

 <b>BHEL</b>	<b>FIELD QUALITY PLAN</b>				No:	REG1920-20200200
	Project:	Solar Based EV charger	Customer :	AIC-EMPI	Rev	00
Rudrapur	<b>GROUP : Renewable Energy Group (REG)</b>				Date	12.08.2020

## **FIELD QUALITY PLAN**

00	10.02.2020	Dinesh Kumar	Alok Kumar	Ayan Debbarma	
<b>Rev</b>	<b>Date</b>	<b>Altered</b>	<b>Checked</b>	<b>Approved</b>	<b>Note</b>

	<b>FIELD QUALITY PLAN</b>				No:	REG1920-20200200
	Project:	Solar Based EV charger	Customer :	AIC-EMPI	Rev	00
Rudrapur	GROUP : Renewable Energy Group (REG)				Date	12.08.2020

## Index

Sl. No	Item	Drawing/Document No.	Rev	No Of Pages
1	Authorization for checks			01
2	Statement of Checks			01
3	SPV Module	FQP/RTS/SSPV/HTCL-01	00	02
4	Solar String Inverter	FQP/RTS/String Inverter/HTCL-01	00	01
5	Cable DC	FQP/RTS/Cable/HTCL-01	00	01
6	LT-ACDB/ACCB	FQP/RTS/ACDB/HTCL-01	00	01
7	Earthing	FQP/RTS/Earthing/HTCL-01	00	01

	<b>FIELD QUALITY PLAN</b>				No:	REG1920-20200200
	Project:	Solar Based EV charger	Customer :	AIC-EMPI	Rev	00
Rudrapur	GROUP : Renewable Energy Group (REG)				Date	12.08.2020

## Authorization of Check

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
<b>A'</b> (Customer Hold Point)	BHEL Engineer	BHEL/OE	BHEL ENGG Centre / Head (Quality): BHEL CFP	BHEL
<b>B'</b> (Formal intimation Engineer shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	BHEL/OE	BHEL ENGG Centre / Head (Quality): BHEL CFP	BHEL
<b>C'</b>	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre / Head (Quality): BHEL CFP	BHEL

Abbreviations used:

HOS - Head of Section

OE- Owner's Engineer

**Note:**

1. Nonconformity Disposition authority for all categories of checks shall be as under: Product nonconformities: BHEL Engineering Centre. Process/ System nonconformities: Head (Quality): BHEL CFP.
2. Wherever log sheet is not called for, suitable record shall be maintained in protocol I Site register.
3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.
4. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.
5. Only authorized persons with proper safety gears to enter construction area.

 <b>BHEL</b>	<b>FIELD QUALITY PLAN</b>				No:	REG1920-20200200
	Project:	Solar Based EV charger	Customer :	AIC-EMPI	Rev	00
Rudrapur	<b>GROUP : Renewable Energy Group (REG)</b>				Date	12.08.2020

## **STATEMENT OF CHECKS**

**Capacity / Type:** 25KWP

**System:** Solar Based EV charger at car parking

**Sub-System:** **SPV MODULES, SOLAR STRING INVERTER, CABLE DC, LT-ACDB/ACCB, EARTHING**

**NOTES:**

1. Abbreviations used

Type of Checks:

**V-** Visual,

**V&E-** Visual and Electrical,

**E-** Electrical

**P-** Physically,

**SL-** Spirit Level

2. Latest revision of Standards & Specification shall apply.
3. Gauges and measuring Instruments, with valid calibration only shall be used
4. Format of record identified with "tick" (✓) mark in column no. 'D\*' shall be essentially included in QA documentation.



