symbol	Meaning of symbol
 Forbidden	Indicates that the operation is prohibited What is prohibited will be described in or near the symbol in either text or picture form.
 Mandatory	Indicates mandatory action What is mandatory will be described in or near the symbol in either text or picture form.

4.2. Limitation of use, disclaimer and disposal

■ Limitation of use

This product is intended to be used as a grid-connected inverter for photovoltaic generation. Any other use is prohibited.

Always consult TMEIC in case of system specification upgrade or modification for any changes related to equipment or other conditions may result in system adjustments.

■ Disclaimer

TMEIC assumes no responsibility in the following cases.

- Earthquake, fire, and other natural disasters, damage produced by the acts of a third party, accidents and damage caused by deliberate or unintentional misuse.
- Damage or losses accompanied by the operation or non-operation of this product (Loss of profit, business halt, etc).
- Damage caused by using this equipment in a different way as the way described in the instruction manual.
- Damage caused by incorrect operations of the inverter used in combination with equipment which is out of TMEIC's scope.

■ Disposal

When disposing this equipment or any of its components, consult a specialist in industrial waste disposal. Improper disposal may result in explosion or produce noxious gases, resulting in injury.

Additionally, local regulations regarding disposal of industrial equipment should be observed.
TMEIC assumes no responsibility for any damage due to improper disposal or any other improper conduct.

4.3. Safety Precautions during operation and use

⚠ DANGER

- **Do not remove the protective covers inside the cabinets.**
  There is a risk of electric shock.
- **Do not touch the internal parts of the equipment or attempt to repair/amend the equipment .**
  It is extremely dangerous and may cause electric shock.
- **Do not insert fingers or any metallic element through the protective covers.**
  There is a risk of injury and electric shock.

⚠ WARNING

- **When a MAJOR FAULT occurs, do not attempt to restart the equipment yourself**
  There is a potential risk of fire. Please contact your local TMEIC sales or service representative.
- **In case a fault occurs, check and record fault conditions, panel display, fault contents, and report to your local TMEIC sales or service representative.**
  Do not perform recovery actions yourself. There is a risk of electric shock and/or injury.
- **Do not run the equipment with the enclosure doors open.**
  There is a risk of electric shock or a risk of fire caused by the intrusion of foreign objects.
- **Stop the equipment immediately when a malfunction, abnormal noise and/or smell is observed.**
  Please contact your local TMEIC sales or service representative.
- **Do not insert pointed objects or fingers into the air intake/exhaust**
  There is a potential risk of electric shock or injury. Moreover, there is a risk of injury from the rotating fan.
- **Before connecting to the photovoltaic source circuit and the grid, confirm safety conditions and operate the inverter carefully by following the instructions given in this manual.**
  Improper operation may cause electric shock and accidents.
- **Do not place objects over the equipment**
  Obstructing the air exhaust may cause an abnormal temperature rise in the interior of the inverter. Additionally, objects may fall into the interior of the inverter and it has a potential risk of fire.
- **In case the ground fault alarm is activated, stop the inverter and check for leakage current in the DC side circuit and wiring**
  There is a potential risk of electric shock.

⚠ WARNING

- **The use of fire near the inverter is prohibited.**
- **Do not place bottles and other recipients containing liquid over the inverter**
  Spilled liquids may cause electric shock. There is also a risk of fire in the interior of the inverter.
- **Do not sit on, climb on, step on or lean on the inverter**
  There is a risk of injury due to a possible inverter tilt. Moreover, deformation in covers may pose an obstacle to the rotation of the fan.
- **Do not connect any energy storage device on the DC side**
  This inverter has been designed to operate only with photovoltaic panels.
  Batteries and other energy storage device have different electrical characteristics and will affect the protection scheme of the inverter.


Forbidden

⚠ WARNING

- **Models PVH-L3360GR-EGS and PVH-L3360GR-E7S is not provided with a GFDI device.**
  PVH-L3360GR-EGS and PVH-L3360GR-E7S must be used with an external GFDI device as required by the article 690 of the National Electrical Code for the installation location.

4.4. Safety precautions when conducting preventive maintenance and inspection

⚠ WARNING

- **Repairs and replacement of parts should be done by TMEIC or by TMEIC recognized qualified personnel.**
- **Do not allow maintenance, inspections and repair to be performed by unqualified personnel**
  There is a potential risk of electric shock, injury, burn, smoke and/or combustion.
- **Do not open the protective covers**
  There is a potential risk of electric shock and/or burn.

【Safety precautions for qualified personnel】

⚠ DANGER

- **Do not touch capacitor terminals or any other live parts.**
  There is a risk of electric shock at charged capacitors and conductors connected to those capacitors.
- **Even after completing the entire stop operation sequence, the DC terminals (both P and N) will still be energized by the photovoltaic array**
  Moreover, the DC circuit capacitor will be energized until discharge is completed (approx. 5 min)
  Do not touch. There is a risk of electric shock

⚠ WARNING

- **Read this instruction manual carefully when performing maintenance, inspection or repairs**
  Any misoperation may cause electric shock and/or fire.
- **Take off all metallic elements such as watches, etc. before beginning to work**
  There is a risk of electric shock when working while wearing metal elements.
- **Turn off circuit breakers and disconnect power before work**
  There is a risk of electric shock and/or injury.
- **Use only insulated tools (spanner, etc.)**
  There is a risk of electric shock when using non-insulated tools
- **Do not touch parts or elements subjected to high temperature (i.e., heat sinks, main bus bar).**
  Even after turning off the power, there is a risk of high temperature at certain elements.
- **Use only replacement parts with the same specifications and type**
  There is a potential risk of fire.
- **Do not touch the equipment with wet hands**
  There is a risk of electric shock.
- **Maintenance, inspection or repairs by a non-designated qualified person is prohibited.**
  There is a risk of electric shock, injury and fire.


Forbidden

4.5. Other safety precautions

⚠ WARNING

- **This equipment is intended to be used in the designated location. For installation in different locations or countries, contact your local TMEIC sales or service representative**
  The use of this equipment in a different location may cause failure, abnormal operation, smoke emission, or combustion due to differences in voltage and environmental conditions.

5. Index

6. Description of the inverter

This inverter converts DC power from PV modules to AC power to the power grid. Fig.6.1 shows a typical PV system configuration with our inverter.

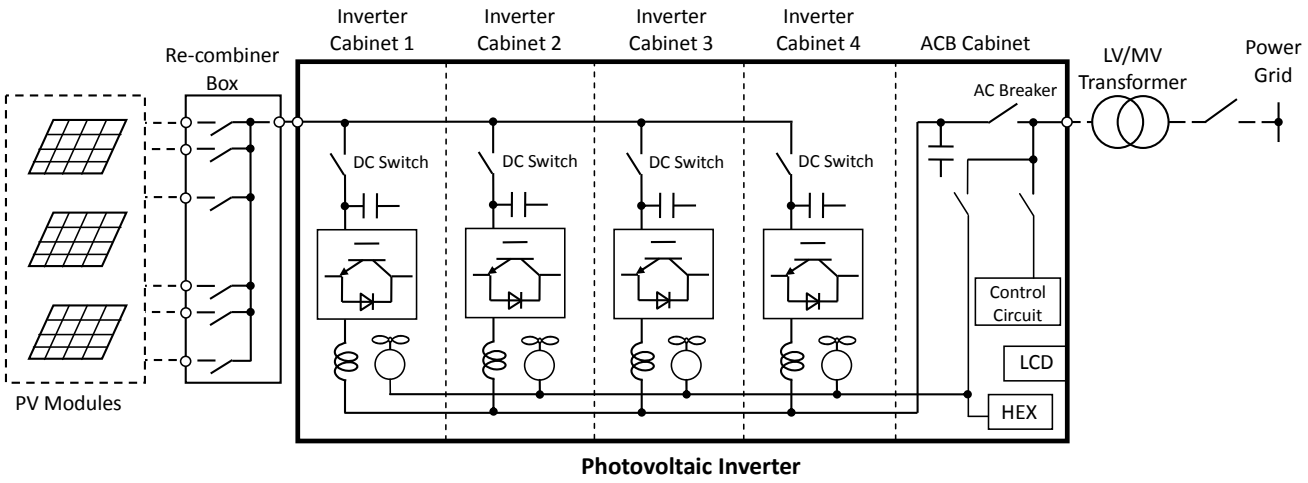
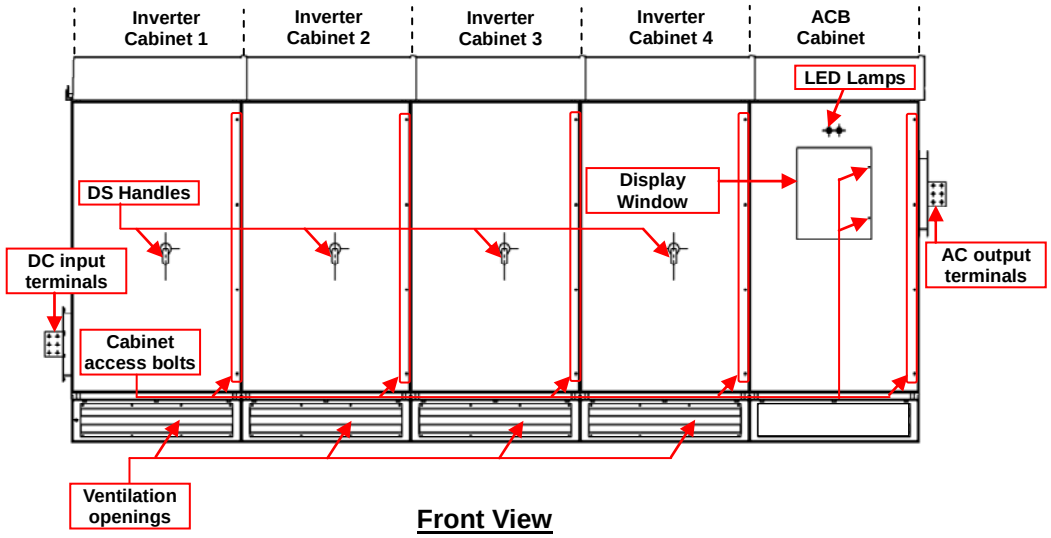


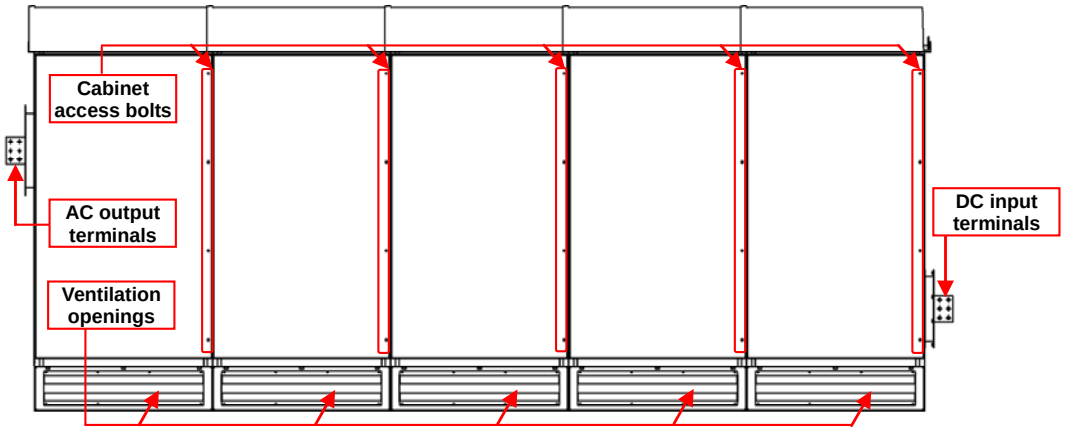
Fig. 6.1 System configuration

Cabinet	Contents
Inverter Cabinet 1-4	DC input terminals, DC load break switch (DS), DC fuses, DC surge protective device, Inverter circuit (INV), AC fuses, Harmonic filter reactor and Cooling fan
ACB Cabinet	AC output terminals, AC circuit breaker (CB), AC filter capacitor, AC surge protective device, Network connection terminal, Signal input/output terminals. Control circuit boards, Auxiliary circuit breakers (8AB, 8C1 etc.) and LCD touch panel (LCD), Heat exchanger(HEX5)

6.1. Outlines and key parts required for operation



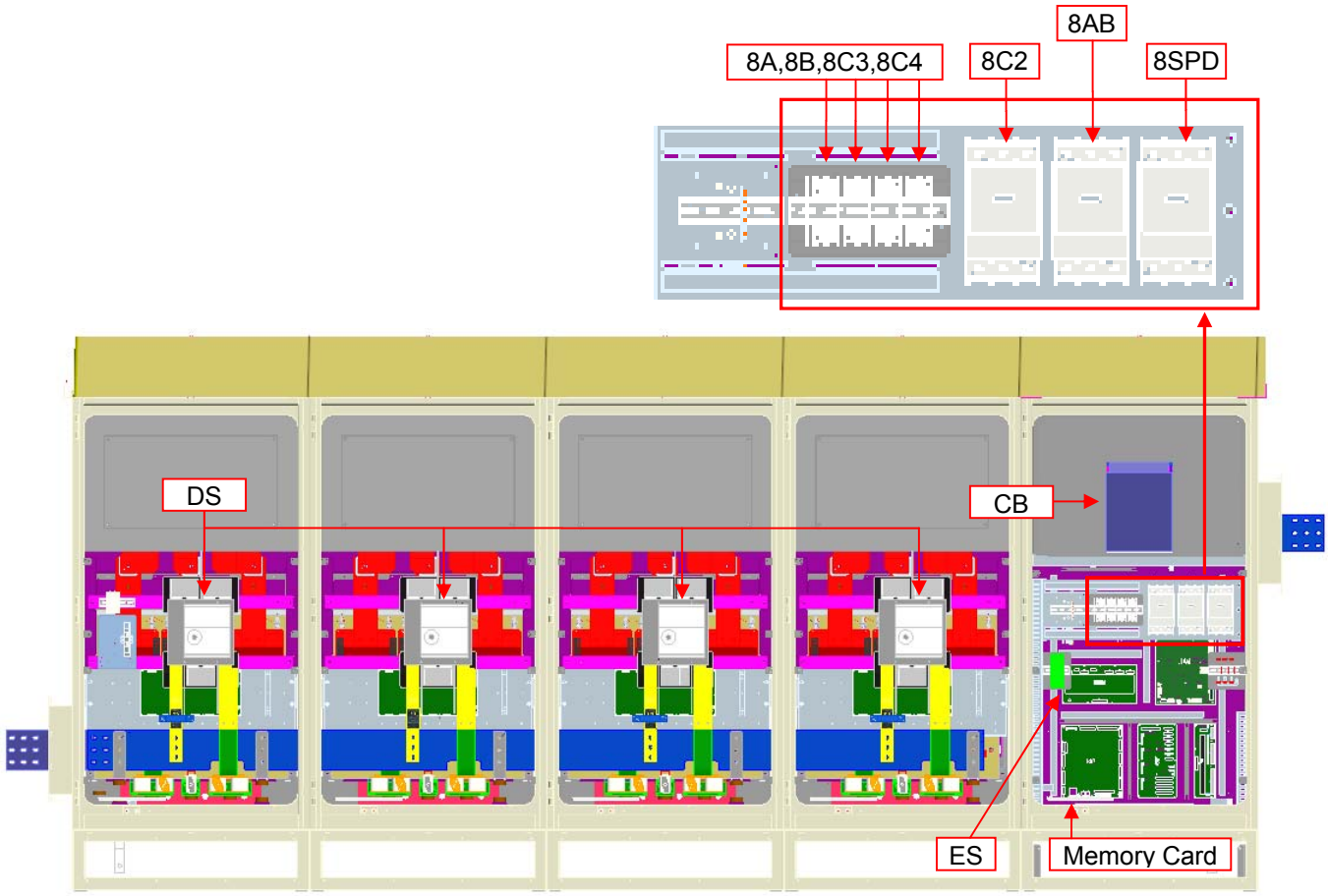
Front View



Rear View

Fig. 6.2 Inverter outline

Name	Location	Description
LED Lamps	ACB Cabinet Door	Indicates inverter operating conditions (RUN / FAULT)
Display Window	ACB Cabinet Door	LCD touch panel and Shut down manual button of CB exist inside.
Cabinet access bolts	Each Cabinet Door	Attachment screws to open/close the cabinet doors.
DS Handles	Each Inverter Cabinet Door	Handle of DC side load break switch to disconnect it from DC input energy source.
Ventilation Openings	Each Cabinet	Air intakes and discharge openings (Please do not block up these openings)



FRONT VIEW

Name	Location	Description
DS	Each Inverter Cabinet	DC side load break switch
CB	ACB Cabinet front side	AC side circuit breaker
8AB,	ACB Cabinet front side	Circuit breaker for the power supply of control circuit and cooling fan
8A,8B	ACB Cabinet front side	Circuit breaker for the power supply of control circuit and cooling fan
8SPD	ACB Cabinet front side	AC SPD line circuit breaker
ES	ACB Cabinet front side	Ethernet switch
Memory Card	On Control PWB (#UP1)	Detailed major fault data are recorded.
8C2, 8C4 (*1)	ACB Cabinet rear side	Circuit breaker of 120V power supply for external circuit
8C3	ACB Cabinet rear side	Circuit breaker for auxiliary circuits of a DC re-combiner box

*1 : Option

Fig 6.3 Front side of internal Components

REAR VIEW

Name	Location	Description
8C1	ACB Cabinet rear side	Circuit breaker of 630V power supply for external circuit (Tracker, etc.)

Fig 6.4 Back side of internal Components

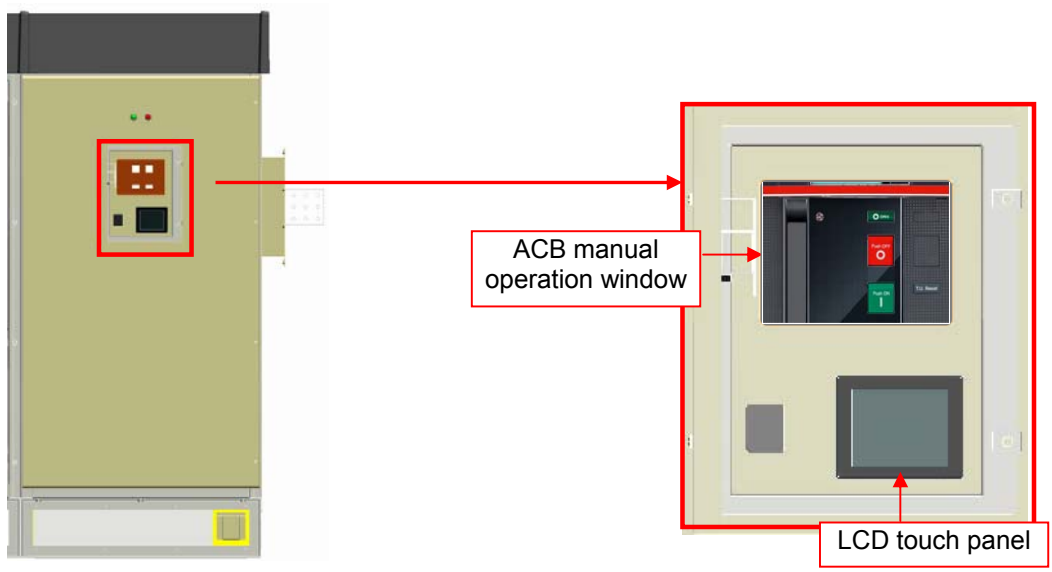


Fig. 6.5 Internal area of auxiliary door on the ACB cabinet

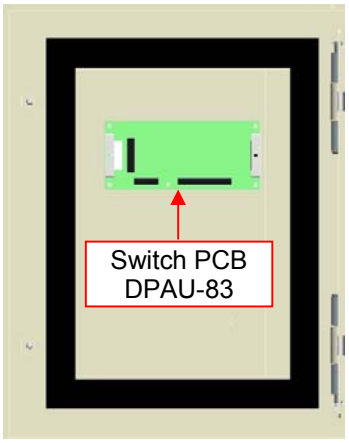


Fig. 6.6 Back side of auxiliary door on the ACB cabinet

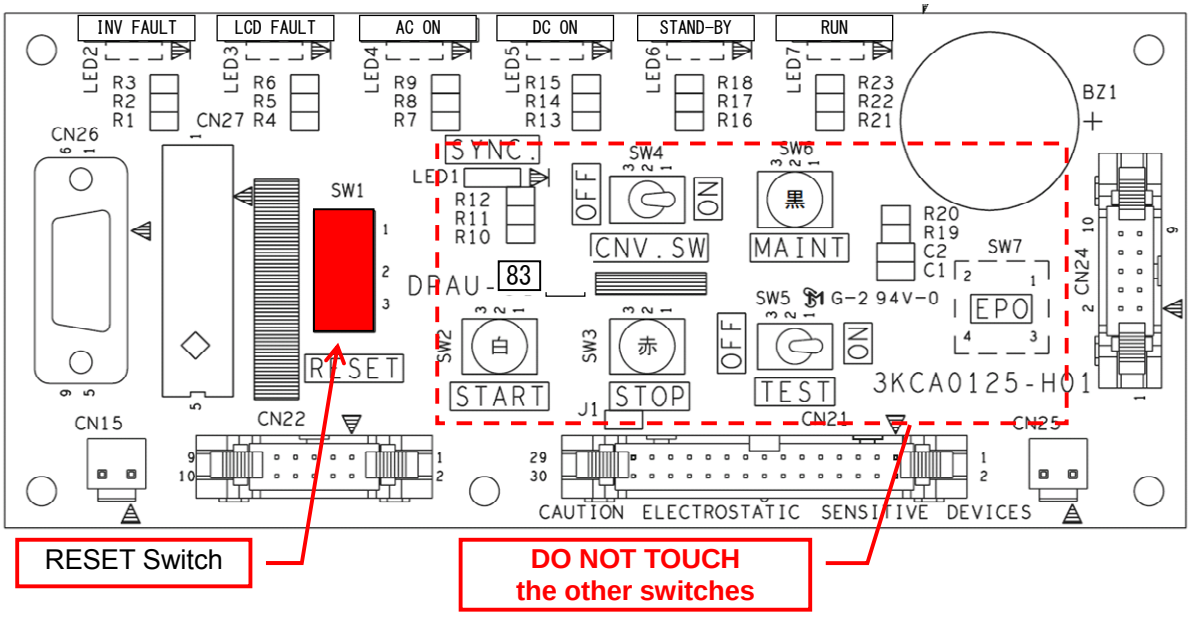


Fig .6.7 Description of the switch PCB DPAU-83

6.2. Operating Functions

Daily Operation

Morning - PV modules start generating power at sunrise and the inverter starts automatically once the power from the PV modules reaches a certain level high enough to drive the inverter.

Daytime - The inverter will deliver as much power as available to the grid depending on the irradiance on the PV modules using MPPT (Maximum Power Point Tracking) control.

Sunset - The power from the PV modules will gradually decrease to a level below the amount required to drive the inverter. At this point, the inverter will stop and disconnect from the grid automatically, entering into the Stand-by mode

Fault detection

When a fault is detected, the inverter will either stop its operation and / or show fault message(s) on the LCD. The faults are categorized into four levels.

Fault level	Description
ALARM	Faults which do not affect the operation of the inverter. The inverter will continue to deliver power to the grid.
GRID FAULT	Faults caused by abnormal voltage or frequency of the power grid. The inverter will stop its operation and disconnect from the grid. After the abnormal grid condition is cleared, the inverter will restart automatically.
MINOR FAULT	Faults which affect normal operation of the inverter caused by temporary abnormal conditions. The inverter will stop its operation and disconnect from the grid. After the abnormal conditions are cleared, the inverter will restart automatically.
MAJOR FAULT	Faults caused by abnormal condition which may damage the inverter. The inverter will stop its operation and disconnect both from the DC input circuit and the grid. On-site operation and detailed check performed by service personnel are required to reset the system.

6.3. Operating states of the inverter

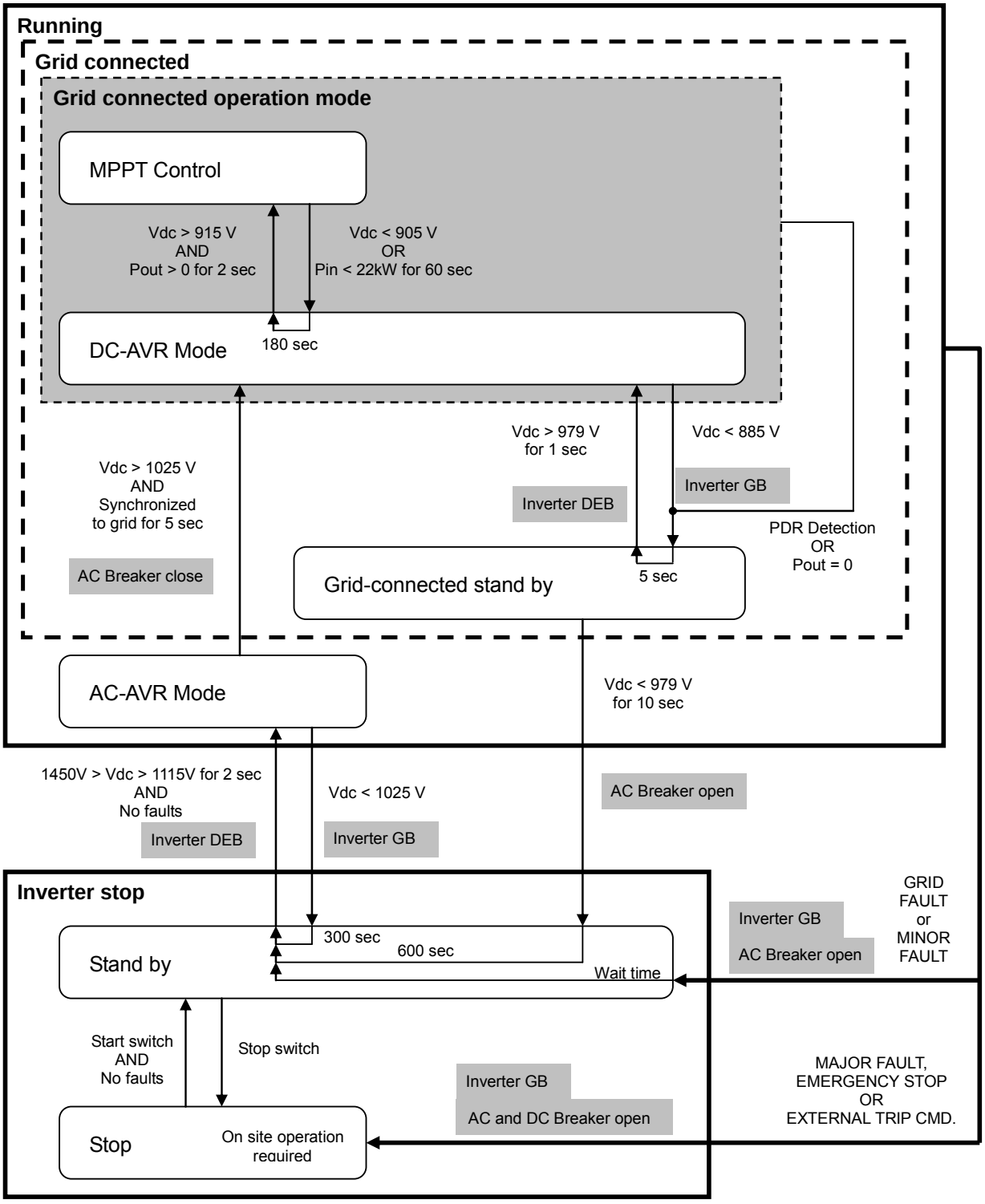


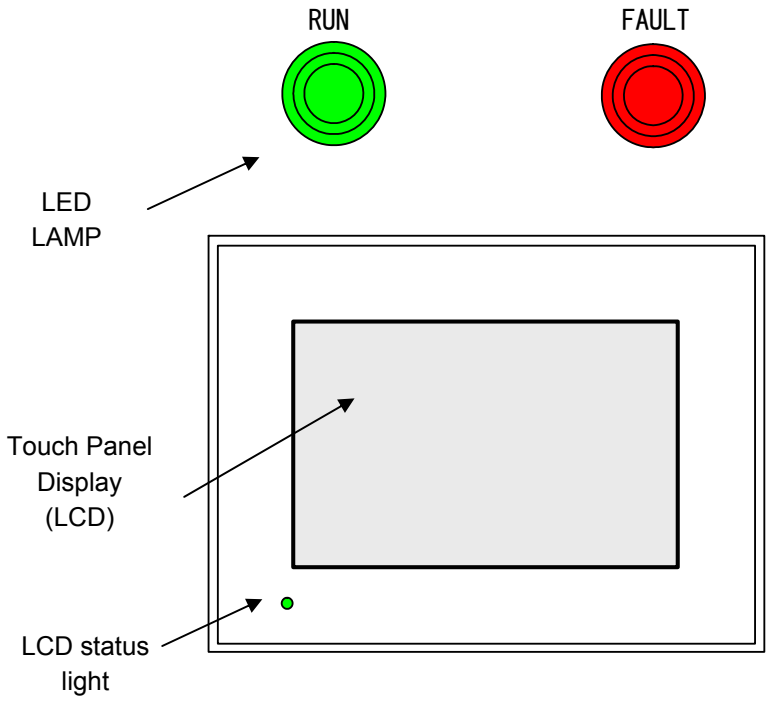
Fig. 6.8 Operating state transition diagram 【PVH-L3360GR-GS / PVH-L3360GR-EGS / PVH-L3360GR-E7S】

Operating state details

Operating State		Description	
STOP	Stop	Typical situation	- Before initial start up - After MAJOR FAULT - After a stop operation
		Operation is completely stopped. Starting operation is required to move to “Stand by” mode. Detection of a MAJOR FAULT results in this state.	
	Stand by	Typical situation	- At night or sunset - After MINOR FAULT or GRID FAULT
		The inverter is connected to the DC input power and waiting for the start-up condition to be established. AC output is not connected to the grid and the main inverter circuit is gate-blocked (GB), which means that the inverter switching is stopped.	
RUNNING	AC-AVR	Transient state from “Stand by” to “DC-AVR”. The inverter starts generating AC voltage, but is not connected to the grid.	
	DC-AVR	Transient state from “AC-AVR” to “MPPT Control” mode. The inverter is connected to the grid.	
	MPPT Control	Power delivering operation. Energy from PV modules is converted to AC energy and delivered to the grid. DC input voltage is controlled based on Maximum Power Point Tracking (MPPT) control.	
	Grid-connected Stand by	Temporary state caused mostly by insufficient DC input power. The inverter stops switching, but is connected to the grid.	

6.4. LCD panel and LED Lamps

LED Lamps are located on the front door of the ACB Cabinet. LCD panel is located inside the auxiliary door of the ACB Cabinet.



Name		Description	
Panel Display	Touch Panel Display (LCD)	Measurements and fault details are displayed. Some setting can be modified thorough this panel. When the touch panel is not used for 3 minutes, the display automatically turns off. Touch the panel to turn it back on.	
	LCD Status	OFF	Power OFF
		GREEN	Normal
		GREEN (*1)	LCD is in standby mode.
		GREEN (*2)	Backlight is broken.
LED Lamps	RUN	GREEN	“DC-AVR” or “MPPT Control” mode
	FAULT	RED	Major Fault, Minor Fault, Grid Fault

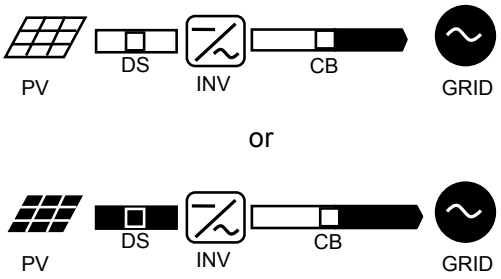
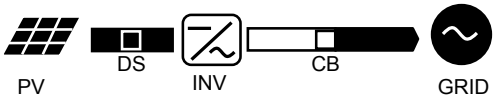
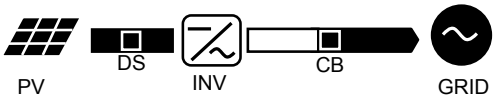
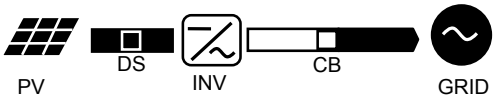
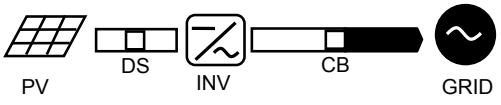
(*1) The light blinks as if a firefly were glowing

(*2) The light blinks by 5 second intervals

Quick Guide for operation status indicators

NOTE: See section 6.3 (Page 17) for the operating state details.

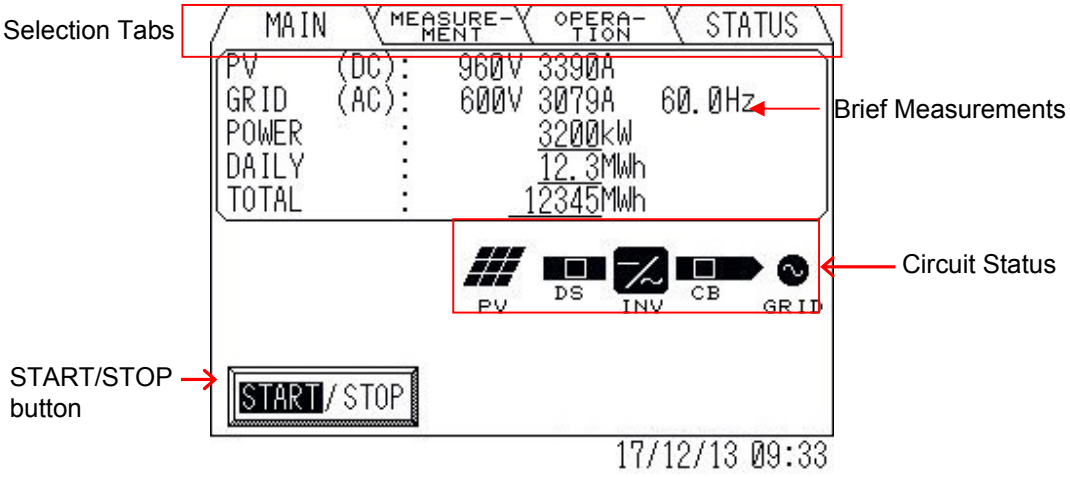
See section 6.2 (Page 16) for the fault category details.

Operating State		Circuit Status (LCD)	LED STATUS
STOP	Stop		
	Stand by		
RUNNING	AC-AVR		
	DC-AVR or MPPT Control		
	Grid-connected Stand by		
Circuit Status and operating state (LCD) after faults occur			LED STATUS
FAULT	ALARM	Operating state does not change	
	GRID FAULT or MINOR FAULT	Operating state goes to “Stand by” 	
	MAJOR FAULT	Operating state goes to “Stop” 	

7. Operating the touch panel display

7.1. Description of display items

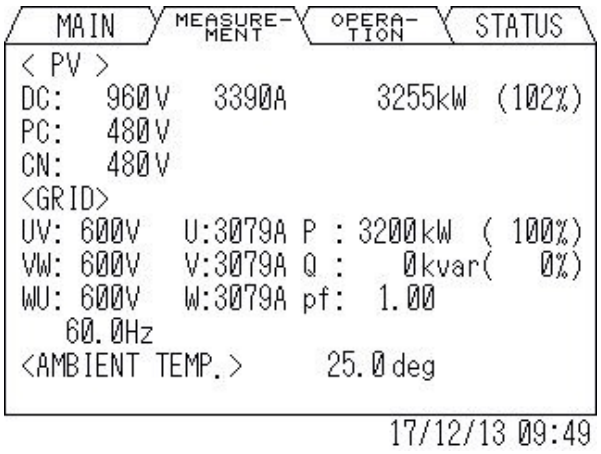
7.1.1. MAIN screen



Name	Description	
Selection tabs	MAIN	Brief measurements, circuit status, START/STOP button
	MEASUREMENTS	Detailed measurements
	OPERATION	Setup, Power factor settings
	STATUS	Event log, Power log, Grid protection function status
Basic Measurements	PV (DC)	DC Voltage (V) and DC Current (A) measurements
	GRID (AC)	AC Voltage (V), AC Current (A) and Frequency (Hz)
	POWER	Output active power (kW)
	DAILY	Total energy delivered to the grid in the day (MWh)
	TOTAL	Total energy delivered to the grid (MWh)
Circuit Status	The following items turn black when they are active.	
	PV	DC input voltage status
	DS	DC load break switch ON / OFF (Black / White) status
	INV	Inverter switching ON / OFF (Black / White) status
	CB	AC circuit breaker ON / OFF (Black / White) status
	GRID	Grid voltage status
START/STOP button	Button used for initial startup operation and normal stop operation.	

For Startup and Stop operation procedures, see chapter 8 (Page 38)

7.1.2. MEASUREMENT screen

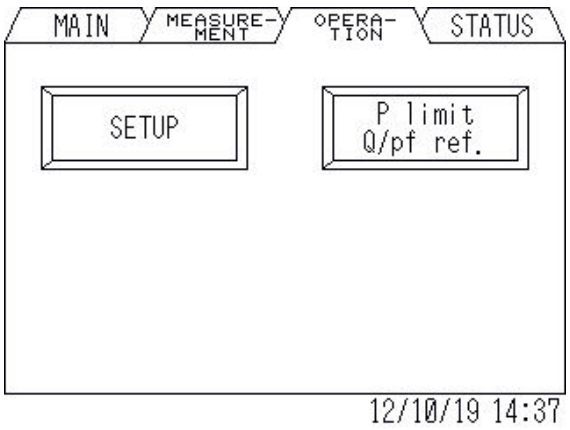


Name	Description	
PV	DC	DC Voltage (V), DC Current (A), DC Power (kW, % of the rating)
	PC	DC Voltage between Positive and Common (V)
	CN	DC Voltage between Common and Negative (V)
GRID	UV	AC Line to Line Voltage between U-V (V)
	VW	AC Line to Line Voltage between V-W (V)
	WU	AC Line to Line Voltage between W-U (V)
	U	AC Current on U Phase (A)
	V	AC Current on V Phase (A)
	W	AC Current on W Phase (A)
	P	Output Active Power (kW, % of the rating)
	Q	Output Reactive Power (kVAR, % of the rating)
	pf	Power Factor (X.XX)
	(No item name)	Frequency (Hz)
AMBIENT TEMP.	(No item name)	Ambient temperature beside the cabinet (degrees C)

NOTE: (a) The accuracy of Q (Reactive Power) and pf (Power Factor) measurements drops when the DC Power is small.

(b) PC (DC Voltage between Positive and Common) and CN (DC Voltage between Common and Negative) will be almost half the values of DC (DC Voltage).

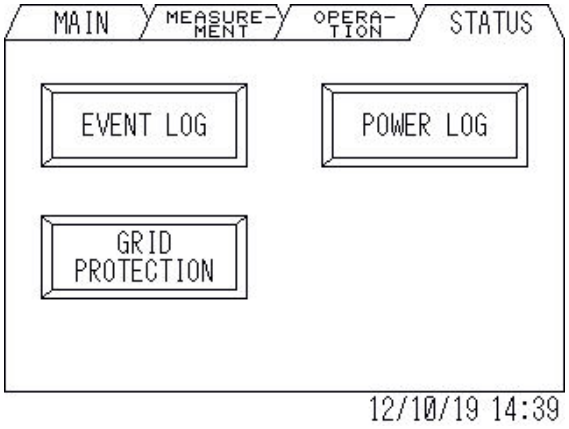
7.1.3. OPERATION screen



Name	Description
SETUP	REMOTE/LOCAL Operation select TIME & DATE setup Fixed Power Factor setting
P limit Q/pf ref	Power limitation setting Reactive power and power factor setting (the values settings in this menu will return to the default settings after the inverter is reset)

For details of the SETUP and P limit Q/pf ref, see section 7.3 to 7.5 (Page 26 to 29)

7.1.4. STATUS screen



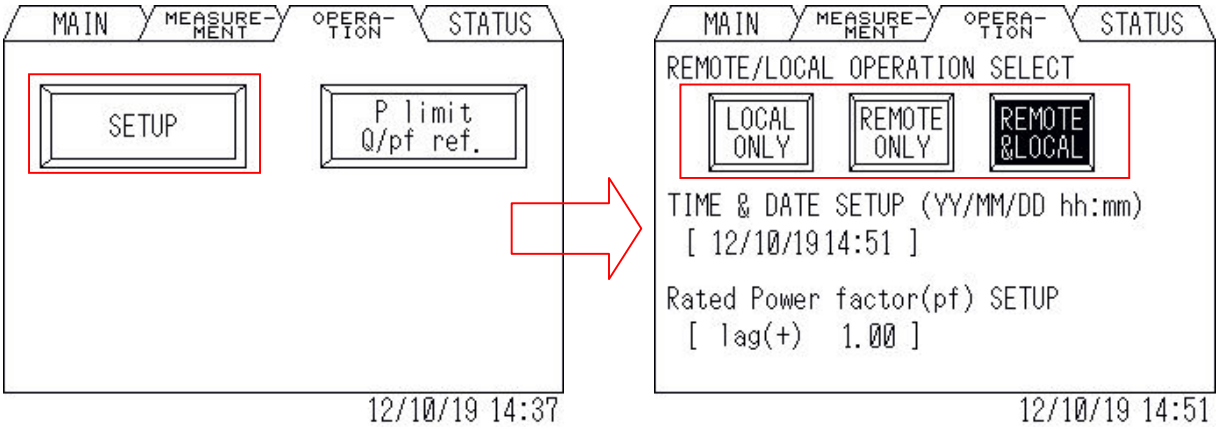
Name	Description
EVENT LOG	Up to 50 events are recorded with time stamps
POWER LOG	Total energy measurement details
GRID PROTECTION	Current setting for grid protection

For details of the EVENT LOG, POWER LOG and GRID PROTECTION, see section 7.6, 7.7 and 7.8 (Page 30 to 31)

7.2. Remote / Local operation setting

Start and stop operation of the inverter can be performed through the touch panel display (Local) or by an external signal (remote). This screen is provided to set the inverter to be operated in “LOCAL ONLY” mode, “REMOTE ONLY” mode or “REMOTE&LOCAL” mode.

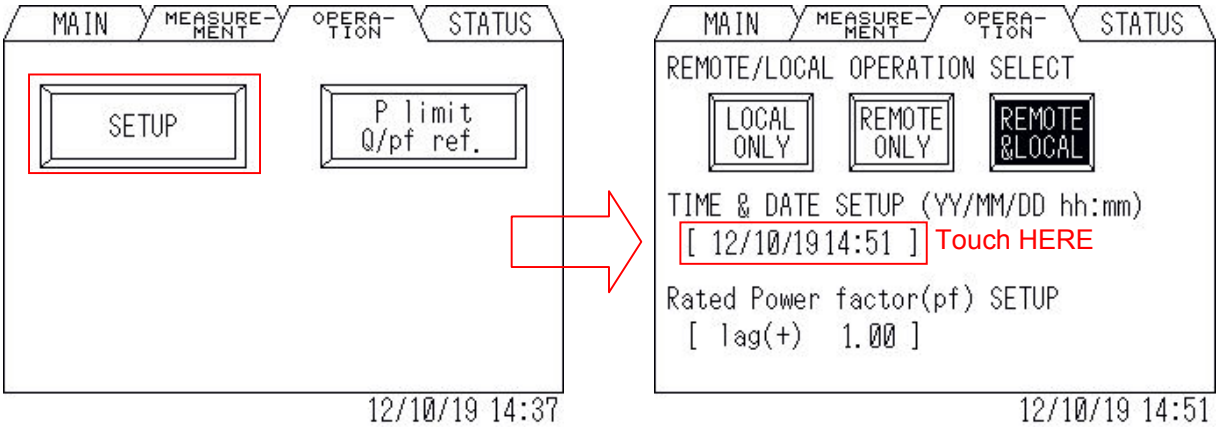
From the OPERATION screen, touch “SETUP” tab to show the SETUP screen.
The current setting is highlighted.

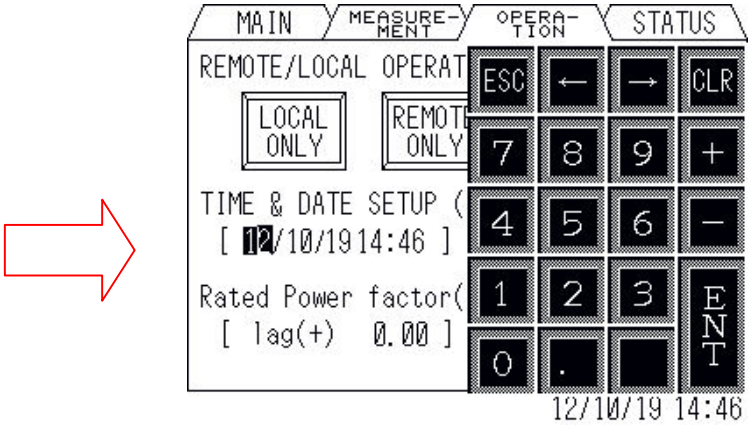


Name	Description
LOCAL ONLY	Only local operations are accepted. Remote operations (start, stop and setting change) through external signals are rejected.
REMOTE ONLY	Only remote operations are accepted. Local operations (start, stop and setting change, except Remote / Local operation setting) from the touch panel display are rejected.
REMOTE & LOCAL	Both local and remote operations are allowed. (Default setting)

7.3. Date and Time setting

From OPERATION screen, touch “SETUP” tab to show the SETUP screen. Then touch the time and the date area to change the settings.





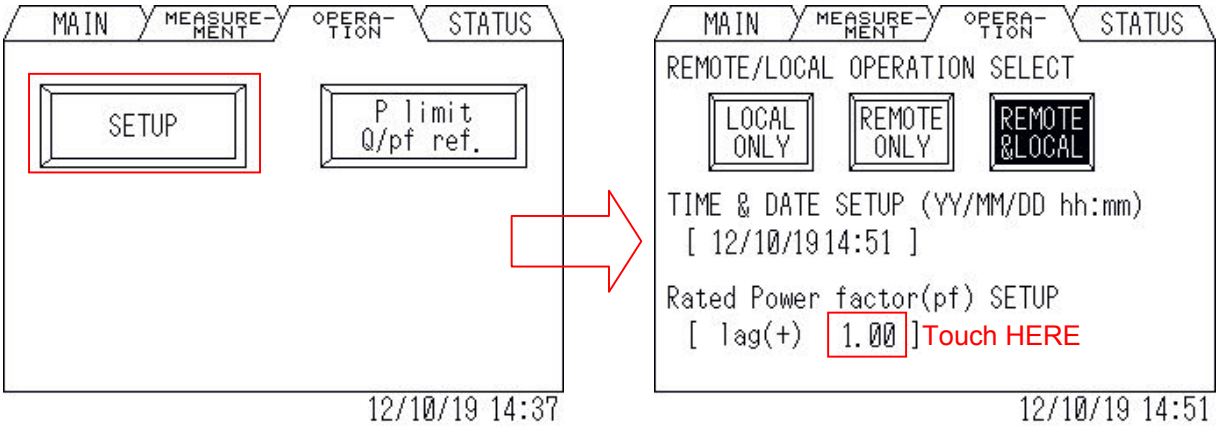
A keypad will show up on the screen. The time stamp can be set as **YY / MM / DD hh : mm**. The hour must be in the **24-hour-clock** format. (Example: 13:22 instead of 1:22 PM)

① Enter the numbers into the highlighted item
② Press “ENT” to set the value
③ After pressing “ENT”, the highlighted item will jump to the next item.
The rotation order will be: Year → Month → Day → Hour → Minutes

7.4. Power Factor setting (SETUP MENU)

Mandatory	Shutdown the inverter when performing the power factor setting described below.

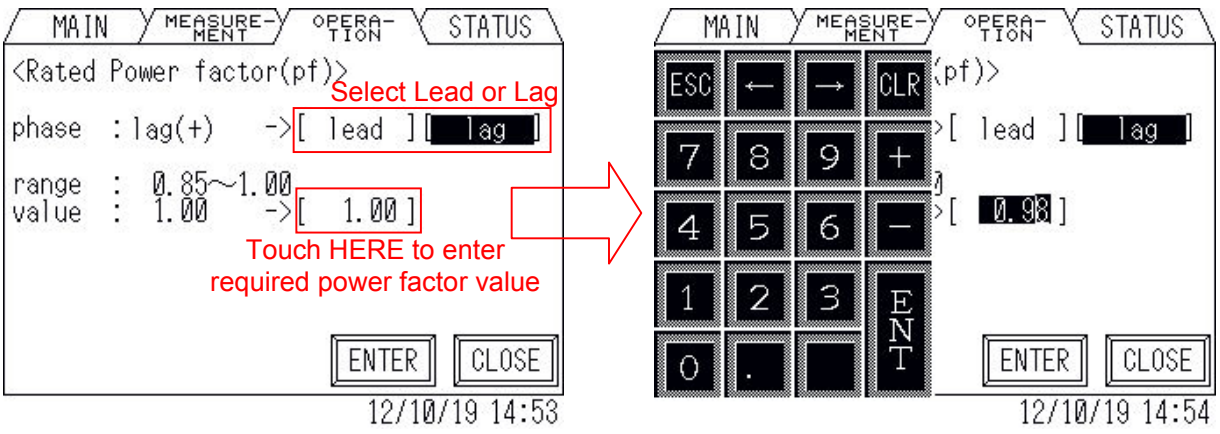
Power factor can be changed in the SETUP screen of the OPERATION MENU. This power factor setting is permanent and will not change after the reset operation.
To set the power factor, touch the power factor number appearing on screen.



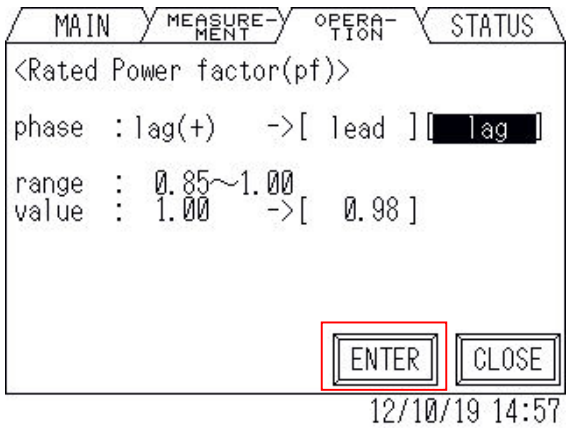
NOTE: Please change the power factor settings under the user's responsibilities. TMEIC will not be responsible for any changes made to the factory settings.

① Select lead or lag for the direction of reactive power flow. **Lead** means **absorbing reactive power** as a reactor. **Lag** means **delivering reactive power** to the grid as a capacitor.

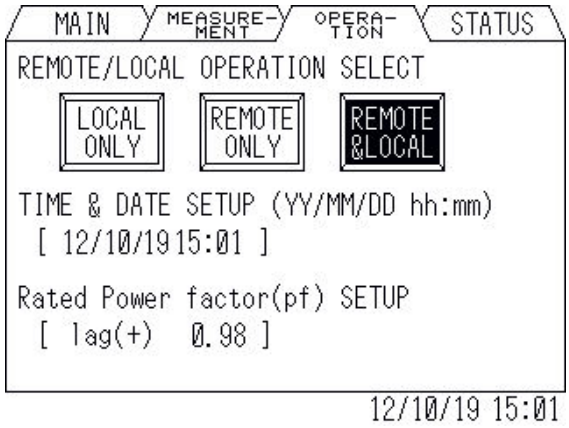
② Touch the power factor value in brackets to enter the new power factor value.



③ Confirm the new power factor by pressing ENTER. Press CLOSE to leave this menu without changing the power factor.



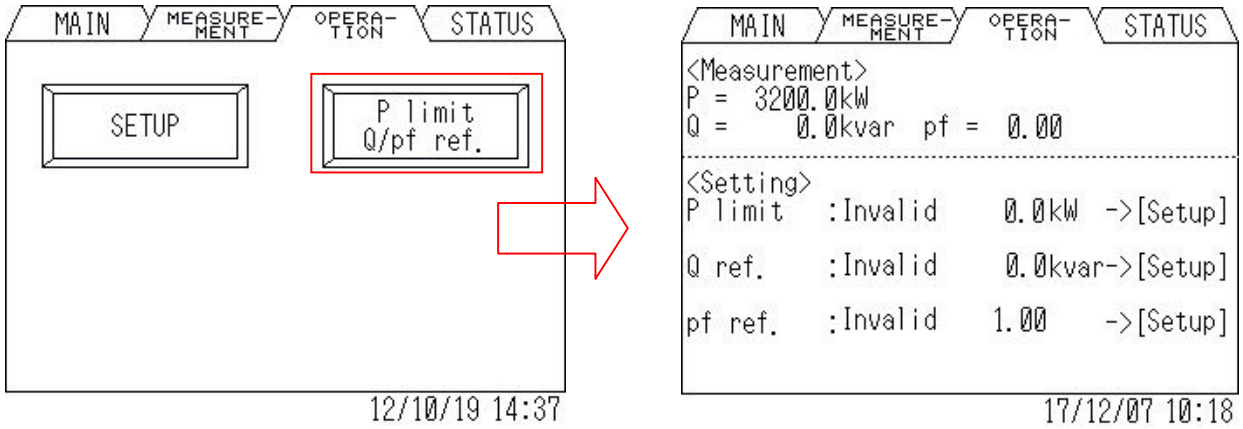
④ Check that the new power factor has been updated on the screen



7.5. Power limitation, Reactive Power and Power Factor Settings (P limit Q/pf ref Menu)

Mandatory	The power factor settings described in this section are temporary. Refer to section 7.3 for permanent settings.

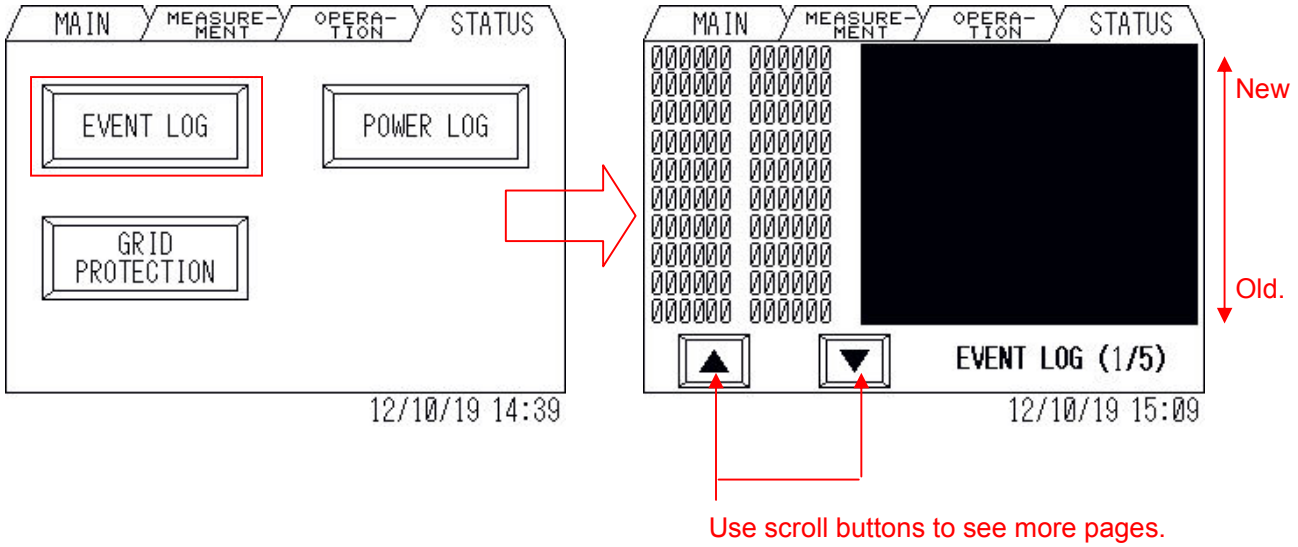
Power Limitation, Reactive Power and Power Factor settings can be changed in this menu. However, the parameters set here are temporary. Thus, if the system is reset, **these settings will return to default values**.



7.6. Event Log browsing

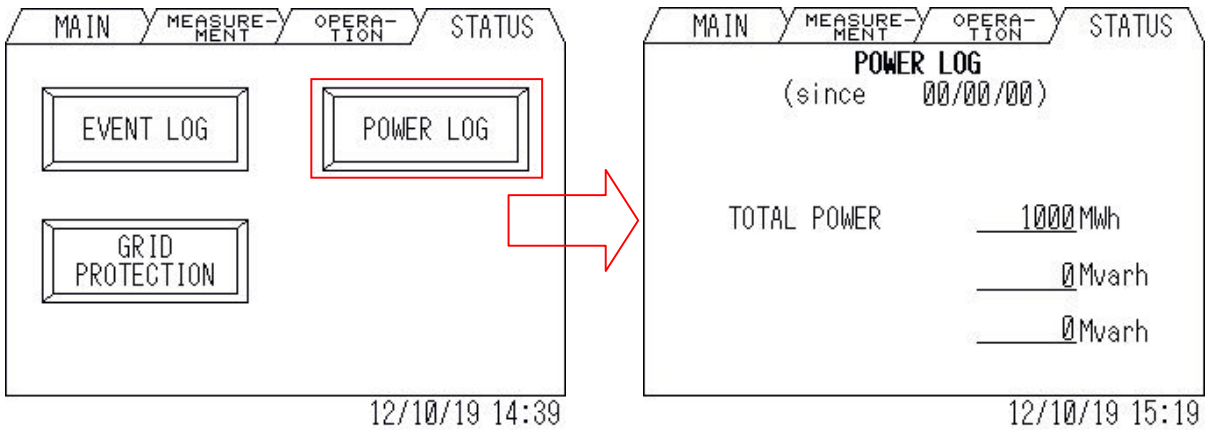
From the STATUS tab, touch the “EVENT LOG” button to show the event log.

Up to 50 events are recorded with time stamps and fault codes



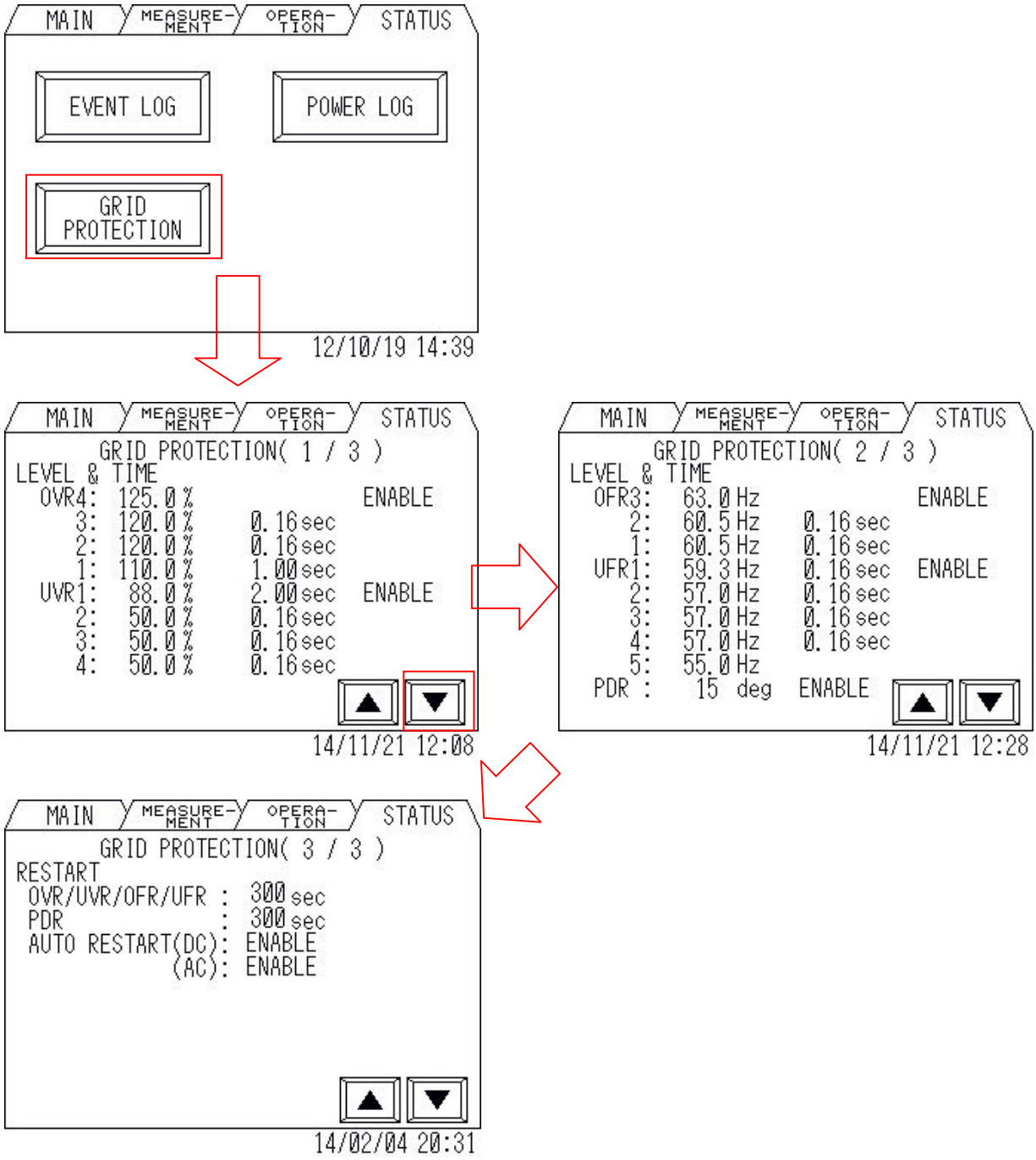
7.7. Power Log

From the STATUS tab, touch the “POWER LOG” button to show the Power log. The total energy delivered to the grid starting the date shown on the screen (YY/MM/DD) is measured.



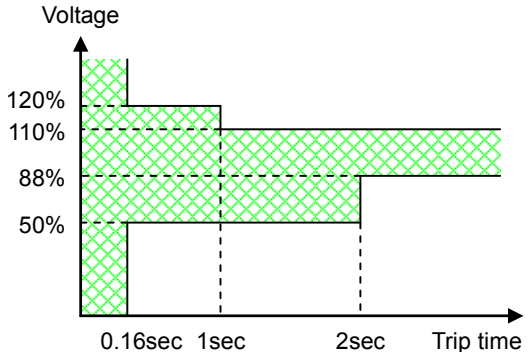
7.8. Grid protection settings browsing

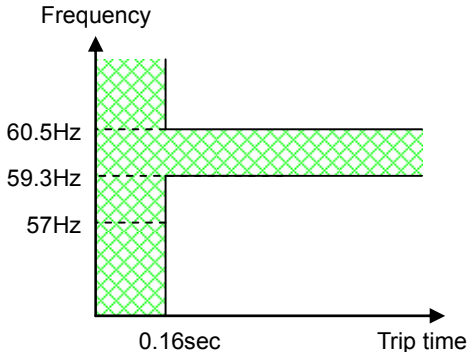
From the STATUS tab, touch the “GRID PROTECTION” button to show the current settings for grid protection functions.



Grid protection settings are set at the factory. Setting values are fixed and were chosen according to the IEEE 1547™-2003 Standard.

Name		Description	Default setting	
LEVEL & TIME				
OVR	OVR2	Grid overvoltage detection level 2 (% of nominal, trip time)	120%	0.16s
	OVR1	Grid overvoltage detection level 1 (% of nominal, trip time)	110%	1.00s
UVR	UVR1	Grid undervoltage detection level 1 (% of nominal, trip time)	88%	2.00s
	UVR2	Grid undervoltage detection level 2 (% of nominal, trip time)	50%	0.16s
OFR	OFR1	Grid over-frequency detection level (% of nominal, trip time)	60.5Hz	0.16s
UFR	UFR1	Grid under-frequency detection level 1 (% of nominal, trip time)	59.3Hz	0.16s
	UFR2	Grid under-frequency detection level 2 (% of nominal, trip time)	57.0Hz	0.16s
PDR		Grid voltage phase jump detection (degrees)	15 deg	
RESTART -				
OVR/UVR/OFR/UFR		Restarting time after abnormal grid voltage/frequency is cleared	300s	
PDR		Restarting time after re-synchronization	300s	
AUTO RESTART (DC)		Auto restart enable/disable status after DC undervoltage	ENABLE	
AUTO RESTART (AC)		Auto restart enable/disable status after GRID FAULT	ENABLE	

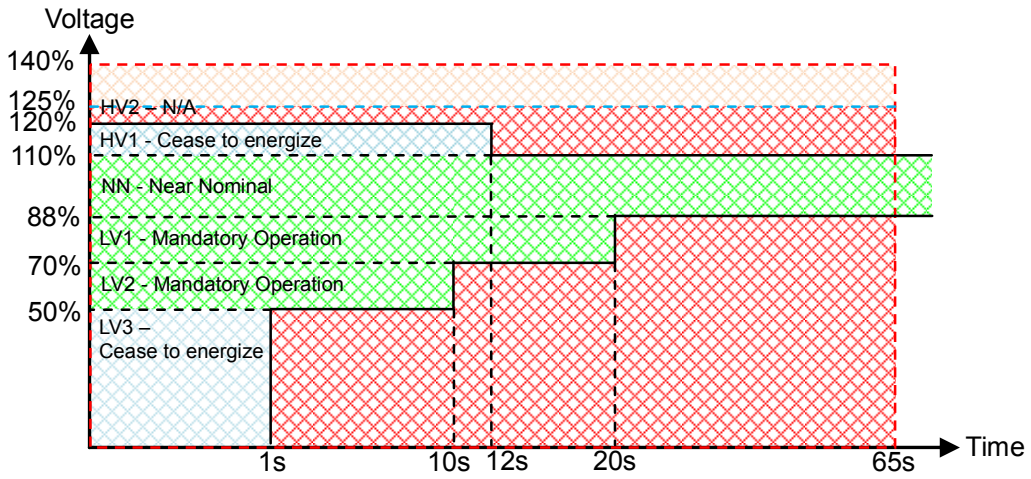




7.9. Smart inverter functions

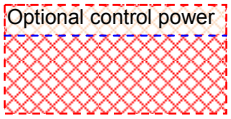
The inverter has the following grid support functions implemented and tested according to UL1741 Supplement SA. Settings can only be accessed and adjusted by service personnel. L/HVRT and L/HFRT settings can be checked in the inverter display. Other functions settings can only be checked by service personnel. Each function is described below.

SA9 Low-High Voltage Ride Through



Range of adjustability: 0% to 140%, 0.01s to 65s

Note: Optional control power circuit is required for settings over 125%

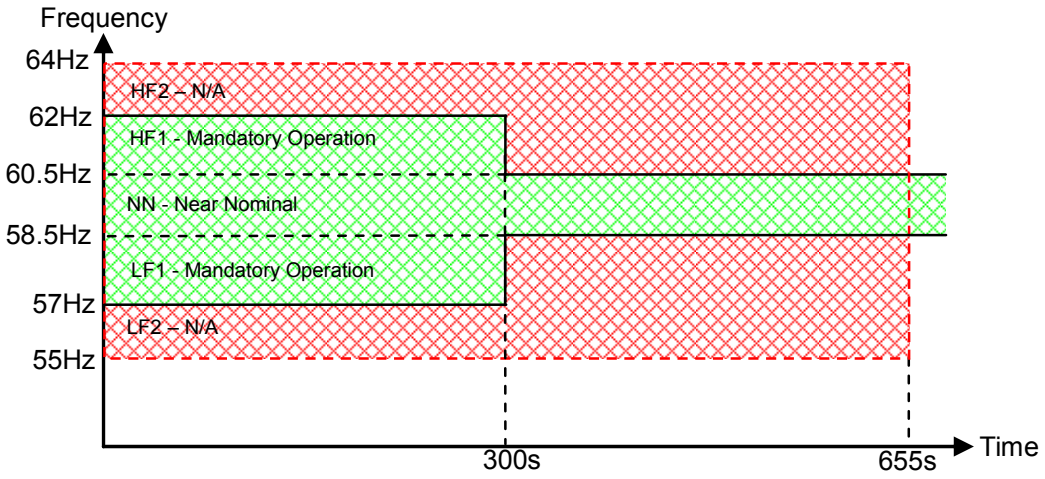


Range of adjustability

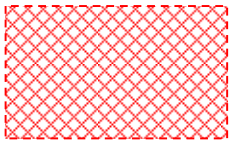
Default settings for Rule 21 are shown in the following table:

Name		Description	Default setting	
LEVEL & TIME				
OVR	OVR4	Grid overvoltage detection level 4 (% of nominal, trip time)	120%	-
	OVR3	Grid overvoltage detection level 3 (% of nominal, trip time)	110%	12s
	UVR2	Grid overvoltage detection level 2 (% of nominal, trip time)	110%	12s
	UVR1	Grid overvoltage detection level 1 (% of nominal, trip time)	110%	12s
UVR	UVR1	Grid undervoltage detection level 1 (% of nominal, trip time)	88%	20s
	UVR2	Grid undervoltage detection level 2 (% of nominal, trip time)	70%	10s
	UVR3	Grid undervoltage detection level 3 (% of nominal, trip time)	50%	1s
	UVR4	Grid undervoltage detection level 4 (% of nominal, trip time)	50%	1s

SA10 Low-High Frequency Ride Through



Range of adjustability: 55Hz to 64Hz, 0.01s to 655s

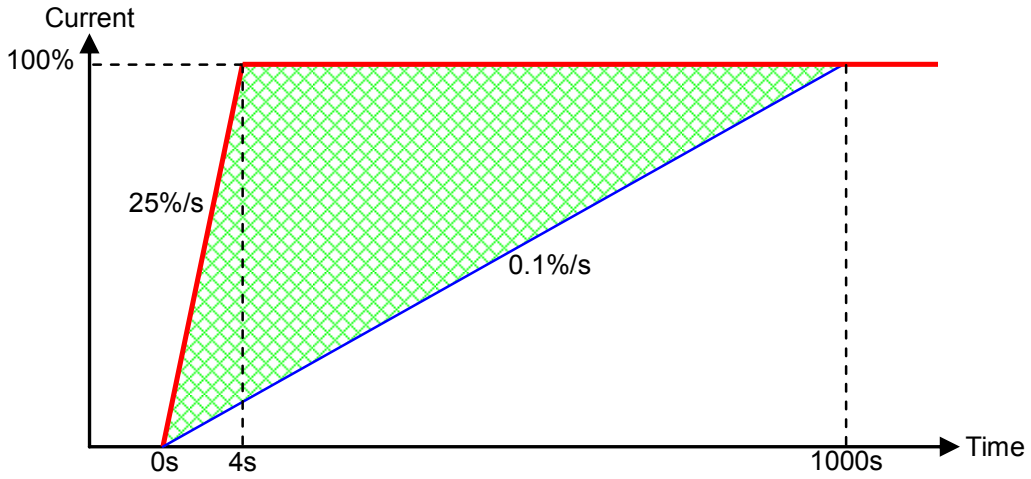


Range of adjustability

Default settings for Rule 21 are shown in the following table:

Name		Description	Default setting	
LEVEL & TIME				
OFR	OFR3	Grid over-frequency detection level 2 (% of nominal, trip time)	62Hz	-
	OFR2	Grid over-frequency detection level 1 (% of nominal, trip time)	60.5Hz	300s
	UFR1	Grid over-frequency detection level 1 (% of nominal, trip time)	60.5Hz	300s
UFR	UFR1	Grid under-frequency detection level 2 (% of nominal, trip time)	58.5Hz	300s
	UFR2	Grid under-frequency detection level (% of nominal, trip time)	58.5Hz	300s
	UFR3	Grid under-frequency detection level 1 (% of nominal, trip time)	58.5Hz	300s
	UFR4	Grid under-frequency detection level 2 (% of nominal, trip time)	58.5Hz	300s
	UFR5	Grid under-frequency detection level 2 (% of nominal, trip time)	57Hz	-

SA11 Normal Ramp Rate and Soft Start Ramp Rate



Range of adjustability: 100%/s to 0.1%/s

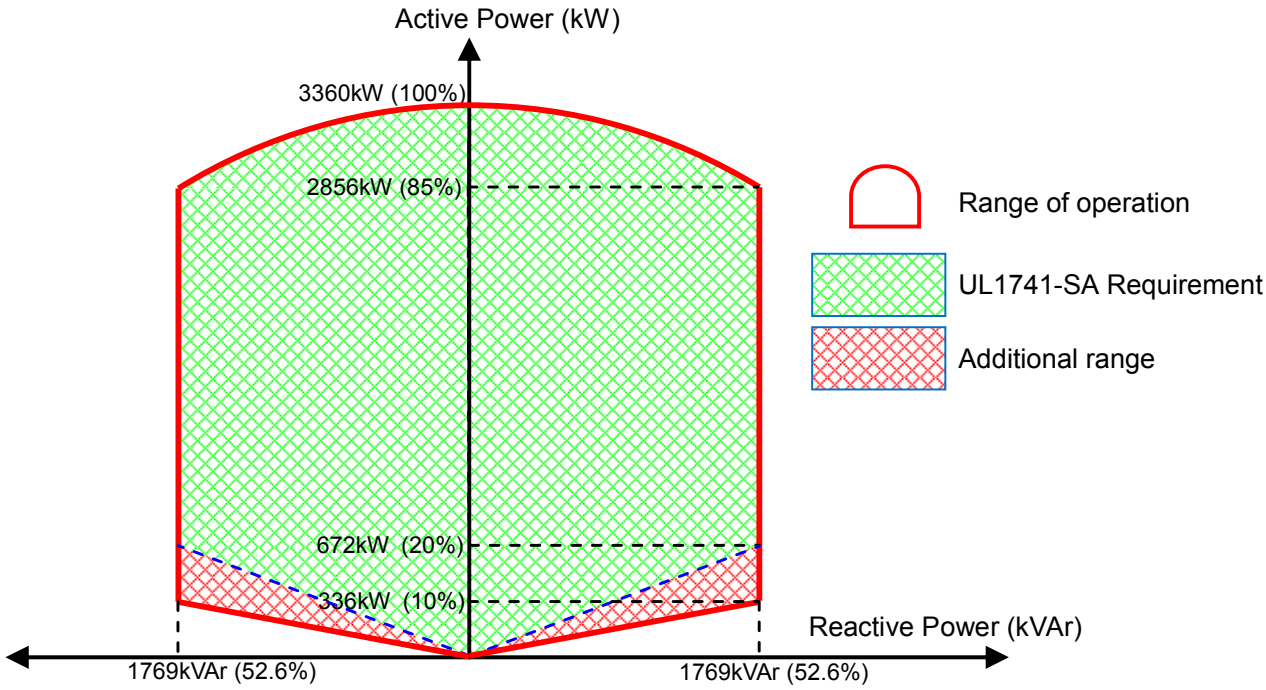
Range of adjustability

Default setting: 100%/s

Normal and soft-start ramp rate are under the same settings. They cannot be programmed independently.

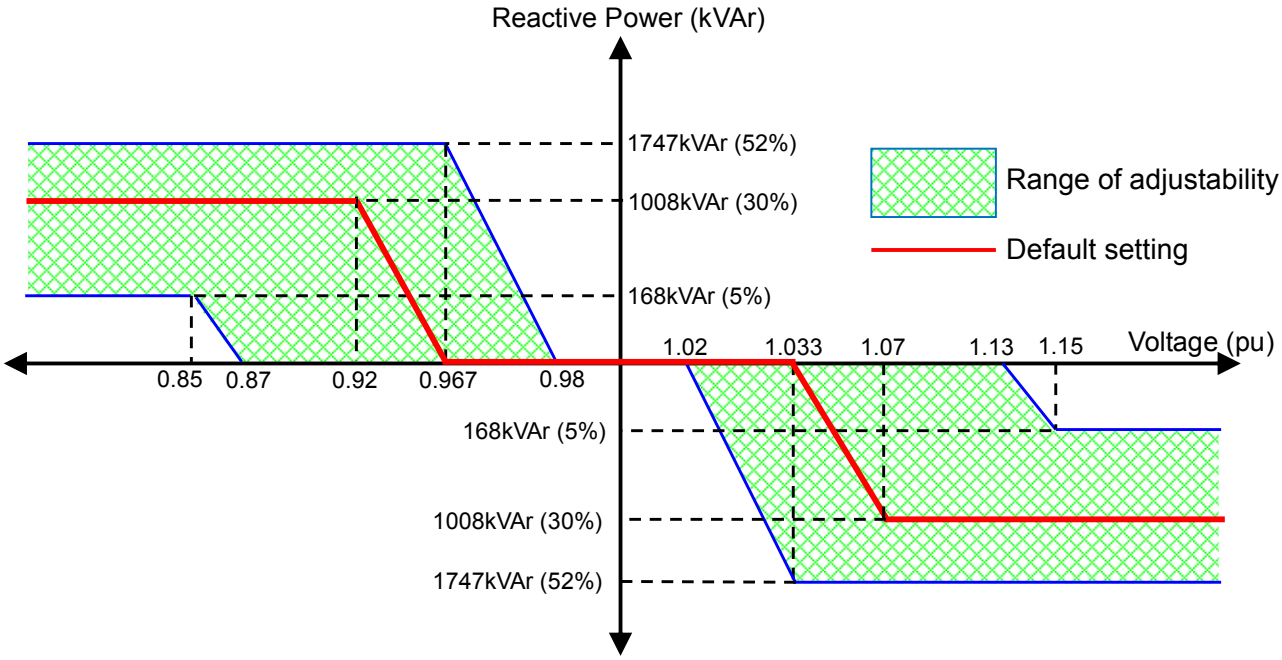
SA12 Specified Power Factor

Reactive power capability of the inverter is depicted in the following graph. It is valid under nominal conditions. For different conditions please contact your TMEIC representative.



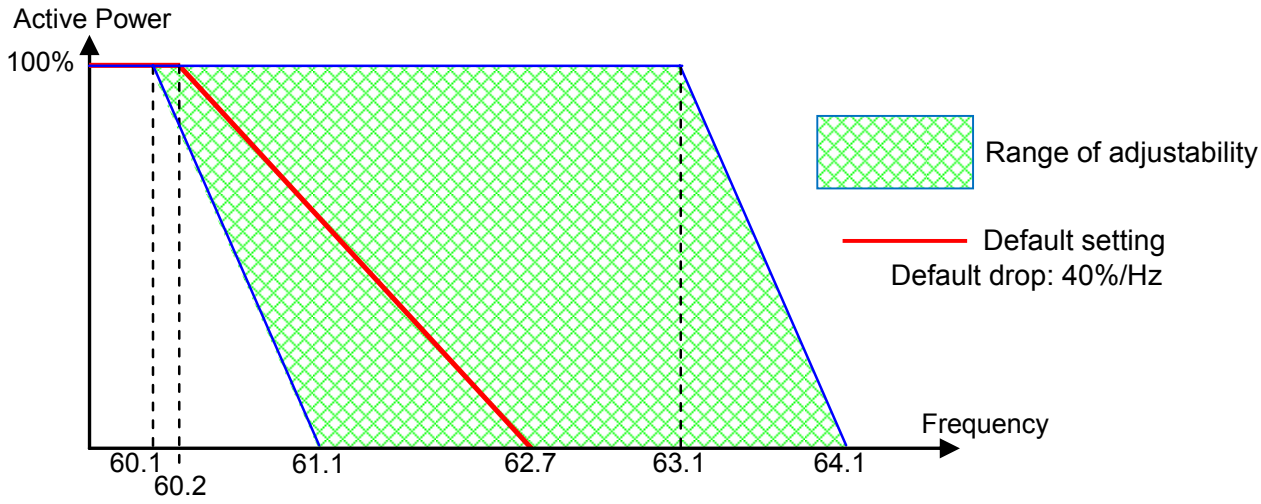
SA13 Volt-VAr

Volt-VAr function can be set within the following adjustability. This function can be set and enabled/disabled only by service personnel. Current settings are only accessible to service personnel. This function operates under reactive power priority, which means that the inverter will derate for active power instead of reactive power when the maximum kVA rating of 3.36MVA is reached.

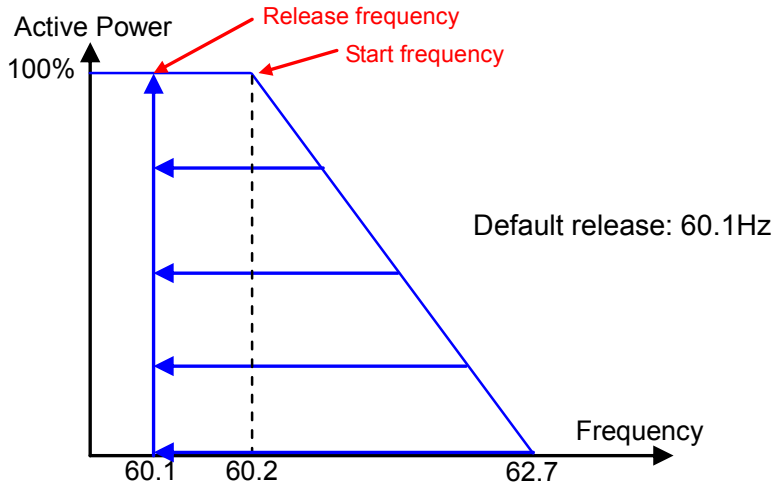


SA14 Frequency Watt

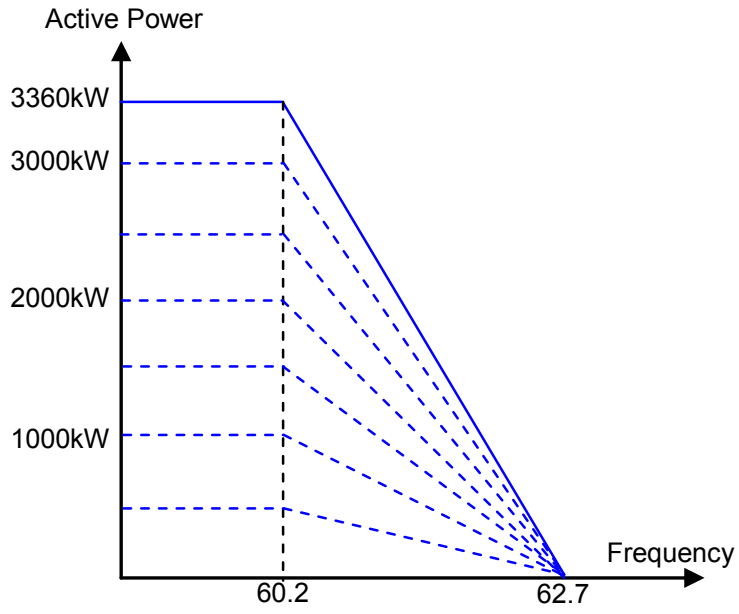
Frequency-watt function can be set within the following adjustability. This function can be set and enabled/disabled only by service personnel. Current settings are only accessible to service personnel.



Frequency-watt function operates with hysteresis so that the power is kept constant when frequency decreases as seen in the following figure. A release threshold is programmed so when the frequency gets lower than the threshold, the power limit is released and the operation returns back to normal.

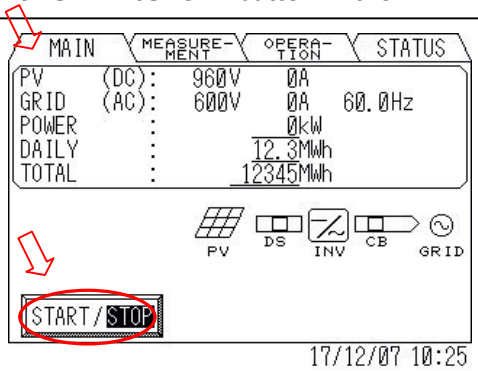
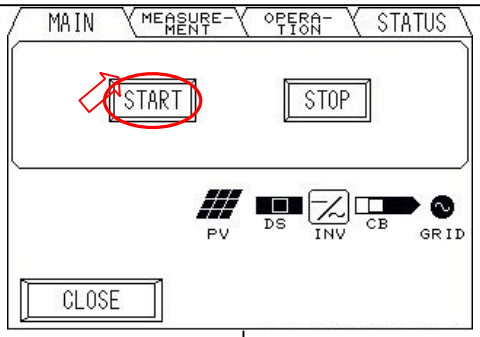


The rate of change of this function depends on the current output at the moment where the frequency crosses the start point. That is, if the inverter is having less than nominal power at the starting point, that power will become 100% for this function. Once the frequency goes back to normal and the release threshold is achieved, the inverter will go up in power up to the maximum power achievable at that moment.

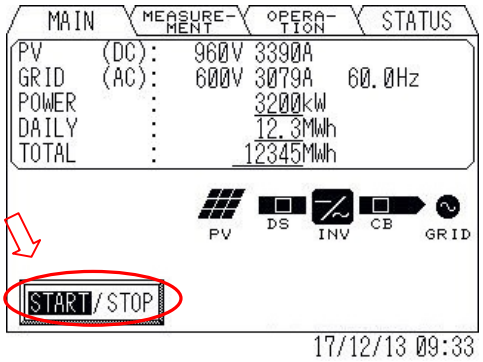
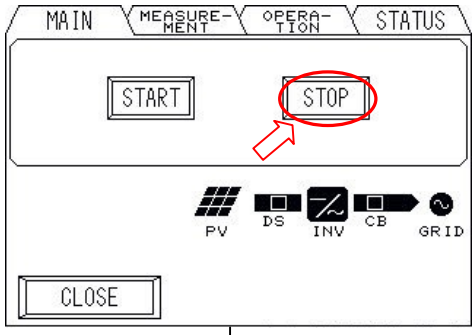


8. Start and Stop Operation

8.1. Start operation

Steps	Procedure	LED Status
Initial state	Check the following, A) AC circuit breaker (CB) is OPEN B) Each DC load-break switch (DS) is OPEN C) Control circuit breaker 8AB,8A,8B,8SPD are CLOSED D) "FAULT" LED is OFF	RUN FAULT
1	**Manually turn on the DC load break switch (DS) of each Inverter cabinet**	RUN FAULT
2	**Press the "START/STOP" button in the "MAIN" tab.** 	
3	**Press the "START" button for a few seconds.** 	
Inverter internal process	DC voltage establishment (depending on irradiance) Inverter Automatically Starts	RUN FAULT
	AC circuit breaker (CB) automatically closes.	RUN FAULT
END	Inverter start process completed.	

8.2. Stop operation

<table>
<tr><th>Steps</th><th>Procedure</th><th>LED Status</th></tr>
<tr><td>Initial state</td><td>A) Inverter is RUNNING
OR
B) Inverter is in STAND BY (morning and night)</td><td>RUN FAULT
RUN FAULT</td></tr>
<tr><td>1</td><td>Press the “START/STOP” button in the “MAIN” tab.
 
</td><td></td></tr>
<tr><td>2</td><td>Press the “STOP” button for a few seconds.
 
</td><td></td></tr>
<tr><td>Inverter internal process</td><td>AC circuit breaker (CB) automatically opens
Inverter automatically stops</td><td>RUN FAULT</td></tr>
<tr><td>3

END</td><td>Manually open the DC load break switch (DS) of each inverter cabinet
Inverter stop process completed.</td><td>RUN FAULT</td></tr>
</table>

9. Communication Features and Remote Operation

For remote operation, this inverter is equipped with dry contacts and a communication port.
The communication port supports either Modbus or Ether-NET networks under TCP/IP protocol. Modbus and Ether-NET are not simultaneously supported and the selection should be done when making the purchase order of the inverter.

9.1. Network Settings for Communication

Network settings should be performed by qualified personnel during commissioning or before shipping at the factory. Please provide the required IP address and Subnet Mask for each inverter as soon as possible. Default Values are as follows:

Modbus (Standard)	
IP Address	192.168.0.1
Subnet Mask	255.255.255.0
Port Number	502

Ether-NET(Option)	
IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Port Number	10001

9.2. Information acquisition

Electrical variables, event log and other relevant information are available through the communication port. SCADA system developers should refer to the Communications Manual for further details.

9.3. Remote start / stop operations

The inverter can be started or stopped through the communication port or through the I/O dry contact signals.
Refer to the Installation Manual for connection using I/O port.

10. Faults analysis

10.1. Reactions to the faults

When a fault is detected, the following actions will occur.

Fault level	Operation	FAULT LED	Buzzer	DS	CB	Auto restart
ALARM	Continue	OFF	OFF	CLOSED	CLOSED	
GRID FAULT	Stand by	Illuminated	Intermittent	CLOSED	OPEN	YES
MINOR FAULT	Stand by	Illuminated	Intermittent	CLOSED	OPEN	YES
MAJOR FAULT	Stop	Illuminated	Continuous	OPEN	OPEN	NO

10.2. In case the display power is lost

When the control system power supply is lost, the fault codes will not be displayed and the fault information cannot be retrieved through the communication port.

- ☐ Check the grid condition (control power supply).
- ☐ Check the DC load break switch status. Make sure to open them if closed.
- ☐ Check circuit breaker 8A, 8AB. Close it if opened or tripped.
- ☐ Check return of control power.

  Follow the procedure in section 10.4 (Page 43) to see the fault messages.

If the display power is still lost, contact customer support.

10.3. Contacting customer support for fault diagnosis

For service inquiry due to fault conditions, send customer support the following information:

- ☐ Completed FAULT DIAGNOSIS SHEET on the next page
- ☐ Data saved in the Memory Card (See section 6.1 on page 12 for its location)

TMEIC SOLARWARE / PHOTOVOLTAIC INVERTER

FAULT DIAGNOSIS SHEET

Date:_____

Time:_____

Filled by:_____

Follow the procedures when an inverter failure occurs.

① Touch the LCD display. Is the display visible? ☐ YES ☐ NO → Check the power supply circuit

If the power supply from the grid is available and circuit breakers 8AB and 8A is ON, but the LCD is still not working, contact our representative with detailed descriptions of the current status of the inverter and the sequence of events leading to the failure, described in the following steps.

② Is the alarm buzzer ringing? ☐ YES, Continuously ☐ YES, Intermittent ☐ NO → Press Silence Alarm button

③ Indicate the status of all circuit breakers and switches

DS/INV1 ☐ON/OFF☐ ☐TRIP **DS/INV2** ☐ON/OFF☐ ☐TRIP **DS/INV3** ☐ON/OFF☐ ☐TRIP **DS/INV4** ☐ON/OFF☐ ☐TRIP

CB ☐ON/OFF☐ **8AB** ☐ON/OFF☐ **8A** ☐ON/OFF☐ **8B** ☐ON/OFF☐ **8SPD** ☐ON/OFF☐

④ Indicate the ON status of each LED Lamps on the AC cabinet.

RUN ☐ **FAULT** ☐

⑤ Press the “Message” button and write down all fault messages displayed in the table below. Use the scroll buttons to display the next fault message. Also, please record and send us all events recorded in the EVENT LOG. Please refer to the instruction manual section 10.4 to see how to operate the LCD display.

Fault Code	Time and date	Fault Message	Remarks

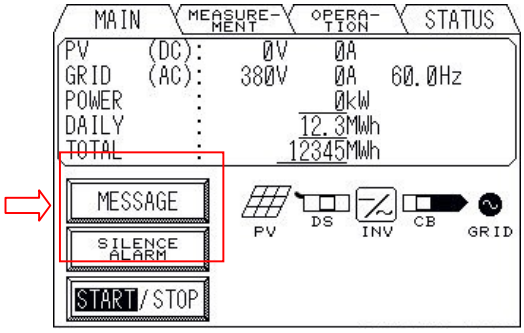
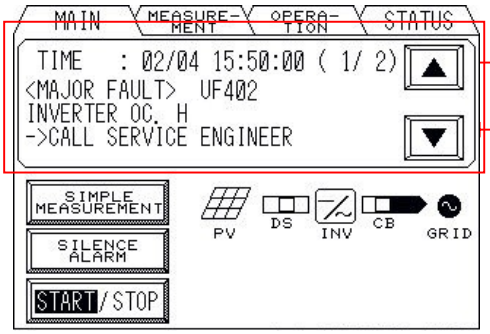
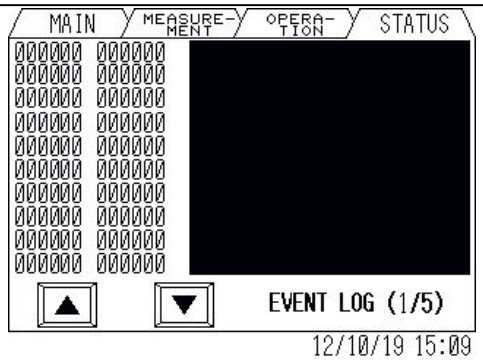
⑥ Retrieve the data from the memory card located in the main control circuit board and send this data to us. Also, please provide us with as much information as possible from the SCADA system or the monitoring system.

COMMENTS: (Describe any relevant information regarding the status of the inverter and the sequence of events. Use additional pages if necessary)

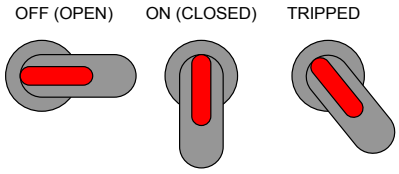
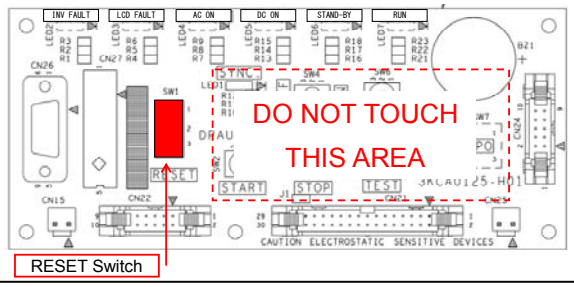
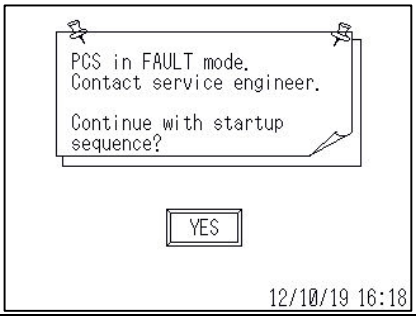
Location of fault (inverter number)

Onsite Conditions at the time of fault (Any onsite work? Weather? Abnormal conditions?)

10.4. Information acquisition of the fault

Steps	Procedure	LED Status
Initial state	When a fault is detected, “MESSAGE” and “ALARM STOP” buttons will show up in “MAIN” tab and the buzzer rings.	RUN FAULT or RUN FAULT
1	**Press “SILENCE ALARM” to stop the buzzer.** **Press the “MESSAGE” button to see fault messages.** 	
2	**Fault code and the details will be displayed.**  Use scroll buttons for multiple fault codes. NOTE: It is common to see multiple faults because the inverter detects the whole sequence of a failure. **The information can also be seen from the EVENT LOG.** 	
END	Refer to section 10.6 (Page 45) for the fault code list.	

10.5. Reset operation

Steps	Procedure	LED Status
Initial state	When a MAJOR FAULT is detected, manual reset operation is required to restart the system.	RUN FAULT
1	**Press "SILENCE ALARM" to stop the buzzer.**	
	Check the fault message following the procedure in "Information acquisition of the fault"	
2	**Ensure the DC load break switch (DS) of each inverter Cabinet and the AC circuit breaker (CB) are OPEN.**  DC load break switch handle positions	
3	**Open the display window on the ACB cabinet door and press the RESET switch on the switch PCB located on the back of the display window.** 	RUN FAULT
	The system will reset, or a warning message will appear in case the cause of the FAULT still exists 	
END		

10.6. Fault codes

10.6.1. ALARM

When an ALARM is detected, the inverter will not stop its operation. A message will show up on the screen, and it will disappear once the fault condition is cleared.

Fault indicator status	
“FAULT” LED	OFF
Buzzer	OFF
External dry contact	ALARM

No.	LCD Display	Fault code	Fault details
1	DC OVERVOLTAGE	UA102	DC voltage is exceeding normal operation range The inverter move to the stand-by mode.
2	GROUND FAULT	UA119	DC ground fault detected through a ground-fault current (Models with GFDI circuit)
3	LOW TEMP.	UA156	The temperature in the inverter cabinets is low.
4	AMBIENT OT.	UA157	The ambient temperature of the inverter is high. Inverter is under limited operation.
5	GROUND FAULT	UA159	DC ground fault detected through PC/CN voltage. (when the inverter’s grounding system is floating.)
6	GROUND FAULT	UA162	AC ground fault detected through CG voltage. (when the inverter’s grounding system is floating.)
7	SPD ERROR	UA211	Fault (operation) detected in one of the SPDs
8	COOLING FAN 12	UA421	Failure has been detected in the cooling fan located either in inverter cabinet 1 or cabinet 2. The inverter is under limited output operation.
9	COOLING FAN 34	UA422	Failure has been detected in the cooling fan located either in inverter cabinet 3 or cabinet 4. The inverter is under limited output operation.
10	HEX ERROR	UA424	Failure has been detected in the heat exchanger. The inverter is under limited output operation.
11	OPE. PROHIBITION	UA804	The hardware setting of SW1 PCB may be wrong.
12	GRID VOLTAGE RISE	UA808	Grid voltage rise suppression function is operated. Please check some parameter settings of the inverter.
13	DS OPEN	UA824	The DC side load break switch is opened while the system is operating connected to the grid or in stand-by mode

10.6.2. GRID FAULT

When a GRID FAULT is detected, the inverter goes into “Stand by” mode. The inverter will restart automatically once the root cause of the fault is cleared.

Fault indicator status	
“FAULT” LED	Illuminated
Buzzer	Intermittent ring
External dry contact	GRID FAULT

No.	LCD Display	Fault code	Fault details
1	GRID OVERVOLTAGE	UF201	Grid voltage over maximum level during a certain time interval
2	GRID UNDERVOLTAGE	UF202	Grid voltage lower than minimum level for a certain time interval
3	OVER FREQUENCY	UF219	Frequency over maximum level during a certain time interval
4	UNDER FREQUENCY	UF220	Frequency lower than minimum level during a certain time interval
5	VOLT. PHASE JUMP	UF221	Phase jump larger than maximum value detected
6	EXT. GRID FAULT	UF892	External grid fault signal is detected. Please check the input signal settings of IO1 PCB.

10.6.3. MINOR FAULT

When a MINOR FAULT is detected, the inverter goes into “Stand by” mode. The inverter will restart automatically once the root cause of the fault is cleared.

Fault indicator status	
“FAULT” LED	Illuminated
Buzzer	Intermittent ring
External dry contact	MINOR FAULT

No.	LCD Display	Fault code	Fault details
1	CB ON FAILURE	UF052	CB ON command and status do not match
2	DC UNDERVOLTAGE	UF103	DC input voltage lower than minimum level
3	DC UNBALANCE 1	UF115	DC capacitor unbalance level 1
4	DC CURRENT UNBL.	UF116	DC current unbalance between units.
5	CTRL.CIRCUIT ERR.	UF206	Abnormal voltage over 10 sec.
6	SYNCHRONIZ. LOSS	UF207	PLL losses synchronization
7	ACB OVER TEMP.	UF216	The temperature in the ACB cabinet is high.
8	INSTANT. AC OV.	UF217	Short time AC overvoltage
9	SHORT TIME AC UV.	UF218	Short time AC undervoltage
10	AC CURRENT. ERR.	UF253	AC voltage sensor error. Filter capacitor voltage and grid voltage are over 20% deviated for over 0.5s
11	CTRL.POW DC UV.	UF311	Control power supply undervoltage The capacitor backup circuit in the ACB cabinet may have error.
12	INVERTER OC.L	UF404	Output current of inverter unit larger than maximum level
13	IGBT OVER TEMP. 1	UF406	Thermal reed switch in inverter cabinet 1 is operated. It indicates overtemperature in the heatsink
14	IGBT OVER TEMP. 2	UF407	Thermal reed switch in inverter cabinet 2 is operated. It indicates overtemperature in the heatsink
15	IGBT OVER TEMP. 3	UF408	Thermal reed switch in inverter cabinet 3 is operated. It indicates overtemperature in the heatsink
16	IGBT OVER TEMP. 4	UF409	Thermal reed switch in inverter cabinet 4 is operated. It indicates overtemperature in the heatsink

No.	LCD Display	Fault code	Fault details
17	OPEN PHASE	UF802	Open phase or current unbalance has been detected
18	PHASE ROTAT. ERR.	UF803	Negative sequence detected in power grid
19	COMMUNICATION ERR.	UF832	A communication time out occurred
20	EXT. MINOR FAULT	UF891	External minor fault signal is detected. Please check the input signal settings of IO1 PCB.

10.6.4. MAJOR FAULT

When a MAJOR FAULT is detected, the inverter goes into “Stop” mode. The inverter will NOT restart automatically. Please contact your local TMEIC sales or service representative. Do not attempt to restart the inverter yourself.