BHARAT HEAVY ELECTRICALS LIMITED  
CFP- RUDRAPUR

**FIELD QUALITY PLAN  
FOR SPV MODULES  
STATEMENTS OF CHECKS**

FQP NO.: FQP/RTS/SSPV/01  
BHEL Doc. NO. : RU:REG:FQP01

REV. NO. : 00

TOTAL SHEETS: 02

SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: SPV MODULES						AREA:		
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	2	3	4	5	6	7	8	9	D*	10
<b>A Material Receipt and Unloading</b>										
A.01	Unloading From Truck	V	Hydra Crane	C	100%		Use Proper material handling equipment	Logbook/ Site register		
A.02	Verification of qty and identification	V	Visual	C	100%	Delivery Challan / Packing List	Correlation of the received with dellavery challan/packing list	Site Material register		
A.03	Reporting of damage/missing items	V	Visual	C	100%		Delivery Challan / Packing List	Site Material register		
<b>B Shifting of (Modules)</b>										
B.01	Any one point is sufficient	V	Hydra Crane/ Manually	C	100%		Use Proper material handling equipment	Logbook/ Site register		
B.02	Storage Space	V	Visual	B	100%		Protection of rain, why not indoor?	Logbook/ Site register		
B.03	Pallet Stack Height	V	Visual	C	100%	Maximum Stack Height 2 pallets	Maximum stack Height 2 pallets	Logbook/ Site register		
<b>C Pre-Erection</b>										
C.01	Document availability	V	Visual	C	100%	BHEL approved layout drawing/data sheet	BHEL approved layout drawing/data sheet	MoM/ e-mails		
C.02	Civil work & MMS Structure	V	Visual	C	100%	BHEL approved drawings/data Sheet	Check the completion of MMS foundation and completion of MMS assembly	Logbook/ Site register		
C.03	Fixing hardware availability	V	Visual	C	100%	Manufacturer Installations Manual/ BHEL approved Drawing/data sheet	Manufacturer Installations Manual / BHEL approved Drawing/data sheet	Logbook/ Site register		
C.04	Unpacking of pallets and module handing	V	Visual	C	100%		Manually shifted at the rooftop	Logbook/ Site register		
<b>D Erection</b>										
D.01	Fixing of modules to MMS using Fasteners	V	Manually/ Torque wrench	C	100%	Manufacturer Installations Manual/ BHEL aprooved PV module data sheet	1) Each module should be supported on the MMS 2) Each Modual should be mounted with Fasteners on MMS at 4 locations	Logbook/ Site register		



BHARAT HEAVY ELECTRICALS LIMITED  
CFP- RUDRAPUR

**FIELD QUALITY PLAN  
FOR SPV MODULES  
STATEMENTS OF CHECKS**

FQP NO.: FQP/RTS/SSPV/01  
BHEL Doc. NO. : RU:REG:FQP01

REV. NO. : 00

TOTAL SHEETS: 02

SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: SPV MODULES						AREA:		
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	2	3	4	5	6	7	8	9	D*	10
D.02	Module series wiring	V	Manually	B	100%	BHEL approved SLD /Data sheet	1) Ensure right Polarity. 2) Number of modules in series Loop Should match SLD 3) No loose Connection allowed No Short Circuiting of modules allowed	Logbook/ Site register		
D.03	Grounding	V & E	Manually	C	100%	Each Individual module frame should be grounded through the Fasteners connecting PV module to MMS and subsequent earthing by using Suitable Size Cu Wires/GI Strip	BHEL approved layout drawing	Logbook/ Site register		
<b>E Pre Commissioning</b>										
E.01	Voc measurement	E	Megger/IR Tester/ Clamp meter	A/B	100%	BHEL approved data sheet	1) String Voc Should match with SLD requirement and data sheet 2) No reverse polarity allowed	Joint Protocol		