Fault indicator status	
“FAULT” LED	Illuminated
Buzzer	Continuous ring
External dry contact	MAJOR FAULT

No.	LCD Display	Fault code	Fault details
1	INVERTER ABNORMAL	UF001	The deviation (error) between the current reference and the feedback current is larger than the setting value (Ex:50%).
2	CB OFF FAILURE	UF053	CB OFF command and status do not match
3	DC OVERVOLTAGE	UF101	DC input overvoltage
4	ZERO PHASE OC.	UF110	Zero sequence overcurrent detected in the ac side of the IGBT unit
5	DC CIRCUIT ABNL.	UF112	Abnormal DC voltage
6	DC UNBALANCE2	UF114	DC capacitor unbalance level 2
7	GROUND FAULT	UF120	DC ground fault detected through a ground-fault current (Models with GFDI circuit)
8	CTRL.PWR. ABNL.	UF128	Abnormal voltage in the control circuit
9	GROUND SHORT	UF160	DC ground fault occurred and GDFI fuse (FDG) was melted. (Models with GFDI circuit)
10	HCT FAILURE	UF231	AC side current transducer have error.
11	FLASH MEM DATA ERR	UF300	Failure in the UP1 PCB (Flash memory error)
12	CTRL.CIRCUIT ERR.	UF301	Failure in the UP1 PCB (AD converter error)
13	CTRL.CIRCUIT ERR.	UF302	Failure in the UP1 PCB (FPGA circuit error)
14	CTRL.CIRCUIT ERR.	UF303	Failure in the UP1 PCB Watchdog in FPGA detects a malfunction
15	CTRL.CIRCUIT ERR.	UF305	Failure in the UP1 PCB Clock error in FPGA
16	CTRL.CIRCUIT ERR.	UF306	Control power supply under voltage (UP1 or RY1)
17	INVERTER OC. H	UF402	Output overcurrent

No.	LCD Display	Fault code	Fault details
18	DC OVERCURRENT 1	UF411	DC current lager than maximum value flowing from the PV array to the inverter cabinet 1.
19	DC OVERCURRENT 2	UF412	DC current lager than maximum value flowing from the PV array to the inverter cabinet 2.
20	DC OVERCURRENT 3	UF413	DC current lager than maximum value flowing from the PV array to the inverter cabinet 3.
21	DC OVERCURRENT 4	UF414	DC current lager than maximum value flowing from the PV array to the inverter cabinet 4.
22	DC REV. CURRENT	UF415	DC current lager than maximum value flowing from the inverter to the PV array.
23	DC REV. CURRENT 2	UF416	DC current lager than maximum value flowing from the inverter to the PV array. In short time.
24	DC NEUTRAL OC 1	UF425	Abnormal DC current at neutral point.(Unit 1)
25	DC NEUTRAL OC 2	UF426	Abnormal DC current at neutral point.(Unit 2)
26	DC NEUTRAL OC 3	UF427	Abnormal DC current at neutral point.(Unit 3)
27	DC NEUTRAL OC 4	UF428	Abnormal DC current at neutral point.(Unit 4)
28	EXTERNAL TRIP	UF818	External trip signal is detected. Please check the hardware connection of IO1 PCB.
29	REPEATED FAULT	UF819	The maximum number of restart operations due to a failure in a period of time has been reached
30	INV. OC. L REPEATED	UF820	The maximum number of restart operations due to a failure in a period of time has been reached
31	DS ON FAILURE	UF821	DS ON interlock operated.

11. Maintenance

This inverter was designed, manufactured and tested to achieve the highest reliability and performance in the industry, but in order to keep its designed reliability and performance, the following conditions are very important.

- ☐ Environmental conditions around the inverter should be maintained as specified.
- ☐ Startup and shutdown procedures should be performed correctly.
- ☐ Appropriate maintenances including periodical inspections, should be performed.

If any of the components are found to be deteriorated or damaged, they have to be replaced with new components with the same type and ratings. This is necessary not only to keep the performance and reliability of the inverter, but also to prevent sudden failures or accidents.

11.1. Maintenance recommendations

Observe the following principles when performing maintenance and inspections.

(1) Prepare all necessary documentation and review the tasks to be performed beforehand. Prepare a check sheet to record all the conditions and inspection results for all items.

(2) Stock spare parts for items that will be regularly replaced during maintenance as well as those that have a higher failure probability. Ensure an appropriate number of parts to be stocked.

(3) If an abnormal operation of the inverter due to incorrect operation or failure is detected, record all the pertaining details and quickly investigate the origin of the problem. For questions and inquiries, contact our service center.

In order to determine the maintenance and inspection schedule, it is necessary to take into account the operating conditions, location, environment, aging and/or wearing characteristics, and the possibility of performing maintenance tasks while the system is operating, etc.

It is encouraged to follow the maintenance inspection plan proposed in this chapter and as described in detail below. Some items require qualified personnel certified by TMEIC.
There are three kinds of inspections to be performed

- ■ Periodical Inspection (Performed by customer)
- ■ Annual Inspection (Performed by a qualified personnel certified by TMEIC)
- ■ Detailed Inspection (Performed by a qualified personnel certified by TMEIC)

11.2. Periodical Inspection

Perform the periodical inspections every three months according to the table below. Please note that the table below is only for reference and guidance. Items may vary according to local conditions or practices. When doing inspections, make sure to confirm and observe the safety precautions given in this instruction manual and in any related documentation.

No.	Inspection subject	Inspection point		Judgment criteria
		Inspection item	Inspection method	
1	Surrounding environment	Dust, gas	Visual inspection	Surrounding environment should be clean and free of gases. Clean the surroundings when excess dust and debris are present.
		Temperature, Humidity	Temperature and humidity sensor	-25～50℃, 5～95%
2	Structure and parts	Vibrations, noise	Visual inspection	No abnormal noise from cooling fan. If an abnormal noise is detected, contact customer support.
		Abnormal heating	Touch the inverter cabinet for abnormal heating	If an abnormal condition is detected, contact customer support.
3	Operation status	LCD Display	Visual inspection	No fading characters or legibility problems. No abnormal displays.
4	LED Lamps	RUN LED Lamp	Visual inspection	Displayed information is correct.
		FAULT LED Lamp	Visual inspection	If the fault display (FAULT LED Lamp) is illuminated, check the fault details on the LCD touch panel and perform corrective actions. Contact our Customer support if required.

11.3. Annual Inspection

Annual inspections consist of external inspection and functions inspection as specified below. Please consider this as a reference. Inspected items may change according to local practices. This inspection should be performed by qualified personnel certified by TMEIC.

No.	Inspection subject	Inspection point			Judgment criteria
		Inspection item	Period	Inspection method	
1	External inspection	Damage or corrosion on the outside of the enclosure, loose bolts	1 year	Visual inspection	No damage or corrosion. No loosening of bolts by confirming unbroken torque marks.
2		Damage on external wiring and loose of connections	1 year	Visual inspection	No abnormalities in wiring. No loosening of screws.
3		Noise, vibrations and smell when operating	1 year	Visual inspection	No abnormal noise, abnormal vibrations or smell when operating.
4		Damage on grounding wiring and loose grounding connections	1 year	Visual inspection	No abnormalities in grounding wiring. No loosening of screws.
5	Functional inspections	Operation check	1 year	Inverter operation	Start/Stop functions are working properly and that the inverter status is reflected on the display/LEDs accordingly.
6	Physical Inspections	DC and AC terminals	1 year	Torque check	Check that the DC and AC terminals are tightened at the proper torque value.

11.4. Detailed Inspection

The detailed inspection is divided into appearance check, component inspection and electrical inspection as described in the following Tables. Detailed inspections should be performed by qualified personnel certified by TMEIC. Please consider this as a reference. Items may vary.

1. Appearance Check

No.	Inspection subject	Inspection point			Judgment criterion
		Inspection item	Period	Inspection method	
1-1	External inspection	Cleaning of internal cabinet	5 years	Visual inspection	No damage and minimal dust present.
1-2	Cabinet internal parts	Ambient effect	5 years	Visual inspection	Minimal discoloration and no corrosion on internal parts.
		Dripping of water and other liquids	5 years	Visual inspection	Look for traces of water and liquids. Clean when necessary.

2. Component Inspection

No.	Inspection subject	Inspection point			Judgment criterion
		Inspection item	Period	Inspection method	
2-1	Bleeding resistor (※)	Discoloration, deformation	5 years	Visual inspection	No discoloration or deformation
2-2	DC capacitor	Discoloration, deformation	5 years	Visual inspection	Replace capacitors if discoloration, deformation or leakage is found.
2-3	AC capacitor	Discoloration, deformation	5 years	Visual inspection	Replace capacitors if discoloration or deformation is found
2-4	Transformers and reactor(※)	1) External view, temperature	5 years	Visual inspection. IR gun for thermal measurement	No discoloration due to overheating or burnt smell.
		2) Vibration noise (check with the inverter stopped and with control power only)	5 years	Visual inspection	No abnormal vibration noise
2-5	Main circuit semiconductor device (IGBT)	Discoloration, deformation	5 years	Visual inspection	No discoloration or deformation. This visual inspection can only be done by checking from the sides. Some IGBTs will not be visible.
2-6	Auxiliary circuit breakers, DC load-break switches	1) Deformation, discoloration, loose handles	5 years	Visual inspection	No deformation, discoloration or loose handles
		2) Open-close operation	5 years	Visual inspection	No abnormality when opening and closing.
		4) Operation characteristic	5/10 years	Visual inspection	No abnormal operation
		5) Internal parts	5/10 years	Visual inspection	No deformation, discoloration or damage. Take off the main cover, but do not disconnect the auxiliary components.
2-7	AC circuit breaker, DC load-break switches	Mechanical counter	5/10 years	Visual inspection	Check the number of operations.
2-8	Relays and switches	1) Overheating of coils, discoloration or buzzing	5 years	Visual inspection	No discoloration due to overheating. No, burnt smell or buzzing

No.	Inspection subject	Inspection point			Judgment criterion
		Inspection item	Period	Inspection method	
2-9	PCB	1) Discoloration of components or board	5 years	Visual inspection	No discoloration
		2) Discoloration, deformation or leakage in capacitors	5 years	Visual inspection	No deformation, discoloration or leakage
		3) Soldering degradation	5 years	Visual inspection	No peeling, deterioration, contamination or corrosion
		4) Presence of foreign objects	5 years	Visual inspection	Dust and foreign objects should be removed
2-10	Fuse	Conductivity and discoloration	5 years	Multimeter, visual inspection	No discoloration or disruption (Expected lifetime 10 years)
2-11	Wiring	Discoloration due to heat and corrosion	5 years	Visual inspection	No discoloration or corrosion, Wiring located near resistors should be carefully inspected.
2-12	Tightened element	Tightening of bolts, nuts and screws	5 years	Visual inspection, screwdriver and wrench	No looseness
2-13	Surge protection circuit (SPD)	1) External appearance	5 years	Visual inspection	No discoloration or deformation. Verify indicator is not activated.

3. Electrical Inspection

No.	Inspection subject	Inspection point			Judgment criterion
		Inspection item	Period	Inspection method	
3-1	Control power supply	Output voltage	5 years	DC voltage meter or multi meter	5V power supply within ±2%, other voltage levels within ±3%.
3-2	LCD Display	Each displayed data, accuracy	5 years	Visual inspection, meter, watch	No fading characters or legibility problems. Displayed values should be within ±2% of the specified values. Calibrate the time settings. (Expected lifetime 10 years)

11.5. Parts replacement

It is recommended to replace some of the internal components with new ones to maintain our inverter's designed reliability and performance. Refer to the "Standard inverter parts replacement list" below for the replacement period of the inverter parts.

⚠ CAUTION

Parts replacement intervals may change according to the ambient conditions.

Standard Inverter Parts Replacement List

Part name	Standard replacement period	Applicable Part#
Cooling fan	10 years	FM1～4
Heat exchanger (Power supply unit)	10 years	HEX5, PS1
LCD display	10 years	LCD
Fuses (Main and control circuit)	10 years	FDG, FOU, FOV, FDRU, FDRV FDRW, FP, FN, FC, F-LV1
Control power PWB	15 years	RY1
Gate driver PWB	15 years	GDA1～4
Auxiliary capacitor unit (Electronic type)	15 years	C-BU
AC circuit breaker	10,000 operations	CB

Remarks

1. The above replacement period may change due to environmental conditions (Temperature, surrounding environment, etc)

2. It is recommended to renew this equipment after 12 to 15 years because parts procurement becomes difficult and repairs become costly over time.

3. Although exchange of parts is not generally needed other than the above, other parts may need to be exchanged due to environment conditions.

12. Contact

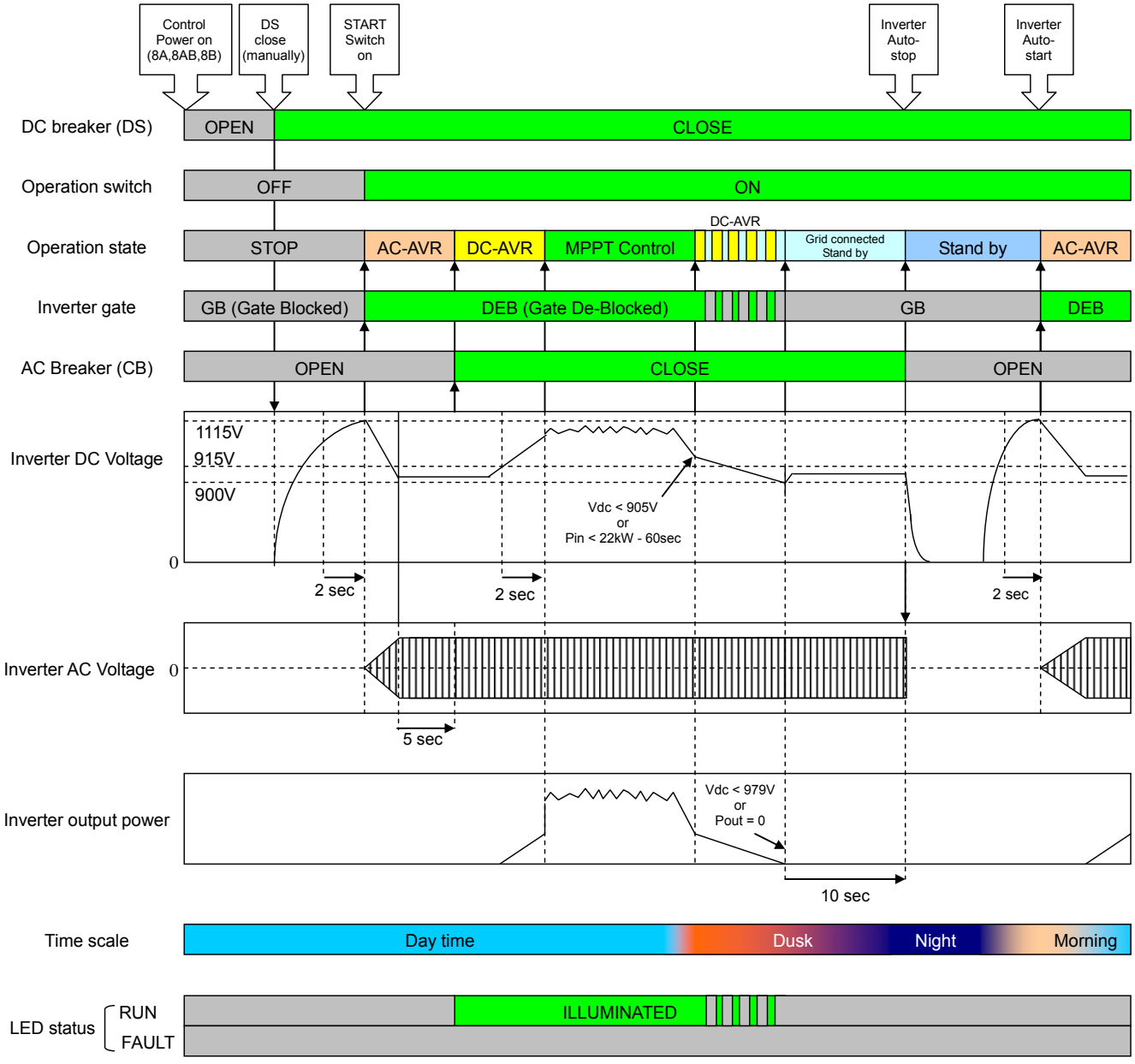
Contact the customer support below for technical inquiry or spare parts information. For technical problems, we require the following information to provide you with the necessary assistance.

- ☐ Product type name
- ☐ Serial number
- ☐ Type and numbers of the PV modules connected
- ☐ For fault diagnosis, FAULT DIAGNOSIS SHEET and the data saved in the memory card

APPENDIX: Timing Charts

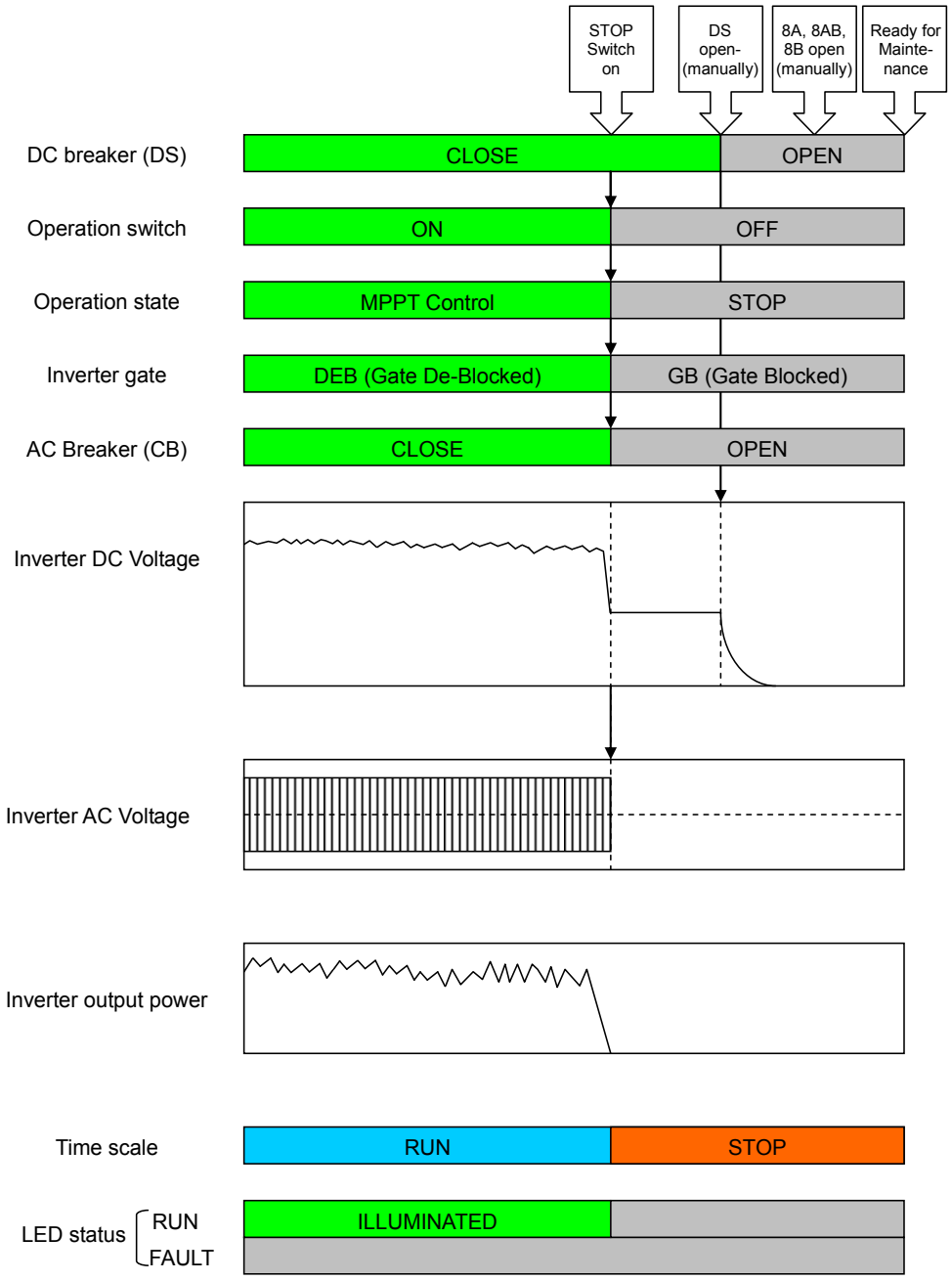
TIMING CHART EXAMPLE 1: Initial startup operation during the daytime

【PVH-L3360GR-GS / PVH-L3360GR-EGS / PVH-L3360GR-E7S】



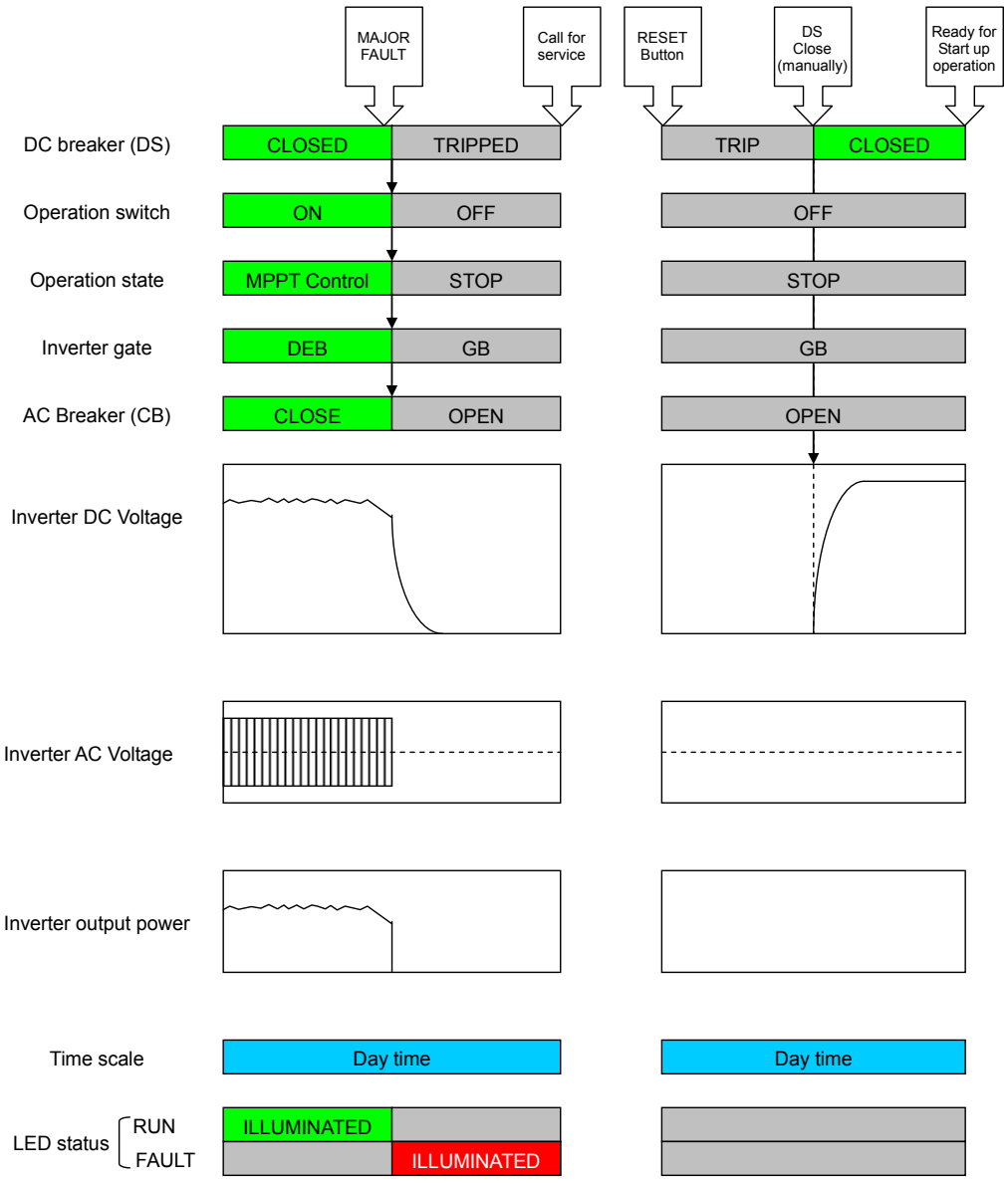
TIMING CHART EXAMPLE 2: Stop operation for maintenance purposes

【PVH-L3360GR-GS / PVH-L3360GR-EGS / PVH-L3360GR-E7S】



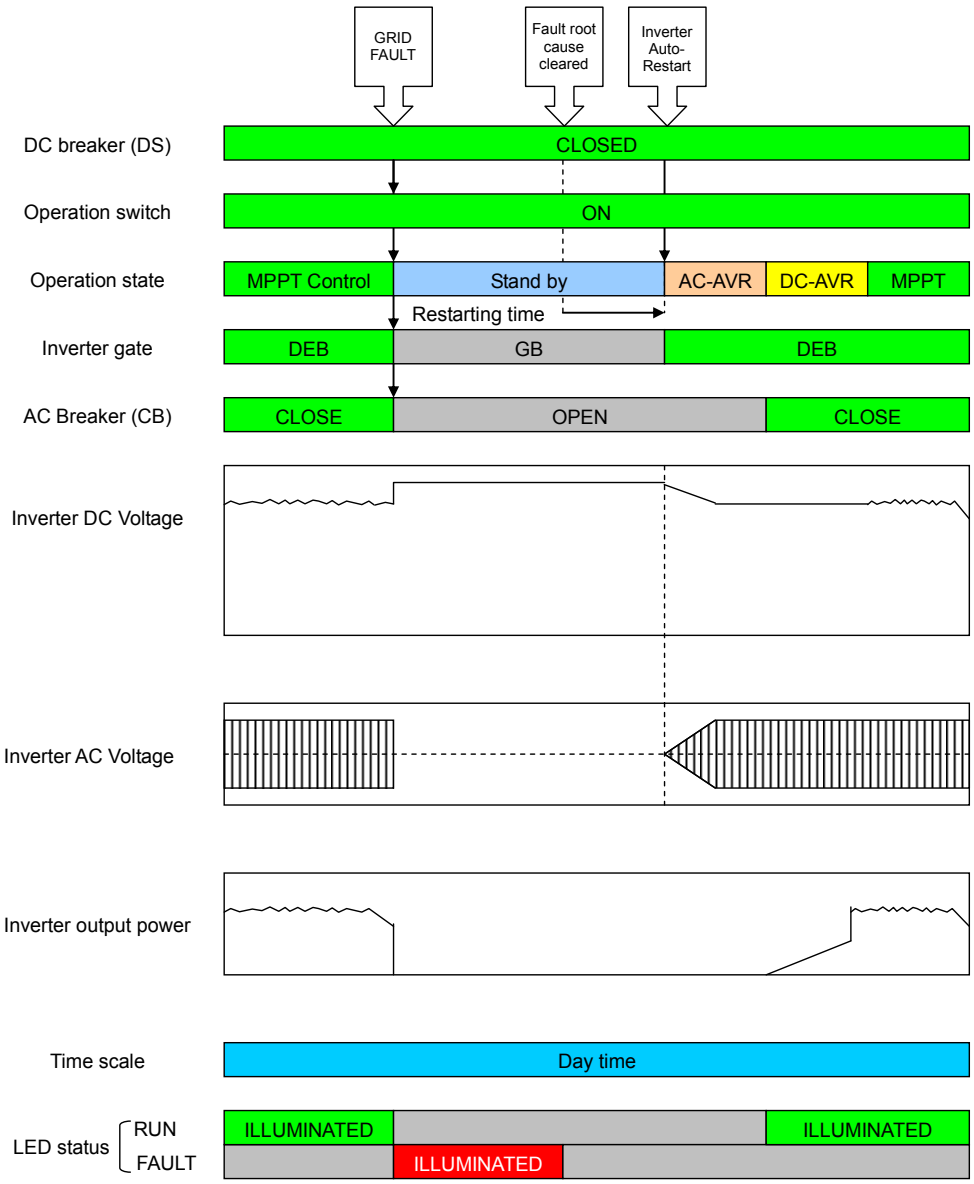
TIMING CHART EXAMPLE 3: Major fault during the day

【PVH-L3360GR-GS / PVH-L3360GR-EGS / PVH-L3360GR-E7S】



TIMING CHART EXAMPLE 4: Restartable fault (Grid fault as an example) during the day

【PVH-L3360GR-GS / PVH-L3360GR-EGS / PVH-L3360GR-E7S】



TOSHIBA MITSUBISHI ELECTRIC INDUSTRIAL SYSTEMS CORPORATION

TM_F50016A

jinkosolar.us

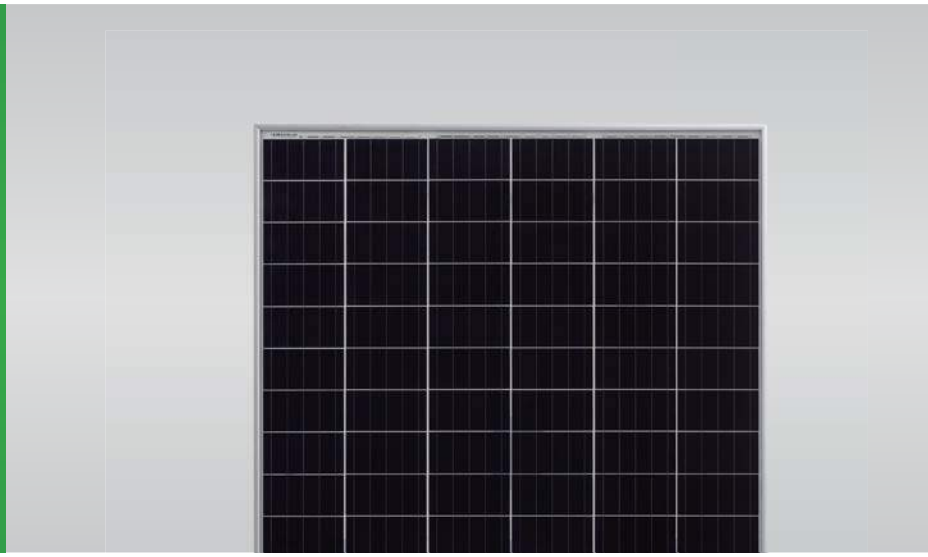
Solar JinKO
Building Your Trust in Solar

Eagle HC 72M G2

380-400 Watt

MONO PERC HALF CELL MODULE

Positive power tolerance of 0~+3%



KEY FEATURES

Diamond Cell Technology
Uniquely designed high performance 5 busbar mono PERC half cell

High Voltage
UL and IEC 1500V certified; lowers BOS costs and yields better LCOE

Higher Module Power
Decrease in current loss yields higher module efficiency

Shade Tolerance
More shade tolerance due to twin arrays

PID FREE
Reinforced cell prevents potential induced degradation

Strength and Durability
Certified for high snow (5400Pa) and wind (2400 Pa) loads

- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- OHSAS18001 Occupational Health & Safety Standards
- IEC61215, IEC61730 certified products
- UL1703 certified products

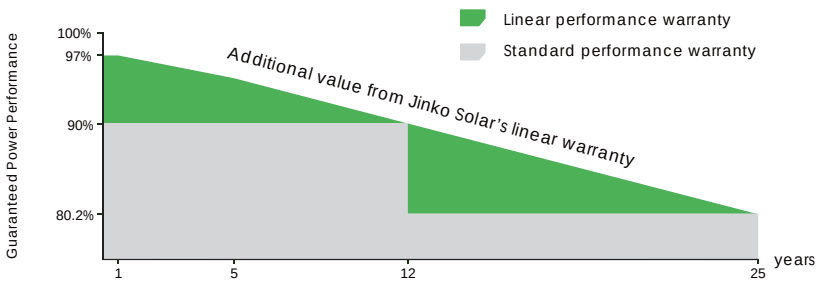
Nomenclature:

JKM400M-72HL-V

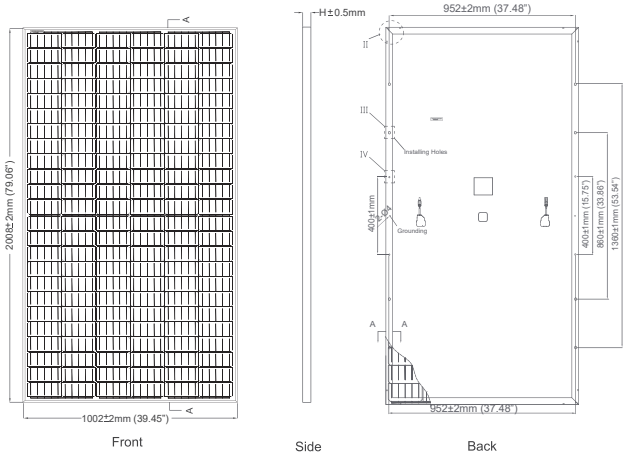
Code	Cell	Code	Cell	Code	Certification
null	Full	null	Normal	null	1000V
H	Half	L	Diamond	V	1500V

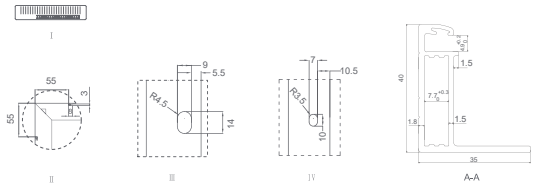
LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty • 25 Year Linear Power Warranty



Engineering Drawings



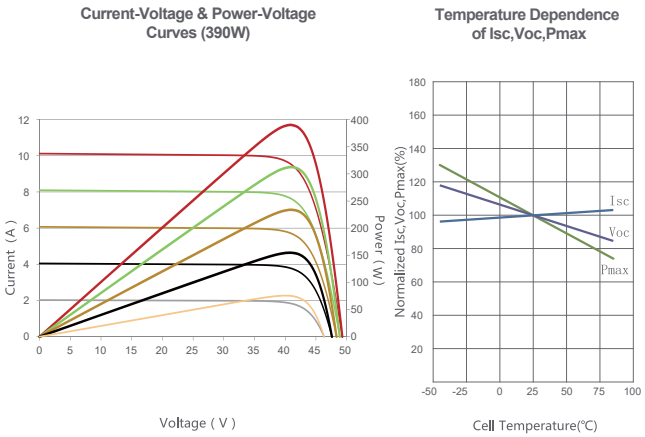


Packaging Configuration

(Two pallets = One stack)

26pcs/pallet, 52pcs/stack, 572pcs/40'HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	Mono PERC Diamond Cell (158.75 x 158.75 mm)
No.of Half-cells	144 (6×24)
Dimensions	2008×1002×40mm (79.06×39.45×1.57 inch)
Weight	22.5 kg (49.6 lbs)
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP67 Rated
Output Cables	12AWG, Anode 1400mm(55.12 in), Cathode 1400mm(55.12 in) or Customized Length
Fire Type	Type 1

SPECIFICATIONS

Module Type	JKM380M-72HL-V		JKM385M-72HL-V		JKM390M-72HL-V		JKM395M-72HL-V		JKM400M-72HL-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	380Wp	286Wp	385Wp	290Wp	390Wp	294Wp	395Wp	298Wp	400Wp	302Wp
Maximum Power Voltage (Vmp)	40.5V	38.6V	40.8V	38.8V	41.1V	39.1V	41.4V	39.3V	41.7V	39.6V
Maximum Power Current (Imp)	9.39A	7.42A	9.44A	7.48A	9.49A	7.54A	9.55A	7.60A	9.60A	7.66A
Open-circuit Voltage (Voc)	48.9V	47.5V	49.1V	47.7V	49.3V	48.0V	49.5V	48.2V	49.8V	48.5V
Short-circuit Current (Isc)	9.75A	7.88A	9.92A	7.95A	10.12A	8.02A	10.23A	8.09A	10.36A	8.16A
Module Efficiency STC (%)	18.89%		19.14%		19.38%		19.63%		19.88%	
Operating Temperature (℃)	-40℃~+85℃									
Maximum System Voltage	1500VDC(UL)/1500VDC(IEC)									
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.36%/℃									
Temperature Coefficients of Voc	-0.28%/℃									
Temperature Coefficients of Isc	0.048%/℃									
Nominal Operating Cell Temperature (NOCT)	45±2℃									

STC: Irradiance 1000W/m² Cell Temperature 25°C AM=1.5

NOCT: Irradiance 800W/m² Ambient Temperature 20°C AM=1.5 Wind Speed 1m/s

* Power measurement tolerance: ± 3%

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

SOLAR FLEX RACK™
A Division of Northern States Metals

Prepared For:

Swinerton Renewable Energy

Tobacco Valley Solar

SFDC ID# 9412

2x13 G3P-X - Structural Calculations
41°54'76.8" N, 72°47'56.4" W Simsbury, CT 06070

Submitted By:

SOLAR FLEX RACK
A Division of Northern States Metals

A product of Northern States Metals (NSM)

3207 Innovation Place, Youngstown, Ohio, 44509-4023

Report By: RC

Reviewed By: NES

STATE OF CONNECTICUT
BRIAN M. FLOOD
29323
LICENSED
PROFESSIONAL ENGINEER

Table of Contents

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	1
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (in/sec^2)	386.4
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

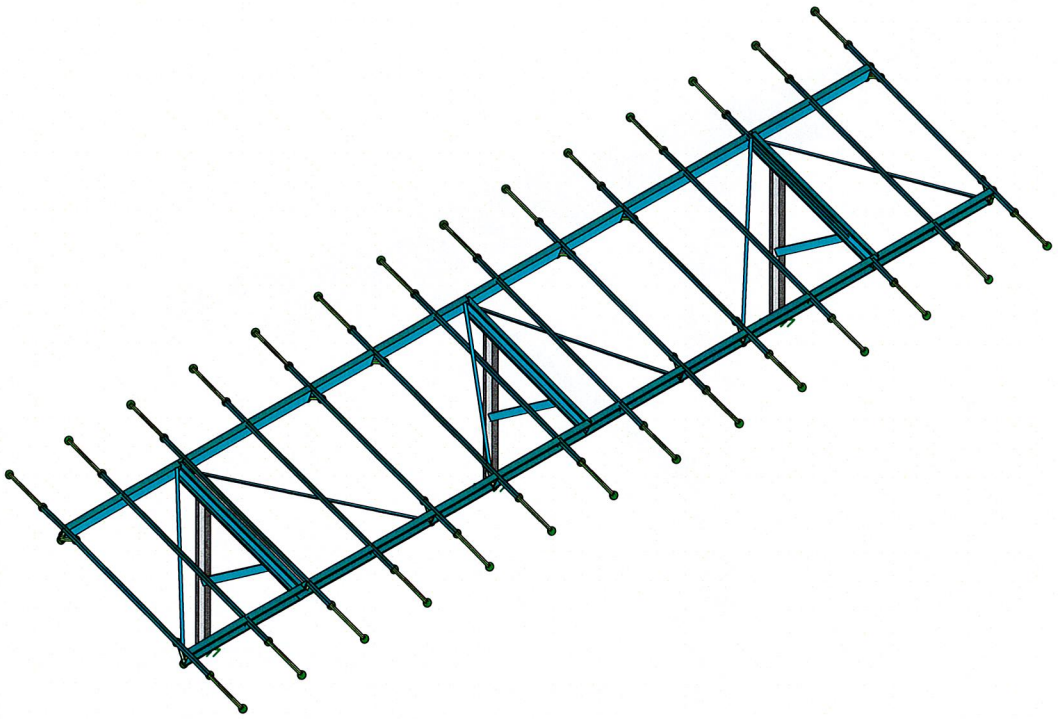
Seismic Code	ASCE 7-10
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	.103
SDS	.19
S1	.065
TL (sec)	6
Risk Cat	I or II
Drift Cat	Other
Om Z	2
Om X	2
Cd Z	2
Cd X	2
Rho Z	2
Rho X	2

Load Combinations

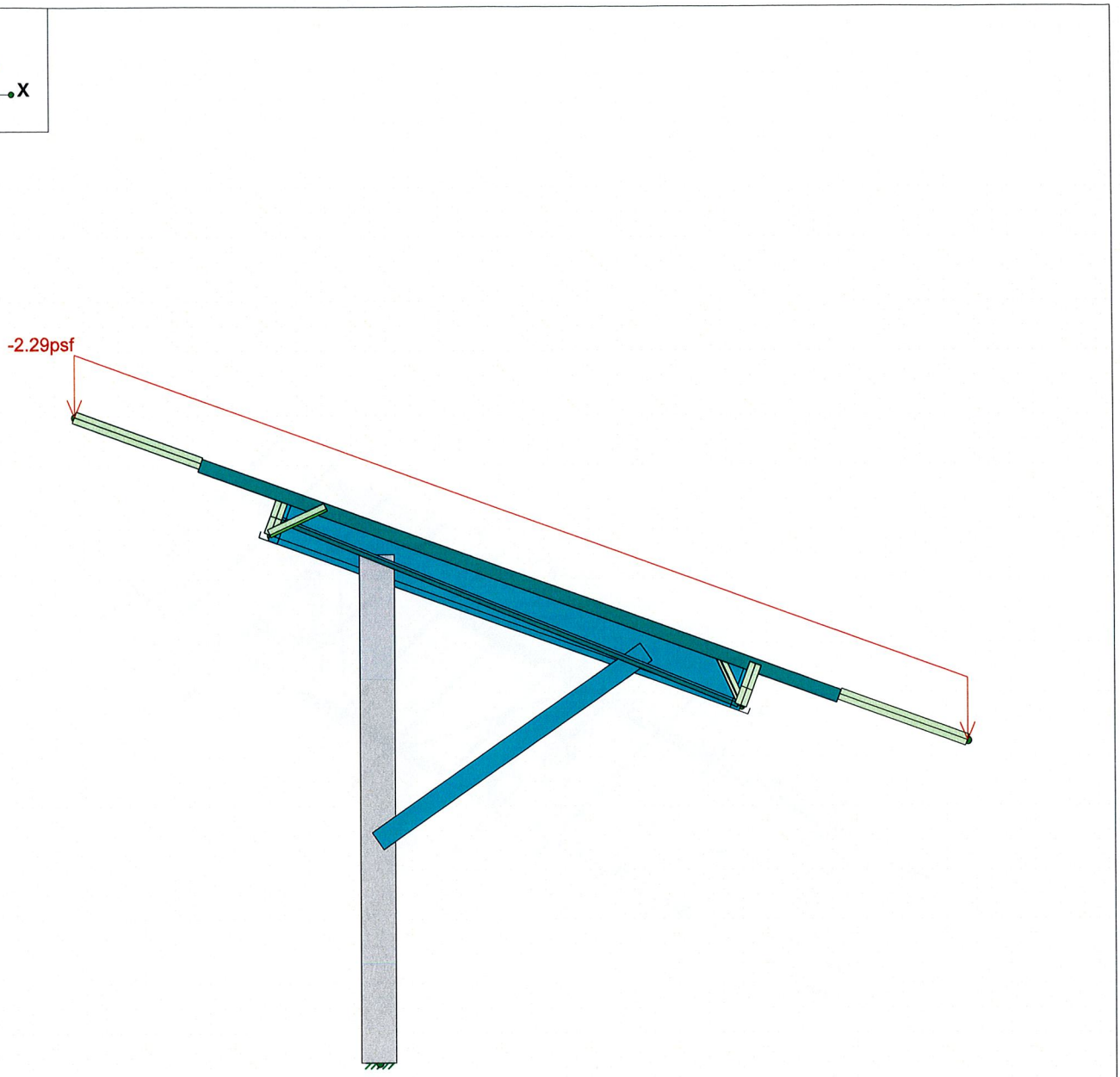
	Description	Solve	PDelta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	IBC 16-8	Yes	Y		DL	1																		
2	IBC 16-10	Yes	Y		DL	1	SL	1																
3	IBC 16-12 (A)	Yes	Y		DL	1	WL+X	.6																
4	IBC 16-12 (B)	Yes	Y		DL	1	WL-X	.6																
5	IBC 16-13 (A)	Yes	Y		DL	1	WL+X	.45	SL	.75	LL	.75												
6	IBC 16-13 (B)	Yes	Y		DL	1	WL-X	.45	SL	.75	LL	.75												
7	IBC 16-15 (A)	Yes	Y		DL	.6	WL+X	.6																
8	IBC 16-15 (B)	Yes	Y		DL	.6	WL-X	.6																
9	Seismic Loads																							
10	IBC 16-12 C (A)	Yes	Y		DL	1	ELX	.7					Sds*DL	.14										
11	IBC 16-12 C (B)	Yes	Y		DL	1	ELX	-.7					Sds*DL	.14										
12	IBC 16-12 (D) (A)	Yes	Y		DL	1	ELZ	.7					Sds*DL	.14										
13	IBC 16-12 (D) (B)	Yes	Y		DL	1	ELZ	-.7					Sds*DL	.14										
14	IBC 16-14 (A) (A)	Yes	Y		DL	1	ELX	.525	SL	.75	LL	.75	Sds*DL	.14										
15	IBC 16-14 (A) (B)	Yes	Y		DL	1	ELX	-.525	SL	.75	LL	.75	Sds*DL	.14										
16	IBC 16-14 (B) (A)	Yes	Y		DL	1	ELZ	.525	SL	.75	LL	.75	Sds*DL	.14										
17	IBC 16-14 (B) (B)	Yes	Y		DL	1	ELZ	-.525	SL	.75	LL	.75	Sds*DL	.14										
18	IBC 16-16 (A) (A)	Yes	Y		DL	.6	ELX	.7					Sds*DL	-.14										
19	IBC 16-16 (A) (B)	Yes	Y		DL	.6	ELX	-.7					Sds*DL	-.14										
20	IBC 16-16 (B) (A)	Yes	Y		DL	.6	ELZ	.7					Sds*DL	-.14										
21	IBC 16-16 (B) (B)	Yes	Y		DL	.6	ELZ	-.7					Sds*DL	-.14										
22	Seismic Overstrength ...																							
23	IBC 16-12 C (A)		Y		DL	1	Om*ELX	.7					Sds*DL	.14										
24	IBC 16-12 C (B)		Y		DL	1	Om*ELX	-.7					Sds*DL	.14										
25	IBC 16-12 (D) (A)		Y		DL	1	Om*ELZ	.7					Sds*DL	.14										
26	IBC 16-12 (D) (B)		Y		DL	1	Om*ELZ	-.7					Sds*DL	.14										
27	IBC 16-14 (A) (A)		Y		DL	1	Om*ELX	.525	SL	.75	LL	.75	Sds*DL	.14										
28	IBC 16-14 (A) (B)		Y		DL	1	Om*ELX	-.525	SL	.75	LL	.75	Sds*DL	.14										
29	IBC 16-14 (B) (A)		Y		DL	1	Om*ELZ	.525	SL	.75	LL	.75	Sds*DL	.14										
30	IBC 16-14 (B) (B)		Y		DL	1	Om*ELZ	-.525	SL	.75	LL	.75	Sds*DL	.14										
31	IBC 16-16 (A) (A)		Y		DL	.6	Om*ELX	.7					Sds*DL	-.14										
32	IBC 16-16 (A) (B)		Y		DL	.6	Om*ELX	-.7					Sds*DL	-.14										
33	IBC 16-16 (B) (A)		Y		DL	.6	Om*ELZ	.7					Sds*DL	-.14										
34	IBC 16-16 (B) (B)		Y		DL	.6	Om*ELZ	-.7					Sds*DL	-.14										
35	Ice Loads																							
36	IBC 16-9		Y		DL	1	OL1	.7																
37	IBC 16-10 (c)		Y		DL	1	OL1	.7	OL2	.7	SL	1												
38	IBC 16-10 (d)		Y		DL	1	OL1	.7	OL3	.7	SL	1												
39	IBC 16-14 (c)		Y		DL	.6	OL1	.7	OL2	.7														

Load Combinations (Continued)

	Description	Solve	PDelta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
40	IBC 16-14 (d)		Y		DL	.6	OL1	.7	OL3	.7														
41	Reactions																							
42	DEAD		Y		DL	1																		
43	SNOW		Y		SL	1																		
44	WIND + x		Y		WL+X	1																		
45	WIND-X		Y		WL-X	1																		

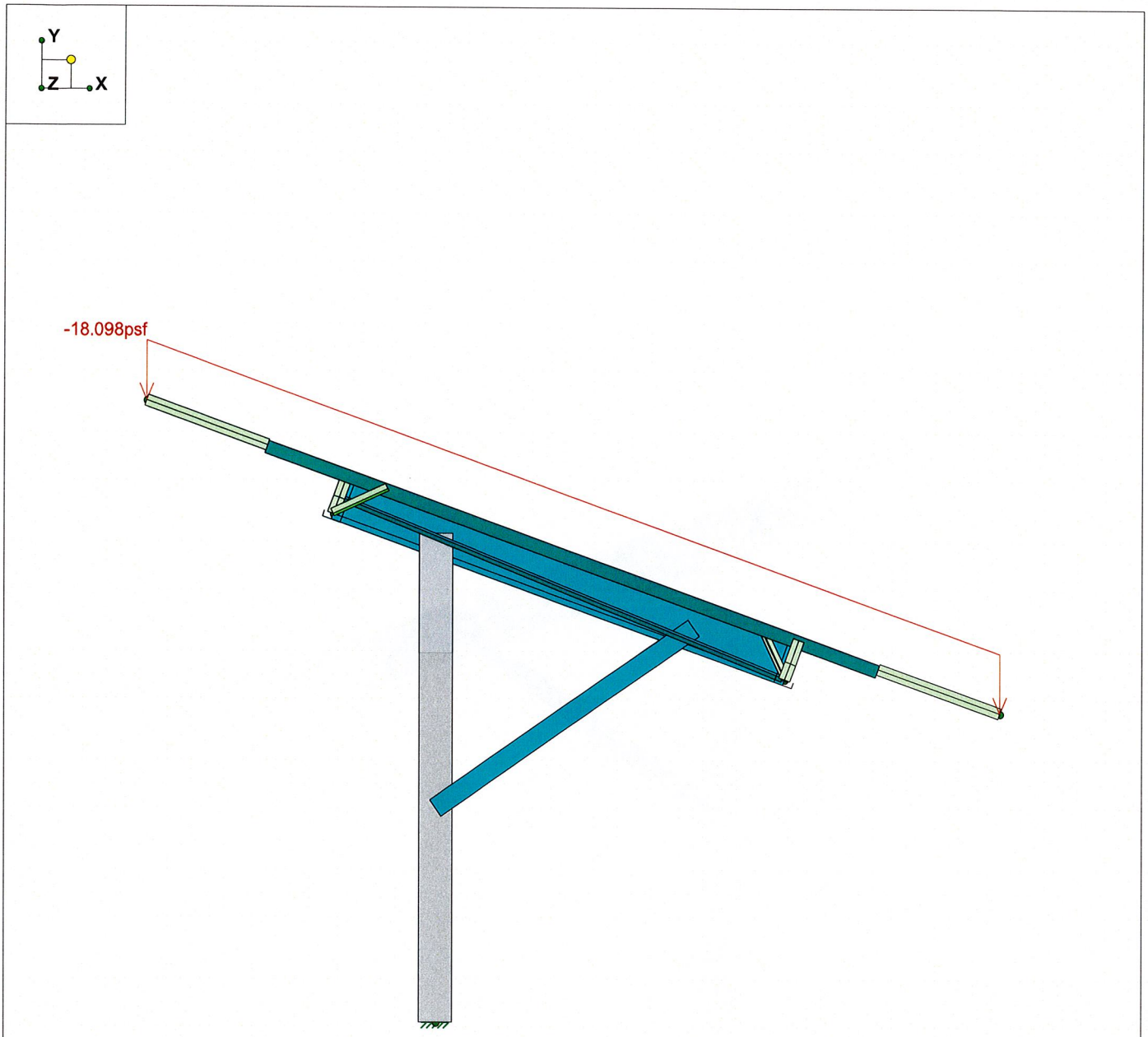


Northern States Metals		SK - 1
NES	Swinerton	Apr 9, 2019 at 9:37 AM
9412	Isometric View	19-0319 2x13 G3P-X Jinko 395W



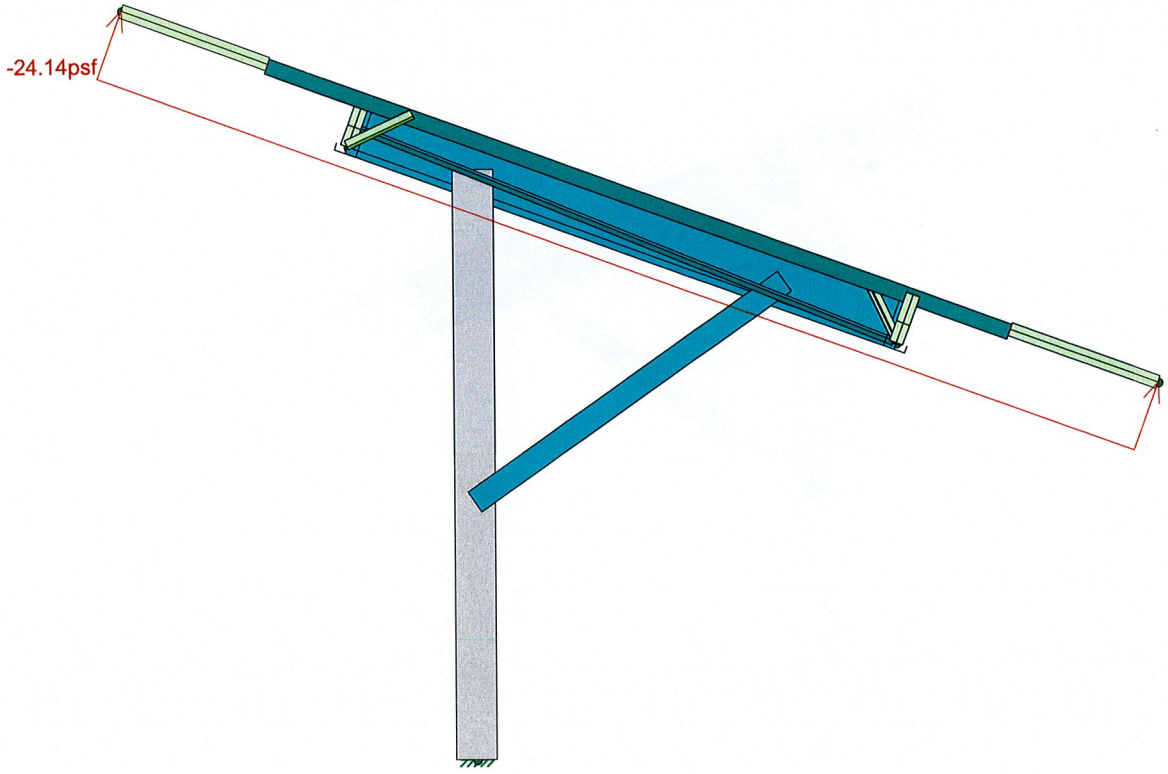
Loads: BLC 2, Solar Panels

Northern States Metals		SK - 2
NES	Swinerton	Apr 9, 2019 at 9:38 AM
9412	Solar Panel Dead Load	19-0319 2x13 G3P-X Jinko 395W



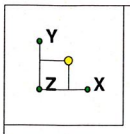
Loads: BLC 3, Snow

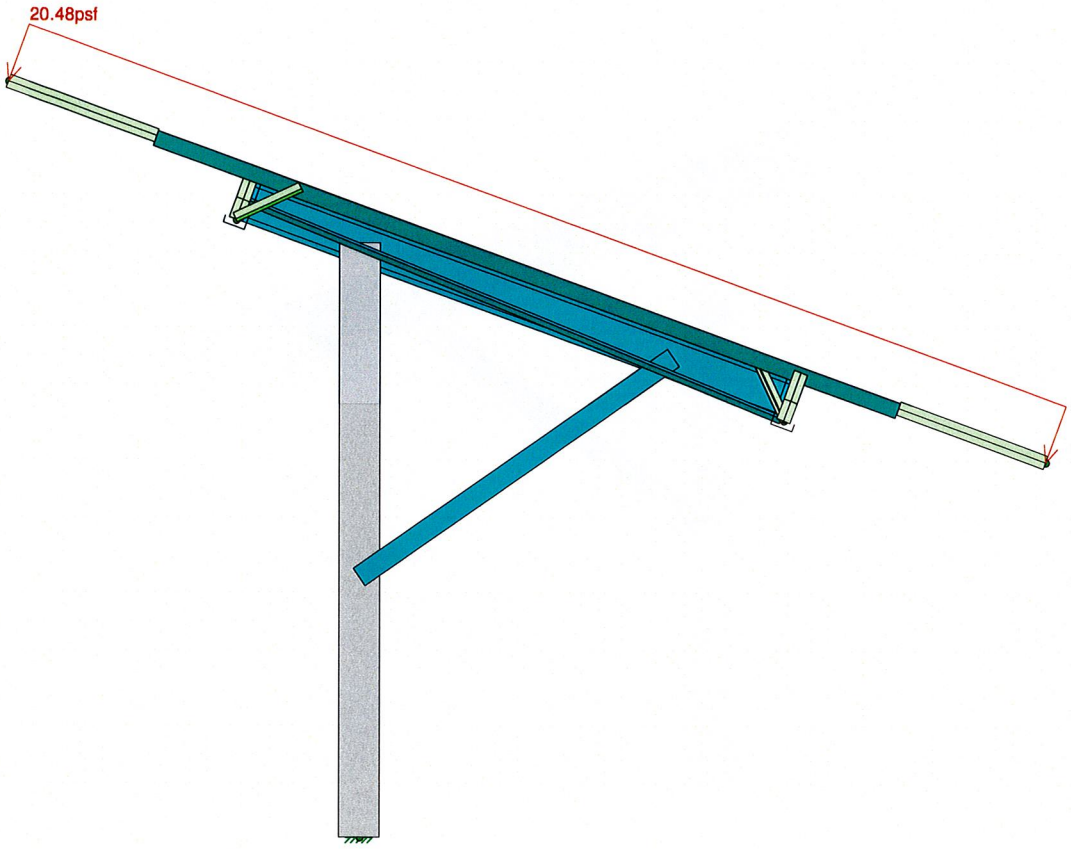
Northern States Metals		SK - 3
NES	Swinerton	Apr 9, 2019 at 9:39 AM
9412	Projected Snow Load	19-0319 2x13 G3P-X Jinko 395W



Loads: BLC 6, Wind +X

Northern States Metals	Swinerton	SK - 4
NES		Apr 9, 2019 at 9:40 AM
9412	Uplift Wind Load	19-0319 2x13 G3P-X Jinko 395W



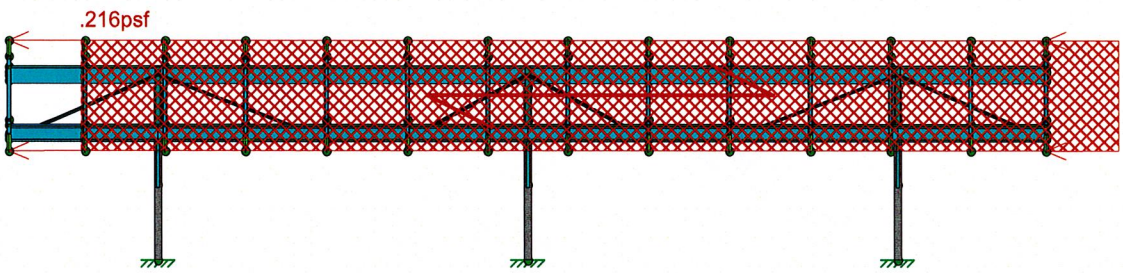


Loads: BLC 7, Wind -X
Envelope Only Solution

Northern States Metals		SK - 5
NES	Swinterton	Apr 11, 2019 at 9:55 AM
9370	Downward Wind Load	19-0403 2x13 G3P-X Jinko 395W.r...

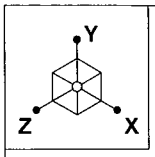
Loads: BLC 4, Seismic X

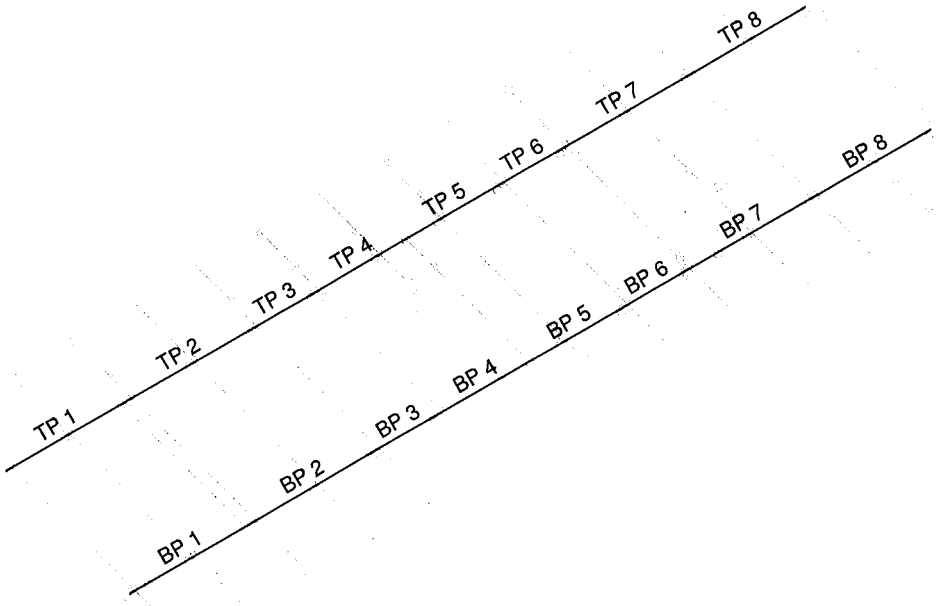
Northern States Metals		SK - 6
NES	Swinerton	Apr 9, 2019 at 9:42 AM
9412	Seismic ELX Load	19-0319 2x13 G3P-X Jinko 395W



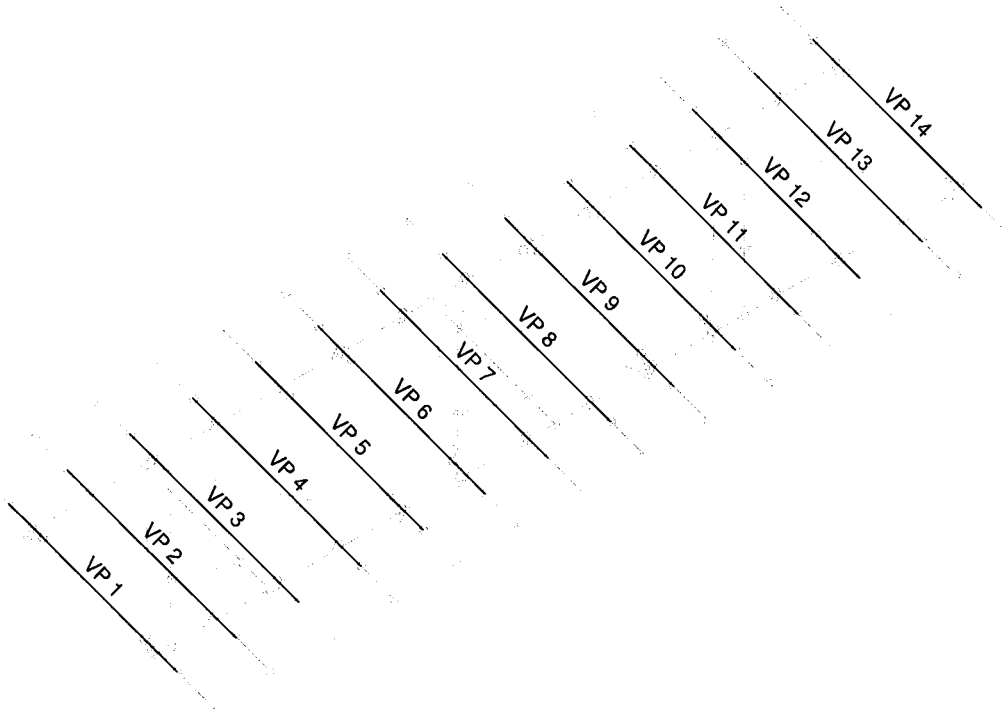
Loads: BLC 5, Seismic Z

Northern States Metals		SK - 7
NES	Swinerton	Apr 9, 2019 at 9:43 AM
9412	Seismic ELZ Load	19-0319 2x13 G3P-X Jinko 395W





Northern States Metals		SK - 8
NES	Swinerton	Apr 9, 2019 at 9:45 AM
9412	Horizontal Naming Scheme	19-0319 2x13 G3P-X Jinko 395W



Northern States Metals		SK - 9
NES	Swinerton	Apr 9, 2019 at 9:46 AM
9412	Vertical Naming Scheme	19-0319 2x13 G3P-X Jinko 395W

Envelope AISI S100-12: ASD Cold Formed Steel Code Checks

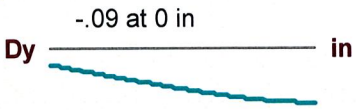
	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pn/Om[k]	Tn/Om[k]	Mnyy/Om[k-in]	Mnzz/Om[k-in]	Cb	Cmyy	Cmzz	Eqn
1	TP 5	HRZ - 8x3.25x0.055x0...	SEE CFS	0	6	.640	0	y	6	7.505	25.674	13.866	40.003	1	.85	.85	C5.2.1...
2	TP 4	HRZ - 8x3.25x0.055x0...	SEE CFS	59.805	6	.640	59.805	y	6	7.505	25.674	13.866	40.003	1	.85	.85	C5.2.1...
3	TP 7	HRZ - 8x3.25x0.055x0...	SEE CFS	83.325	6	.845	83.325	y	6	7.505	25.674	13.866	40.191	1	.85	.85	C5.2.1...
4	TP 2	HRZ - 8x3.25x0.055x0...	SEE CFS	0	6	.845	0	y	6	7.505	25.674	13.866	40.191	1	.85	.85	C5.2.1...
5	TP 8	HRZ - 8x3.25x0.055x0...	SEE CFS	0	6	.417	0	y	6	7.505	25.674	13.866	40.221	1	.85	.85	C5.1.1...
6	TP 1	HRZ - 8x3.25x0.055x0...	SEE CFS	73.765	6	.417	73.765	y	6	7.505	25.674	13.866	40.221	1	.85	.85	C5.1.1...
7	BP 7	HRZ - 8x3.25x0.055x0...	SEE CFS	83.325	6	.797	83.325	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C3.3.1...
8	BP 2	HRZ - 8x3.25x0.055x0...	SEE CFS	0	6	.797	0	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C3.3.1...
9	VP 4	V - HU - 2.25x0.045x1...	SEE CFS	15.392	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
10	VP 11	V - HU - 2.25x0.045x1...	SEE CFS	15.392	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
11	BP 4	HRZ - 8x3.25x0.055x0...	SEE CFS	59.805	6	.672	39.87	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C3.3.1...
12	BP 5	HRZ - 8x3.25x0.055x0...	SEE CFS	0	6	.672	19.935	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C3.3.1...
13	TILT 2	TILT - 6x2.5x0.074x0.75	.987	17.5	6	.402	66.5	y	6	10.852	31.137	14.563	47.352	1	.6	1	C5.2.1...
14	VP 10	V - HU - 2.25x0.045x1...	.964	22.496	2	.190	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
15	VP 5	V - HU - 2.25x0.045x1...	.964	22.496	2	.190	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
16	BP 1	HRZ - 8x3.25x0.055x0...	.963	73.765	6	.430	73.765	y	6	7.505	25.674	15.537	47.103	1	.85	.85	C5.2.1...
17	BP 8	HRZ - 8x3.25x0.055x0...	.963	0	6	.430	0	y	6	7.505	25.674	15.537	47.105	1	.85	.85	C5.2.1...
18	TILT 1	TILT - 6x2.5x0.074x0.75	.919	17.5	6	.369	66.5	y	6	10.852	31.137	14.563	47.325	1	.6	1	C5.2.1...
19	TILT 3	TILT - 6x2.5x0.074x0.75	.919	17.5	6	.369	66.5	y	6	10.852	31.137	15.297	47.329	1	.6	1	C5.2.1...
20	VP 8	V - HU - 2.25x0.045x1...	.915	15.392	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.1.1...
21	VP 7	V - HU - 2.25x0.045x1...	.915	15.392	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.1.1...
22	VP 2	V - HU - 2.25x0.045x1...	.903	15.392	6	.089	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
23	VP 13	V - HU - 2.25x0.045x1...	.903	15.392	6	.089	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
24	VP 9	V - HU - 2.25x0.045x1...	.868	22.496	2	.180	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
25	VP 6	V - HU - 2.25x0.045x1...	.868	22.496	2	.180	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
26	VP 12	V - HU - 2.25x0.045x1...	.852	99.455	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
27	VP 3	V - HU - 2.25x0.045x1...	.852	99.455	6	.092	15.392	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
28	FRONT BRAC...	FB - 3x1.75x0.070x0.5	.567	28.679	6	.002	0	y	12	5.609	14.43	4.722	12.31	1	.6	1	C5.2.1...
29	VP 1	V - HU - 2.25x0.045x1...	.554	22.496	6	.095	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
30	VP 14	V - HU - 2.25x0.045x1...	.554	22.496	6	.095	21.312	z	6	.788	10.333	5.784	2.929	1	.85	.6	C5.2.1...
31	BP 6	HRZ - 8x3.25x0.055x0...	.521	39.87	6	.085	0	y	6	7.505	25.674	13.866	41.85	1	.85	.85	C5.1.1...
32	BP 3	HRZ - 8x3.25x0.055x0...	.521	0	6	.085	39.87	y	6	7.505	25.674	13.866	41.851	1	.85	.85	C5.1.1...
33	FRONT BRAC...	FB - 3x1.75x0.070x0.5	.520	28.679	6	.002	0	y	16	5.609	14.43	4.722	12.31	1	.6	1	C5.2.1...
34	FRONT BRAC...	FB - 3x1.75x0.070x0.5	.520	28.679	6	.002	0	y	17	5.609	14.43	4.722	12.31	1	.6	1	C5.2.1...
35	TP 6	HRZ - 8x3.25x0.055x0...	.500	39.87	6	.079	0	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C5.2.1...
36	TP 3	HRZ - 8x3.25x0.055x0...	.500	0	6	.079	39.87	y	6	7.505	25.674	15.537	48.132	1	.85	.85	C5.2.1...
37	HZRBRACE 5	HORIZ. BRACING	.084	0	2	.004	118.355	z	2	.106	5.868	1.353	2.519	1	.85	.402	C5.1.1...
38	HZRBRACE 2	HORIZ. BRACING	.084	0	2	.004	118.356	z	2	.106	5.868	1.353	2.519	1	.85	.402	C5.1.1...
39	HZRBRACE 4	HORIZ. BRACING	.063	0	2	.004	103.159	z	2	.14	5.868	1.353	2.519	1	.85	.373	C5.1.1...

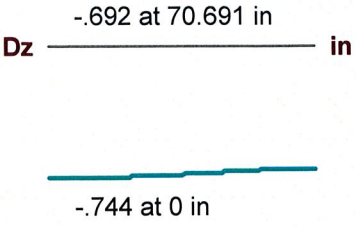
Envelope AISI S100-12: ASD Cold Formed Steel Code Checks (Continued)

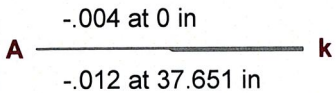
	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pn/Om[k]	Tn/Om[k]	Mnyy/Om[k-in]	Mnzz/Om[k-in]	Cb	Cmyy	Cmzz	Eqn
40	HZRBRACE 3	HORIZ. BRACING	.063	0	2	.004	103.158	z	2	.14	5.868	1.353	2.519	1	.85	.373	C5.1.1...
41	HZRBRACE 1	HORIZ. BRACING	.043	111.831	2	.004	0	z	4	.119	5.868	1.353	2.519	1	.85	.251	C5.1.1...
42	HZRBRACE 6	HORIZ. BRACING	.043	111.831	2	.004	0	z	4	.119	5.868	1.353	2.519	1	.85	.251	C5.1.1...

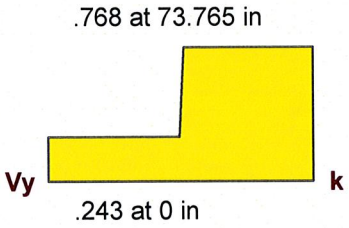
Beam: ***TP 1&8 by Symmetry***

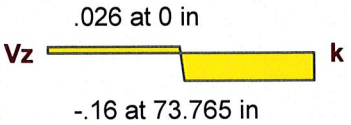
Shape: **HRZ - 8x3.25x0.055x0.75**
Material: **A653 SS Gr. 50**
Length: **73.765 in**
I Joint: **N5**
J Joint: **N1**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

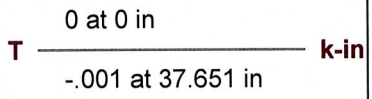


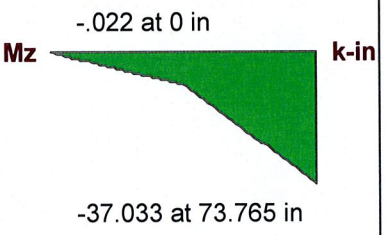


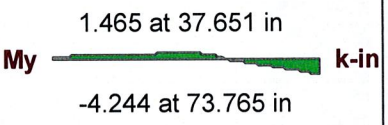


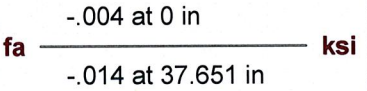


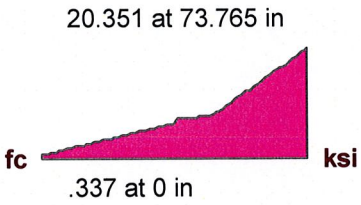


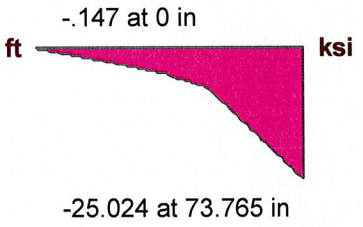












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.417 (y)**	Max Defl Ratio	**L/2268**
Location	**73.765 in**	Location	**73.765 in**	Location	**46.872 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.85**
Lb	**74 in**	**74 in**
KL/r	**62.311**	**23.204**

L Comp Flange	**74 in**
L-torque	**73.765 in**

RIB STIFFENER NOT INCLUDED IN RISA ANALYSIS.

Section: CS 8 x 3.25 x 0.055 x 0.75 Ribs.sct NSM
Channel 8x3.25x0.75-16 Gage Northern States Metals Co.

Rev. Date: 4/10/2019 9:29:24 AM
By: NSM
Printed: 4/10/2019 9:30:43 AM

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 55, Fy=55 ksi
Design Parameters:

Lx	6.167 ft	Ly	6.167 ft	Lt	6.167 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.8500	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	-0.012	-37.033	0.768	-4.244	-0.160
Applied	-0.012	-37.033	0.768	-4.244	-0.160
Strength	30.745	54.653	5.999	16.609	6.678

Effective section properties at applied loads:

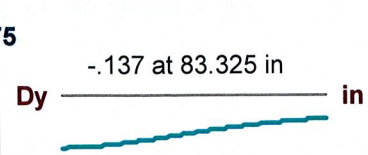
Ae	0.86920 in^2	Ixe	8.6074 in^4	Iye	1.1768 in^4
		Sxe(t)	2.1891 in^3	Sye(l)	1.2832 in^3
		Sxe(b)	2.1159 in^3	Sye(r)	0.5044 in^3

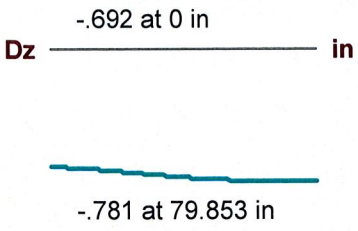
Interaction Equations

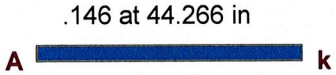
NAS Eq. C5.1.1-1	(Mx, My, T)	0.509 + 0.245 + 0.000 = 0.755 <= 1.0
NAS Eq. C5.1.1-2	(Mx, My, T)	0.678 + 0.256 - 0.000 = 0.933 <= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.422 + 0.016)= 0.662 <= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.065 + 0.001)= 0.257 <= 1.0

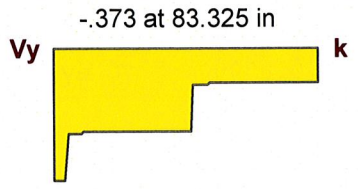
Beam: ***TP 2&7 by Symmetry***

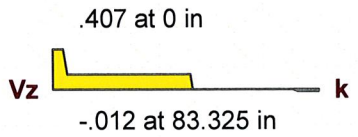
Shape: **HRZ - 8x3.25x0.055x0.75**
Material: **A653 SS Gr. 50**
Length: **83.325 in**
I Joint: **N1**
J Joint: **N36**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

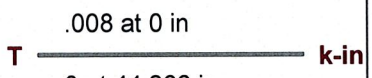


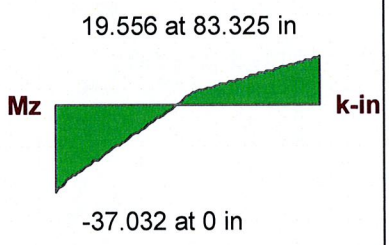


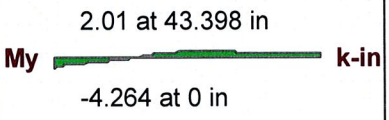


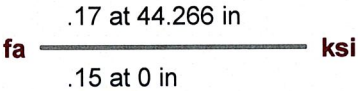


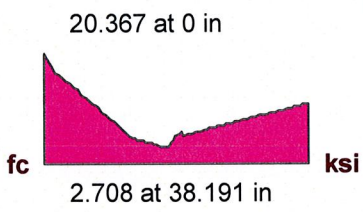


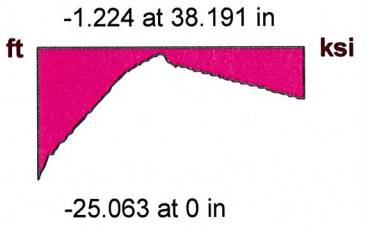












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.845 (y)**	Max Defl Ratio	**L/6330**
Location	**0 in**	Location	**0 in**	Location	**16.491 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.85**
Lb	**83 in**	**183 in**
KL/r	**69.89**	**57.384**

L Comp Flange	**83 in**
L-torque	**83.325 in**

RIB STIFFENER NOT INCLUDED IN RISA ANALYSIS.

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 55, Fy=55 ksi
Design Parameters:

Lx	15.250 ft	Ly	6.917 ft	Lt	6.917 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.8500	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	0.128	-37.032	-1.440	-4.264	0.407
Applied	0.128	-37.032	-1.440	-4.264	0.407
Strength	10.635	52.758	5.999	16.609	6.678

Effective section properties at applied loads:

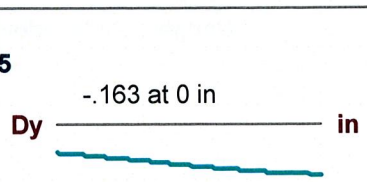
Ae	0.86854 in^2	Ixe	8.5973 in^4	Iye	1.1755 in^4
		Sxe(t)	2.1882 in^3	Sye(l)	1.2832 in^3
		Sxe(b)	2.1118 in^3	Sye(r)	0.5037 in^3

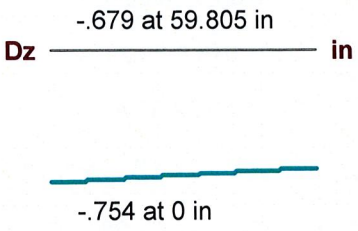
Interaction Equations

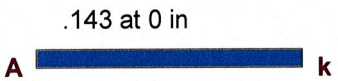
NAS Eq. C5.2.1-1	(P, Mx, My)	0.012 + 0.598 + 0.219 = 0.830 <= 1.0
NAS Eq. C5.2.1-2	(P, Mx, My)	0.008 + 0.702 + 0.257 = 0.967 <= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.422 + 0.058)= 0.693 <= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.066 + 0.004)= 0.264 <= 1.0

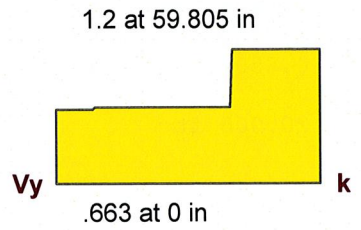
Beam: ***TP 4&5 by Symmetry***

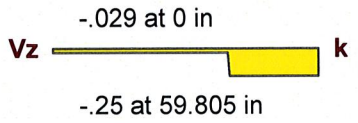
Shape: **HRZ - 8x3.25x0.055x0.75**
Material: **A653 Gr. 55**
Length: **59.805 in**
I Joint: **N118A**
J Joint: **N141**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

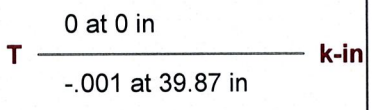


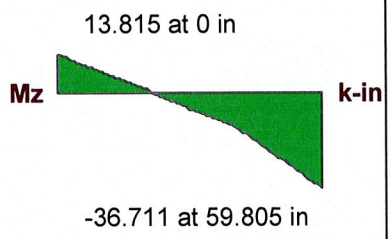


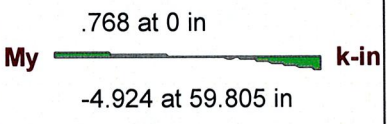


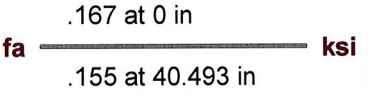


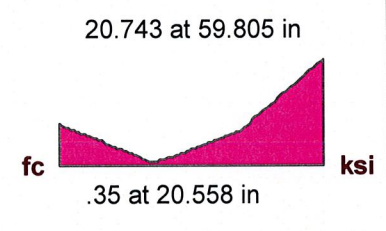


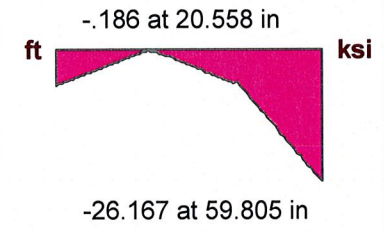












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.640 (y)**	Max Defl Ratio	**L/4540**
Location	**59.805 in**	Location	**59.805 in**	Location	**42.362 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.85**
Lb	**60 in**	**183 in**
KL/r	**50.523**	**57.384**

L Comp Flange **60 in**
L-torque **59.805 in**

RIB STIFFENER NOT INCLUDED IN RISA ANALYSIS.

Section: CS 8 x 3.25 x 0.055 x 0.75 Ribs.sct NSM
Channel 8x3.25x0.75-16 Gage Northern States Metals Co.

Rev. Date: 4/10/2019 9:29:24 AM
By: NSM
Printed: 4/10/2019 9:35:51 AM

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 55, Fy=55 ksi
Design Parameters:

Lx	15.250 ft	Ly	5.000 ft	Lt	5.000 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.8500	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	0.133	-36.711	1.200	-4.924	-0.250
Applied	0.133	-36.711	1.200	-4.924	-0.250
Strength	12.142	56.978	5.999	16.609	6.678

Effective section properties at applied loads:

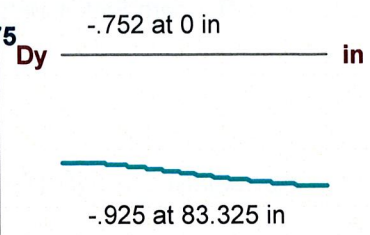
Ae	0.86746 in^2	Ixe	8.5806 in^4	Iye	1.1734 in^4
		Sxe(t)	2.1867 in^3	Sye(l)	1.2832 in^3
		Sxe(b)	2.1052 in^3	Sye(r)	0.5024 in^3

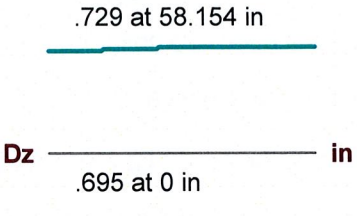
Interaction Equations

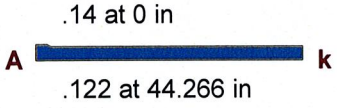
NAS Eq. C5.2.1-1	(P, Mx, My)	0.011 + 0.549 + 0.253 = 0.813	<= 1.0
NAS Eq. C5.2.1-2	(P, Mx, My)	0.009 + 0.644 + 0.296 = 0.949	<= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.415 + 0.040)= 0.675	<= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.088 + 0.001)= 0.299	<= 1.0

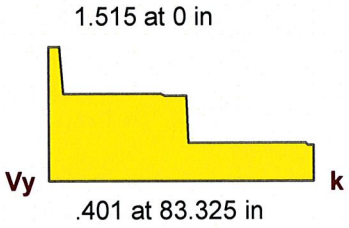
Beam: ***BP 2&7 by Symmetry***

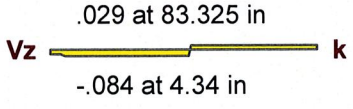
Shape: **HRZ - 8x3.25x0.055x0.75**
Material: **A653 Gr. 55**
Length: **83.325 in**
I Joint: **N2**
J Joint: **N35**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

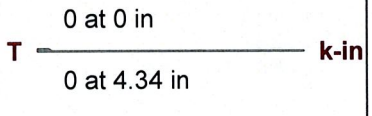


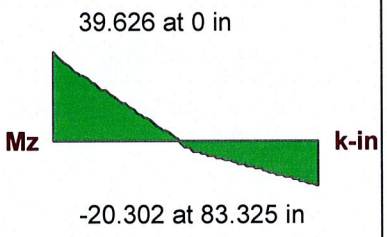


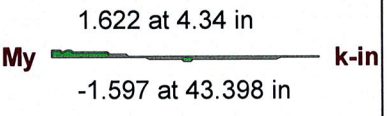


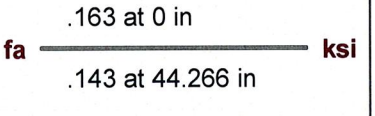


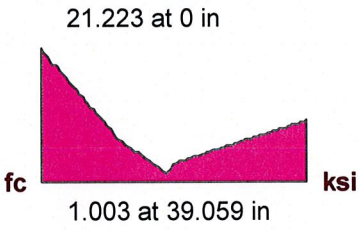


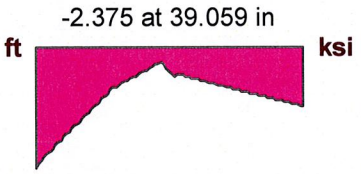












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.797 (y)**	Max Defl Ratio	**L/5519**
Location	**0 in**	Location	**0 in**	Location	**17.359 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.85**
Lb	**83 in**	**183 in**
KL/r	**69.89**	**57.384**

L Comp Flange	**83 in**
L-torque	**83.325 in**

RIB STIFFENER NOT INCLUDED IN RISA ANALYSIS.

Rev. Date: 4/10/2019 9:29:24 AM
By: NSM
Printed: 4/10/2019 9:38:14 AM

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 55, Fy=55 ksi
Design Parameters:

Lx	15.250 ft	Ly	6.917 ft	Lt	6.917 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.8500	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	0.140	39.626	1.515	1.609	-0.050
Applied	0.140	39.626	1.515	1.609	-0.050
Strength	10.635	52.758	5.999	16.528	6.678

Effective section properties at applied loads:

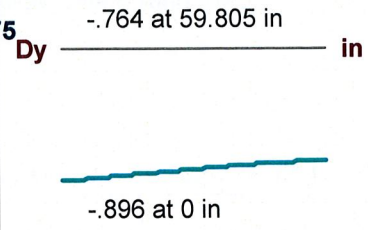
Ae	0.86317 in^2	Ixe	8.5139 in^4	Iye	1.1648 in^4
		Sxe(t)	2.0789 in^3	Sye(l)	1.2830 in^3
		Sxe(b)	2.1805 in^3	Sye(r)	0.4973 in^3

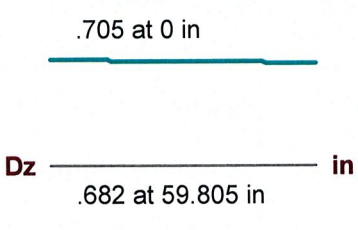
Interaction Equations

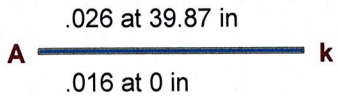
NAS Eq. C5.2.1-1	(P, Mx, My)	0.013 + 0.641 + 0.083 = 0.737	<= 1.0
NAS Eq. C5.2.1-2	(P, Mx, My)	0.009 + 0.751 + 0.097 = 0.857	<= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.484 + 0.064)= 0.740	<= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.009 + 0.000)= 0.096	<= 1.0

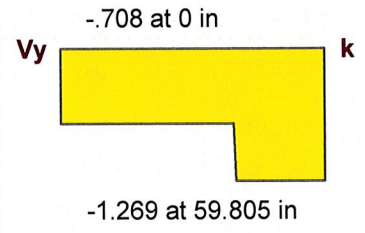
Beam: ***BP 4&5 by Symmetry***

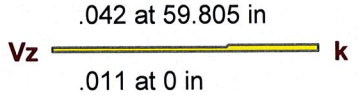
Shape: **HRZ - 8x3.25x0.055x0.75**
Material: **A653 Gr. 55**
Length: **59.805 in**
I Joint: **N117A**
J Joint: **N142**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

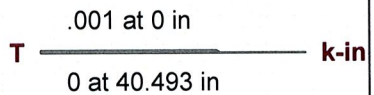


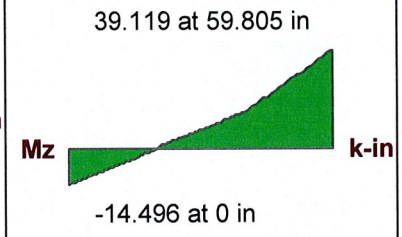


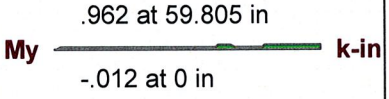


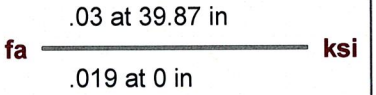


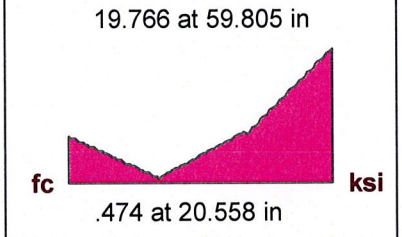


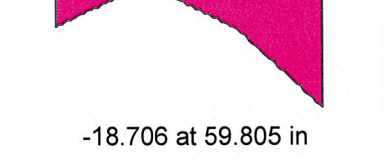












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.672 (y)**	Max Defl Ratio	**L/4160**
Location	**59.805 in**	Location	**39.87 in**	Location	**42.362 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.85**
Lb	**60 in**	**183 in**
KL/r	**50.523**	**57.384**

L Comp Flange	**60 in**
L-torque	**59.805 in**

RIB STIFFENER NOT INCLUDED IN RISA ANALYSIS.

Section: CS 8 x 3.25 x 0.055 x 0.75 Ribs.sct NSM
Channel 8x3.25x0.75-16 Gage Northern States Metals Co.

Rev. Date: 4/10/2019 9:29:24 AM
By: NSM
Printed: 4/10/2019 9:40:41 AM

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 55, Fy=55 ksi
Design Parameters:

Lx	15.250 ft	Ly	5.000 ft	Lt	5.000 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.8500	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	0.026	39.119	-1.269	0.962	0.042
Applied	0.026	39.119	-1.269	0.962	0.042
Strength	12.142	56.978	5.999	16.797	6.678

Effective section properties at applied loads:

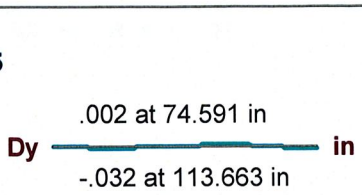
Ae	0.86913 in^2	Ixe	8.6063 in^4	Iye	1.1766 in^4
		Sxe(t)	2.1154 in^3	Sye(l)	1.2832 in^3
		Sxe(b)	2.1890 in^3	Sye(r)	0.5043 in^3

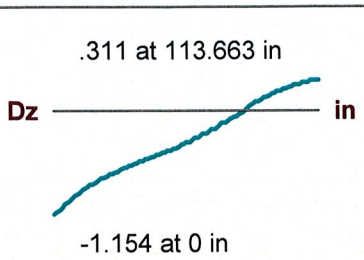
Interaction Equations

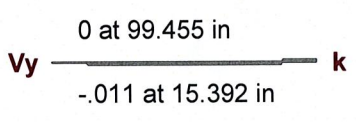
NAS Eq. C5.2.1-1	(P, Mx, My)	0.002 + 0.584 + 0.049 = 0.635	<= 1.0
NAS Eq. C5.2.1-2	(P, Mx, My)	0.002 + 0.687 + 0.057 = 0.746	<= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.471 + 0.045)= 0.718	<= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.003 + 0.000)= 0.058	<= 1.0

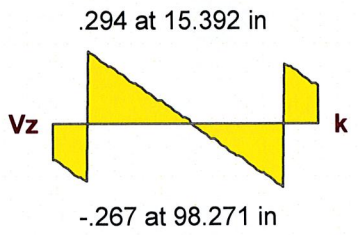
Beam: ***VP 4&11 by Symmetry***

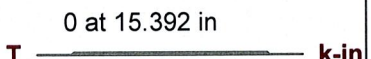
Shape: **V - HU - 2.25x0.045x1.25**
Material: **A653 SS Gr. 50**
Length: **113.663 in**
I Joint: **N103**
J Joint: **N104**
LC 6: IBC 16-13 (B)
Code Check: **SEE CFS**
Report Based On 97 Sections

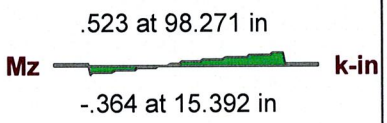


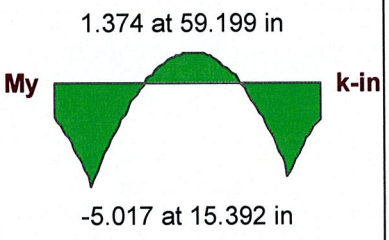


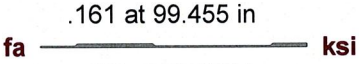


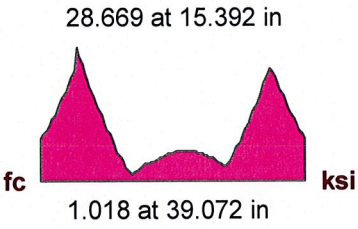


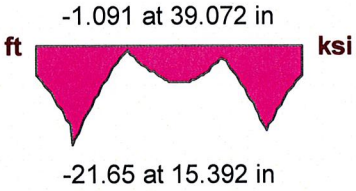












AISI S100-12: ASD Code Check

Max Bending Check	**SEE CFS**	Max Shear Check	**0.092 (z)**	Max Defl Ratio	**L/4401**
Location	**15.392 in**	Location	**15.392 in**	Location	**80.511 in**
				Span	**1**

	y-y	z-z
Cm	**.85**	**.6**
Lb	**84 in**	**84 in**
KL/r	**98.446**	**99.299**

L Comp Flange	**84 in**
L-torque	**113.663 in**

RETURNS ON FLANGES NOT INCLUDED IN RISA ANALYSIS.