 <b>BHARAT HEAVY ELECTRICALS LIMITED</b> CFP- RUDRAPUR		<b>FIELD QUALITY PLAN</b> <b>FOR SOLAR STRING INVERTER</b> <b>STATEMENTS OF CHECKS</b>						FQP NO.: FQP/RTS/String Inverter/01 BHEL Doc. NO. : RU:REG:FQP01 REV. NO. : 00 TOTAL SHEETS: 01		
SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: SOLAR STRING INVERTER						AREA:		
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	D*	10
<b>A Material Receipt and Unloading</b>										
A.01	Unloading From Truck	V	Manually/ Hydra Crane	C	100%	Manufacturers instruction Manual	Use proper material handling equipment with proper safety precautions.	Log book/Site register		
A.02	Verification of qty and specification & identification	V	Visual	C	100%	Purchase order, delivery challan & packing list.	Correlation of the lot received with purchase order, delivery challan & packing list.	Site material register		
A.03	Packing inspection	V	Visual	C	100%	Manufacturers instruction Manual	Package should be in good condition i.e. without breakage or visual defects. Should not be in opened condition.	Site material register		
A.04	Reporting of damage/missing items	V	Visual	C	100%	Delivery challan & packing list.	Delivery challan/Packing List.	Site material register/e-mails		
<b>B Storage of Inverters</b>										
B.01	Storage space	V	Visual	B	100%	Manufacturer installation manual	All inverters must be placed indoor.	Site material register		
B.02	Handling and Movement	V	Manual/ Hydra Crane	C	100%	Manufacturer installation manual	Store in such a way which avoid direct mechanical hit with sharp objects and also store in such a way that easy material movement access possible.	Site material register		
<b>C Pre-Installation &amp; checking</b>										
C.01	Document availability/ tools availability	V	Manually	C	100%	BHEL approved drawing/ Manufacturer's Instruction Manual	Document availability/tools availability	Log book/Site register		
<b>D Installation</b>										
D.01	Fix the inverter mounting plate on the stand with nut and bolts and tighten properly	V	Screw driver set/ Drill machine	C	100%	Manufacturer's instruction manual	Manufacturers instruction manual	Log book/Site register		
D.02	Lift the string inverter manually and position the inverter in place on the stand	V	Manually	C	100%	Manufacturer's instruction manual	Manufacturers instruction manual	Log book/Site register		
D.03	All DC power input connections, AC power output connections & communications as per manufacturer manual.	V	Manually	C	100%	Manufacturer's instruction manual	Cable size as per Manufacturers instruction manual/BHEL Approved drawings.	Log book/Site register		
D.04	All earthing connections should be as per refer manufacturer manual.	V	Manually	C	100%	Manufacturer's instruction manual	Manufacturer's instruction manual	Log book/Site register		
<b>E Pre-Commissioning</b>										
E.01	Ensure that all the cables connections are properly tightened.	V	Manually	C	100%	Manufacturer's instruction manual	Manufacturer's instruction manual	Log book/Site register		
E.02	Check rating of source and the cable terminations.	V	Manually	C	100%	Manufacturer's instruction manual	Manufacturer's instruction manual	Log book/Site register		
E.03	All DC output power conductors from inverter to external transformer are properly sequenced and tightened.	V	Manually	C	100%	Manufacturer's instruction manual	Manufacturer's instruction manual	Log book/Site register		
E.04	Check IR/HV	E	Megger/IR Tester	C	100%	Manufacturer's installation manual	Manufacturer's installation manual	Joint Protocol		



BHARAT HEAVY ELECTRICALS LIMITED  
CFP- RUDRAPUR

**FIELD QUALITY PLAN  
FOR SOLAR DC CABLE  
STATEMENTS OF CHECKS**

FQP NO.: FQP/RTS/Cable/01  
BHEL Doc. NO. : RU:REG:FQP01

REV. NO. : 00

TOTAL SHEETS: 01

AREA:

SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: CABLE						FORMAT OF RECORD			REMARKS	
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD					
1	2	3	4	5	6	7	8	9	D*	10		
<b>A Material Receipt and Unloading</b>												
A.01	Unloading From Truck	V	Manually/ Hydra Crane	C	100%		Use Proper Material handling equipment	Site Material register				
A.02	Verification of qty and identification	V	Visual	C	100%	Delivery Challan /Packing List	correlation of the lot received with delivery challan / packing list.	Site Material register				
A.03	Packing inspection	V	Visual	C	100%		Cable spools should be in good condition i.e. without breakage of visual defects should not in opened condition.	Site Material register				
A.04	Reporting of damage/missing items	V	Visual	C	100%		Delivery Challan /Packing List	Site Material register/ e-mails				
<b>B Storage of Cables</b>												
B.01	Movement to rooftops	V	Manually	C	100%		Use Proper Material handling equipment	Site Material register				
B.02	Storage space	V		B/C	100%		The storage area should be non flooded, All cables preferably store on original spools itself to avoid damage on rooftops under the Roof area dry secure / manufacturer installation	Site Material register		Storage space should be dry		
B.03	Handling and Movement	V	Manually	C	100%		Cable Store in such a way which avoid direct mechanical hit with sharp objects and also store in such a way that easy material movement access possible	Site Material register				
<b>C Pre-Erection</b>												
C.01	Document availability	V	Manually	C	100%	BHEL approved Layout drawings	BHEL approved Layout drawings	Log book/Site register				
C.02	Continuity	E	Multimeter	C	100%	BHEL Spec	Continuity should be checked through out cable before usage	Log book/Site register				
<b>D Erection</b>												
D.01	PV Cable erection solar PC connector assembly and Solar PV module wiring	V	Manually	C	100%	BHEL approved Layout drawings	As per BHEL approved Layout drawings	Log book/Site register				
D.02	IR test on cable from PV array to string inverter (between conductor and earth)	E	Megger/IR Tester	C/B	100%	Manufacturer installation manual	Manufacturer installation manual	Joint Protocol				

 <b>BHARAT HEAVY ELECTRICALS LIMITED</b> CFP- RUDRAPUR		<b>FIELD QUALITY PLAN</b> <b>FOR LT_ACDB PANEL</b> <b>STATEMENTS OF CHECKS</b>						FQP NO.: FQP/RTS/ACDB/01 BHEL Doc. NO. : RU:REG:FQP01  REV. NO. : 00 TOTAL SHEETS: 01		
SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: LT-ACDB/ACCB PANEL						AREA:		
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	D*	10
<b>A Material Receipt and Unloading</b>										
A.01	Unloading From Truck	P	Manually/ Hydra Crane	C	100%		Use proper material handling equipment with proper safety precautions.	Site Material Register		
A.02	Verification of qty and identification	P	Visual	C	100%	Material must be carefully unpacked & checked lot received with Delivery Challan/packing list.	Material must be carefully unpacked & checked lot received with Delivery Challan/packing list.	Site Material Register		
A.03	Reporting of damage/missing items.	V	Visual	C	100%	BHEL approved drawing/ Data Sheet	Delivery challan/packing list	Site Material Register		
<b>B Storage of ACDB</b>										
B.01	Movement to outdoor storage space	V	V	C	100%		Use Proper Material handling equipment	Site Material Register		
B.02	Storage space	V	V	C	100%		The storage area should be non flooded, All ACDB/ACCB should be stoe vertically. Check the positioning of the equipment to avoid the stresses on rooftops under the Roof side area/dry top covered/installation manual	Site Material Register		
B.03	Handling and Movement	V	V	C	100%		Store in such a way that easy material movement/ equipment movement access possible	Site Material Register		
<b>C Shifting of ACDB &amp; Metering board</b>										
C.01	Movement to rooftops & required location	P	Manually	C	100%	BHEL approved Layout drawings	Use proper material handling equipment with proper safety precautions.	Log book/Site register		
C.02	Handling	P	V	C	100%	BHEL approved Layout drawings	It Should be kept vertically & check the positioning of the panel & board to avoid stresses.	Log book/Site register		
<b>D Pre-Installation</b>										
D.01	Ensure availability of all related documents/tools	P	Manually	C	100%	Manufacturer installation manual	Manufacturer installation manual	Log book/Site register		
D.02	Front availability (Foundation readiness/Frame readlines/Wall readlines)	P	Manually	B	100%	BHEL approved drawing	BHEL approved drawing	Log book/Site register		
<b>E Installation Check</b>										
E.01	Check Alignment	SL	Manually	C	100%	BHEL approved drawing	BHEL approved drawing	Log book/Site register		
E.02	Check tightness of bus bar/ all other connection	V	Manually	C	100%	BHEL approved drawing	BHEL approved drawing	Log book/Site register		
E.03	Checking Earthing	E	Megger	B	100%	BHEL approved drawing	BHEL approved drawing	Log book/Site register		
E.04	IR/HV Test	E	Megger/IR Tester	A/B	100%	As per relevant standard	As per relevant standard	Joint Protocol		