Member Check - 2012 North American Specification - US (ASD)

Material Type: A653 SS Grade 50/3, Fy=50 ksi
Design Parameters:

Lx	7.000 ft	Ly	7.000 ft	Lt	7.000 ft
Kx	1.0000	Ky	1.0000	Kt	1.0000
Cbx	1.0000	Cby	1.0000	ex	0.0000 in
Cmx	0.6000	Cmy	0.8500	ey	0.0000 in
Braced Flange: None		kϕ	0 k		
Red. Factor, R: 0		Lm	20.000 ft		

Loads:	P (k)	Mx (k-in)	Vy (k)	My (k-in)	Vx (k)
Entered	0.0490	-0.3640	-0.0110	-5.0170	0.2940
Applied	0.0490	-0.3640	-0.0110	-5.0170	0.2940
Strength	1.7450	4.7568	0.7897	5.9552	3.2670

Effective section properties at applied loads:

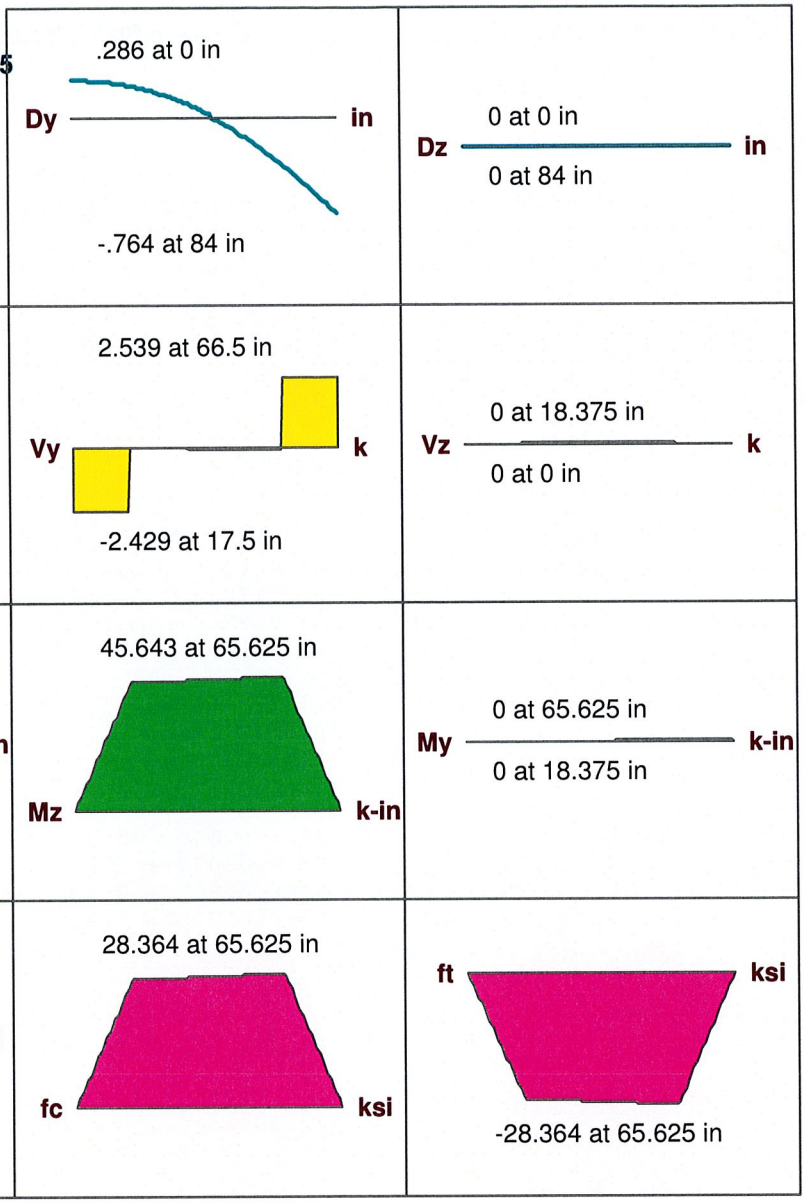
Ae	0.37726 in^2	Ixe	0.33178 in^4	Iye	0.26771 in^4
		Sxe(t)	0.18130 in^3	Sye(l)	0.19890 in^3
		Sxe(b)	0.18130 in^3	Sye(r)	0.29610 in^3

Interaction Equations

NAS Eq. C5.2.1-1	(P, Mx, My)	0.028 + 0.046 + 0.722 = 0.796	<= 1.0
NAS Eq. C5.2.1-2	(P, Mx, My)	0.005 + 0.077 + 0.842 = 0.924	<= 1.0
NAS Eq. C3.3.1-1	(Mx, Vy)	Sqrt(0.005 + 0.000)= 0.070	<= 1.0
NAS Eq. C3.3.1-1	(My, Vx)	Sqrt(0.710 + 0.008)= 0.847	<= 1.0

Beam: ***TILT 2***

Shape: **TILT - 6x2.5x0.074x0.75**
Material: **A653 Gr. 60**
Length: **84 in**
I Joint: **N141**
J Joint: **N142**
LC 6: IBC 16-13 (B)
Code Check: **0.987 (bending)**
Report Based On 97 Sections



AISI S100-12: ASD Code Check

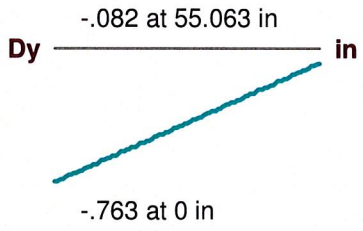
Max Bending Check	**0.987**	Max Shear Check	**0.402 (y)**	Max Defl Ratio	**L/195**
Location	**17.5 in**	Location	**66.5 in**	Location	**84 in**
Equation	**C5.2.1-1**			Span	**2**
Gov.Ø Equation	**C3.1.4**				

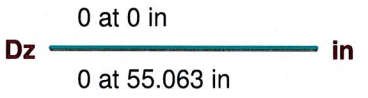
R (D6.1.1) **Not Used**

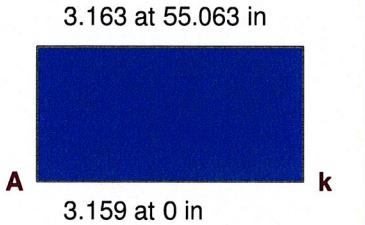
			y-y	z-z		
Fy	**60 ksi**	Cm	**.6**	**1**	A eff. (Fy)	**.594 in^2**
Pn/Ω	**10.852 k**	Lb	**48 in**	**48 in**	A eff. (Fn)	**.753 in^2**
Tn/Ω	**31.137 k**	KL/r	**52.276**	**20.337**	Iy eff.	**.637 in^4**
Mny/Ω	**14.563 k-in**				Sy eff. (L)	**.686 in^3**
Mnz/Ω	**47.352 k-in**	L Comp Flange	**48 in**		Sy eff. (R)	**.405 in^3**
Vny/Ω	**6.313 k**	L-torque	**84 in**		Iz eff.	**4.828 in^4**
Vnz/Ω	**6.167 k**				Sz eff. (T)	**1.609 in^3**
Cb	**1**				Sz eff. (B)	**1.609 in^3**

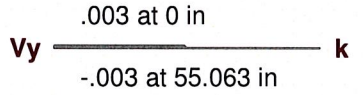
Beam: ***FRONT BRACE 2***

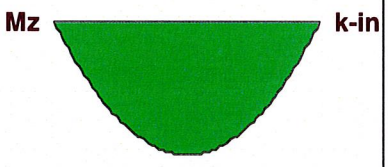
Shape: **FB - 3x1.75x0.070x0.5**
Material: **A653 SS Gr. 50**
Length: **55.063 in**
I Joint: **N144**
J Joint: **N145**
LC 6: IBC 16-13 (B)
Code Check: **0.567 (bending)**
Report Based On 97 Sections

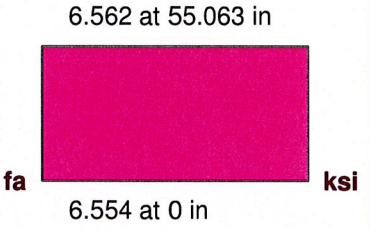


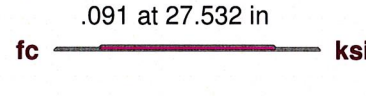


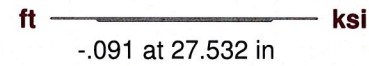












AISI S100-12: ASD Code Check

Max Bending Check	**0.567**	Max Shear Check	**0.001 (y)**	Max Defl Ratio	**L/10000**
Location	**28.679 in**	Location	**55.063 in**	Location	**0 in**
Equation	**C5.2.1-1**			Span	**0**
Gov.Ø Equation	**C3.1.2**				

R (D6.1.1) **Not Used**

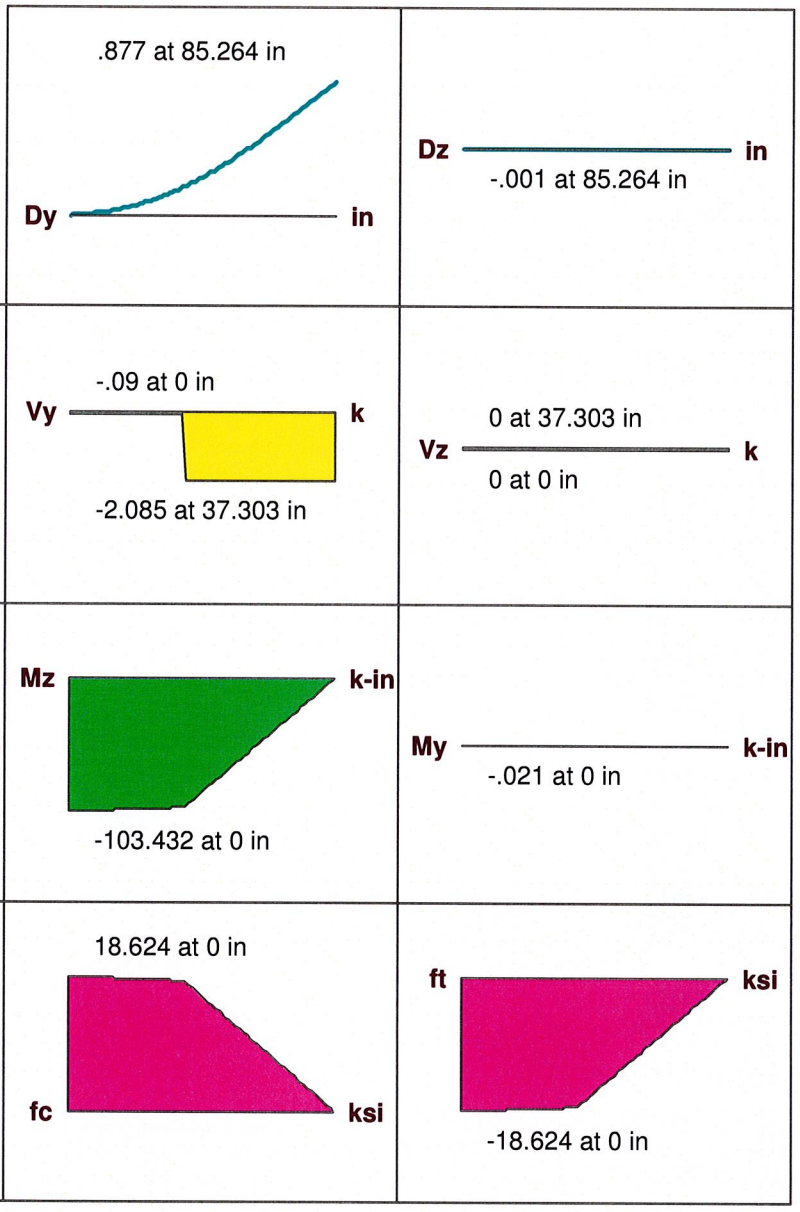
			y-y	z-z		
Fy	**50 ksi**	Cm	**.6**	**1**	A eff. (Fy)	**.454 in^2**
Pn/Ω	**5.609 k**	Lb	**55.063 in**	**55.063 in**	A eff. (Fn)	**.482 in^2**
Tn/Ω	**14.43 k**	KL/r	**85.58**	**45.715**	Iy eff.	**.2 in^4**
Mny/Ω	**4.722 k-in**				Sy eff. (L)	**.316 in^3**
Mnz/Ω	**12.31 k-in**	L Comp Flange	**55.063 in**		Sy eff. (R)	**.178 in^3**
Vny/Ω	**3.334 k**	L-torque	**55.063 in**		Iz eff.	**.699 in^4**
Vnz/Ω	**3.386 k**				Sz eff. (T)	**.466 in^3**
Cb	**1**				Sz eff. (B)	**.466 in^3**

Envelope AISC 14th(360-10): ASD Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-in]	Mnzz/om [k-in]	Cb	Eqn
1	POST 3	W6X9	.762	0	2	.104	37.303	y	2	41.992	80.24	51.476	144.779	1	H1-1b
2	POST 1	W6X9	.762	0	2	.104	37.303	y	2	41.992	80.24	51.476	144.779	1	H1-1b
3	POST 2	W6X9	.745	36.415	2	.105	37.303	y	2	41.992	80.24	51.476	144.779	1	H1-1b

Column: ***POST 3***

Shape: **W6X9**
Material: **A992**
Length: **85.264 in**
I Joint: **N34**
J Joint: **N15**
LC 2: IBC 16-10
Code Check: **0.762 (bending)**
Report Based On 97 Sections



AISC 14th(360-10): ASD Code Check

Direct Analysis Method

Max Bending Check	**0.762**	Max Shear Check	**0.104 (y)**
Location	**0 in**	Location	**37.303 in**
Equation	**H1-1b**	Max Defl Ratio	**L/97**

Bending Flange	**Non-Compact**	Compression Flange	**Non-Slender**
Bending Web	**Compact**	Compression Web	**Non-Slender**

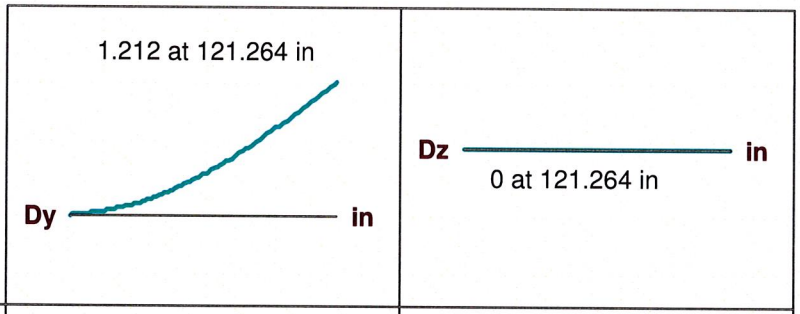
			y-y	z-z
Fy	**50 ksi**	Lb	**85.264 in**	**85.264 in**
Pnc/om	**41.992 k**	KL/r	**94.107**	**34.468**
Pnt/om	**80.24 k**			
Mny/om	**51.476 k-in**	L Comp Flange	**85.264 in**	
Mnz/om	**144.779 k-in**	L-torque	**85.264 in**	
Vny/om	**20.06 k**	Tau_b	**1**	
Vnz/om	**30.435 k**			
Cb	**1**			

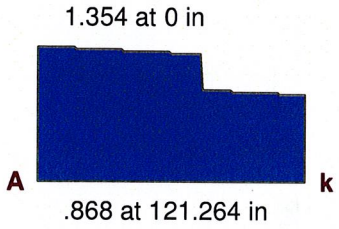
Envelope AISC 14th(360-10): ASD Steel Code Checks

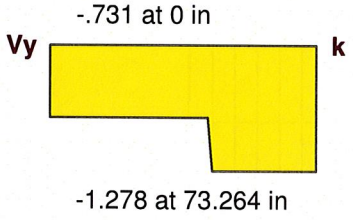
	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-in]	Mnzz/om [k-in]	Cb	Eqn
1	POST 3	W6X12	.710	0	5	.075	73.264	y	2	30.562	106.287	69.461	167.063	1	H1-1b
2	POST 1	W6X12	.710	0	5	.075	73.264	y	2	30.562	106.287	69.461	167.063	1	H1-1b
3	POST 2	W6X12	.692	0	5	.077	73.264	y	2	30.562	106.287	69.461	167.063	1	H1-1b

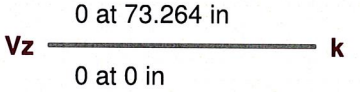
Column: ***POST 3***

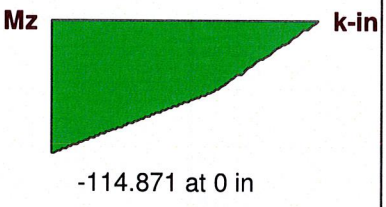
Shape: **W6X12**
Material: **A992**
Length: **121.264 in**
I Joint: **N34**
J Joint: **N15**
LC 5: IBC 16-13 (A)
Code Check: **0.710 (bending)**
Report Based On 97 Sections

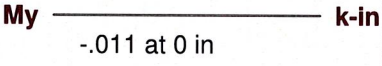


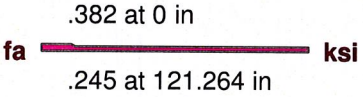


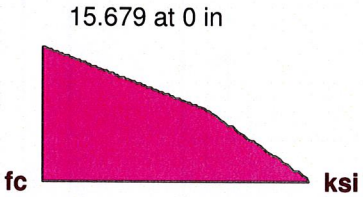


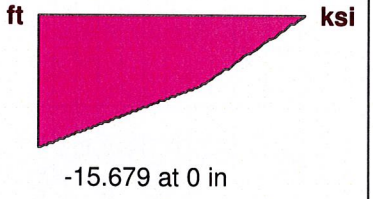












AISC 14th(360-10): ASD Code Check

Direct Analysis Method

Max Bending Check	**0.710**	Max Shear Check	**0.046 (y)**
Location	**0 in**	Location	**73.264 in**
Equation	**H1-1b**	Max Defl Ratio	**L/100**

Bending Flange	**Compact**	Compression Flange	**Non-Slender**
Bending Web	**Compact**	Compression Web	**Non-Slender**

			y-y	z-z
Fy	**50 ksi**	Lb	**121.264 in**	**121.264 in**
Pnc/om	**30.562 k**	KL/r	**132.133**	**48.602**
Pnt/om	**106.287 k**			
Mny/om	**69.461 k-in**	L Comp Flange	**121.264 in**	
Mnz/om	**167.063 k-in**	L-torque	**121.264 in**	
Vny/om	**27.738 k**	Tau_b	**1**	
Vnz/om	**40.24 k**			
Cb	**1**			

Customer: Swinerton
Project: Tobacco Rd
Zip/Location: Simsbury CT
Configuration: 2x13 G3P-X
Date/Engineer: 4/10/2019 - NES
Post Size: W6x9 - 30" GC, 4.25' PAG

Factored Post Reaction

RISA reaction calculations are assuming the post is fixed at grade.

Load Case	Load Combination ASD (ASCE 7-10)	Post Location	X - Strong Axis Shear (lb)	Y-Axial (lb)	Z - Weak Axis Shear (lb)	MX - Weak Axis Over Turning Moment (lbs-in)	MZ - Strong Axis Over Turning Moment (lbs-in)
1	DL	Worst Post	17	674	0	6	14,772
2	DL + SL	Worst Post	142	4,249	-1	40	**99,982**
3	DL + 0.6 WL+X	Worst Post	-987	-2,050	0	-6	6,381
4	DL + 0.6 WL-X	Worst Post	869	2,984	0	6	22,397
5	DL + 0.45 WL+X + 0.75 SL	Worst Post	-731	1,314	0	31	71,194
6	DL + 0.45 WL-X + 0.75 SL	Worst Post	750	**5,088**	0	32	84,870
7	0.6 DL + 0.6 WL+X	Worst Post	**-994**	-2,319	0	-3	571
8	0.6 DL + 0.6 WL-X	Worst Post	862	2,715	0	4	16,382
9	DL + 0.7 ELX + 0.14 SDSxDL	Worst Post	-53	691	0	7	17,560
10	DL - 0.7 ELX + 0.14 SDSxDL	Worst Post	60	693	0	5	12,773
11	DL + 0.7 ELZ + 0.14 SDSxDL	Worst Post	17	692	**-43**	-2,637	15,613
12	DL - 0.7 ELZ + 0.14 SDSxDL	Worst Post	17	692	**43**	**2,637**	15,612
13	DL + 0.525 ELX + 0.75 SL + 0.14 SDSxDL	Worst Post	-89	3,373	0	32	80,636
14	DL - 0.525 ELX + 0.75 SL + 0.14 SDSxDL	Worst Post	143	3,375	0	31	77,025
15	DL + 0.525 ELZ + 0.75 SL + 0.14 SDSxDL	Worst Post	112	3,374	-33	-2,295	79,217
16	DL - 0.525 ELZ + 0.75 SL + 0.14 SDSxDL	Worst Post	112	3,374	33	2,295	79,212
17	0.6 DL + 0.7 ELX - 0.14 SDSxDL	Worst Post	-49	385	0	4	10,851
18	0.6 DL - 0.7 ELX - 0.14 SDSxDL	Worst Post	52	388	0	2	6,068
19	0.6 DL + 0.7 ELZ - 0.14 SDSxDL	Worst Post	-13	386	-43	-2,598	8,900
20	0.6 DL - 0.7 ELZ - 0.14 SDSxDL	Worst Post	-13	386	43	2,598	8,900

DL = Dead Load
LL = Live Load
SL = Snow Load
EL = Seismic Load (ELX about the X- Axis; ELZ about the Z-Axis)
WL = Wind Load (WL+X = Wind in the +X Axis; WL-X = Wind in the -X Axis)

FACTORED LOAD TABLE (SIGNAGE OPPOSITE FROM RISA REACTION)		
CASE I		
Strong Axis Moment	-99,982	lb-in
Strong axis Shear - at Grade	994	lb
CASE II		
Weak Axis Moment	-2,637	lb-in
Weak Axis Shear - at Grade	43	lb
CASE III		
Axial Load - UP (negative in RISA)	2,319	lb
Axial Load - DOWN (positive in RISA)	5,088	lb

Deflections (all in inches)		
	Strong Axis (Dy)	Weak Axis (Dz)
RISA at top of post:		
L-pile at assumed grade:		
Length of PAG in RISA:	61.264	61.264
θ (radians)		
TOTAL DEFLECTION:	**0**	**0**

Customer: Swinerton
Project: Tobacco Rd
Zip/Location: Simsbury CT
Configuration: 2x13 G3P-X
Date/Engineer: 4/10/2019 - NES
Post Size: W6x12 - 66" GC, 7.25' PAG

Factored Post Reaction

RISA reaction calculations are assuming the post is fixed at grade.

Load Case	Load Combination ASD (ASCE 7-10)	Post Location	X - Strong Axis Shear (lb)	Y-Axial (lb)	Z - Weak Axis Shear (lb)	MX - Weak Axis Over Turning Moment (lbs-in)	MZ - Strong Axis Over Turning Moment (lbs-in)
1	DL	Worst Post	12	727	0	3	14,910
2	DL + SL	Worst Post	107	4,311	0	22	**103,719**
3	DL + 0.6 WL+X	Worst Post	-981	-2,000	0	-4	40,499
4	DL + 0.6 WL-X	Worst Post	855	3,040	0	3	-8,447
5	DL + 0.45 WL+X + 0.75 SL	Worst Post	-721	1,371	0	18	97,239
6	DL + 0.45 WL-X + 0.75 SL	Worst Post	716	**5,150**	0	17	67,042
7	0.6 DL + 0.6 WL+X	Worst Post	**-986**	-2,291	0	-2	35,064
8	0.6 DL + 0.6 WL-X	Worst Post	850	2,750	0	1	-14,252
9	DL + 0.7 ELX + 0.14 SDSxDL	Worst Post	-53	745	0	4	19,383
10	DL - 0.7 ELX + 0.14 SDSxDL	Worst Post	59	747	0	3	11,236
11	DL + 0.7 ELZ + 0.14 SDSxDL	Worst Post	-15	746	**-47**	-4,468	16,079
12	DL - 0.7 ELZ + 0.14 SDSxDL	Worst Post	-15	746	**47**	**4,468**	16,078
13	DL + 0.525 ELX + 0.75 SL + 0.14 SDSxDL	Worst Post	-77	3,434	0	18	84,392
14	DL - 0.525 ELX + 0.75 SL + 0.14 SDSxDL	Worst Post	118	3,436	0	17	78,169
15	DL + 0.525 ELZ + 0.75 SL + 0.14 SDSxDL	Worst Post	84	3,435	-36	-4,405	82,104
16	DL - 0.525 ELZ + 0.75 SL + 0.14 SDSxDL	Worst Post	84	3,435	36	4,405	82,097
17	0.6 DL + 0.7 ELX - 0.14 SDSxDL	Worst Post	-51	416	0	2	12,587
18	0.6 DL - 0.7 ELX - 0.14 SDSxDL	Worst Post	53	418	0	1	4,457
19	0.6 DL + 0.7 ELZ - 0.14 SDSxDL	Worst Post	-12	417	-47	-4,355	9,267
20	0.6 DL - 0.7 ELZ - 0.14 SDSxDL	Worst Post	-12	417	47	4,355	9,266

DL = Dead Load
LL = Live Load
SL = Snow Load
EL = Seismic Load (ELX about the X- Axis; ELZ about the Z-Axis)
WL = Wind Load (WL+X = Wind in the +X Axis; WL-X = Wind in the -X Axis)

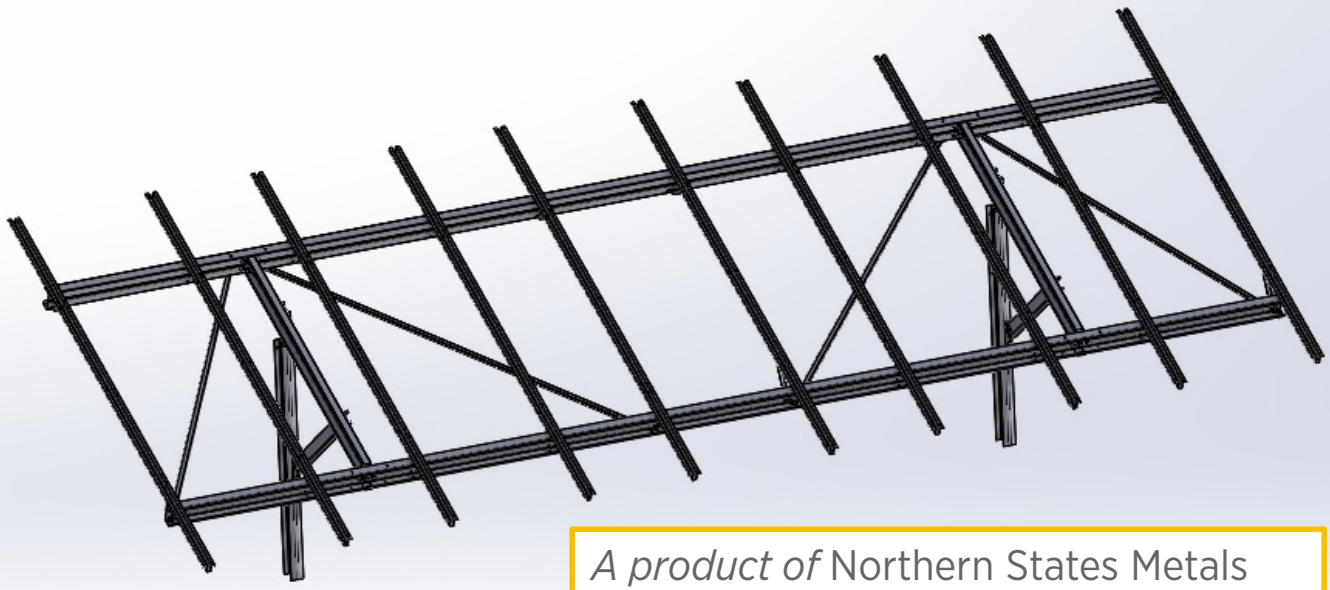
FACTORED LOAD TABLE (SIGNAGE OPPOSITE FROM RISA REACTION)		
CASE I		
Strong Axis Moment	-103,719	lb-in
Strong axis Shear - at Grade	986	lb
CASE II		
Weak Axis Moment	-4,468	lb-in
Weak Axis Shear - at Grade	47	lb
CASE III		
Axial Load - UP (negative in RISA)	2,291	lb
Axial Load - DOWN (positive in RISA)	5,150	lb

Deflections (all in inches)		
	Strong Axis (Dy)	Weak Axis (Dz)
RISA at top of post: L-pile at assumed grade: Length of PAG in RISA: θ (radians)	61.264	61.264
TOTAL DEFLECTION:	**0**	**0**

SOLAR FLEXRACK™

A Division of Northern States Metals

FlexRack Series G3 Installation Manual



A product of Northern States Metals
3207 Innovation Place
Youngstown, OH 44509
Office: 800-689-0666
Fax: 330-799-2074

Table of Contents

Important Disclaimer/Clarifications:

UL2703 Section 21, Subsection 21.1 identifies a single design load parameter. Your Solar FlexRack is an engineered product designed to withstand loads specific to your location and applicable building codes for the area of installation. Therefore, Solar FlexRack models differ from one another. Please reference your drawing package for the design of your custom Solar FlexRack.

This manual illustrates the most efficient method for installation. All sequenced instructions outlined in this manual must be followed in the correct order. If you choose to use an alternate method you must submit the proposed installation steps in writing and seek approval from SFR Engineering. Failure to follow installation instructions contained in the engineering drawings or failure to verify a new method of installation with the engineering team will void your warranty.

Therefore, you must refer to the engineering drawings you received when you ordered your SFR model. These engineering drawings will contain any installation instructions unique to your Solar FlexRack model.

Installers must follow all local/state/provincial/and national safety regulations for the entirety of the project being completed.

Please read and understand any additional installation instructions included in your engineering drawings.

MANUFACTURING

NSM/Solar FlexRack has manufacturing facilities in Youngstown, Ohio USA, Phoenix, Arizona USA at OMCO Solar, and Markham, Ontario Canada at the Woodbine Tool and Die manufacturing facility. NSM/*Solar FlexRack* abides by both Buy America Acts and Ontario Domestic Content requirements for all facilities respectively.

Important Disclaimer/Clarifications:

Electrical Installation shall be in accordance with the National Electrical Code or CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

Damage to materials while in transit should be immediately directed to the carrier who will instruct you about freight damage claims.

Solar Flexrack advises the installer to develop and implement an interim construction material stabilization contingency procedure in case a severe weather event occurs prior to the completion of the entire installation.

Tool List

- Colored Mason Line
- Drill with adjustable clutch
- $^{9}/_{16}$”, $^{7}/_{8}$”, $^{3}/_{8}$” sockets & ratchet driver
- $^{9}/_{16}$”, $^{7}/_{8}$”, $^{1}/_{2}$” sockets & wrenches
- 4’ Lifting strap (continuous loop) – To aid in lifting heavy members.
- Digital Level Mfr #: THD9403
- Steel Spring Clamp Mfr #: 222702

Hardware Installation

The following details provide different hardware installation methods that must be followed throughout the installation process.

Snug-Tight Method: Per the RCSC: "Snug tight is the condition that exists when all of the plies in a connection have been pulled into ***firm contact*** by the bolts in the ***joint*** and all of the bolts in the ***joint*** have been tightened sufficiently to prevent the removal of the nuts without the use of a wrench."

Snug-tight can be achieved by the following:

- A few impacts of an impact wrench
- An electric torque wrench until the wrench begins to slow
- Full effort of a worker on an ordinary spud wrench

Installation:

1. Install the proper hardware (bolt, washers, plate washers, and nut) through the holes or slots in the connection.
2. Insert the bolt without damaging the threads.
3. Tighten the bolt until all plies of the connection are in firm contact with each other.

Inspection:

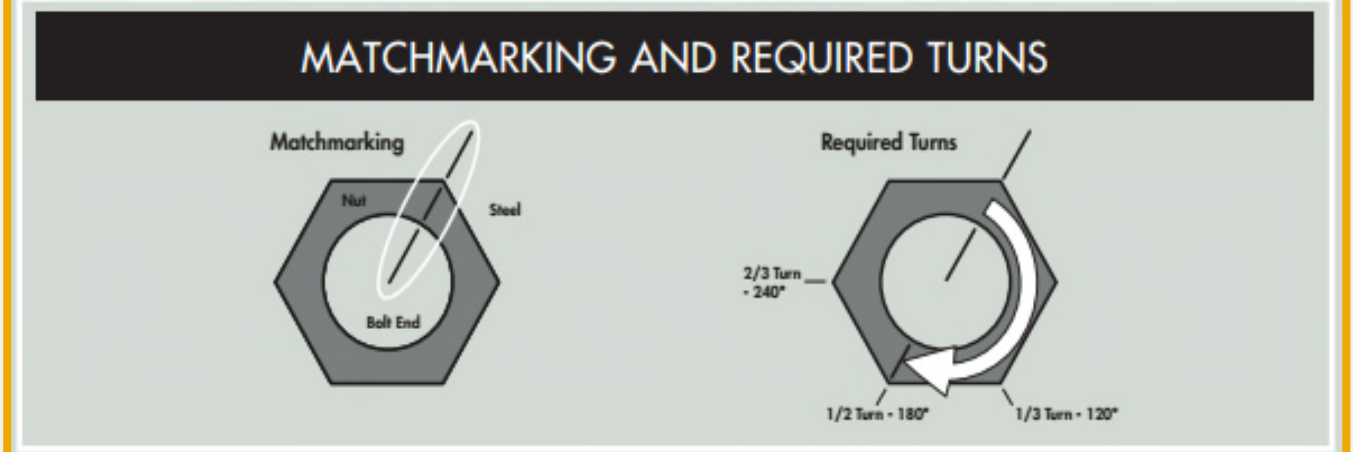
- The connection must be visually ensured that the plies of the connected elements have been brought into firm contact with each other.
- It shall be determined the bolt(s) in the joint have been tightened sufficiently to prevent the turning of the nut without the use of a wrench.

Note:
When visual inspection indicates that the fastener may not have been sufficiently tightened to prevent the removal of the nut by hand, the inspector shall physically check for this condition for the fastener.

Turn-of-Nut Method

For Pre-tensioned Joints and Slip-Critical Joints

1. Install the proper hardware (bolt, washers, plate washers, and nut) through the holes or slots in the connection.
2. Insert the bolt without damaging the threads
3. Tighten the bolt until all plies of the connection are in firm contact with each other (snug tight condition). More than 1 cycle through the bolt pattern may be required to achieve the sung-tightened joint.
4. Match mark the nut and protruding end of the bolt after snug tightening.
5. Rotate the nut by the amount specified. The bolt must be secured from rotating with the nut.

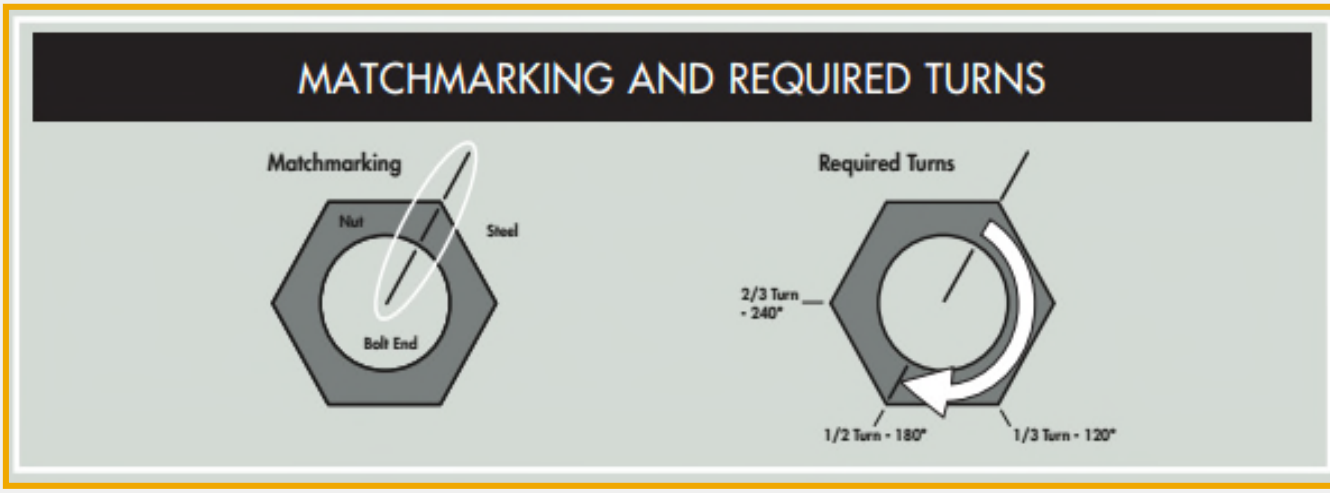


Inspection and Quality Control- Turn-of-Nut Method

Inspection takes place during installation for Turn-of-Nut bolt(s).

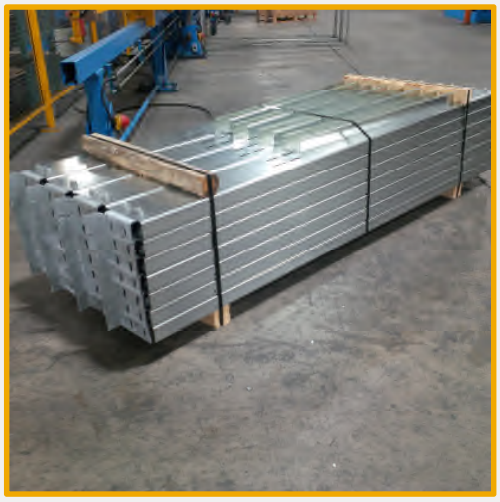
1. It must be verified that the proper rotation of the turned element relative to the unturned element by the amount specified in the engineering drawings is achieved.

2. Check the nut was rotated properly by visually inspecting that the match mark was also rotated properly to the amount specified. See reference below



Note:
Upon completion, it is not permitted to turn the nut in the loosening direction except for the purpose of complete removal of the individual fastener assembly. Such fasteners shall not be reused.

Components and Shipping Specifications



Tilt Bracket Assembly
- Bundle Quantity: 28 Pieces
- Approx. Bundle Size: 100” Long x 32” Wide x 24” Tall
- Approximately 1,350lbs

Horizontal Rail
- Bundle Quantity: 16 Pieces
- Approx. Bundle Size: 330” Long x 36” Wide x 12” Tall
- Approximately 1,700lbs

Vertical Rail
- Bundle Quantity: 128 Pieces
- Approx. Bundle Size: 165” Long x 28” Wide x 20” Tall
- Approximately 3,060lbs

Top Bracket
- Approx. Bundle Quantity: 600 Pieces
- Approx. Bundle Size: 48” Long x 39” Wide x 48” Tall
- Approximately 4,000 lbs

Components and Shipping Specifications

Horizontal Braces
- Bundle Quantity: 360 Pieces
- Approx. Bundle Size: 120” Long x 33” Wide x 14” Tall
- Approximately 3,000lbs

Lower Bracket
- Approx. Bundle Quantity: 850 Pieces
- Approx. Bundle Size: 48” Long x 39” Wide x 15” Tall
- Approximately 1900 lbs

Torsion Braces
- Bundle Quantity: 1900 Pieces
- Approx. Bundle Size: 45” Long x 28” Wide x 22” Tall
- Approximately 2,300lbs

Components and Shipping Specifications

Fasteners (include Clips)

- Quantity per Bundle
- Bundle Size
- Weight

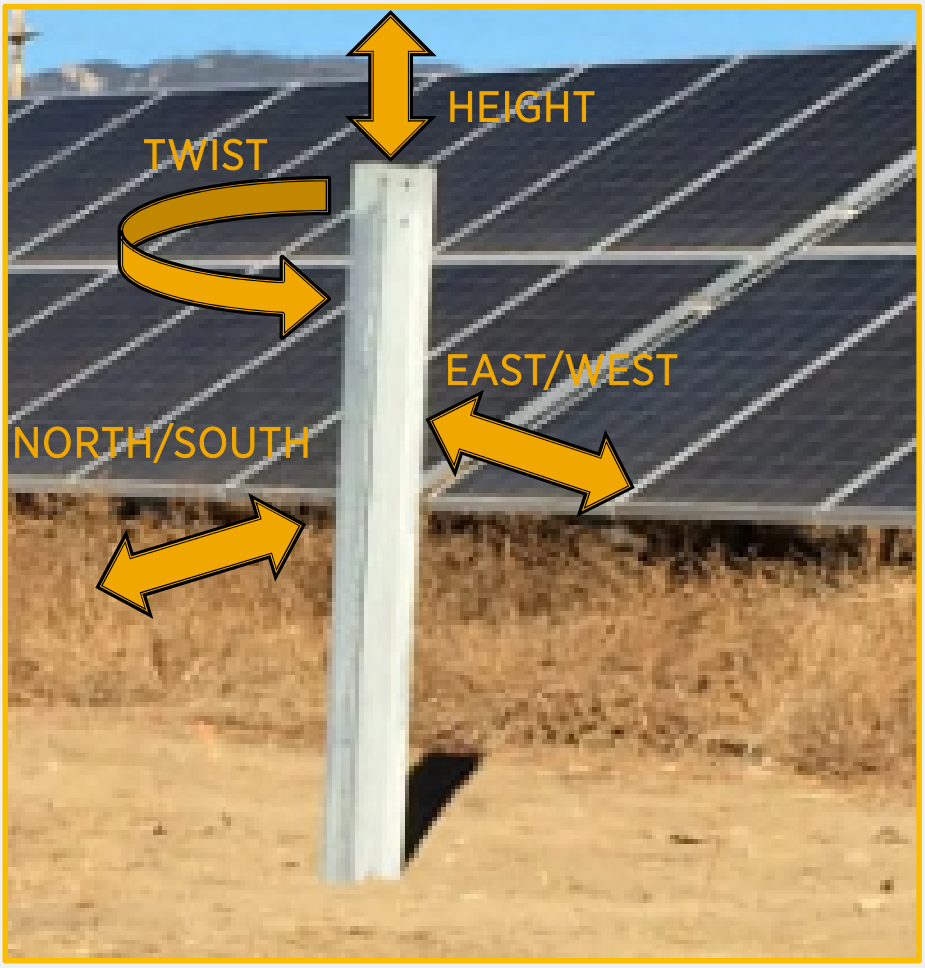
(Include ½” , 3/8” , Plate Washers, Washers)

STORAGE REQUIREMENTS

All racking materials are to be stored in dry level areas not prone to excessive moisture, flooding or snow accumulation. Damage to the galvanized coating can occur if these storage conditions are not met.

-Structural components (channels, preassembled assemblies) should be palletized and not double-stacked. During site handling, damage to components can be avoided by not placing parts onto gravel or rock-covered surfaces.
-Boxed hardware components (nuts, bolts, washers) should be stored in a covered structure or utility trailer and exposure to moisture is to be avoided. Open hardware should be consumed within 24 hours.

Post Installation Tolerances



Post Installation Tolerances :

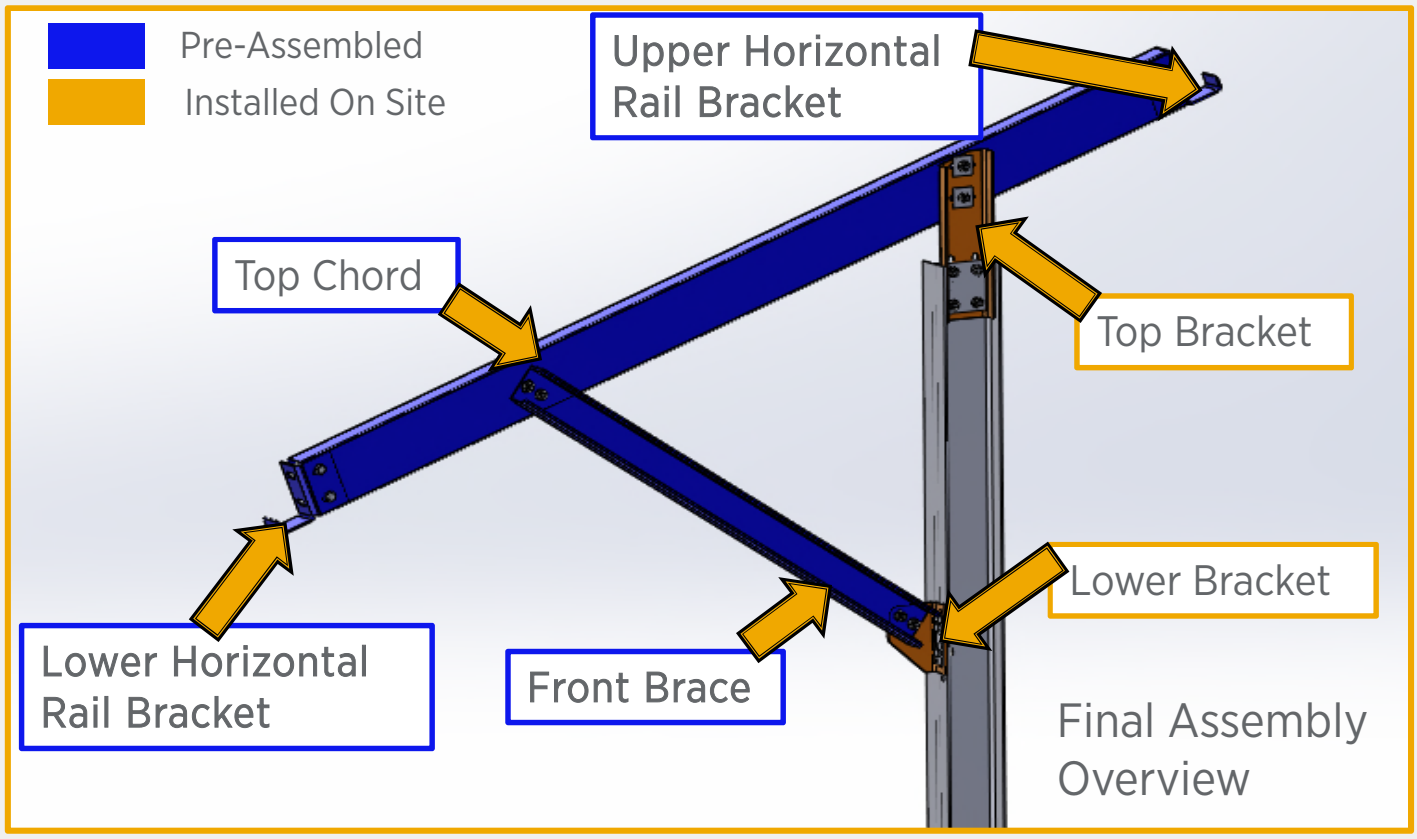
- Height +/- 1"
- North to South Distance +/- 1"
- East to West +/- 1.25"
- Twist +/- 2°

Note:

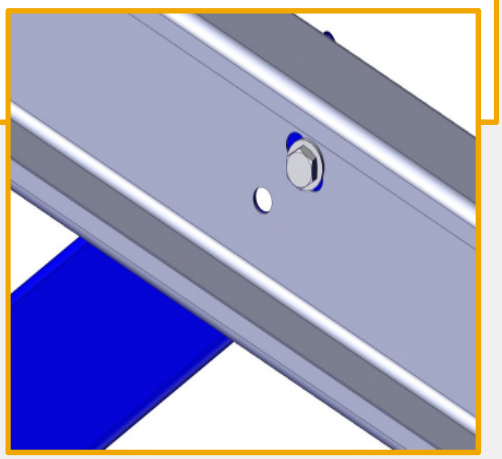
-Tolerances provided are typical. Please refer to Drawing Set for project specific installation tolerances.
-All tolerances shall be measured from top of post.

Two Member Tilt Installation

Assembly shown below represents Two Member Tilt connection to Wide Flange. For Round Post and SFR Smart Post Tilt Bracket Installation Procedure, see Appendix A or B



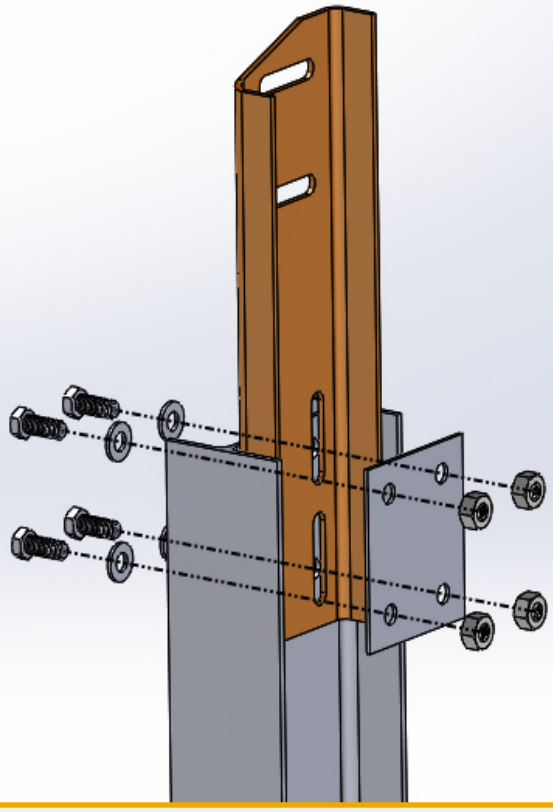
Pre-Assembled components (blue) include the Top Chord, Front Brace, Upper and Lower Horizontal Rail Brackets **Refer to Drawing Set for dimensions of tilt components and fastener quantities.**

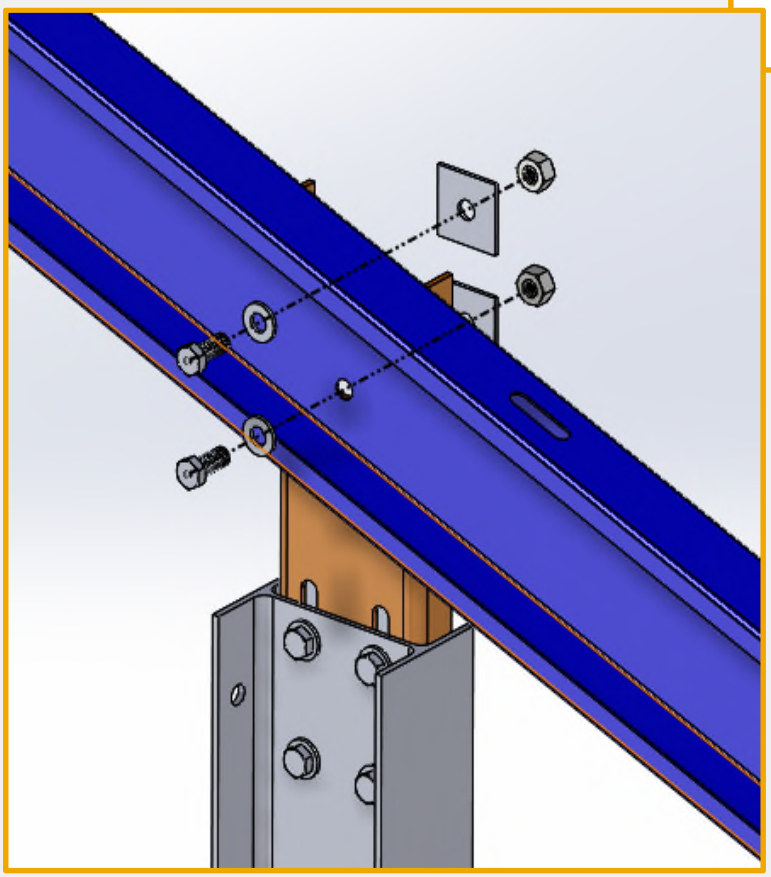


Note: Top Chord & Front Brace are connected by a single bolt. An additional bolt is required during installation. **ALL Pre-installed bolts must be tightened after tilt is fully assembled.**

Two Member Tilt Installation

Step 1 - Attach Top Bracket to web of the Wide Flange with hardware shown in the drawing set. Establish the height of the Top Bracket on the 1st and last post (or 1st post on adjacent rack). Plumb Top Bracket and install hardware finger tight. String a line between top brackets to properly align all Top Brackets.

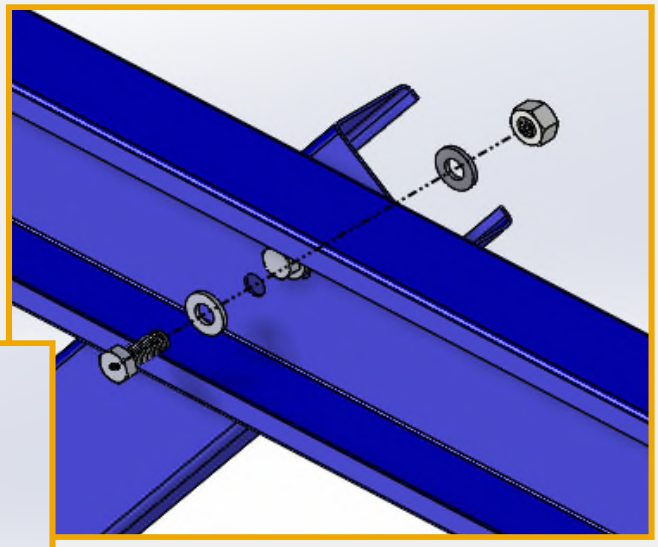


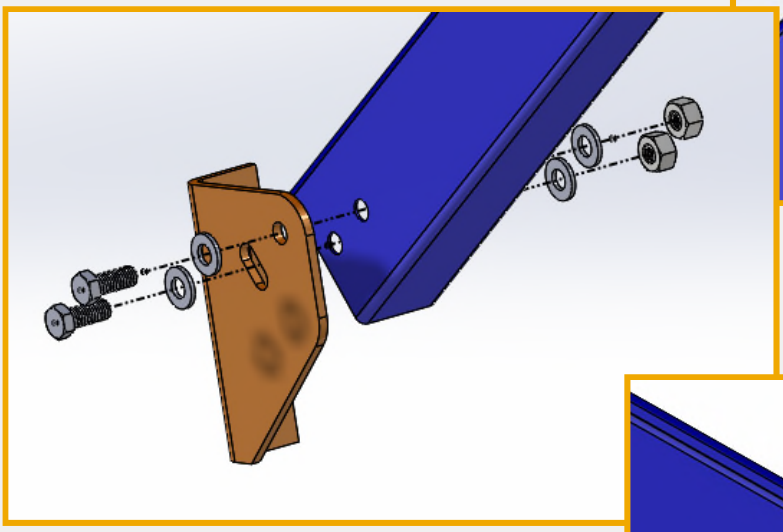


Step 2 – Attach Top Chord to Top Brackets on first and last post. Set Angle, and install hardware loosely. String a line between Top Chords to properly align all Top Chords. Allow front brace to swing down into position.

Two Member Tilt Installation

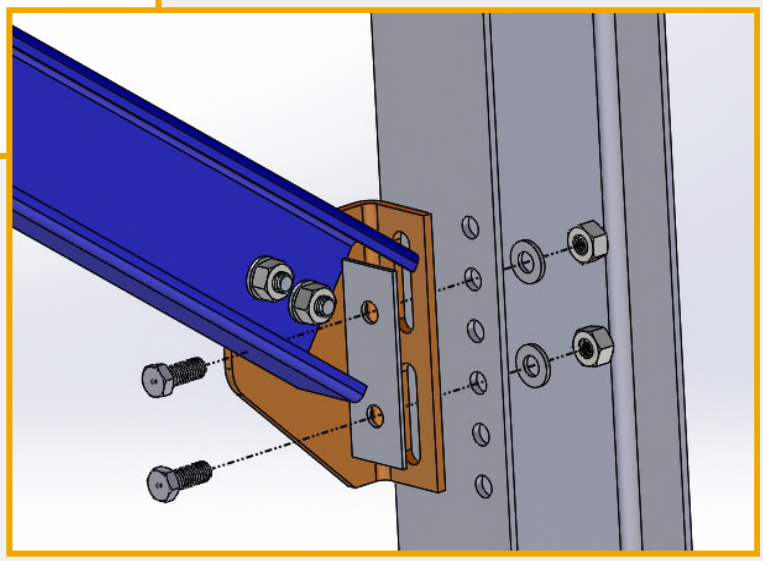
Step 3 - Install final bolt connecting Front Brace to Top Chord





Step 4 - Install Lower Bracket to Front Brace

Step 5 - Install Lower Bracket to Post



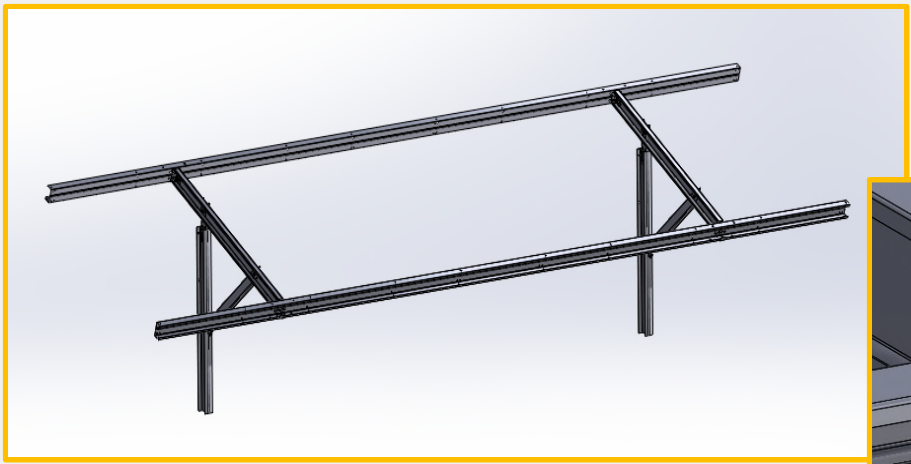
Note: 6 holes are located in the South Flange of the post for adjustability.

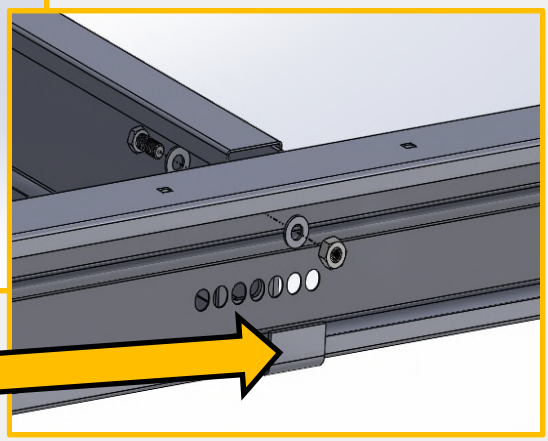
Step 6 - Tighten all hardware (including pre-installed hardware) as outlined in Drawing Set leaving the Horizontal Rail Brackets Loose.

Note: The following rack installation illustration represents a Wide Flange Post. The same installation practices will be used of Round Post and SFR Smart Post Installations.

Series G3-X Installation

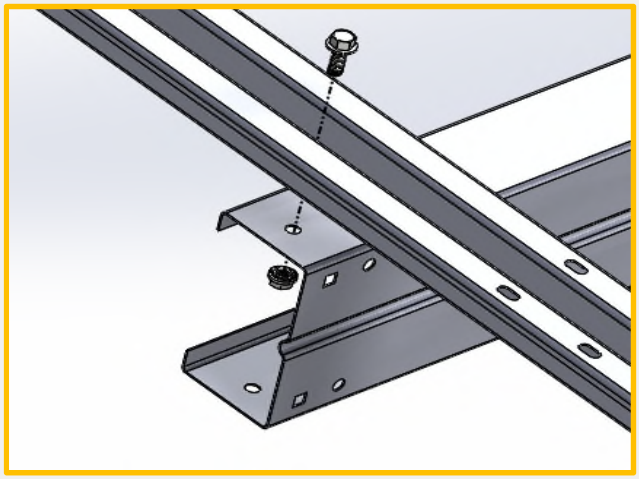
Step 1 – Lift Horizontal Rails into position on Horizontal Rail Brackets. Secure with one bolt per Horizontal Rail Bracket **finger tight**. (Horizontal Rail may need adjusted to attached Vertical Rails and Horizontal Bracing)

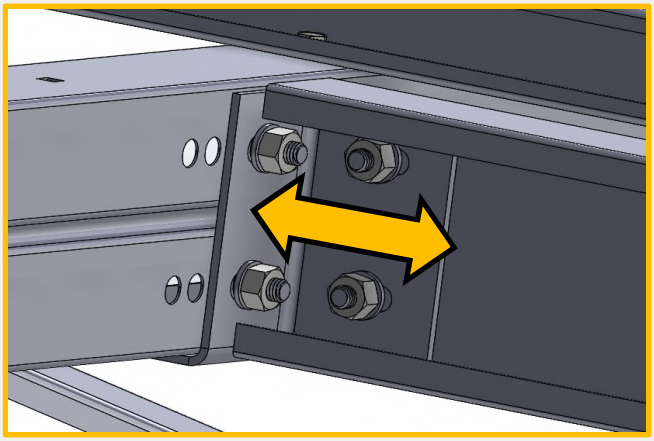




Bent tab on Horizontal Rail Bracket assists in Horizontal Rail installation.

Step 2 – Attach Vertical Rails to Horizontal Rails through round holes in the Horizontal Rail. **(See Appendix C for Landscape Vertical Rail Installation.)**



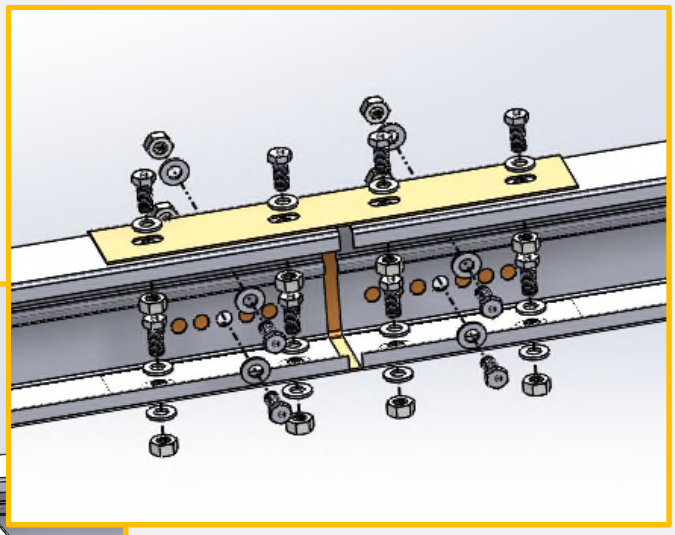


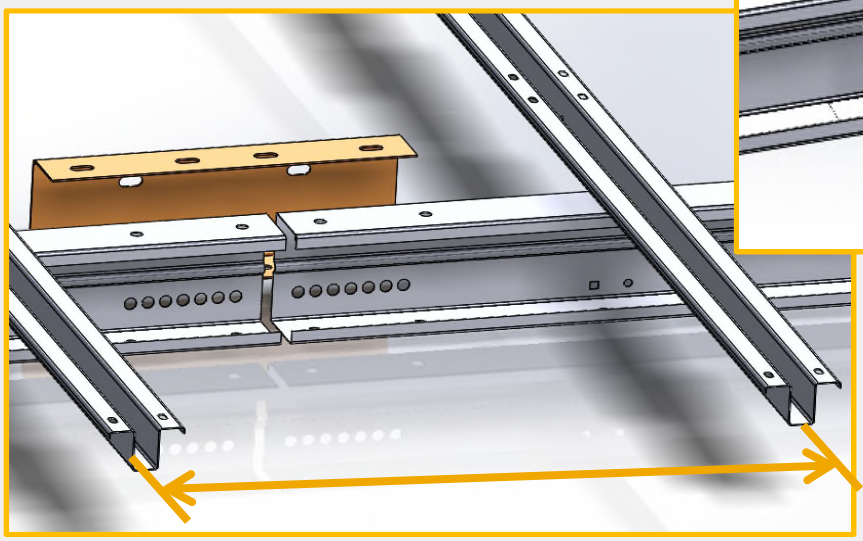
Note: Slots are provided in the Horizontal Rail Bracket to adjust Horizontal Rail spacing North to South. Leave Bolts connecting Horizontal Rail Bracket to Top Chord Loose.

Series G3-X Installation

Note: If rack is not spliced skip to Step 5.
Two splice connections are available. Splice at Tilt Bracket (odd post count), and Splice at Mid Span (even post count). Splice connection must be fastened before Horizontal Rail is attached to Horizontal Rail Brackets. Refer to the Drawing Set for Vertical Rail spacing over the Splice. Once Vertical Rails are fastened to the Horizontal Rails, the finger tight bolts can be removed to install Splice Connection.

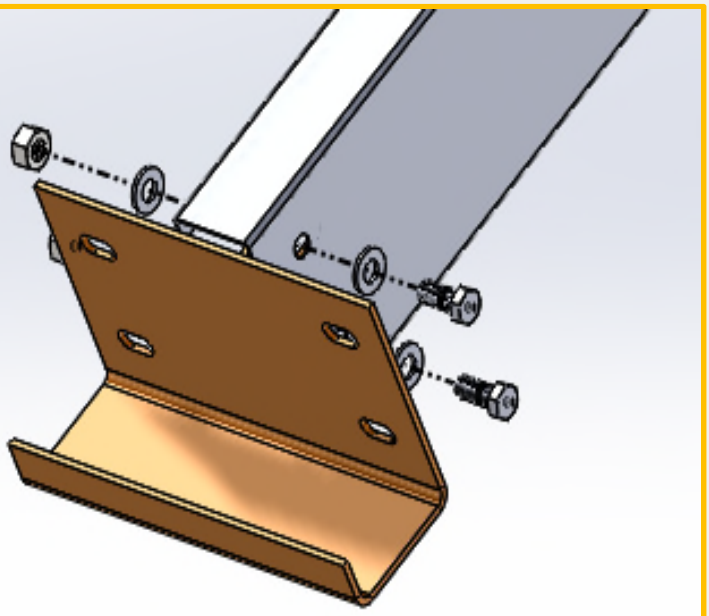
Step 3 – Midspan Splice. After bolts are removed and both sub-assemblies are resting on the Horizontal Rail Brackets, the Splice Channel is attached to the Horizontal Rails of both sub-assemblies. Bolt the Splice Channel to the Horizontal Rails as shown. Start with the fasteners in the Web





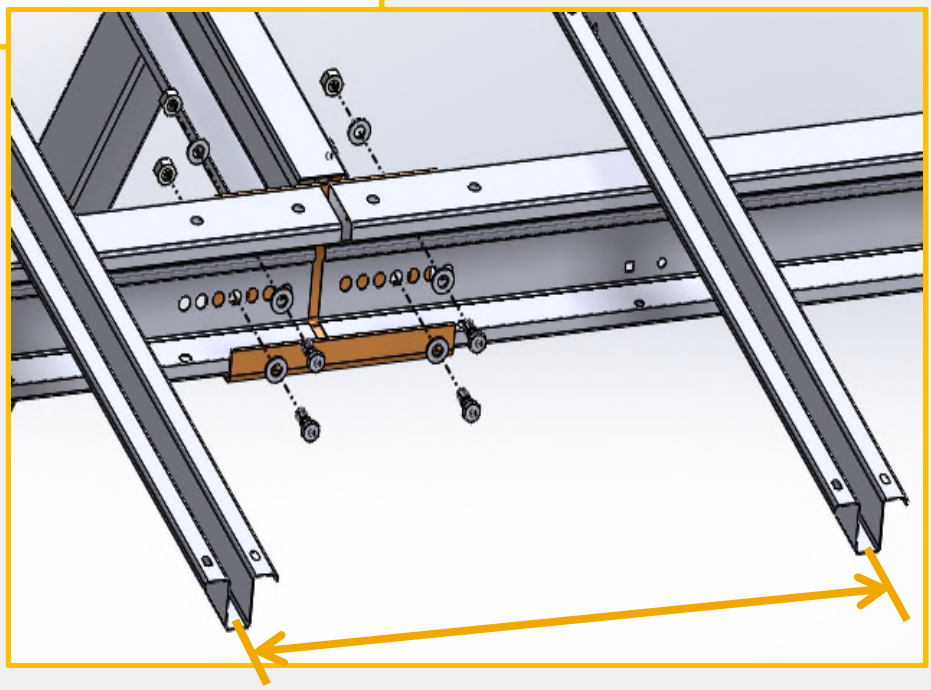
Series G3-X Installation

Step 4 – Tilt Bracket Splice. Splice Horizontal Rail Bracket will not be pre-assembled to the Tilt Top Chord. Fasten the Splice Horizontal Rail Bracket to the Top Chord as shown below. Install Hardware Loosely.



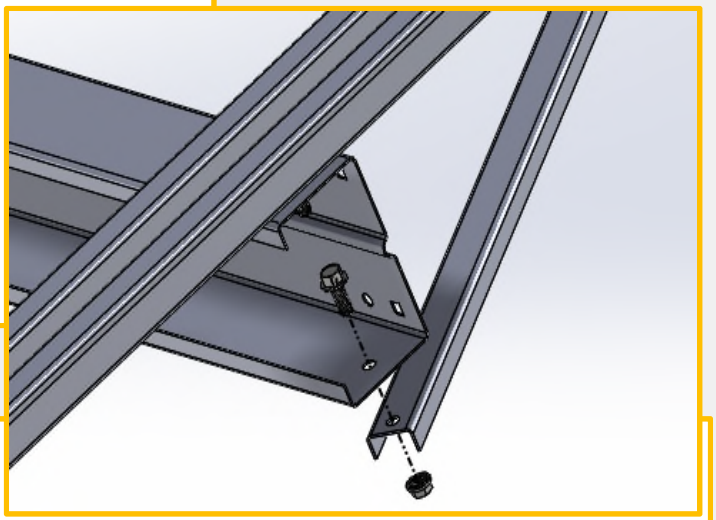
Note: The long leg of the Splice Horizontal Rail Bracket must be installed toward the open face of the Tilt Top Chord.

Step 4a – Attached Horizontal Rails from both sub-assemblies to Splice Horizontal Rail Bracket with hardware as shown.



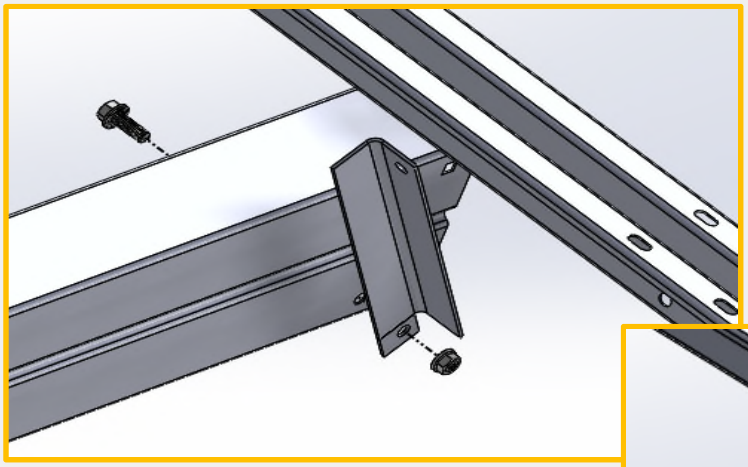
Series G3-X Installation

Step 5 - Attach Horizontal Bracing to Horizontal Rails through the pre-punched holes. Secure with hardware. See Drawing Set for connection locations. Bolt must face downward. (Horizontal Brace will square the rack)



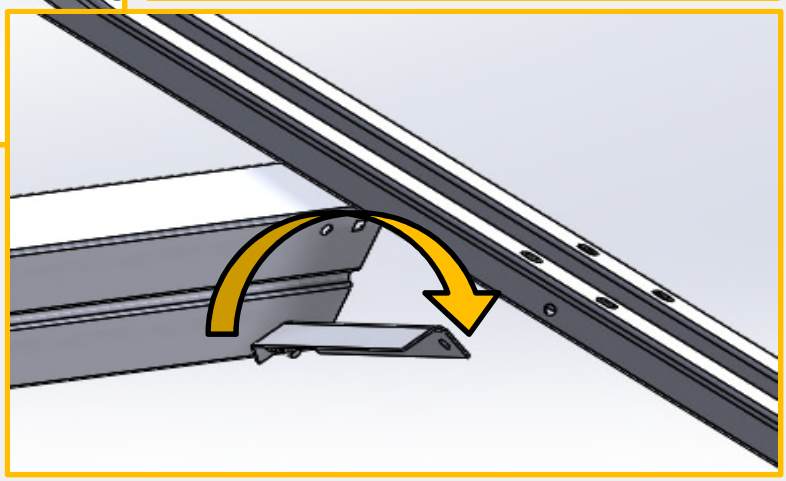
Note: Horizontal Brace attaches to top Horizontal Rail through square hole in the bottom flange, and attaches to bottom Horizontal Rail through round hole directly under Vertical Rail. See Drawing Set for bracing locations

Step 6 - Install Torsion Braces



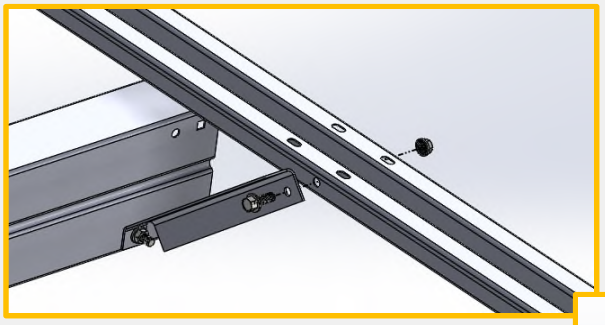
Step 6a - Attach Torsion Brace to Horizontal Rail.

Note: Torsion Brace attaches to Horizontal Rail through round holes in the web as shown.



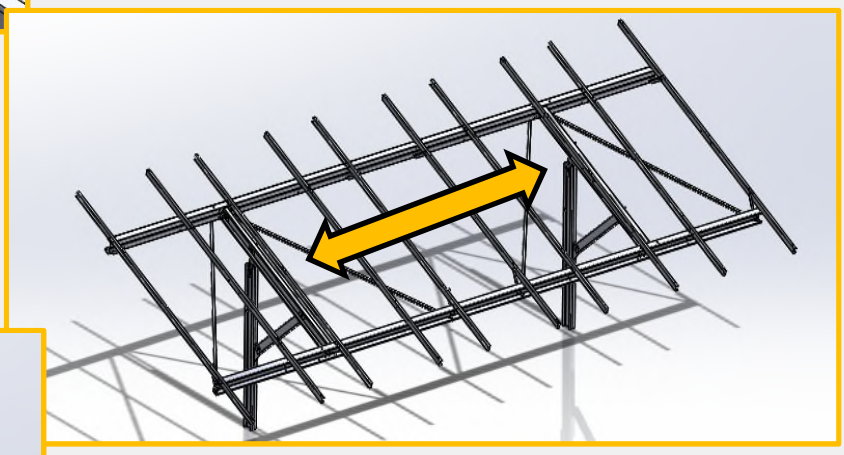
Step 6b - The Torsion Brace is bent and rotated into position to line up the hole in the Vertical Rail.

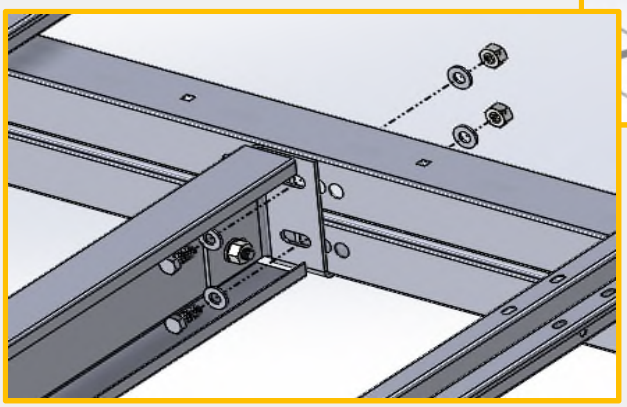
Series G3-X Installation



Step 6c - Attach loose end of Torsion Brace to the web of Vertical Rail. Secure with Hardware. See Drawing Set for connection locations

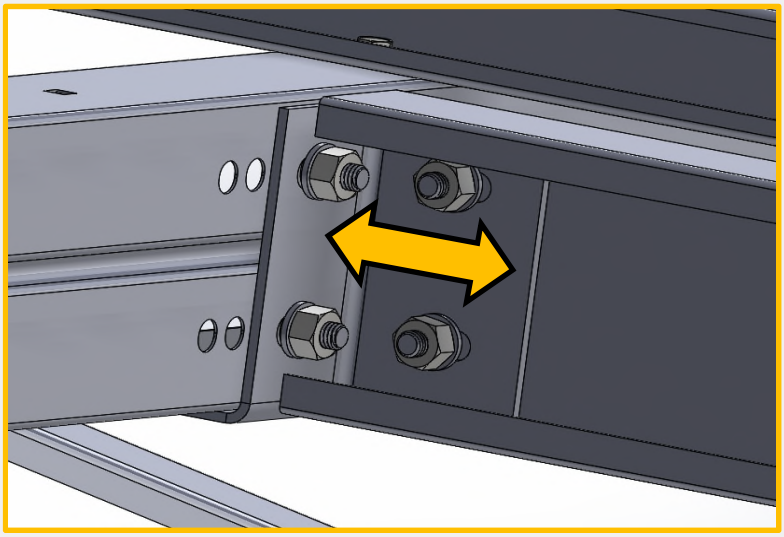
Step 7 - Bolt may be loosened from Step 1 to Adjust rack East to West.





Step 8 - Fasten Horizontal Rail to Horizontal Rail Bracket with supplied hardware.

Step 9 - Tighten pre-assembled hardware to secure Horizontal Rail Bracket to Top Chord.

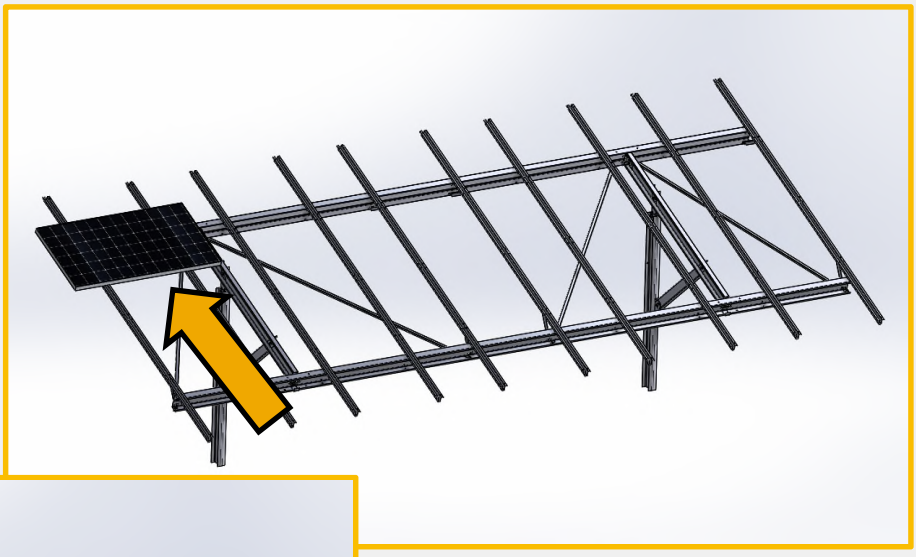


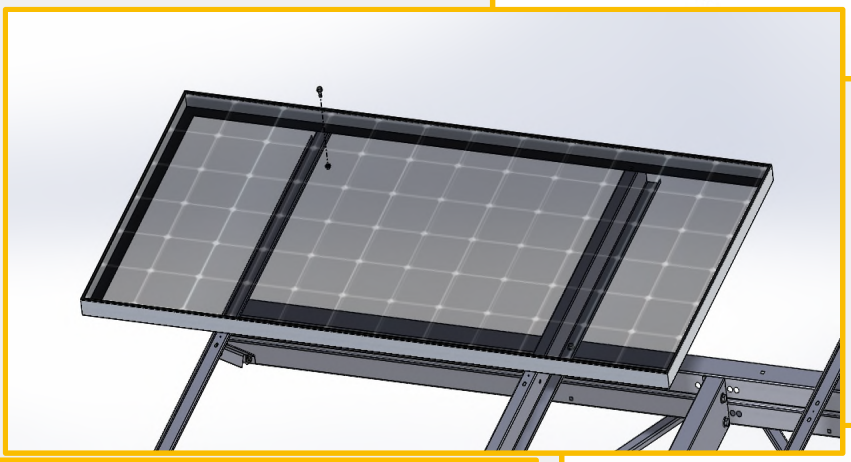
Note: Slots are provided in the Horizontal Rail Bracket for Adjustability North to South

Step 10 - Tighten all Hardware using fastening methods outlined in the Drawing Set.

G3L-X Module Installation: Direct Bolt Landscape Orientation

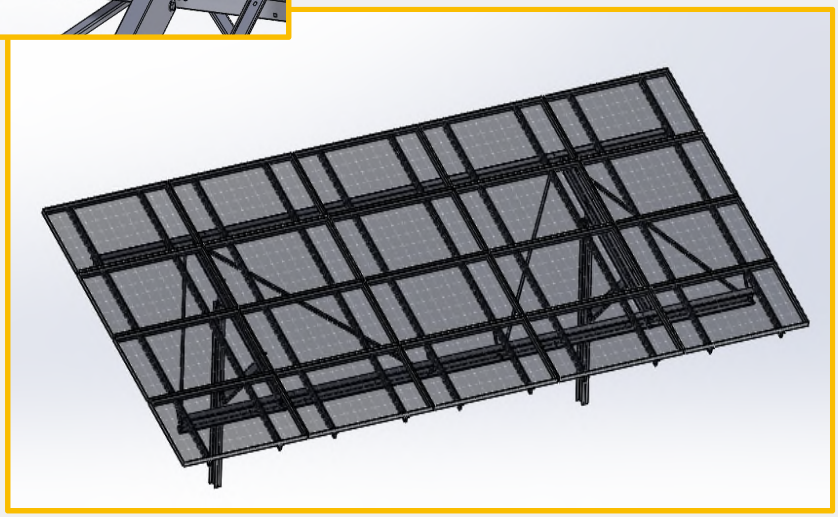
Step 1 – Install Module on the Vertical Rail. Align mounting holes in Module with pre-punched slots in Vertical Rail.





Step 2 – Install Serrated Flange Head Bolt. Torque hardware as outlined in the Drawing Set.

Step 3 – Install the rest of the modules following Step 1 and Step 2

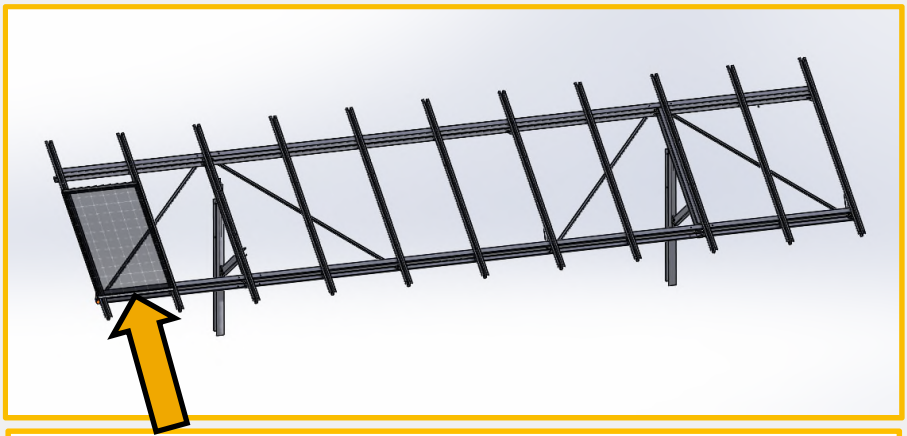


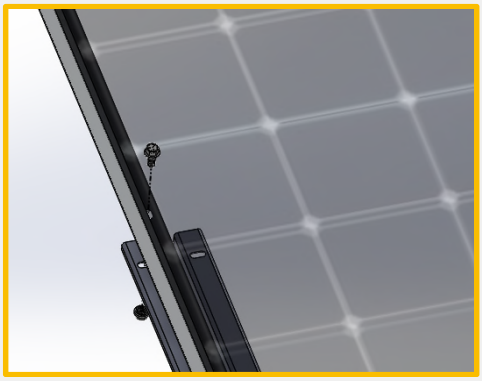
Note: Direct Bolt Method is UL approved for bonding the module to the rack.

Note: Periodically check designed ground clearance dimension from module edge to grade for conformance.

G3P-X Module Installation: Direct Bolt Portrait Orientation

Step 1 – Install Module on the Vertical Rail. Align mounting holes in Module with pre-punched slots in Vertical Rail.

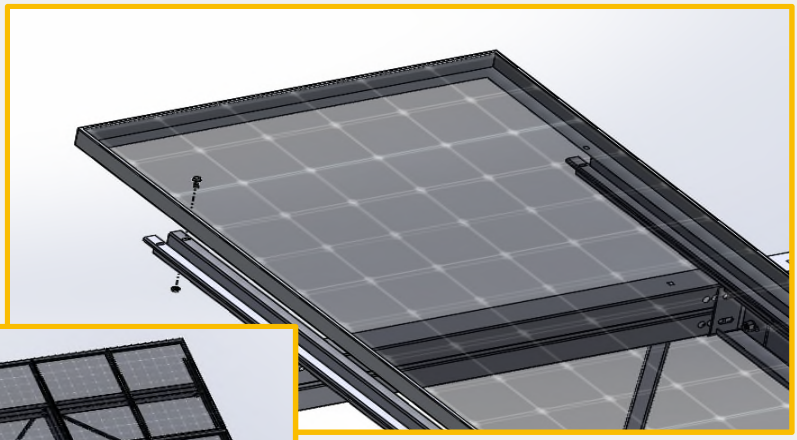


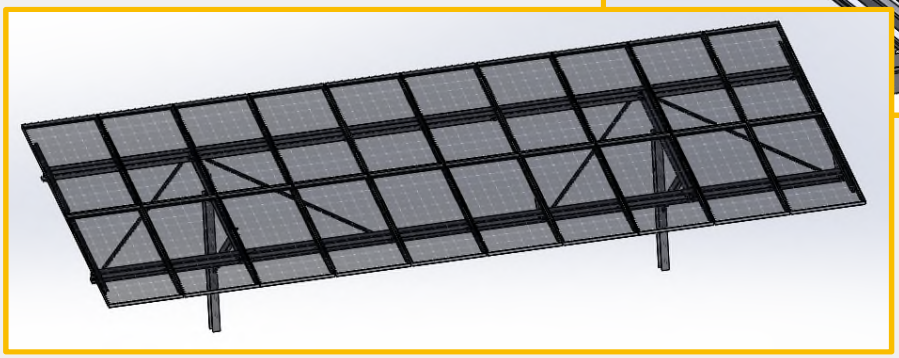


Step 2 – Install Serrated Flange Head Bolt. Torque hardware as outlined in the Drawing Set.

Note: Module mounts to the outside flange of the last Vertical Rail.

Step 3 – Install the rest of the modules following Step 1 and Step 2





Note: Periodically check designed ground clearance dimension from module edge to grade for conformance.

Note: Direct Bolt Method is UL approved for bonding the module to the rack.

Series G3-X Installation

EPDM Strip Application

An EPDM strip must be placed on the edge of each horizontal rail. Remove the cover from the adhesive backing and firmly apply the EPDM strip as shown in the picture below. The thicker edge of the EPDM strip will hang over the end of the horizontal rail.

Note: The G3 racking system does not require EPDM strip application. The EPDM strips are pre-installed on the G3 racking system.

Series G3-X Installation

Solar FlexRack Logo Plate Installation

Apply one logo plate per rack. The plate must be applied so to be clearly identified and not obstructed. The logo plate shall be applied to the web of the north horizontal rail. The location of the plate must be consistent on all racks throughout the site.

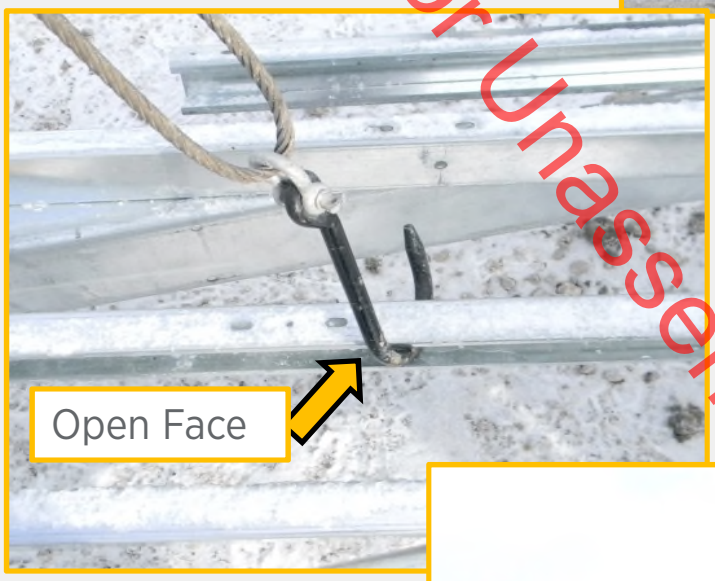
Step 1: Each logo plate includes a date chart. Using the provided hole-punch pliers, punch the month, day and year that the logo plate is applied.

Step 2: Remove the cover from the adhesive backing and press the logo plate firmly onto the rack. (Note Figure Right: applied to web of north horizontal rail)

Note:** The G3 racking system does not require logo plate application. The logo plate is pre-installed on the G3 racking system.

Series G3 Installation
Preassembled Landscape/Portrait

Step 1 - Attach a spreader bar to the end of the material handler. Fasten lifting hooks to the ends of the spreader bar.

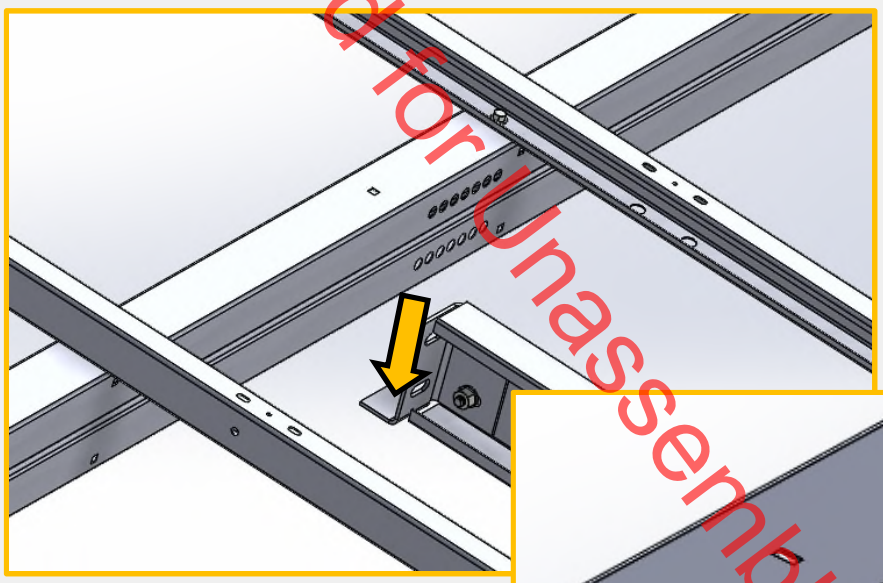


Step 2 - Insert lifting hooks into the open face of the vertical rails specified on the drawings. (See Appendix D for attaching lifting hooks to Portrait rack.)

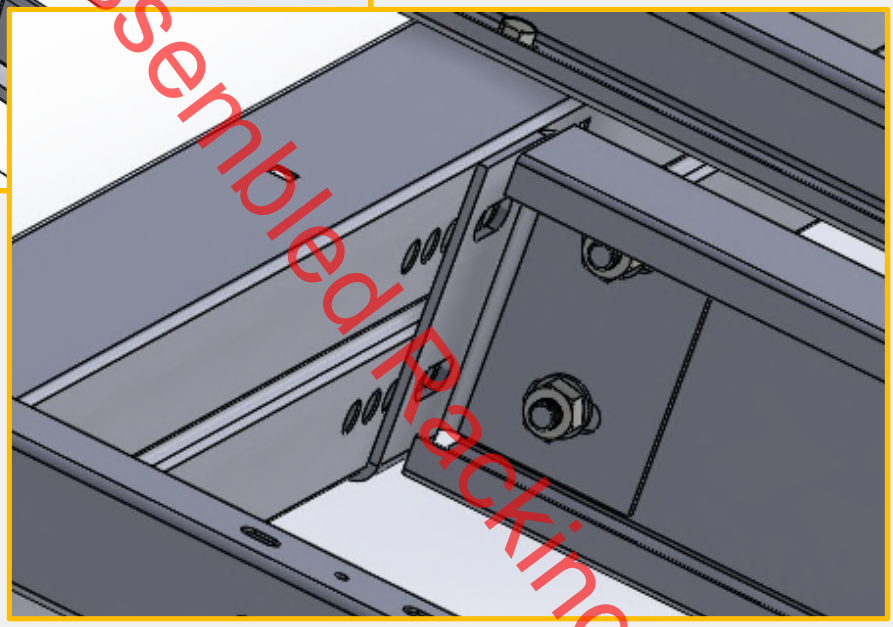
Note: Adjust spreader bar so the rack is level during lift

G3 Installation
Preassembled Landscape/Portrait

Step 3 - Machine operator begins to lift rack. Two workers are position on each end to assist operator. Rack will unfold during lift under its own weight. **The machine operator and workers guide the rack into position on the Horizontal Rail Brackets located at each end of the Top Chord.**



Step 4 - Once the rack is nested onto the Horizontal Rail Brackets the lifting hooks can be removed.

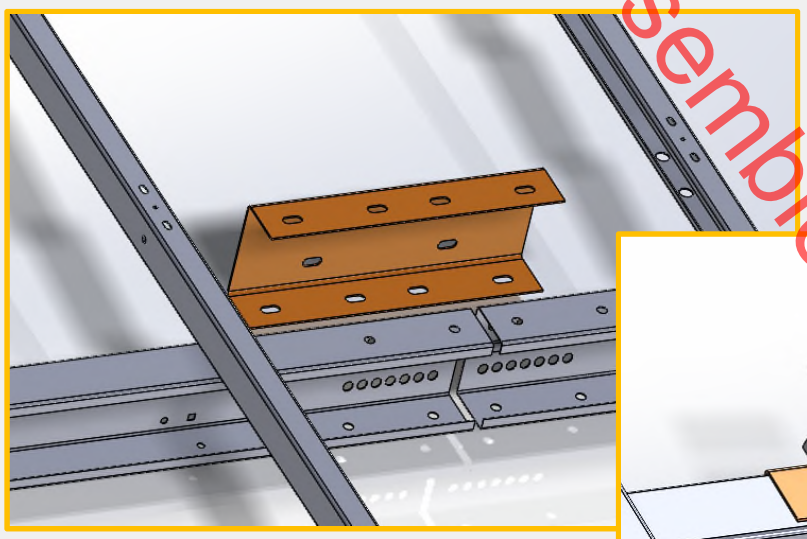


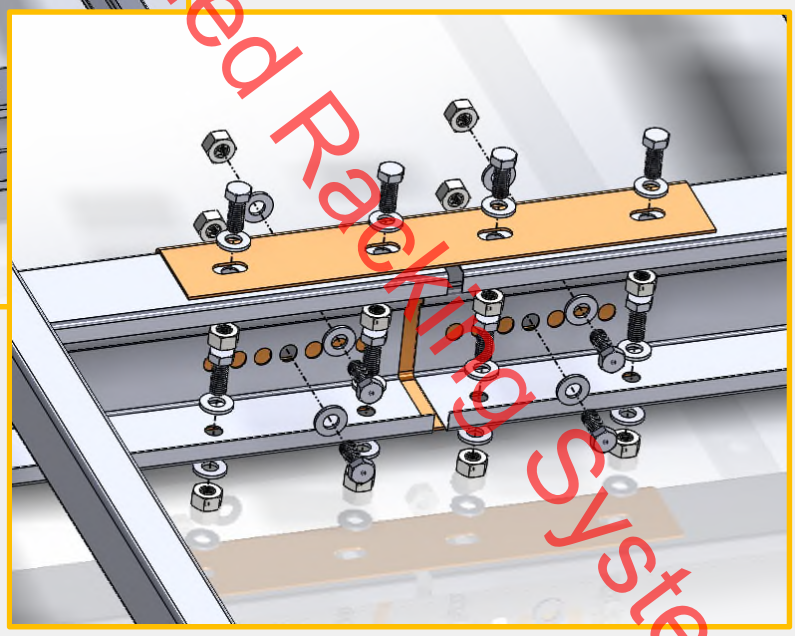
Pre-assembled fasteners connecting Horizontal Rail to Vertical Rail & Torsion Braces do NOT need re-tightened once the rack is installed

G3 Installation
Preassembled Landscape/Portrait

Note: If rack is not spliced skip to Step 7.
Two splice connections are available. Splice at Tilt Bracket (odd post count), and Splice at Mid Span (even post count). Splice connection must be fastened before Horizontal Rail is attached to Horizontal Rail Brackets. Refer to the Drawing Set for Vertical Rail spacing over the Splice.

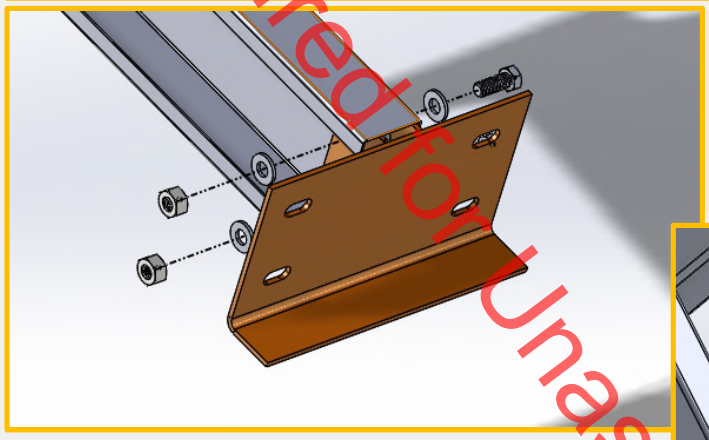
Step 5 – Midspan Splice. After both sub-assemblies are resting on the Horizontal Rail Brackets, the Splice Channel is attached to the Horizontal Rails of both sub-assemblies. Bolt the Splice Channel to the Horizontal Rails as shown. Start with the fasteners in the Web.



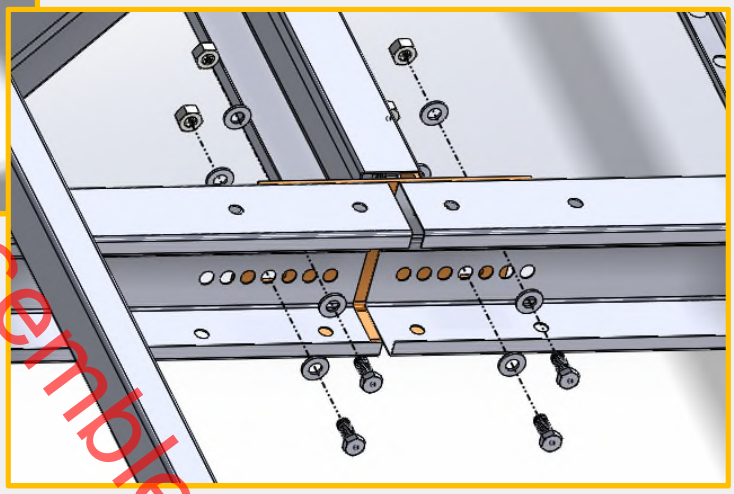


G3 Installation
Preassembled Landscape/Portrait

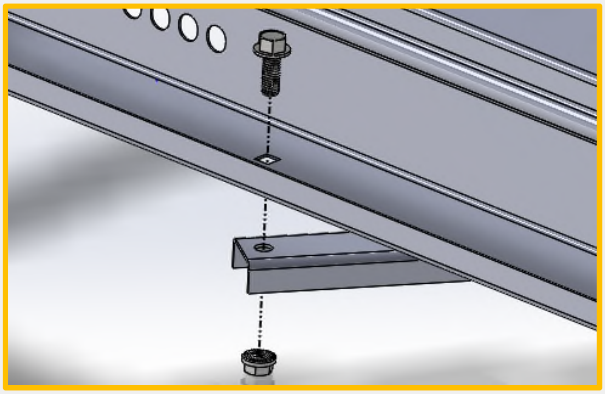
Step 6 – **Tilt Bracket Splice.** Splice Horizontal Rail Bracket will not be pre-assembled to the Tilt Top Chord. Fasten the Splice Horizontal Rail Bracket to the Top Chord as shown below. Install Hardware Loosely.



Note: The long leg of the Splice Horizontal Rail Bracket must be installed toward the open face of the Tilt Top Chord.



Step 6a – Attached Horizontal Rails from both sub-assemblies to Splice Horizontal Rail Bracket with hardware as shown.

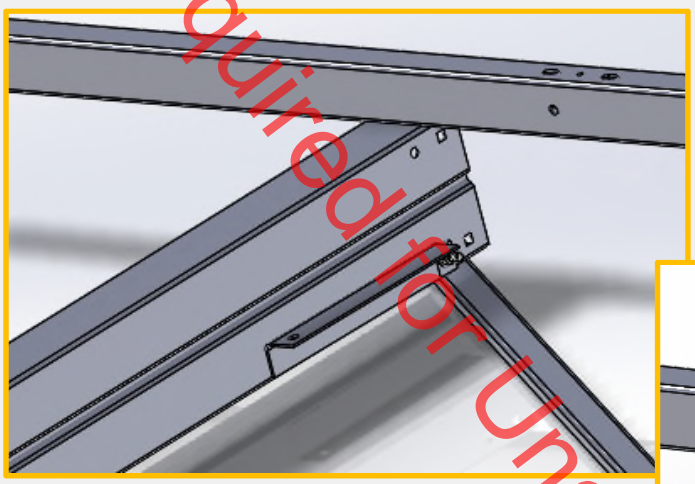


Step 7 - Attach Horizontal Bracing to Horizontal Rails through the pre-punched holes. Secure with hardware. See Drawing Set for connection locations. Bolt must face downward. (Horizontal Brace will square the assembly)

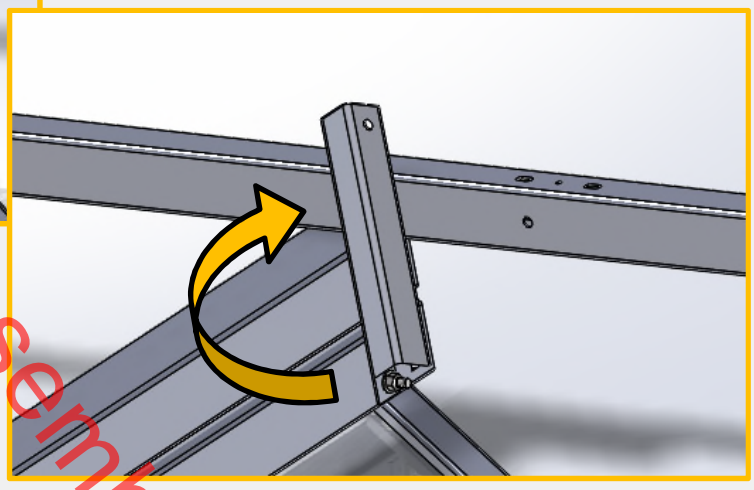
Note: Horizontal Brace attaches to top Horizontal Rail through square hole in the bottom flange, and attaches to bottom Horizontal Rail through round hole directly under Vertical Rail. See Drawing Set for bracing locations

G3L Installation
Preassembled Landscape

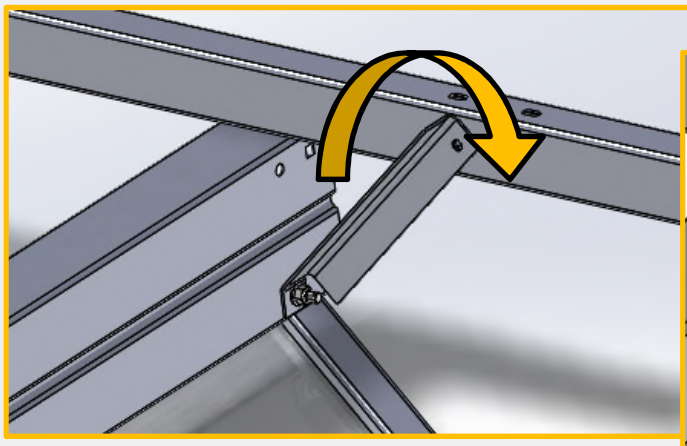
Step 8 - Install Torsion Braces. Torsion Braces arrive on site flattened and attached to the Horizontal Rail.

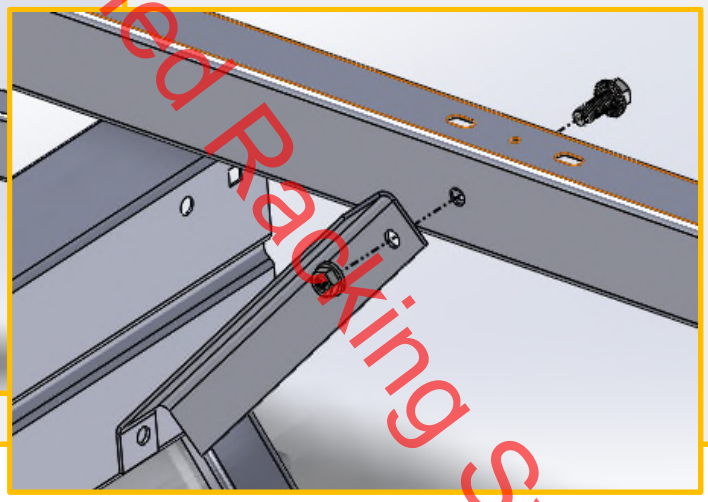


Step 8a - The Torsion Brace must be rotated to contact the Vertical Rail.



Step 8b - The Torsion Brace is bent into position to line up the hole in the Vertical Rail.

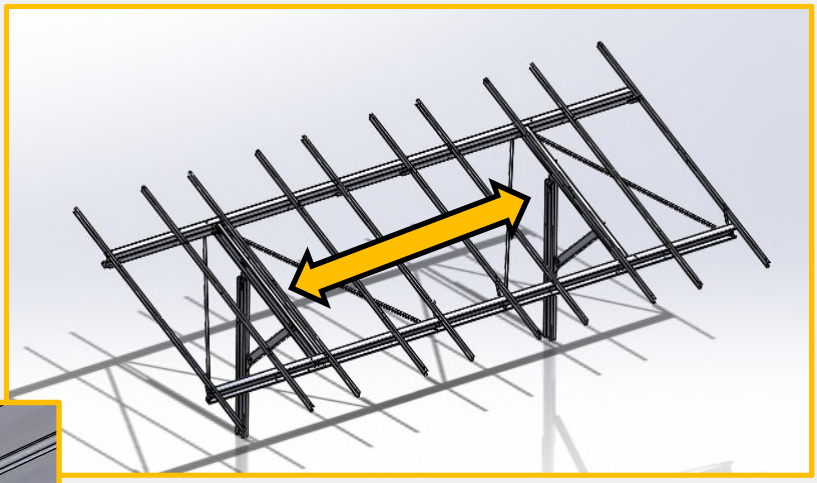


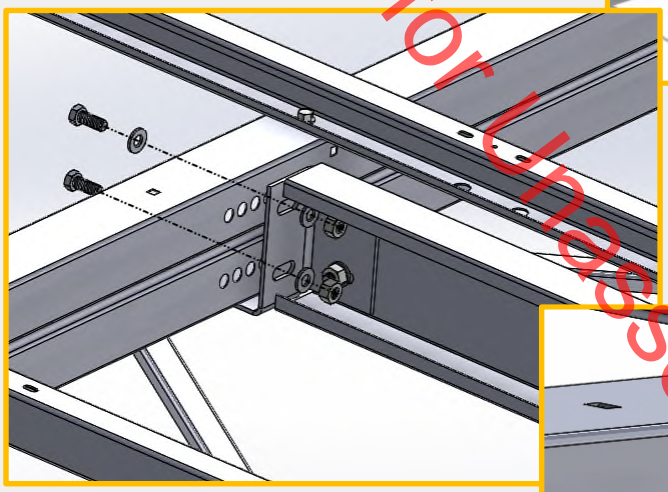


Step 8c - Attach loose end of Torsion Brace to Vertical Rail. Secure with Hardware. See Drawing Set for connection locations

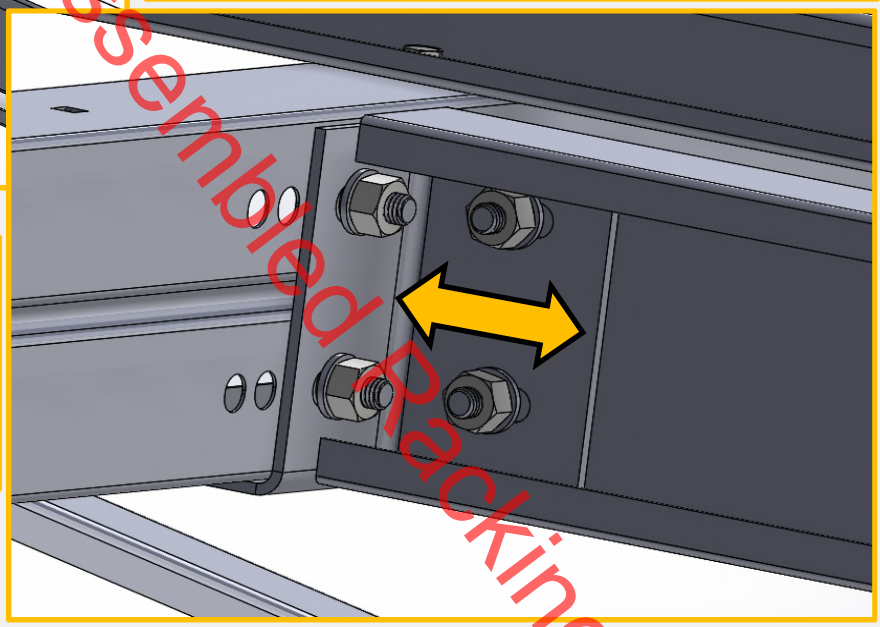
G3 Installation
Preassembled Landscape/Portrait

Step 9 - Adjust rack East to West to line up holes in the Horizontal Rail to Horizontal Rail Brackets





Step 10 - Fasten Horizontal Rail to Horizontal Rail Bracket with supplied hardware.