 <b>BHARAT HEAVY ELECTRICALS LIMITED</b> CFP- RUDRAPUR		<b>FIELD QUALITY PLAN</b> <b>FOR EARTHING</b> <b>STATEMENTS OF CHECKS</b>						FQP NO.: <b>FQP/RTS/Earthing/01</b> BHEL Doc. NO. : RU:REG:FQP01 REV. NO. : 00 TOTAL SHEET: 01		
SYSTEM: ROOF TOP SOLAR SYSTEM		SUB-SYSTEM: EARTHING SYSTEM						AREA:		
SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS	
1	2	3	4	5	6	7	8	9	* D	10
<b>A RECEIPT AND STORAGE</b>										
A.01	EARTHING MATERIAL / GI strips & earthing & ROD.	V	Manually	C	100%	DELIVERY CHALLAN/ BHEL SPECS.	DELIVERY CHALLAN/ BHEL SPECS.	Site Material Register		
A.02	PROPER STORAGE	V	Manually	C	100%	PROPER STACKING	PROPER STACKING	Site Material Register		
<b>B PRE ERECTION</b>										
B.01	CHECK FOR DAMAGE TO THE MATERIAL	V	Manually	C	100%	FREE FROM DAMAGE/ RUST/ CORROSION	FREE FROM DAMAGE/ RUST/ CORROSION	Site Material Register		
B.02	EARTHING OF METALLIC FRAME OF ALL ELECTRICAL EQUIPMENT & STRUCTURES	V	Manually	B	100%	BHEL TECH. SPECS.	BHEL TECH. SPECS.	Log book/Site register		
B.03	APPLICATION OF PROTECTIVE PAINTING ON EQUIPMENT BOLTED CONNECTION	V	Manually	B	100%	BHEL TECH. SPECS.	PAINTING WITH ANTI CORROSIVE PAINT/ COUMPOUND	Log book/Site register		
B.04	CONNECTION BETWEEN EQUIPMENT EARTHING LEADS & BETWEEN EARTHING CONDUCTOR SHALL BE OF WELDED TYPE CHEK WELDING SLAG HAS BEEN REMOVED BEFORE APPLICATION OF PROTECTIVE COATING	V	Manually	C	100%	WELDS IS TO BE TREATED WITH RED LEAD COUPOND & BITUMEN COMPOUND	WELDS IS TO BE TREATED WITH RED LEAD COUMPOUND & BITUMEN COMPOUND	Log book/Site register		
B.05	RESISTANCE OF JOINTS	E	Megger	B	100%	NOT MORE THAN THE RESISTANCE OF EQUIVALENT LENGTH OF CONDUCTOR	AS PER STANDARD	Log book/Site register		
B.06	EARTHING CONDUCTORS BURIED, EMBEDDED	V	Manually	C	100%	BHEL LAY OUT DRGS & BHEL TECH. SPECS.	BHEL LAY OUT DRGS & BHEL TECH. SPECS	Log book/Site register		
B.07	EARTHING PITS ARE PROPERLY PREPARED FOR ELCTRODES	V	Manually	B	100%	IS:3043/ BHEL TECH . SPECS.	IS:3043/ BHEL TECH . SPECS.	Log book/Site register		
B.08	CLAMPING / SUPPORT OF EARTHING CONDUCTORS ALONG WALL, COLUMN ETC.	V	Manually	C	100%	BHEL TECH. SPECS.	ONE METER INCASE OF WELDING / 750MM IN CASE OF CLEAT SUPPORT	Log book/Site register		
<b>C TESTING</b>										
C.01	CONTINUITY OF EARTH CONDUCTORS & EFFICIENCY OF ALL BONDS & JOINTS CHECKING	E	Megger	A/B	100%	IS:3043	IS:3043	Log book/Site register		
C.02	EARTH RESISTANCE OF TREATED EARTH PIT ONLY	E	Earth Resistance Tester	A/B	100%	IS:3043	IS:3043	Joint Protocol		