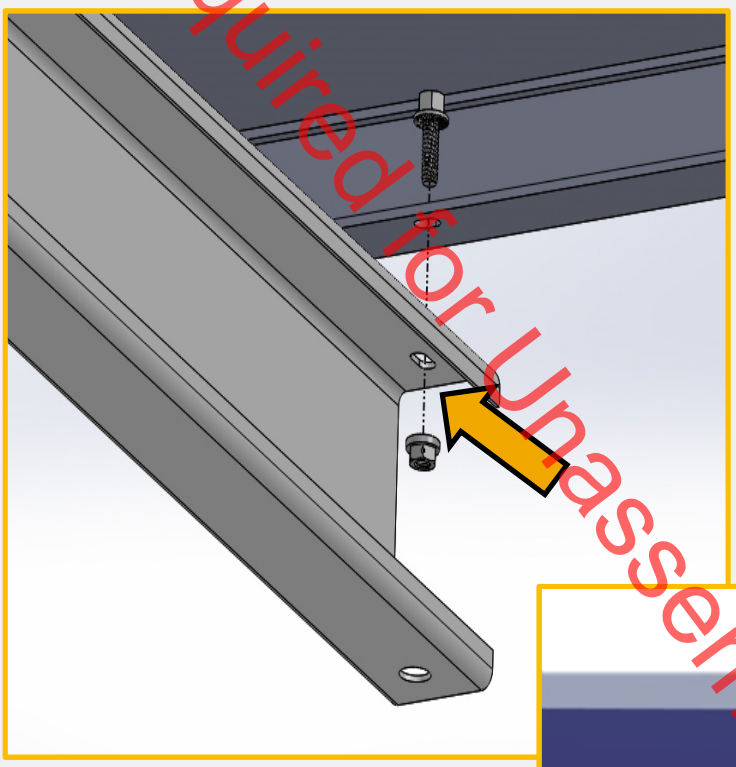
Step 11 - Tighten pre-assembled hardware to secure Horizontal Rail Bracket to Top Chord.

Note: Slots are provided in the Horizontal Rail Bracket for Adjustability

Step 12 - Tighten all Hardware using fastening methods outlined in the Drawing Set.

Module Installation: Direct Bolt
Preassembled Landscape

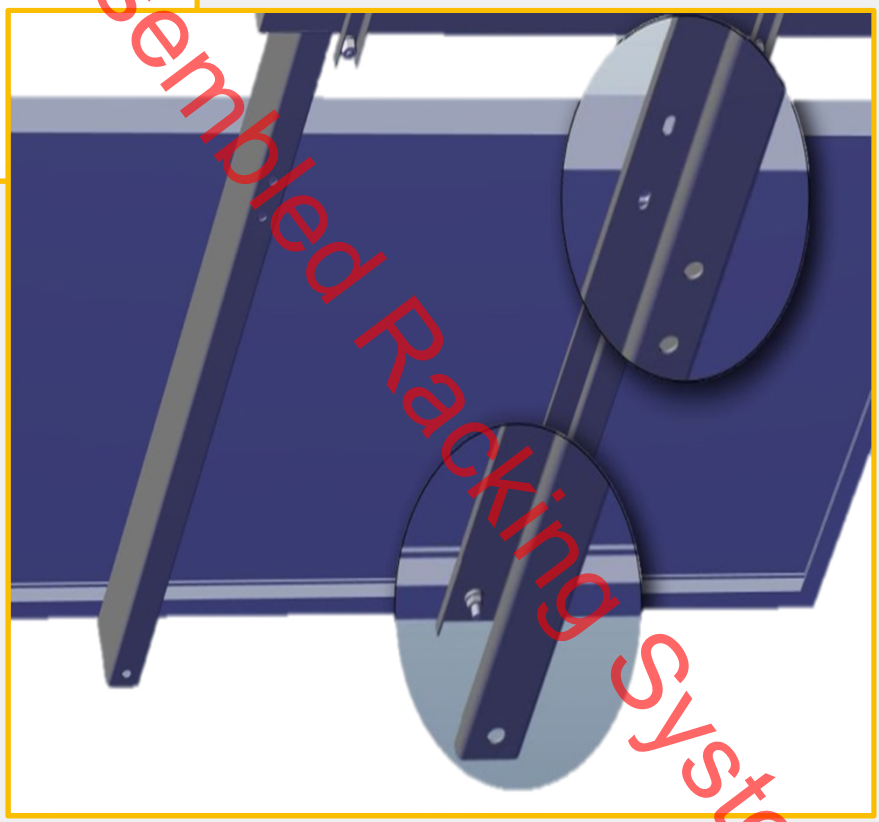
Step 1 – Install Module on the Vertical Rail. Align mounting holes in Module with pre-punched slots in Vertical Rail.



Step 2 – Install Serrated Flange Head Bolt. Torque hardware as outlined in the Drawing Set.

Note: Direct Bolt Method is UL approved for bonding the module to the rack.

Note: Periodically check designed ground clearance dimension from module edge to grade for conformance.



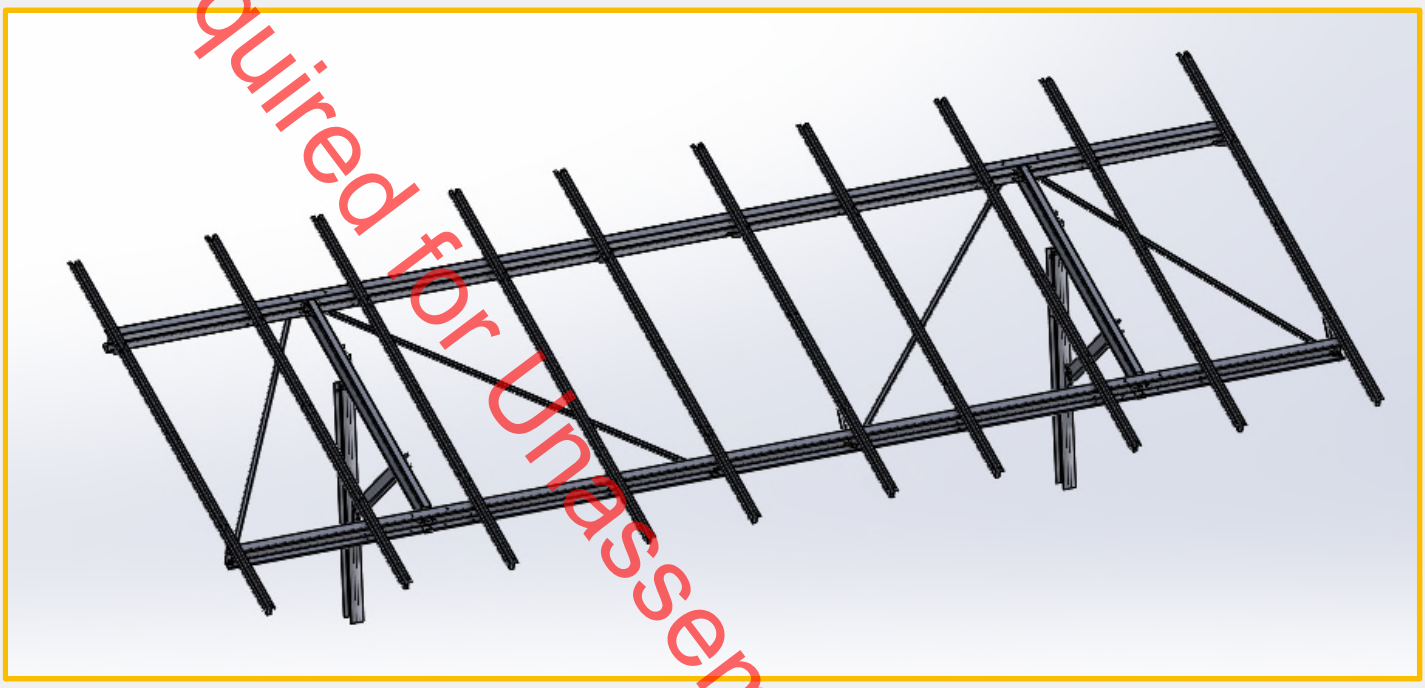
Site & Installation Control Plan

Control Plan - Constructed Solar Site

Control Plan Number	Field Location	Date (Orig.)	Current Release Level	Current Release Date
SF-1		10/2/2014	Rev. 0	October 2, 2014
Rack Part Numbers	**Description**			
Core Team	**Supplier Name**		**Quality Department Approval**	
Greg Huzyak, Pat Landers	Northern States Metals		*Jeremy Jones*	
Customer Contact / Team Contact				

PROCESS NUMBER	OPERATION DESCRIPTION	EXPECTED OUTPUT		METHODS				CONTROL METHOD	REACTION PLAN
		PRODUCT	PROCESS	PRODUCT / PROCESS / SPECIFICATION and TOLERANCE	EVALUATION/ MEASUREMENT TECHNIQUE	SAMPLE SIZE	SAMPLE FREQ		
1	NSM and Customer Site Planning	SFR Racking system plan design literature	NSM Engineering to send to Customer and Contstruciton vendors	Install Manual	Reviewed by EIT or PE	1 per site		Install Manual versions and revisions will be kept in controlled files at NSM	None needed
		SFR Racking system plan design installation	Certified installer program and or onsite training	Completed for every site	NSM Solar Flexrack Field Technician & Solar Flexrack Field Service Manager	each site		Training to be competed along with Field Tech / Field Service Manager to site designated leaders	Signed / Dated acknowledgement of training completion record. To be scanned and saved.
2	Supplied Components and Hardware	Mechanical & Physical Certification	Received and Reviewed by NSM QE	ASTM specs and any customer specific requirements	Proper documentation	Per Lot		Electronic copy forwarded to NSM QE/ Hardcopy sent along with shipment.	Penalize vendor for not sending certifications.
		Product Inspection Record	Received and Reviewed by NSM QE	Count reference paperwork	Visual confirmation	All orders		Electronic copy forwarded to NSM QE/ Hardcopy sent along with shipment.	Penalize vendor for not sending inspection records.
		Packaging	Photographic representations from install manual and vendors sent before first shipment from vendor to site.	Product specific packaging not standard across all products	Visual inspection of packaging to ensure quality of product will be maintained during transit	First Shipment of newly developed product category		Emailed to NSM QE / Process Engineer for approval.	Reject parts not packaged to plan (if damaged).
		Shipping Paperwork	Bill of Lading and Shipment Approval Form	Identified Paperwork necessary to ship to the site	Quality inspection reports / Certs / Material ID tag listing the part number and quantity per lot / skid.	Each shipment		Information placed on MASTER BOM by NSM for part number / quantity / and date shipped once notified by vendor of release.	Contact NSM shipping for any delinquent documents.
3	Site Receiving and Storage	Parts receiving by Site Mgmt teams	Product verification	correct part number	Signed BOL & Signed Checklist by both driver & receipient	Per Lot		Checklist to ensure necessary paperwork (mill certs / FAI) is delivered with each shipment.	Contact vendor to resolve any discrepancy.
		Parts receiving by Site Mgmt teams	Quanitity verification	correct quantiy	Signed BOL & Signed Checklist by both driver & receipient	Per Lot		Checklist to be filed and entered into a site BOM shared by site PM and NSM PM	Contact vendor to resolve any discrepancy.
		Parts receiving by Site Mgmt teams	Quality Inspection	no defects	Signed BOL & Signed Checklist by both driver & receipient	Per Lot		Checklist to be filed and entered into a site BOM shared by site PM and NSM PM. Reported damaged product or poor quality to be noted on BOL and photographed Immediately	Contact vendor to resolve any discrepancy. Non conforming goods to be staged in a site pre-established hold area defined by Site Map
		Structural Member	Storage & Preservation	Raised from ground on pallet or other	Storage and laydown ares defined by Site Operators	Per Lot		Site Operations to send photo of intended laydown area.	Site Operators fix storage to comply storage specifications.
		Hardware	Storage & Preservation	Raised from ground and under cover	Storage and laydown ares defined by Site Operators	Per Lot		Site Operations to send photo of storage location (box truck, pole building, storage shed, etc).	Site Operators fix storage to comply storage specifications.
4	Project Assembly and Wrap up	Site owner or constructor final report.	Visual and Mechanical inspections	Clean bill of health	Visual and Mechanical inspections	Site		Shared Master BOM and order sheets display 100% completion for piece count delivery and proper assembly.	Site and NSM work cooperatively to close any open issues.
		Site commision report	Visual and Mechanical inspections	Clean bill of health	Visual and Mechanical inspections	Site		Accountablity for assembled correctly.	Site and NSM work cooperatively to close any open issues.

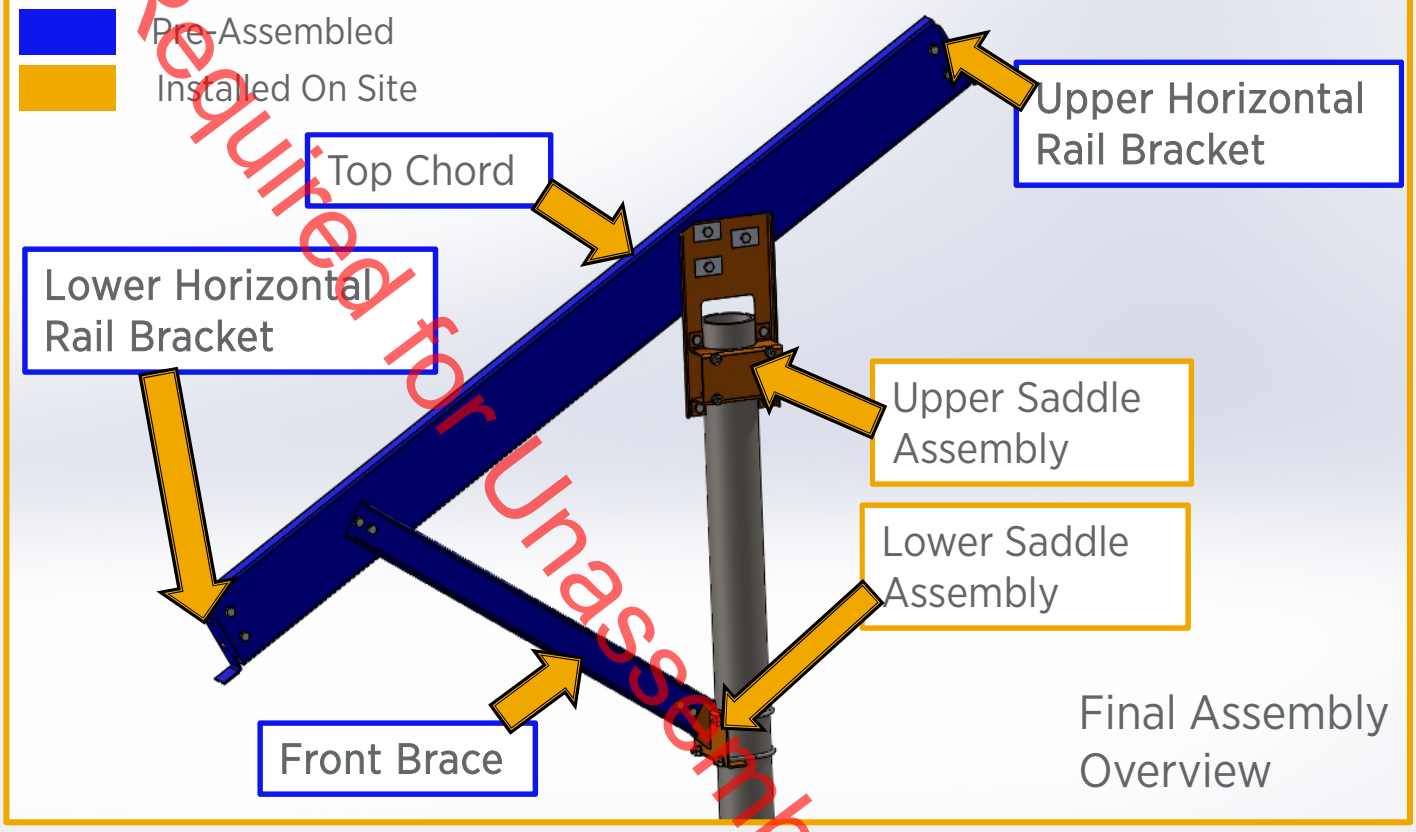
Thank you for choosing Solar FlexRack as your racking partner!



Please send any feedback to info@solarflexrack.com with project name, location, sales rep, product installed and any pictures you would want to include. We rely on your feedback to continue to lead the way in mounting innovation!

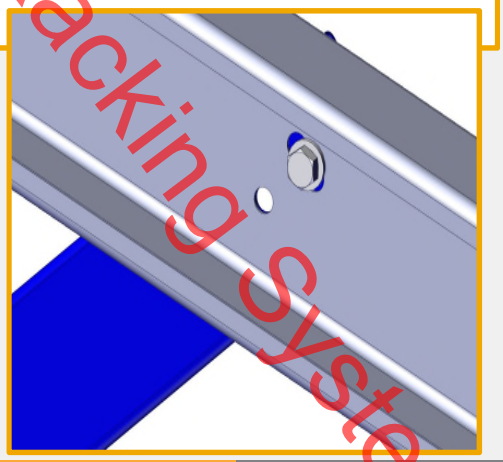
Two Member Tilt Installation

Appendix A - Two Member Tilt connection to Round Post.



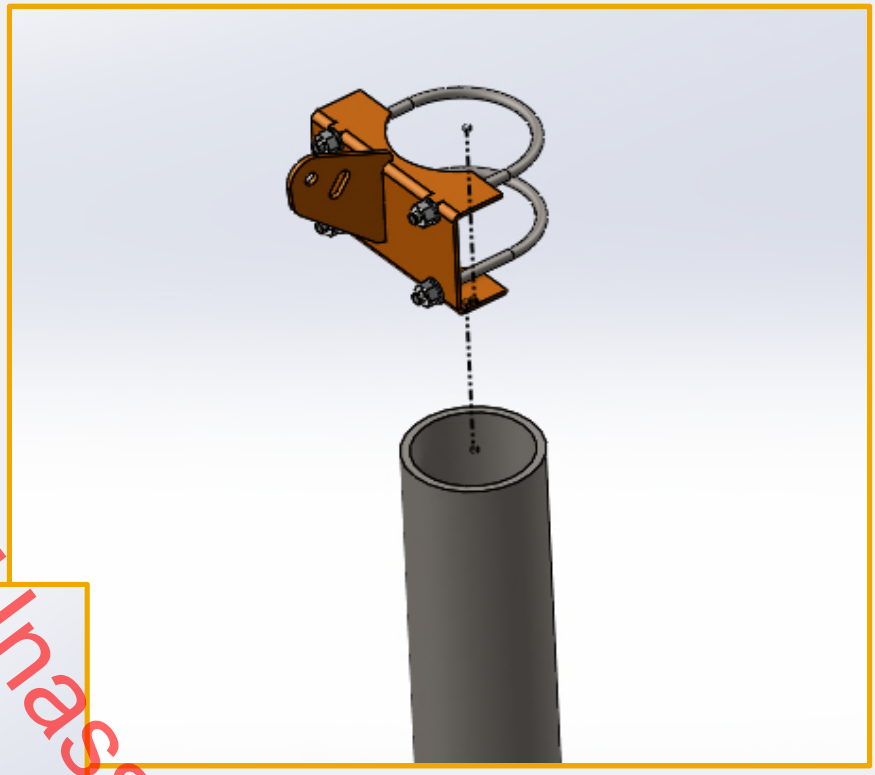
Pre-Assembled components (blue) include the Top Chord, Front Brace, Upper and Lower Horizontal Rail Brackets **Refer to Drawing Set for dimensions of tilt components and fastener quantities.**

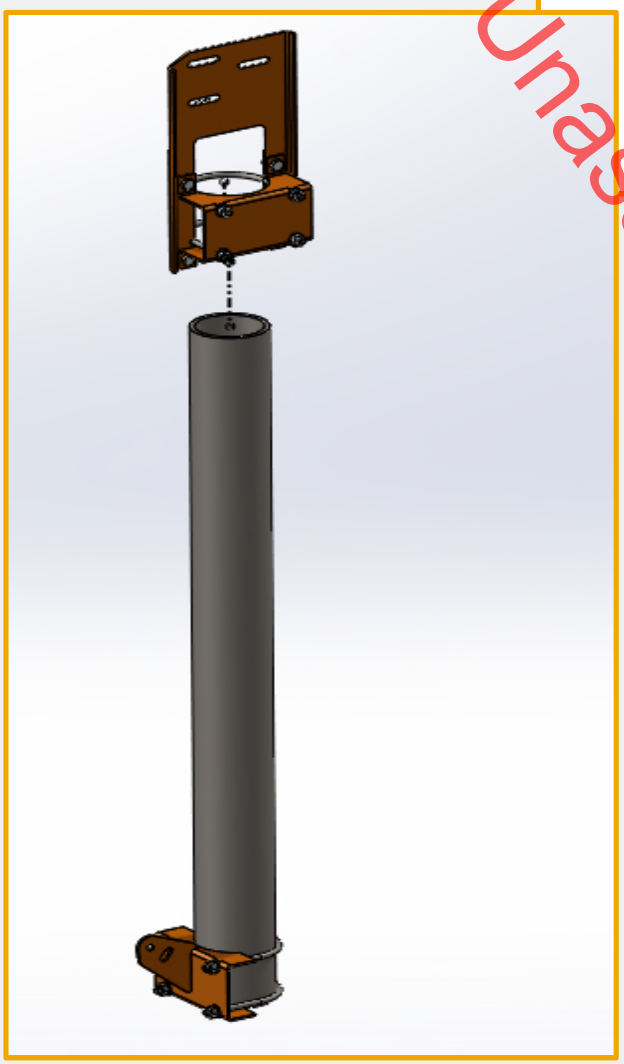
Note: Top Chord & Front Brace are connected by a single bolt. An additional bolt is required during installation. **ALL Pre-installed bolts must be tightened after tilt is fully assembled.**



Two Member Tilt Installation

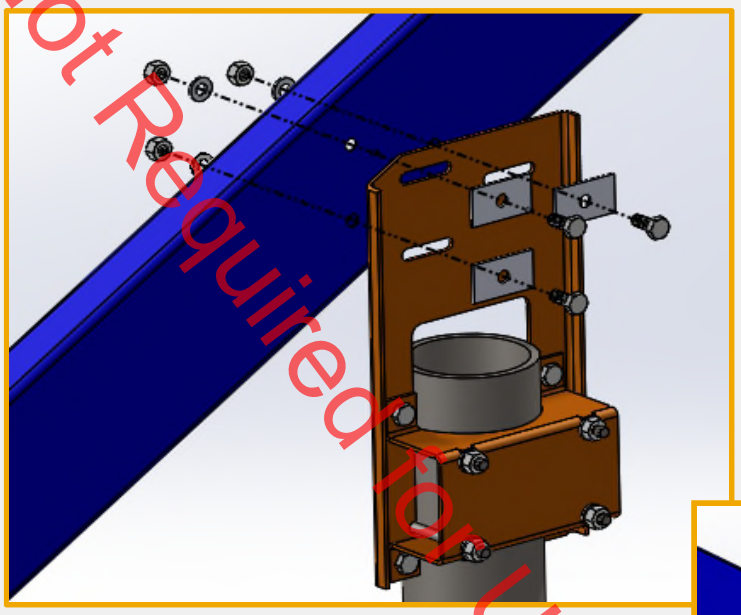
Step 1 – Slide the Lower Saddle Assembly over the top of the post and set on the ground.



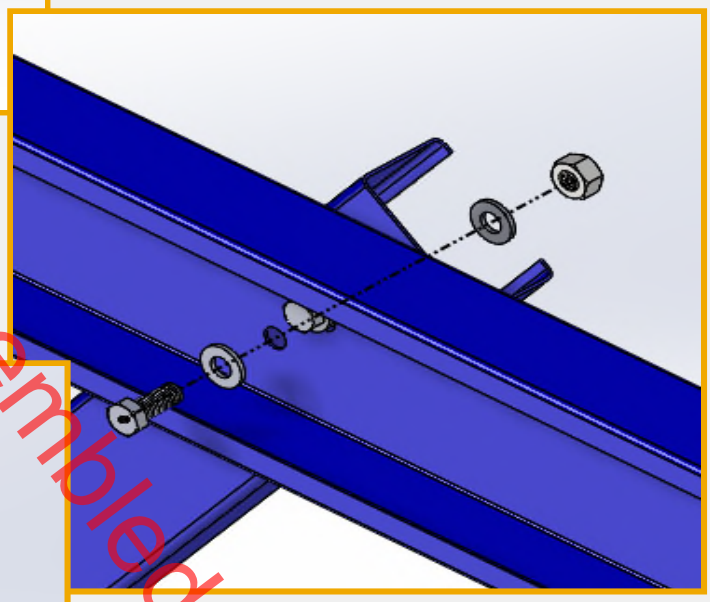


Step 2 – Slide the Upper Saddle Assembly over the Post. Establish the height of the Upper Saddle Assembly on the 1st and last post (or 1st post on adjacent rack). Plumb the Upper Saddle Assembly and tighten the preinstalled U-bolts finger tight. String a line between top brackets to properly align all the Upper Saddle Assembly. Use a Carpenter square to align the Upper Saddle perpendicular to the string line.

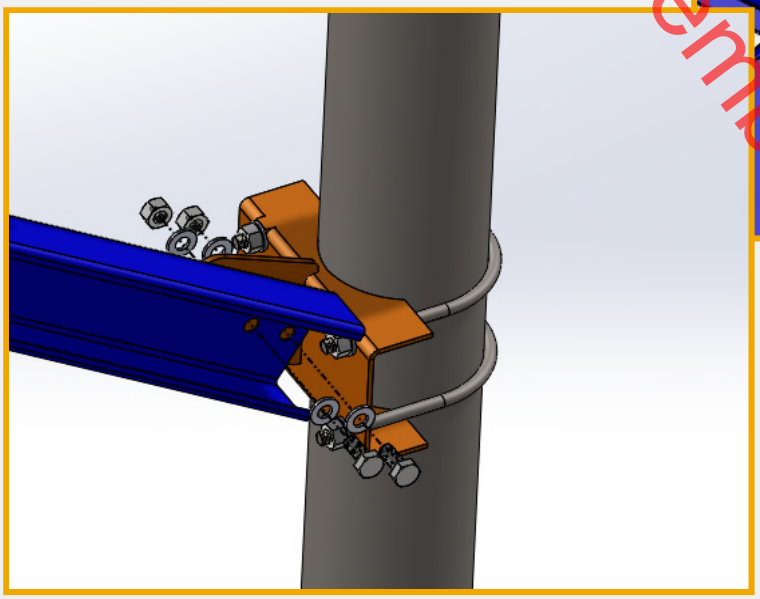
Two Member Tilt Installation



Step 3 – Attach Top Chord to Upper Saddle Assembly. Install hardware loosely. Allow front brace to swing down into position.



Step 4 - Install final bolt connecting Front Brace to Top Chord

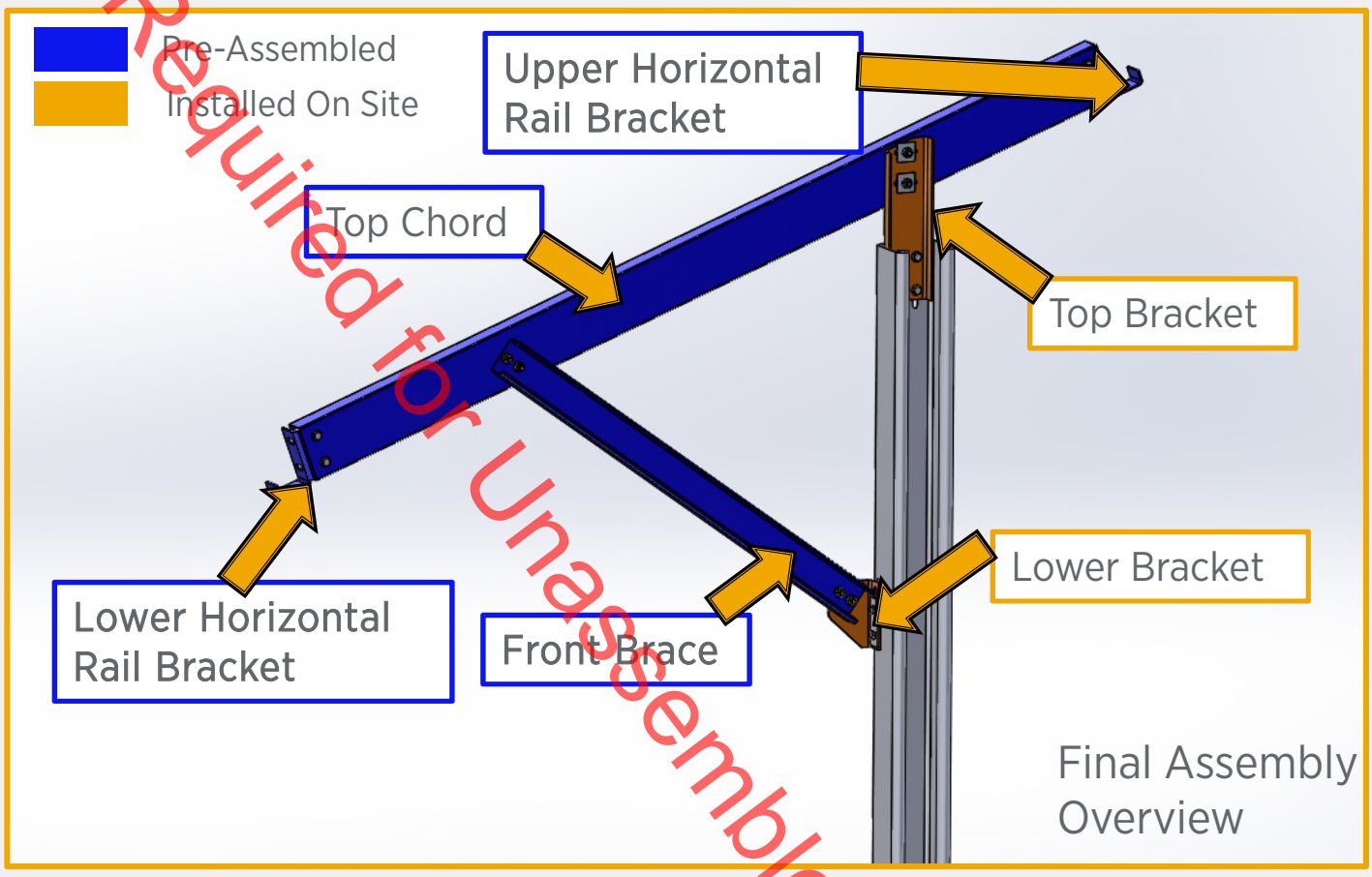


Step 5 – Install Front Brace to Lower Saddle Assembly

Step 6 - Tighten all hardware (including pre-installed hardware) as outlined in Drawing Set leaving the Horizontal Rail Brackets Loose.

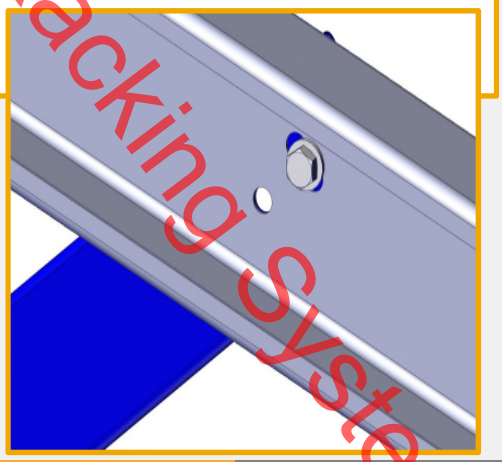
Two Member Tilt Installation

Appendix B - Two Member Tilt connection to SFR Smart Post.



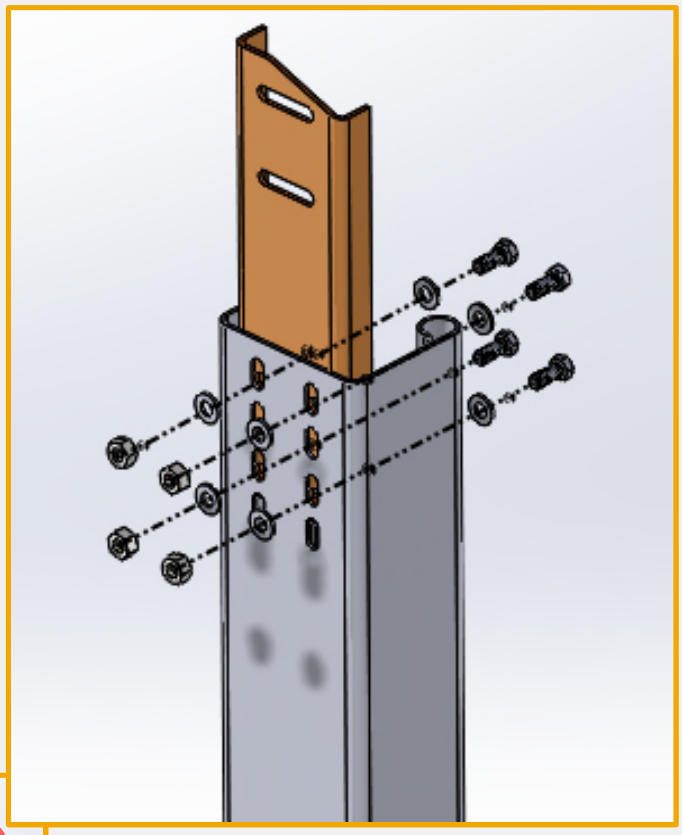
Pre-Assembled components (blue) include the Top Chord, Front Brace, Upper and Lower Horizontal Rail Brackets **Refer to Drawing Set for dimensions of tilt components and fastener quantities.**

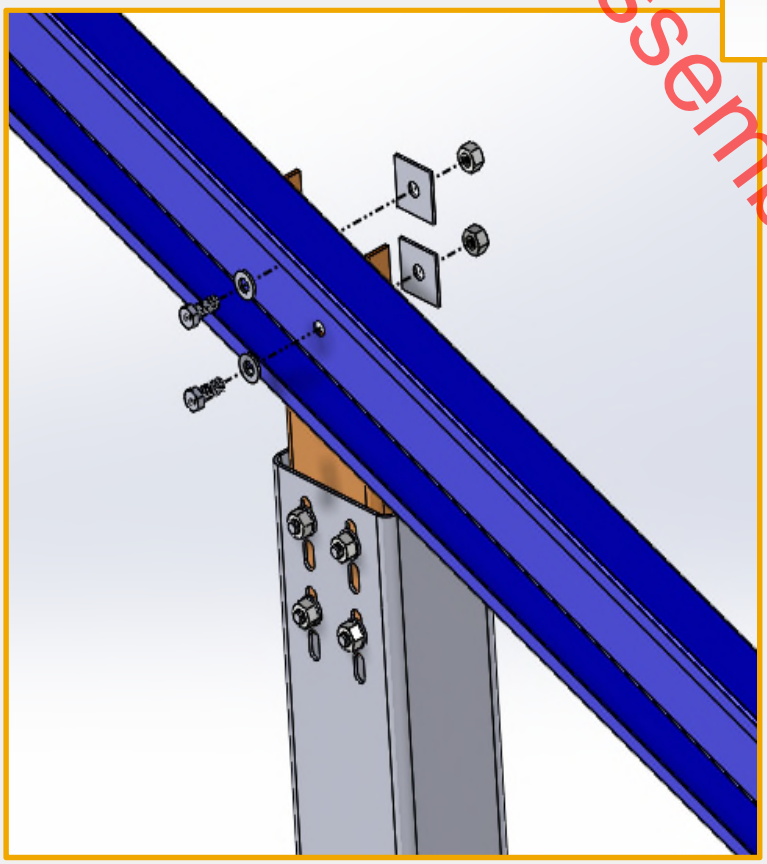
Note: Top Chord & Front Brace are connected by a single bolt. An additional bolt is required during installation. **ALL Pre-installed bolts must be tightened after tilt is fully assembled.**



Two Member Tilt Installation

Step 1 - Attach Top Bracket to web of the Smart Post with hardware shown in the drawing set. Establish the height of the Top Bracket on the 1st and last post (or 1st post on adjacent rack). Plumb Top Bracket and install hardware finger tight. String a line between top brackets to properly align all Top Brackets.

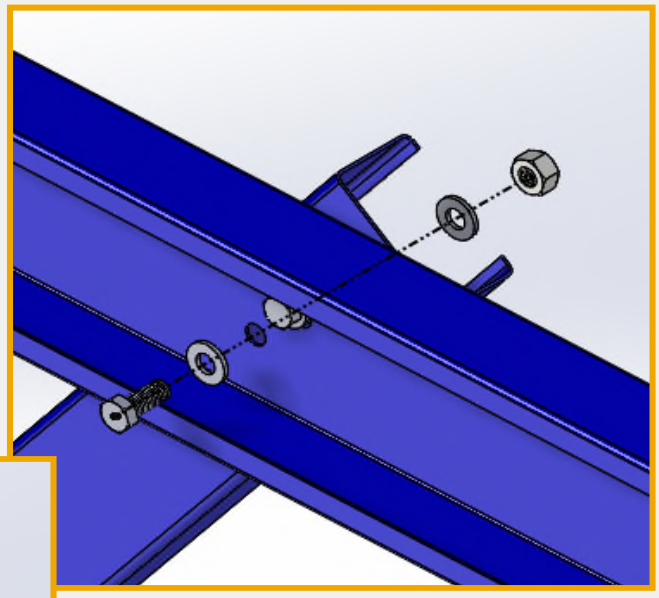


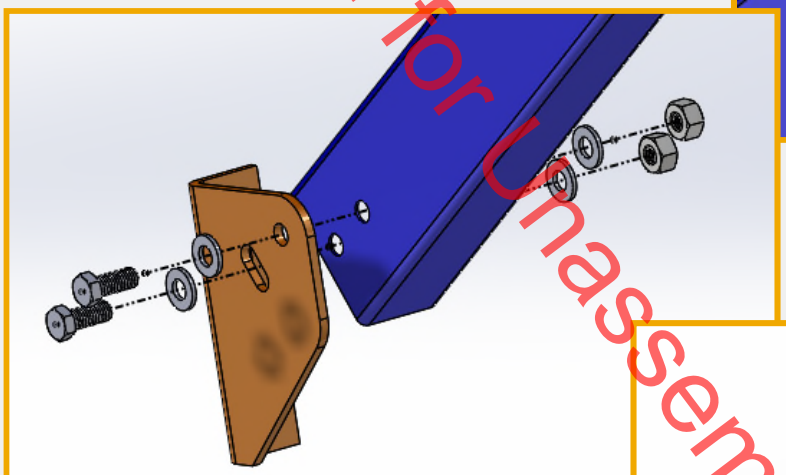


Step 2 – Attach Top Chord to Top Brackets on first and last post. Set Angle, and install hardware loosely. String a line between Top Chords to properly align all Top Chords. Allow front brace to swing down into position.

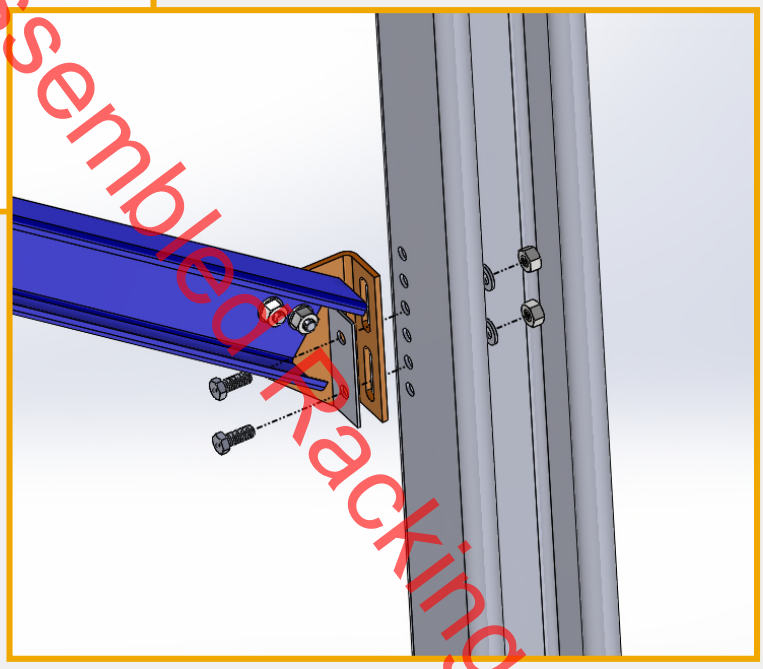
Two Member Tilt Installation

Step 3 - Install final bolt connecting Front Brace to Top Chord





Step 4 - Install Lower Bracket to Front Brace



Step 5 - Install Lower Bracket to Post

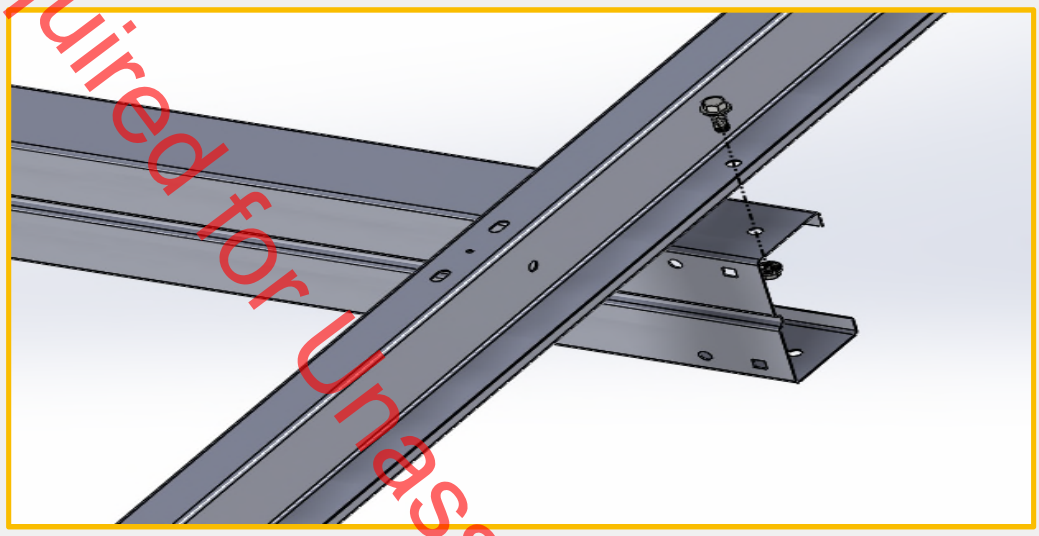
Note: 6 holes are located in the South Flange of the post for adjustability.

Step 6 - Tighten all hardware (including pre-installed hardware) as outlined in Drawing Set leaving the Horizontal Rail Brackets Loose.

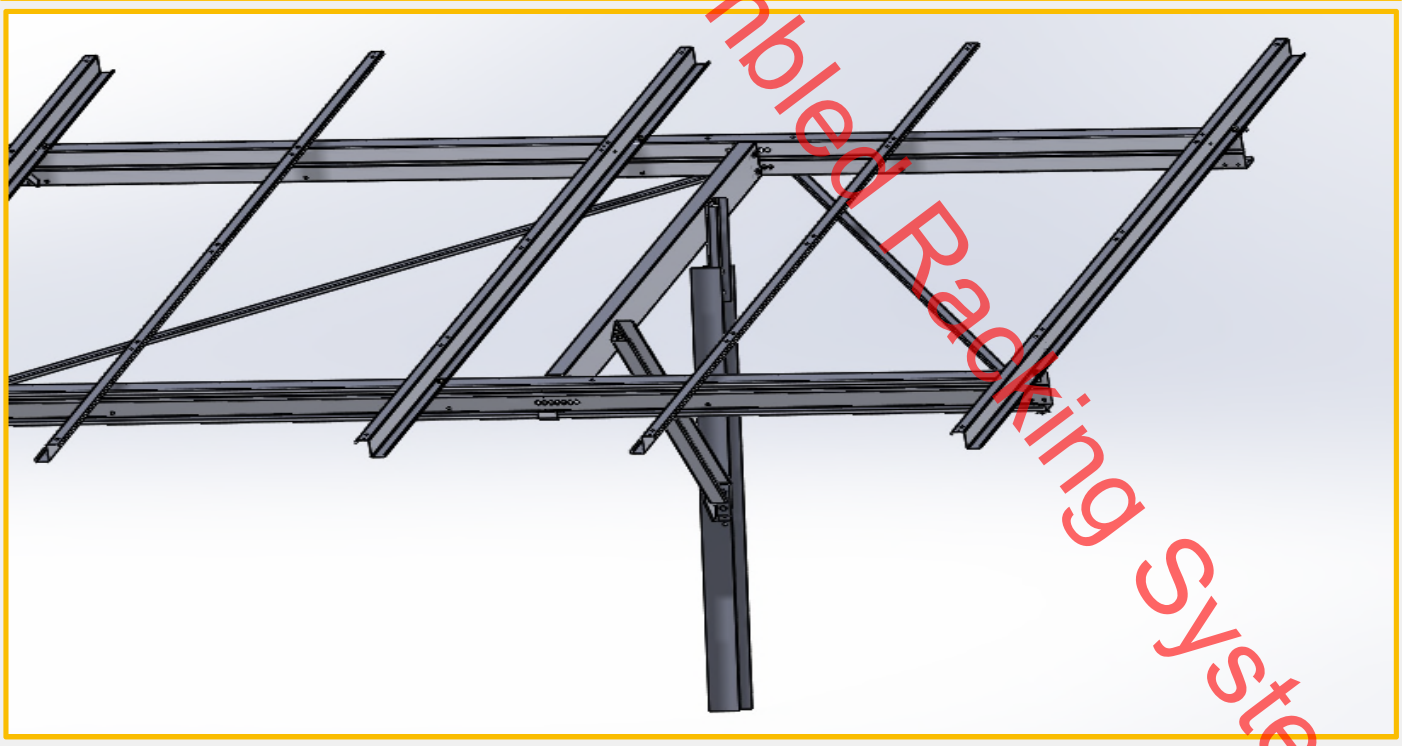
Series G3-X Installation

Appendix C – Vertical Rail Installation for Landscape Racks Only

Step 2 – Attach Vertical Rails to Horizontal Rails through round holes in the Horizontal Rail.



Note: The bottom flange of the Z-Purlin Vertical must face outward at each end of the rack. Z-Purlin Vertical Rails must face each other as shown below



G3P Installation

Appendix D – Attaching Lifting Hooks on G3P Rack

Step 1 – Insert lifting pin through center hole in vertical rail specified on the drawings.

Step 2 – Attach cotter pin to lifting pin to ensure lifting pin does not slide out.

Step 3 – Hook the lifting hooks on the lifting pins and continue the G3 Installation.

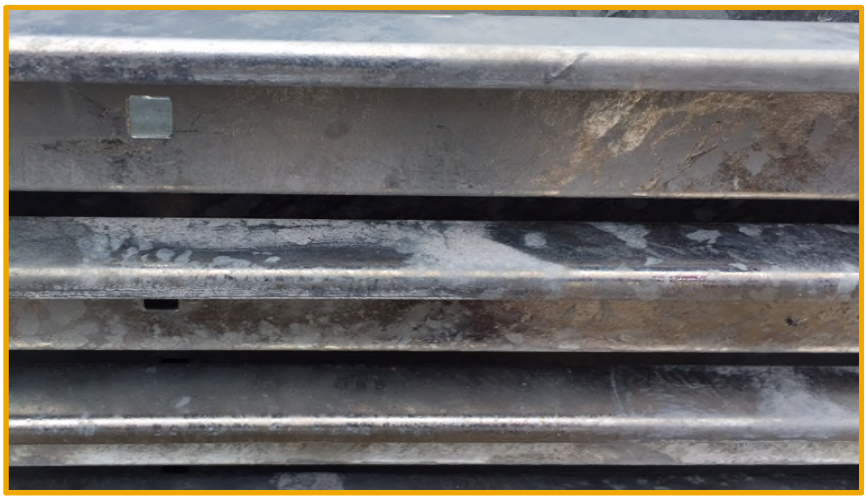
Appendix E – Guide to Wet Storage Stain

Wet storage staining defined:

Wet storage stain is the white or grey powder-like deposit formed by accelerated corrosion of the zinc coating when freshly galvanized members are packed closely, and stored or shipped under damp and poorly ventilated conditions.

This staining is a temporary cosmetic distraction that is common in the many industries that use galvanized steel components. The powder can be up to 100 times as voluminous as the pure zinc metal itself. Most often, there is no effect to the base steel and it is likely that you still are seeing pure zinc despite what looks like significant corrosion activity.

In some instances, normal climatic conditions can also cause wet storage staining to occur on freshly galvanized surfaces if they have not yet been quenched in water. An example of this would be in early autumn with a cycle of condensation forming on cold nights followed by hot days.



What wet storage stain is not:

Wet storage staining is not indicative of inferior galvanizing quality, steel corrosion, or compromised coating thickness.

Wet storage staining is not an attack on previously weathered zinc surfaces which already have formed their normal protective layer.

How to prevent wet storage staining:

Wet storage stain is best avoided by preventing new zinc surfaces from trapping rain or condensate water during storage and transportation between stacks or layers.

- Materials stored outdoors should be arranged in such a manner that water can easily run off the surfaces (tilted).
- Parts should be stored in areas with adequate ventilation.
- Non-staining dry timber should be used for wooden spacers.
- Storage areas prone to flooding should be avoided.
- Small hardware or fasteners in bags that get wet should be opened to get fresh air and avoid greenhouse effects.

How to manage affected pieces:

- Once recognized, affected surfaces should be arranged to permit their surfaces to dry rapidly. The attack will then cease, and with a supply of fresh dry air to the surfaces, the normal protective layer will form.
- Heavy buildup of white corrosion products can be partially removed by brushing with a stiff-bristle brush. They can be removed completely by washing with weak acid such as vinegar, which must be followed by a thorough rinsing with water. The original bright, metallic surface will however not be restored.

***References**

Wet Storage Stain - American Hot Dip Galvanizers Association.

16798 West Bernardo Drive
San Diego, CA 92127-1904
858.622.4040
swinertonrenewable.com

Swinerton Renewable Energy

Spill Prevention, Control, and Countermeasure (SPCC) Plan

DWW Solar II, LLC – 26.4 MWac
Simsbury, CT

May 1, 2019
Project number 18059005

Prepared for:
DWW Solar II, LLC

Prepared by:
Swinerton Renewable Energy
San Diego, CA

Joseph Taulane
Project Engineer
jtaulane@swinerton.com

SWINERTON RENEWABLE ENERGY

Contents

Appendices

1. Regional Map
2. Overall Site Plan
3. Crisis Management Flow Chart (Construction)
4. Aquifer Map
5. Contingency Plan

Management Approval

Management, with the authority to commit the necessary resources including manpower, equipment, and materials to prevent, respond to, and report spills or releases to the water or land of the State of Connecticut supports this Spill Prevention, Control, and Countermeasures Plan.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Project Manager
DWW Solar II, LLC

Project Manager - Signature

Date

Professional Engineer Certification

Pursuant to 40 CFR 112.3(d)

I hereby certify that I have examined the facility and, being familiar with the provisions of 40 CFR Part 112, attest that this Spill Prevention, Control, and Countermeasures Plan has been prepared in accordance with good engineering practices.

Engineer: _____
Registration Number: _____
State: _____

P.E. Name: _____

Signature: _____

Date of Plan Certification:

Pursuant to 40 CFR 112.5

In accordance with 40 CFR 112.5, the facility owner and operator/Operation & Maintenance (O&M) contractor will periodically review and evaluate this SPCC Plan within six months of any changes in the Project design, construction, operation, or maintenance that materially affects the Project's potential for an oil discharge. The facility owner and operator/O&M contractor will review this SPCC Plan at least once every five years. Amendments to the SPCC Plan, if any are needed, are made within six months. The facility owner and operator/O&M contractor will implement any amendment as soon as possible, but not later than six months following preparation of any amendment. Any amendments to this Plan will be reviewed and certified by a registered Professional Engineer, in accordance with 40 CFR 112.3(d). The following table will be used to record all reviews and amendments of the SPCC Plan.

Record of SPCC Plan Reviews and Amendments

Date	Authorized Individual	Review Type	PE Certification	Summary of Changes

Pursuant to 40 CFR Part 112, Appendix C

Operations and Maintenance/Owner of DWW Solar II, LLC
85 County Rd. and 60 Hoskins Rd. Simsbury, CT 06070

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

   Yes _____ No **X**

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?

   Yes _____ No **X**

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the formula in Attachment C-III, Appendix C, 40 CFR 112 or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II, and III to DOC/NOAA's "Guidance for Facility and Vessel Response Environments" (Section 10, Appendix E, 40 CFR 112 for availability) and the applicable Area Contingency Plan.

   Yes _____ No **X**

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula (Attachment C-III, Appendix C, 40 CFR 112 or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake?

   Yes _____ No **X**

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   Yes _____ No **X**

1. Introduction

One of The U.S. Environmental Protection Agency's (USEPA) top priorities is to prevent, prepare for, and respond to oil spills that occur in and around inland waters of the United States. The USEPA is the lead federal response agency for oil spills occurring in inland waters.

The USEPA's oil spill prevention program includes the Spill Prevention, Control, and Countermeasure (SPCC) and the Facility Response Plan (FRP) rules. The SPCC rule helps facilities prevent a discharge of oil into navigable waters or adjoining shorelines. The FRP rule requires certain facilities to submit a response plan and prepare to respond to a worst-case oil discharge or threat of a discharge.

This is a site-specific SPCC plan that outlines the project scope of work and presents a comprehensive plan to prevent, respond, and report oil spills and releases to the environment during the construction and operation phase of the Project. This SPCC Plan addresses the requirements of the EPA regulations specified in Title 40 of the Code of Federal Regulations (CFR). These regulations codified in 40 CFR Part 112 establish the procedures, methods, and equipment to prevent discharge of oil (i.e., petroleum oil and non-petroleum products) from non-transportation related onshore and offshore facilities into or upon the navigable Waters of the United States or adjoining shorelines.

The SPCC Plan will follow the following regulatory elements:

- Facility Diagram – 40 CFR 112.7(a)(3)
- Secondary Containment – 40 CFR 112.7(c)
- Contingency Plan – 40 CFR 112.7(d)
- Inspections, Testing, and Records – 40 CFR 112.7(e)
- Personnel Training and Discharge Prevention Procedures – 40 CFR 112.7(f)
- Security – 40 CFR 112.7(g)

1.1 Project Site

On behalf of DE Shaw and DWW Solar II, LLC, Swinerton Renewable Energy is proposing to construct a 26.4 megawatt-AC solar photovoltaic (PV) system, including the construction of an approximately 1,500 feet of underground transmission line to an existing substation. The project is located between Country Road and Hopmeadow Street, in the town of Simsbury, Hartford County, Connecticut. **See Appendix 1**

1.2 Project Description

The final Project design is broken into two sections that are split by an existing overhead transmission corridor. The expected area will occupy approximately 130 acres The Project's primary components include approximately 124,202 PV modules mounted on a fixed tilt system and 11 solar inverters. The racking system foundations will utilize driven posts that would not require concrete. Other Project components include electrical cables, conduit, electrical cabinets, switchgears, inverters, SCADA systems and metering equipment. The solar facility would be fenced and seeded in a low growth seed mix to reduce storm water runoff and erosion. **See Appendix 2:**

1.3 Site Contact and Emergency Contact

Facility Owner: DWW Solar II, LLC. 1166 Avenue of the Americas, 9th floor New York, NY 10036	**State Oil Pollution Control Agencies:** Connecticut Department of Energy & Environmental Protection 79 Elm Street. Hartford, CT 06106-5127 Office: (860) 424-3000
Site Contact: Chris Thuman Office: (212) 478-0549 Cell: (716) 998-5559 Email: Christopher.Thuman@deshaw.com	**Local Fire Department:** Simsbury Fire Marshal 871 Hopmeadow St, Simsbury, CT 06070 (860) 658-1973 Emergency: 911
Construction Project Manager: Nancy Woods Swinerton Renewable Energy Phone: (949) 933-4792 Email: nwoods@swinerton.com	**Local Police Department:** Simsbury Town Police Department 933 Hopmeadow St, Simsbury, CT 06070 (860) 658-3100 Emergency: 911
Construction Project Engineer: Luigi Soper Swinerton Renewable Energy Phone: (661) 333-0205 Email: lsoper@swinerton.com	**Hospital:** Hartford Hospital 80 Seymour St, Hartford, CT 06102 (860) 545-5000 Emergency: 911
Construction Project Superintendent: Mike Isaacson Swinerton Renewable Energy Phone: (858) 229-4995 Email: misaacson@swinerton.com	**Operator/O&M Contractor:** TBD

2. Regulatory Setting

2.1 Applicability of SPCC Plan Regulations (40 CFR 112)

Spill Prevention, Control, and Countermeasure (SPCC) plans for facilities are prepared and implemented as required by the U.S. Environmental Protection Agency (USEPA) Regulation 40 CFR 112. A non-transportation-related facility is subject to SPCC regulations if:

- The facility's total aboveground storage capacity exceeds 1320 gallons; or
- The facility's total underground storage tank (UST) capacity exceeds 42,000 gallons; and
- If, due to its location, the facility could reasonably be expected to discharge oil into or upon the navigable waters or adjoining shorelines of the United States.

An SPCC plan is generally not required to be filed with the United States EPA (USEPA), but a copy must be available for on-site review by the Regional Administrator (RA) during normal working hours. The SPCC plan must be submitted to the US EPA Region 1 and the State agency along with the other information specified in 40 CFR 112.4 if either of the following occurs:

- The facility discharges more than 1,000 gallons of oil into or upon the navigable waters of the United States or adjoining shorelines in a single spill event; or
- The facility discharges oil in quantities that may be harmful in two spill events within any 12-month period.

3. Site Information

Oil Storage:
Oil at the Project site detailed in Table 1 and 2, below:

Table 1: Oil storage at DWW Solar II, LLC (Construction)

Description	Secondary Containment	Type	Volume	Location	Use
Construction Equipment Diesel Fuel and Gasoline (Temporary)	Double-walled and/or lined berm *See section 4.2	Stationary Refueling Tanks	500 Gallons Red Diesel 250 Gallons Gasoline	At Construction Laydown Yard	Fueling construction equipment during construction
Contractor Diesel Fuel (Temporary)	Single-Walled	Mobile Refueler	(2) 100 Gallons	Mobile- Parked overnight in the Temp. Construction Facility	Fueling construction equipment during construction

Table 2: Oil storage at DWW Solar II, LLC (Operation)

Description	Secondary Containment	Type	Volume	Location	Use
Transformer Oil (Envirotemp FR3)	N/A (Inspections Only) *See section 4.4	11 Oil-Filled Equipment Units	TBD	Placed Throughout the PV Field	Cooling/Maintaining transformer temperature

4. Prevention of Releases to the Environment during Construction and Operation

4.1 Procedures to prevent releases to the environment

Swinerton and all subcontractors will exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated by environmental law. Swinerton and all subcontractors will maintain spill cleanup equipment and materials at the work site. In the event of a spill, Swinerton and all subcontractors will take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. The site plan shall include where any fuels, hazardous substances, solvents or lubricants will be stored. This spill plan is to address any leaks or spills of fuels, hazardous substances, solvents or lubricants.

Swinerton and all subcontractors will conduct fueling and lubricating of equipment and motor vehicles in a manner that protects against spills and evaporation. Spill kit will be provided on site and train staff how to use the spill kit. Swinerton and all subcontractors will prevent oil or hazardous substances from entering the ground, drainage areas, or navigable waters. In accordance with 40 CFR 112, surround all temporary fuel oil or petroleum storage tanks with a temporary berm or containment of sufficient size and strength to contain the contents of the tanks, plus 10 percent freeboard for precipitation. The berm will be impervious to oil for 72 hours and be constructed so that any discharge will not permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Provide general secondary containment for oil transfer operations as required by 40 CFR 112.7.

4.1.1 Aquifer Protection

Spill response equipment will be available on-site at all times along with personnel trained in the proper use of such equipment. A person or persons will be designated by Swinerton for emergency response coordination on a 24/7 basis. (Section 1.3 Site Contact and Emergency Contact)

Avoid refueling within 200 feet of wetlands and watercourses. Refueling will not be allowed within the designated the aquifer protection area. Additionally, for any hazardous materials used or stored within the Aquifer Protection Zone, a Hazardous Materials Management Plan will be developed and submitted to the Town. **See Appendix 4 for aquifer map and refueling locations.**

Paints, paint products and other hazardous materials should be removed from the site during non-work hours or otherwise stored in a secure area to prevent vandalism. Place covered trashcans and recycling receptacles around the site. Cover and maintain dumpsters, check frequently for leaks, and never clean a dumpster by hosing it down on site.

Notification of the project start date should be sent to the Public Water System as soon as it has been determined. Public Water System personnel should be granted daily site access to review compliance with site best management practices. The Public Water System, DPH Drinking Water Section (860-509-7333 OR after hours at 860-509-8000), and appropriate sections of the Department of Energy and Environmental Protection must be notified immediately of any chemical/fuel spill or any major failure of an erosion and sedimentation control at the construction site. Emergency telephone numbers and a statement

identifying the construction site as a sensitive public water supply area should be posted where they are readily visible to contractors and other on-site personnel. A note should be added to the construction documents stating the sensitivity of the area.

4.2 Containment and Diversionary Structures

The stationary fuel tanks called out in section 3, Table 1 should be double walled to provide protection from accidental punctures and or cracks that could lead to a fuel leak. Additional containment will include dirt berms lined with 6-mil plastic that will be placed around the fuel tanks and tanker trucks/heavy equipment parked on site which will provide at least 110 percent containment volume of largest storage tank within containment structure.

4.3 Horizontal Directional Drilling Containment

Horizontal Directional Drill (HDD) is a means of creating a crossing path beneath surface features without intruding directly on that feature, compared to conventional open-cut trenching methods where the surface would otherwise sustain direct disturbance. HDD uses specific drilling equipment capable of boring a drill path at a shallow inclined angle into the subsurface, and steering the borehole at depth beneath a surface, such as a stream, roadway, railroad, or combination of these features, and re-emerging at the surface on the other side of the surface. Once the borehole is created, it is successively reamed by larger bits until the borehole is wide enough for pre-assembled pipeline to be pulled through the borehole.

HDD drilling requires specialty drill equipment to allow shallow-angled entry of a drill bit, steering and remote telemetry tracking of the drill head and advancing the drill string by addition of successive segments of drill pipe until a pre-determined exit point is reached that may be several hundred to thousands of feet distant from the entry point. HDD requires drill fluid to be pumped down the drill string through the head of the drill bit. Drill fluid is required for several critical functions:

- It cools the drill head and string as it grinds through soil and/or rock;
- It helps to lubricate and support the borehole side-walls while the bit and drill string pass Through.
- It provides a fluid to carry rock and soil cuttings in suspension from the drill path face back to the point of entry, so the cuttings can be cleared from the HDD borehole path; and
- It assists in stabilizing an open bore hole, by exerting positive pressure on the borehole wall and through the buildup of a wall cake, also produces a bridging mechanism to hold soil particles in place.

The drill fluid must be maintained under pressure within the borehole in order to carry out all of these functions.

4.3.1 Frac-out Detection

The most obvious signs of a frac-out are surface seepage or loss of circulation/pressure of the drilling fluid. The loss of the returning fluid is a sign that pressure is not being contained in the drill hole and surface seepage is occurring outside the hole. If there is a reduction in the quantity of drilling fluid returning to the drilling site (loss of circulation), this could be a warning sign. However, some loss of drilling fluid is also normal in the drilling process. There can be instances during the drilling process when a small layer of

loose sand, a small gravel layer or a small rock fracture is encountered. These occurrences will require minimal, additional drilling fluids to fill in the voids. Consequently, a small drilling fluid loss in and of itself is not an indication of a potential frac-out condition. It is the loss of drilling fluid in combination with other factors, which may indicate a potential frac-out condition. For example, if there is a loss of drilling fluid and the return of cuttings do not show a large quantity of gravel that could indicate a loss of containment pressure within the hole.

4.3.2 General Corrective Action

Once a frac-out is detected, the drilling crew shall take immediate corrective action. The only pressure causing the frac-out to occur is the pressure from the drilling fluid pumps. Therefore, the most immediate direct corrective action is:

- To stop the drilling fluid pumps or decrease the pressure (by stopping the pumps or decreasing the pressure, the pressure in the hole will quickly bleed off. With no/reduced pressure in the hole, the frac-out will stop or decrease significantly).
- As soon as a frac-out is detected, the circulation of mud will only be stopped/reduced temporarily until the response process has been initiated. Once the response/ containment process has been initiated and is under control, the drilling activities will immediately resume.

4.3.3 Entry and Exit Locations

There is greater potential for a frac-out at the entry and exit locations. Frac-outs at the entry and exit locations have been considered and the following preventive actions have been developed:

- The entry and exit locations on all directionally drilled crossings shall have dry land segments where a frac-out can be easily detected, contained, and remediated.
- To isolate and contain a potential frac-out at each of the drill sites, there must be a berm around the downslope side of the drilling rig set-up area. Hay bales or silt fence must be part of the berm on the resource side of the drilling area.

In the event of a frac-out in an entry or exit location, the following corrective actions will be taken immediately:

- The source/pumps will be stopped temporarily, or the pressure will be decreased.
- The frac-out will be contained immediately by installing hay bales or silt fence and/or constructing dikes or pits.
- The drilling mud will be removed from the ground surface to the greatest extent possible and removed from the site using manual equipment such as shovels and wheel barrows or earth-moving equipment such as backhoes or small bulldozers, portable pumps and/or vacuum trucks.
- If necessary, the affected area will be watered down to further dissipate drilling muds that remain after mechanical efforts have been exhausted.
- The affected areas will be restored within 30 days as closely as possible to their previous condition.
- Documentation must be made and maintained by the contractor. Documentation will consist of the following:

- Photographs/video or affected area and progress toward cleanup
- Spill logs provided by Swinerton Safety Manager (Appendix A of Oil Spill Contingency Plan)
- Demonstrating compliance with EPA spill recovery and clean up measures described in this spill plan

4.3.4 Wetlands and Bodies of Water

In the event of a frac-out into wetlands and/or waterbodies, the containment and corrective actions described below must be taken immediately and the Contractor must make the appropriate contacts in accordance with Section 8 below.

- All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, will be completely isolated, recovered, then recycled or disposed of to prevent entry into waters of the state.
- An adequate supply of materials needed to control erosion and to contain drilling fluids will be maintained at the project construction site and deployed as necessary.
- Anti-seep collars or equivalent technology will be used to prevent draining the wetlands.
- The source/pumps will be stopped temporarily, or the pressure will be decreased.
- The frac-out will be contained immediately by installing hay bales or silt fence and/or constructing dikes or pits (do not construct earthen dikes or berms within wetland or stream areas).
- The drilling mud will be removed from the ground surface and from the site to the greatest extent possible by manual means such as by use of shovels, wheelbarrows and/or vacuum hoses. Earth moving equipment such as backhoes or small bulldozers will be used only if manual means prove to be impractical and only after appropriate measures have been taken to minimize impacts to the resource.
- The affected areas will be restored as closely as possible to their previous condition.
- Documentation must be made and maintained by the contractor. Documentation will consist of the following:
    - Photographs/video or affected area and progress toward cleanup
    - Spill logs provided by Swinerton Safety Manager (Appendix A of Oil Spill Contingency Plan)
    - Demonstrating compliance with EPA spill recovery and clean up measures described in this spill plan
- Typically, drilling activities will not be suspended unless the frac-out creates a threat to public health and safety or unless suspended by the contractor's safety manager.
- If a pollution discharge to the Munnisunk Brook, Saxton Brook, or Bissell Brook occurs during the course of this project, the CTDEEP Wildlife Division should be notified within 48 hours of the event (laura.saucier@ct.gov or 860-424-3101)

4.4 Contingency Planning (Operation)

Because the DWW Solar II, LLC facility is an unmanned facility with all the aboveground oil storage contained in oil-filled equipment, there is a low probability for any large or significant release of oil. Most spills and releases would be in the range of a few drips to a few gallons. There is a low potential for spills between 5 gallons and 20 gallons. There is a very low probability that there will be any spills over the reportable spill quantity of 42 gallons of oil. However, the operator/O&M contractor employees that perform routine maintenance checks will have a spill kit in their service trucks. **See Appendix 5 for the Oil Spill Contingency Plan.**

4.5 Transformer Inspections and Maintenance (40 CFR 109.5)

Qualified technicians will be employed for all site/project activities. All transformers and transformer containments will be periodically inspected in accordance with the manufacturer's recommendations. Technicians will be provided with the necessary materials (including but not limited to spill kits) to contain and prevent further spread of any environmental issues that are observed. Remediation plans will be drawn up and executed on a case-by-case basis as needed. Visual inspections can be one of the most valuable and convenient tools for determining equipment problems when performed by experienced technicians. A "trained eye" can often detect problems by just walking into substations or glancing at switchgear lineups. The power of observation is also very useful during outages when even closer equipment examination can be performed. Additionally, prior to shipping transformers to the job site, Factory Test reports will indicate pressure hold readings and cancel shipment of transformers with known leaking potential.

The frequency of performing visual inspections (and other procedures) is based upon the relative condition of the equipment and the equipment reliability requirements. It is recommended that monthly visual inspection occur for much of the equipment that is considered to be in average condition and having medium level reliability requirements. This suggested inspection interval may increase or decrease based upon the specific equipment's condition and reliability requirements.

In addition to visual inspections, our other senses such as hearing, and smell can also help detect problems with energized equipment. Although the other senses generally do not detect as many problems as vision does, the pungent smell of ozone usually indicates advanced corrosion problems. Crackling sounds may indicate similar corrosion or insulation tracking conditions. The smell of burnt varnish or other insulation can indicate complete insulation failure, or an overload condition, especially with regards to dry-type transformers and motors. Corrosion, if not prevented or treated can lead to the deterioration of protective walls and linings. Cracking or holes can appear and allow contaminates to enter the surrounding environment. Additionally, an unusually high vibration noise or the squeal of a failing bearing can point to a potential mechanical problem which can result in contaminants entering the surrounding environment.

Gauges and Meters:

Outdoor equipment gauges can provide valuable information related to potential equipment problems as long as simple visual inspections are regularly conducted and logged. Transformer, load tap-changer, bushing, and oil circuit breaker (OCB), fluid levels should be observed at least once every six months. OCB sight glasses that do not allow oil levels to be distinguished present a potential hazard, and if significant oil leaks are also present, safe breaker operation may be compromised.

Pressure gauges located on transformers, circuit breakers, and other equipment can also provide solid information regarding potential equipment anomalies. Finally, transformer temperature gauges are often useful indications of potential problems, and the maximum temperature indicator position should also be noted and logged at least once a month and saved for three years if no unusual change is recorded.

Internal Inspections:

Internal inspections are conducted at least once every six months by removing enclosure covers which requires a great deal of care and safety considerations. Adherence to NFPA-70E for Personal Protective Equipment (PPE) requirements should be maintained with diligence while performing internal inspections.

Any sign of rodent entrance requires immediate action as rodents can cause sudden short-circuit faults as they crawl throughout the bus or damage critical wiring with their sharp teeth. Often rodents gain access to switchgear via networks of unsealed conduits which is also an indication of potential problems. A signed record of inspections must be kept with this Plan for three years.

5. Personnel Training

All personnel, including Swinerton employees, subcontractor personnel, operators, jobber technicians, and temporary employees, working at the project site are briefed in hazardous material management and spill prevention as part of their new hire Environmental, Safety and Health orientation (ES&H). In addition, Supervisor Environmental Awareness Training will be provided for non-manual personnel, supervisors, foremen, and subcontractor supervision, as needed. Those personnel responsible for actively responding to and cleaning up small and incidental spills and handling wastes shall be trained in the proper use of response materials and equipment and the use of personal protective equipment for potential hazards. Supervisors and foreman will be responsible for supervising training of new employees and after to ensure the best practices are being carried out to prevent a spill.

Supervisors, foremen, subcontractors, and selected craft will all receive new hire orientation training related to ES&H issues that will be experienced at the project site. Additional personnel may receive hazardous material/waste management training and spill response training. A typical outline of each is presented below.

Spill Prevention and Response:

- Definition of Spills
- Sources of Spills
- Planning
- Spill Prevention
- Response Procedure
- Spill Management
- Spill Kits
- Spill Reporting

6. Security

The entire site will be fenced with a 6-foot chain link fence topped with one foot of barbed wire to control and restrict access from the general public. All entrances to the facility area are gated and locked with a Knox box to allow fire department access, should an emergency occur. The access to the project is restricted to employees, subcontractors, and visitors with special badges.

7. Emergency Procedures

The following spill response procedures apply to both construction and operations phases of the Project. Subcontractors are responsible for responding to all spills and releases that they cause or for which they are responsible. Swinerton will respond to any spills or release that occur and will provide spill response support to subcontractors, as required during construction. The operator/O&M contractor will do so during operations. Subcontractors are responsible for properly disposing of the cleanup waste generated from a spill or release. The Project Field Superintendent shall be notified when a release occurs, no matter the quantity or responsible party (i.e., Swinerton, subcontractor, operator/O&M contractor). A typical Project spill kit material list is provided in Section 9. Oily debris and or contaminated soil will be properly disposed of. Additionally, container storage will be set up on an as-needed basis for oily rag disposal and clean up materials within the construction lay down yard/staging area.

7.1 Immediate Notifications

The following mitigation measures shall be carried out immediately in the event of any spill.

1. If spilled materials are flammable, eliminate sources of ignition near the spill area.
2. IF IT CAN BE PERFORMED SAFELY, put on the proper personal protective equipment, stop the source of the spill, and contain the spill within as small an area as possible.
3. Contact the field area superintendent:
   During construction:
   - Mike Isaacson – Project Field Superintendent: (858) 229-4995
   - Nancy Woods – Project Manager: (949) 933-4792

   During operations:
   - TBD

7.2 Smaller Spills and Releases

If the spill is small or minor, less than or equal to 42 gallons and is NOT in an environmentally sensitive area and will NOT enter a waterway, the spill shall be promptly cleaned-up by onsite personnel and properly disposed of. There are no environmentally sensitive areas on site. The Environmental, Safety and Health (ES&H) Manager will be notified as soon as possible of the location and action taken. The ES&H Manager or responsible Superintendent will complete the Incidental Spill Log (Appendix A of the Contingency Plan) for all spills, no matter how minor. If a subcontractor is responsible for the spill, the subcontractor's ES&H Manager or designee will be responsible to fill out the same Incidental Spill Log (Appendix A of the Contingency Plan) for all spills, no matter how minor. The subcontractor is to immediately notify the ES&H Manager.

The O&M Contractor Project Manager (PM) and the ES&H Manager will determine if further notifications are necessary. If it is raining, promptly place plastic sheeting over the spill until the rainfall stops and use booms or absorbents to protect the spill from storm-water runoff. Subcontractors are responsible for cleaning up their own spills; however, the O&M contractor will provide assistance, as required.

7.3 Larger Spills and Releases

- For large spills or spills threatening environmentally sensitive areas (e.g., buffer areas, nesting areas, water courses, etc.), immediately contact the O&M Project Manager and/or ES&H Manager.
- The Project Manager (PM), or ES&H Manager will be responsible for coordinating and directing an emergency response effort. If a subcontractor is responsible, then the subcontractor may coordinate the cleanup if approved by the PM.
- The PM will secure the area and establish perimeter control at a safe distance from the spill until the emergency management response team arrives and safely cleans up the spill.
- The PM shall notify the project owner management representative immediately after a spill event that could potentially impact human health or the environment outside of the site property boundary.
- If the spill enters the waters of the State or US and causes oil sheen in the water, the PM will notify Owner, who will determine the notifications required.
- The ES&H Manager or responsible PM will complete an Environmental Incident Form and issue it to the Project Management Team (PMT) (Listed in section 1.3 Site Contacts)
- The ES&H Manager will conduct an incident investigation and determine the root cause and additional causal factors that contributed to the incident.
- For significant incidents, the ES&H Manager or PM will develop an Environmental Incident Report discussing the incident in detail, the cause of the incident, and the corrective action employed to prevent this type of incident from occurring again.
- The ES&H Manager will implement any approved corrective measures or modify any procedures necessary to help prevent a repeat of the incident.

Oil Spill Removal Organization – OSRO

OSRO is a voluntary program that was developed to assist oil handling facilities and vessels in preparing spill response plans. Currently, Swinerton does not have any contracts, but are in the process of evaluating and contracting with an OSRO company that can service all of our sites across the country.

8. Reporting

8.1 Internal Reporting

The ES&H department shall be notified of all spills and releases, regardless of the volume of the release. After a release has occurred, the O&M PM and the ES&H Manager will determine if additional reporting to a regulatory agency or the contractor's legal departments is required. The PM will notify Owner of any major spills or releases. In addition to these requirements, all environmental incidents and spills less than the reportable quantities will be recorded in the Project's Incidental Spill Log. **See appendix 3 for the Crisis Management Flow Chart.**

8.2 External Reporting

The Project Manager or Owner will notify/advise all appropriate regulatory agencies that a release that triggered a regulatory notification has occurred along with pertinent information regarding the release.

- Immediately report release or threatened release of hazardous materials if there is a reasonable belief that the release or threatened release poses a significant present or potential hazard to human health, safety, property or the environment.
    - 9-1-1
    - Connecticut Division of Emergency Management and Homeland Security: (860) 685-8531
- Report a discharge of oil into navigable Waters of the US that creates a sheen into Waters of the State and marine water of any amount of oil, or single discharge of 1,000 gallons or two 42-gallon discharges within a 12-month period into navigable Waters of the US or adjoining shoreline.
    - Connecticut Department of Energy & Environmental Quality: (860) 424-3000
    - National Emergency Response: (800) 424-8802
    - US Environmental Protection Agency Region 1: (800) 424-8802

When contacting any of the above agencies be prepared to provide the following details:

1. Exact address of the facility
2. Phone number of the facility
3. Any injuries at the facility
4. Date and time of spill/discharge
5. The type of material spilled/discharged
6. Estimates of the quantity of the material spilled/discharged
7. The source of the spill/discharge (e.g., pipe, tank, truck)
8. Where the spill/discharge occurred (e.g., soil, pavement, storm water drain, waterway)
9. Actions taken to contain the spill/discharge
10. Other agencies contacted

9. Spill Kits

Spill kits will be used throughout the project site to support the first response and subsequent cleanup of spills and releases that occur on the project. The following sections provide recommendations for typical spill kits.

9.1 Vehicular Spill Kit

Each vehicle on site should carry a spill kit which meets the following specifications:

- Packaged spill kit to absorb up to 5 gallons of oil
- Absorbent mats/pads
- Absorbent socks
- Temporary disposal bags
- Protective gloves/Tyvek suit/labels

Vehicles and equipment with chronic leaking issues will be stored with plastic sheeting under to catch any leaks until equipment can be repaired or removed from site.

9.2 Large Spill Station

A large spill station shall be provided in all areas where liquid chemicals, oils or other fluids are used or stored. Fueling locations and jobsite trailers will contain large spill stations. Work crews are responsible for placing additional spill kits at key locations when the risk has been identified.

Large spill stations shall provide sufficient absorbent and response materials to mitigate a variety of spill conditions and situations. The spill station shall be contained in a weather-proof box, drum, wheeled/lidded container, or trunk which can be mobilized to the spill site. They shall have the following attributes:

- Total absorbency capability of up to 40 gallons (150 liters) of oil
- Contain a variety of absorbent socks
- Contain a variety of absorbent mats/pads/pillows
- Contain temporary disposal bags
- Contain labels

9.3 Bulk Oil Absorbent Pads

A sufficient quantity of bulk oil absorbent pads will be maintained onsite for response to spills to land or water. Pads must be hydrophobic and float on water. Sufficient inventory will be maintained to absorb at least 100 gallons (400 liters) of oil.

9.4 Loose Absorbent

Granular absorbent will be maintained for use in areas where there is a likelihood of small spills, drips, or splashes of oil. Granular absorbent can be clay, cellulose, peat, cat litter, or other appropriate biodegradable or natural proven absorbent material. Loose absorbent will be packaged or containerized in such a manner as to facilitate ease of use and distribution. Polypropylene or other man-made, non-biodegradable materials are not permitted.

9.5 Typical Project-Assembled Spill Kit Supplies

- Plastic/metal 55-gallon barrel or 40-gallon wheeled trash container with lid and labeled
- Bulk granular, diatomaceous earth, absorbent material
- Oil-absorbent pads and booms
- Large trash bags
- Rubber gloves
- Safety goggles
- Tyvek suits and coverall

Appendix 1

Regional Map

SITE LOCATION

Tobacco Valley Solar, Simsbury, CT ■ Simsbury, CT
November 19, 2018 ■ Terracon Project No. J2185137

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: TARIFFVILLE, CT (1/1/1970) and TARIFFVILLE, CT (1/1/1984).

Appendix 2

Overall Site Plan

PHOTOVOLTAIC ARRAY SITE PLAN

N

0 50' 100' 250' 500'

1" = 250'-0"

SYSTEM SUMMARY	
PROJECT LOCATION	SIMSBURY, CT
DESIGN TEMPERATURE (MIN.)	-20°C
STRING SIZE	26
MODULE TYPE	JINKO JKM395M-72HL-V JKM400M-72HL-V
MODULE WATTAGE	395 & 400
MODULE QTY.	395W: 38,116 400W: 86,086
INVERTER	TMEIC 3360 kW
INVERTER QTY.	11
SYSTEM SIZE (AC)	26,400 kVA (AT 25°C) 26,400 kW (AT POI)
SYSTEM SIZE (DC)	49,490 kW
ARRAY TYPE	FIXED TILT (2P)
GROUND COVER RATIO	71.7% (18'-6")
ARRAY TILT	20°
ARRAY AZIMUTH	180°

LEGEND

JINKO 395W MODULES (3.5 BLOCKS)

JINKO 400W MODULES (7.5 BLOCKS)

GENERAL NOTES

1. ALL REFERENCES TO (N) ROADS, BASINS, OR OTHER CIVIL INFRASTRUCTURE ARE FOR ELECTRICAL REFERENCE ONLY. SEE CIVIL PLANS BY OTHERS FOR ALL CIVIL RELATED CONSTRUCTION DRAWINGS.

FOR PERMIT

SWINERTON RENEWABLE ENERGY

CONSULTANT

BLYMYER ENGINEERS
1101 MARINA VILLAGE PARKWAY # 100
ALAMEDA, CA 94501 510.521.3773

STAMP/SEAL

STATE OF CONNECTION — No. 31172 — LICENSED PROFESSIONAL ENGINEER

REV #	DESCRIPTION	DATE
	FOR CLIENT REVIEW	
A	FOR UTILITY REVIEW	2019-03-15
B	FOR PERMIT	2019-03-22

PROJECT TITLE:

TOBACCO VALLEY SOLAR
DWW SOLAR II, LLC (QP713)
FIXED-TILT PV ARRAYS
SIMSBURY, CT

SHEET TITLE:

PHOTOVOLTAIC ARRAY SITE PLAN

JOB NO.: 219008	PROJECT MGR: CG
DRAWN: CVV	SCALE: 1" = 250'

SHEET NUMBER

G-100

L:\Acad\2019dwg\219008 Swinerton Simsbury Tobacco Valley CT DE Show\01 CAD\working\219008 G-100.dwg March 22, 2019 - 5:14PM ksingh

Appendix 3

Crisis Management Flow Chart (Construction)

DWW Solar II, LLC
Crisis Management Flow Chart

INCIDENT OCCURS

TEAM LEADERS / FIRST RESPONDERS

Superintendent
Mike Isaacson
(858) 229-4995

Sr. Project Engineer
Luigi Soper
(661) 333-0205

Project Manager
Nancy Woods
(949) 933-4792

CALL 9-1-1 (If Required)
Team Leader designates a representative to meet emergency medical services at front gate (project entry)

Team Leader ensures that all other project personnel are accounted for.

TEAM LEADER THEN NOTIFIES SWINERTON BUILDERS UPPER MANAGEMENT & CORPORATE SAFETY

Senior Safety Manager
Michael D. Darling: (408) 470-9981

Division Manager
George Hershman: (619) 781-2884

Field Operations Manager
Garrett Cope: (858) 229-5755

Operations Manager
Dave Grubb Jr.: (415) 553-0434

TEAM LEADER IMMEDIATELY NOTIFIES THE FOLLOWING:

DWW Solar II, LLC Representatives
Safety Manager
TBD

DWW Solar II, LLC Development
TBD

TEAM LEADER IMMEDIATELY NOTIFIES THE FOLLOWING:

DWW Solar II, LLC
Safety Manager
TBD

TEAM LEADER IMMEDIATELY NOTIFIES THE FOLLOWING:

TBD

IF MEDIA ARRIVES OR IS ANTICIPATED, TEAM LEADER NOTIFIES THE FOLLOWING:

DWW Solar II, LLC Spokesperson
TBD

Swinerton Spokesperson (Backup #1)
George Hershman: (619) 781-2884

From Incident to this point, within Five (5) minutes

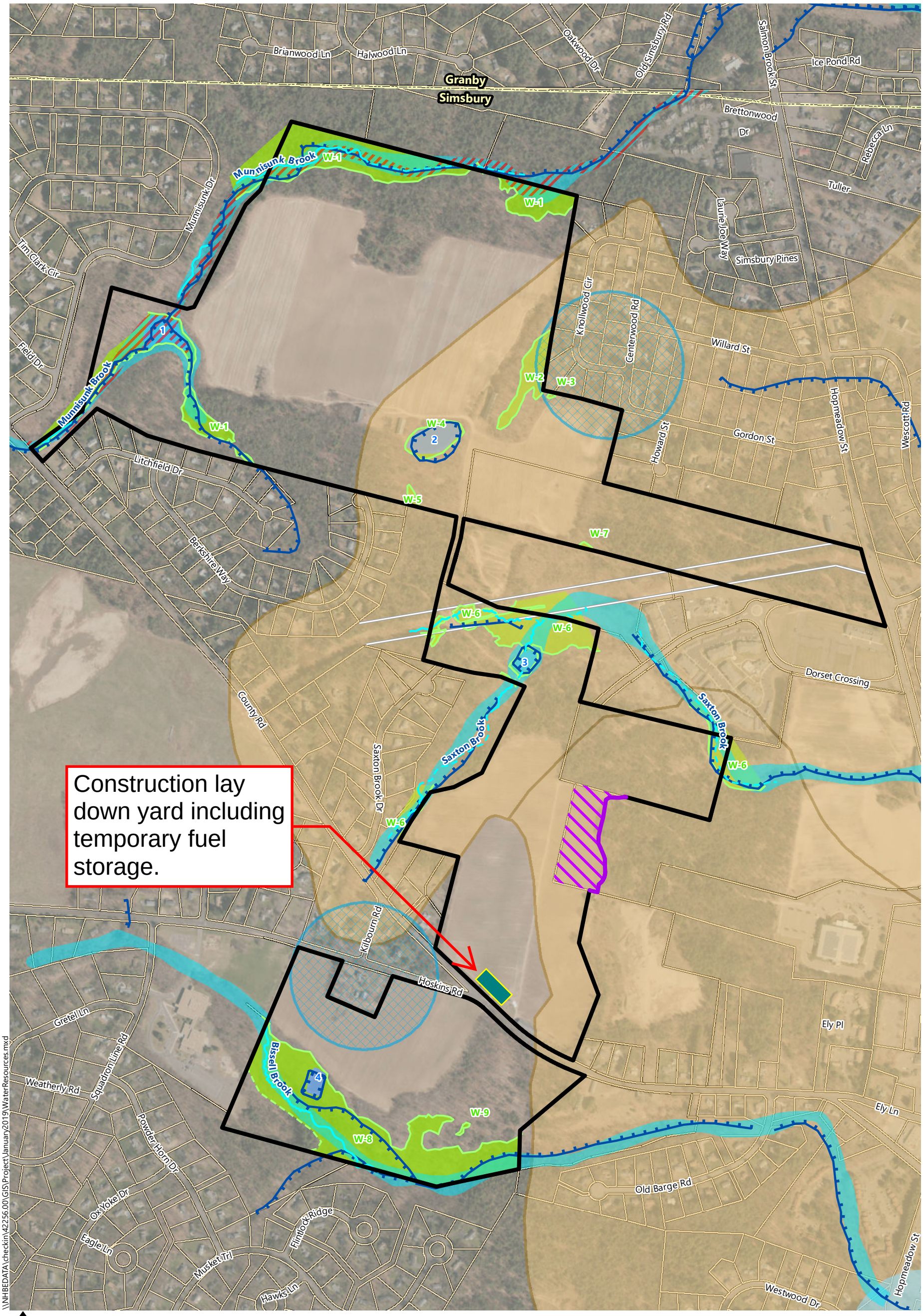
SAFETY MANAGER NOTIFIES:

TBD

If Regional Safety Manager is unavailable, Team Leader is to notify Corporate Safety Director

Appendix 4

Aquifer Map



\\NHBEDATA\checkin\42256.00\GIS\Project\January2019\WaterResources.mxd

0 325 650 1300 Feet

- Property Boundary
- Lease Area
- Adjacent Parcels
- Town Boundary
- Existing Eversource ROW
- Wetland Resource Area
- Farm Pond
- Delineated Wetland Edge
- Approximate Wetland Edge
- Stream
- Approximate Stream
- Surface Water Quality - Class A
- Aquifer Protection Area
- Ground Water Quality - GAA, GAAs
- Ground Water Quality - GA, GAA May be impaired
- 100-Year Floodplain (FEMA)
- Regulatory Floodway (FEMA)

Tobacco Valley Solar

Simsbury, Connecticut

Floodplain, Surface & Groundwater Resources Map

Source: VHB, CTDEEP, FEMA, ESRI

Appendix 5

Contingency Plan

16798 West Bernardo Drive
San Diego, CA 92127-1904
858.622.4040

swinertonrenewable.com

Oil Spill Contingency Plan

DWW Solar II, LLC

85 County Rd. and 60 Hoskins Rd. Simsbury, CT 06070

Prepared for:

DWW Solar II, LLC

Prepared by:

Swinerton Renewable Energy
16798 West Bernardo Drive
San Diego, CA 92127

Facility Information

Facility Name:	DWW Solar II, LLC
Facility Location:	Simsbury Connecticut
Facility Address:	85 County Rd. and 60 Hoskins Rd. Simsbury, CT 06070
Facility Contact Name:	Chris Thuman – DE Shaw Phone: (716) 998-5559
Operator/ Operator Name and Address:	DWW Solar II, LLC 1166 Avenue of the Americas, 9th floor New York, NY 10036

Emergency Response Contacts

SPCC Plan Coordinator:	Swinerton Renewable Energy Office: (858) 622-4040
Primary emergency contact	Luigi Soper Swinerton Renewable Energy Phone: (661) 333-0205 Email: lsoper@swinerton.com
National Response Center (NRC):	U.S. Environmental Protection Agency 1(800) 424-8802
Regional Response Center	U.S. EPA, Region 1 (800) 424-8802
State Emergency Response	Connecticut Division of Emergency Management and Homeland Security (860) 685-8531
Local Emergency Response	Connecticut Department of Energy & Environmental Quality (860) 424-3000
Police Department	Simsbury Town Police Department (860) 658-3100 or 911 for emergency
Fire Department	Simsbury Fire Marshal (860) 658-1973 or 911 for emergency
Hospital	Hartford Hospital (860) 545-5000 or 911 for emergency

Certifications

Management Approval, Commitment of Resources and Designated Person. This facility is committed to preventing discharges of oil to navigable waters and the environment, and to maintaining the highest standards for spill prevention control and countermeasures through the implementation and regular review and amendment to the Plan. This Plan has the full approval of management and is supported by management with the authority to commit the necessary resources including manpower, equipment, and materials to expeditiously control and remove any quantity of oil or hazardous substances released to the water or land of the state.

Name: _____

Title: _____

Signature: _____

Date: _____

Definition of Responsibilities and Duties

Facility O&M Manager

The Facility O&M Manager or designated alternate shall have the following responsibilities:

a) Mobilize and organize employees as necessary to assist with spill response.
b) Investigate the discharge to assess the actual or potential threat to human health or the environment:

- Location of the discharge relative to receiving water bodies;
- Quantity of spilled material;
- Ambient conditions (temperature, rain);
- Other contributing factors such as fire or explosion hazards; and
- Sensitive receptors downstream

c) Request outside assistance from local emergency responders, as needed.
d) Evaluate the need to evacuate facility and evacuate employees, as needed.
e) Notify:

- Local emergency responders
- State authorities
- National Response Center
- Response contractor(s)
- Local emergency planning committee

f) Communicate with neighboring property owners regarding the discharge and actions taken to mitigate the damage.

g) If the oil reaches (or threatens to reach) a navigable waterway, notify the National Response Center (1-800-424-8802) and the local fire/police departments to limit access to the waterway by local residents until the oil has been contained and recovered.
h) Notify downstream water users of the spill and of actions that will be taken to protect these downstream receptors.

Employee and Contractor Responsibilities

The site is unmanned and there are no full-time employees onsite. Operations and Maintenance technicians visit the site for periodic scheduled and unscheduled maintenance. These technicians shall be trained and available to respond to an oil discharge.
Technicians responding to a spill or leak have the following responsibilities:

a. If unsafe conditions exist (e.g. fire, explosion or other threat to life), the employee should evacuate the area and call 911.
b. For small spills (less than 42 gallons) that have not reached a water source, attempt to contain and control the spill, if safe to do so.
c. Immediately notify the Facility O&M Manager or designated alternate upon discovery of the spill.
d. After initial response measures have been taken, or if the spill is beyond the individual's ability to contain it, make note of the time the spill occurred, the type of material spilled, and the approximate quantity of the spilled material. These items will be needed if subsequent reporting is required.

Procedures for early detection and timely notification of an oil discharge

Procedures for preventing the release of oil to the environment during construction and operation are detailed in section 4 of the Spill Prevention, Control, and Countermeasures Plan. However, in the event of a spill, the following section details the steps and procedures for responding to the spills and proper notification.

Emergency Procedures

Response to Minor Discharges

A "minor" discharge is defined as one that poses no significant harm (or threat) to human health and safety or to the environment. Minor discharges are generally those where:

- The quantity of product discharged is small (e.g., may involve less than 42 gallons of oil);
- Discharged material is easily stopped and controlled at the time of the discharge;
- Discharge is localized near the source;
- Discharged material is not likely to reach water;
- There is little risk to human health or safety; and
- There is little risk of fire or explosion.

Minor discharges will usually be cleaned up by facility personnel. In general, the following steps are taken if possible and safe to do so:

- Identify and shut down source of the discharge to stop the flow
- Contain the discharge to the smallest area with sorbents, berms, fences, trenches, sandbags, or other material

- Take immediate action to prevent the discharge from reaching off-site or surface water.
- Contact the Facility O&M Manager or his/her alternate.

Response to a Major Discharge

A "major" discharge is defined as one that cannot be safely controlled or cleaned up by facility personnel, such as when:

- The discharge is large enough to spread beyond the immediate discharge area – over 42 gallons;
- The discharged material enters water;
- The discharge requires special equipment or training to clean up;
- The discharged material poses a hazard to human health or safety; or
- There is a danger of fire or explosion.

In the event of a major discharge, all workers will immediately evacuate the discharge site and notify the Facility O&M Manager. If the Facility O&M Manager is not present at the facility, the on-site technician notifies the Facility O&M Manager of the discharge and has authority to initiate notification and response actions.

The Facility O&M Manager shall:

- Obtain medical assistance if workers are injured;
- Notify the Fire Department or Police Department;
- Coordinate cleanup and obtain assistance from a cleanup contractor or other response organization as necessary; and
- Ensure wastes are containerized and characterized for proper disposal by a licensed waste hauler or cleanup contractor.

Notification Procedures

The Facility O&M Manager has authority to initiate notification activities.

Internal Notifications

Spill information will be entered into the Operation and Maintenance Contractor's incident reporting system.

The report will include the following information:

- Site name;
- Location information (state);
- General information (date of release, date reported, immediate action taken, ground conditions, external emergency services contacted, regulatory agencies notified);
- Material release information (type, specific location, quantity, duration, secondary containment breached, media impacted, cleanup action, weather conditions);
- Cause(s) of release;

External Notifications

Table 1 contains the release reporting requirements in the state. The Facility O&M Manager shall be responsible for providing the appropriate notifications.

In general, the notification shall include the following information:

- The exact address or location and phone number of the facility;
- Date and time of the discharge;

- Type of material discharged;
- Estimate of the total quantity discharged;
- Estimate of the total quantity discharged to navigable waters;
- Source of discharge;
- Description of all affected media;
- Cause of the discharge;
- Any damages or injuries caused by the discharge
- Actions being used to stop, remove, and mitigate the effects of the discharge;
- Whether an evacuation may be needed; and
- Names of individuals and/or organizations who have also been contacted.

Information shall also be submitted to the U.S. EPA Regional Administrator (RA) within 60 days from the occurrence of one of the following discharge events:

- (1) a single discharge of more than 1,000 U.S. gallons of oil to navigable waters or adjoining shorelines or
- (2) Two discharges to navigable waters or adjoining shorelines each more than 42 U.S. gallons of oil occurring within any twelve-month period.

The following information will be submitted:

- Name of the facility;
- Individuals name;
- Location of the facility;
- Maximum storage or handling capacity of the facility and normal daily throughput;
- Corrective action and countermeasures taken, including a description of equipment repairs and replacements;
- An adequate description of the facility, including maps, flow diagrams, and topographical maps as necessary;
- The cause of the reportable discharge, including a failure analysis of the system or subsystem in which the failure occurred; and
- Additional preventive measures you have taken or contemplated to minimize the possibility of recurrence.

Spill Response Resources

Spill kits containing absorbent materials and other cleanup materials are located at inverters skids throughout the facility. Additionally, container storage will be set up on an as-needed basis for oily rag disposal and clean up materials within the construction lay down yard/staging area. The equipment has the capacity to control oil discharges of at least 530 gallons[1]. The facility has reliable communication equipment that allows it to be remotely monitored at all times. This equipment is capable of providing timely notification of an oil discharge.

[1] This amount is the maximum discharge likely to occur. It is based on the oil capacity of the skid-mounted transformer located at each inverter skid, which is the largest oil-filled equipment at the site that is not equipped with adequate secondary containment.

Table 1: Release Reporting Requirements

TYPES OF RELEASES	AMOUNT	WHO REPORTS?	TO WHOM	WHEN	LEGAL AUTHORITY
(Federal) Navigable Waters	Any Amount "Harmful quantity"	Any person in charge of a vessel or facility (offshore or onshore)	NRC (800) 424-8802	Immediately, when it can be done safely	Federal Water Pollution Control Act (FWPCA) §311 33 CFR 153.203 40 CFR 110.6
Marine Waters	Any amount	Any party responsible for the discharge/ threatened discharge; Responding local or state agency	Connecticut Department of Energy & Environmental Quality (860) 424-3000	Immediately, but not later than 15 minutes after discovery of the spill or threatened release	Connecticut Water Quality Standards and Wastewater Treatment Requirements: Table 3 of section 22a-426-9 of the Regulations of Connecticut State Agencies
State Waters	Any amount of oil or petroleum product	Any person	Connecticut Department of Energy & Environmental Quality (860) 424-3000	Immediately upon knowledge of a release.	Connecticut Water Quality Standards and Wastewater Treatment Requirements: Section 22a-426-3

Table 1: Release Reporting Requirements					
Oil Discharges to Land (Including Onshore drilling, exploration, or production operation)	≥1 barrel (42 gallons) if uncontained and no threat to state waters 10 barrels or more if contained and identified in spill contingency plan – if no threat to state waters.	Facility owner or operator	Connecticut Department of Energy & Environmental Quality (860) 424-3000	Immediately upon knowledge of a release	Section 22a-426-9 Environmental Criteria Table 1 - Surface Water Criteria by Classification
Aboveground Storage Tanks (ASTs)	≥1 barrel (42 gallons)	Facility owner or operator of a tank facility		Immediately upon knowledge of a release	HSC 25270.8

Appendix A

Spill Log

WRITTEN SPILL REPORT FORM

Name of Person Filing Report	
Name of Person Reporting Release	
Type of Material Spilled	
Amount of oil typically stored on-site at any time (gallons)	
Maximum on-site oil storage capacity (gallons)	
Estimated Quantity Spilled	
Description of affected area	
Cause of spill	
Property Damages or Personal Injuries	
Corrective Actions Taken	
Evacuation needed?	
Actions taken to prevent recurrence?	
Changes to be made to SPCC Plan base on incident	

Other Information	

Signature of Person Filing Report

Date