Energising Quality

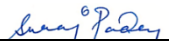
VCS Quality Services Pvt Ltd

STANDARD SPECIFICATION

FOR

SOLAR ELECTRIC POWER SYSTEM

VCS – SS – EL - 4012

					
02	25.04.2022	SP	RD	AA	HK
01	16.10.2019	MG	VV	AD	SK
00	05.07.2017	MG	RD	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	**:**	**If printed**
CONTROLLED COPY	**:**	**If in soft and signed**

REVISION RECORD

Rev.	Revision Date	Prepared by	Checked by	Approved by	Authorized by	Revision Description
00	05.07.2017	MG	RD	AD	SK	Issued for use as Standard
01	16.10.2019	MG	VV	AD	SK	New revision system updated
02	25.04.2022	SP	RD	AA	HK	New revision system updated

ABBREVIATION

BIS/IS	Bureau of Indian standards
IEC	International Electro-Technical Commission
BS	British Standards
IEEE	Institute of Electrical and Electronics Engineers
NEMA	National Electrical Manufacturers Association
PESO	Petroleum and Explosives Safety Organization
MPPT	Maximum Power Point Tracking
PCU	Power Conditioning Unit
FCBC	Float cum boost Charger
OISD	Oil Industries Safety Directorate
CCE	Chief Controller of Explosive
DGMS	Director General Mines Safety
IE Rules	Indian Electricity Rules
CPRI	Central Power Research Institute
VRLA	Value Regulated Lead Acid
Ni-Cd	Nickel Cadmium
AH	Ampere hour
MCCB	Moulded case circuit breaker
SCR	Silicon Controlled Rectifier
PV	Photo Voltaic
ELV	Extra low Voltage
LV	Low Voltage
VOC MOD	Module Open Ckt Voltage
VOC ARRAY	Array Open Ckt Voltage
VOC STC	Module Open Ckt Voltage at STC
Isc MOD	Module Short Circuit Current
Isc ARRAY	Array Short Circuit Current
AC	Alternating current
DC	Direct current
NOCT -	Nominal operating cell temperature
STC	Stand testing conditions

CONTENTS

1.0 SCOPE

1.1 The intent of this specification is to define the requirements of solar power supply system and the associated battery sets, solar street lighting system. Tenderer's scope of work includes design, manufacture, testing, packing, storage, delivery to site, installation, earthing, testing & commissioning of the complete Solar system with solar array, charge controllers, battery banks.

1.2 Three Phase chargers, DC-DC converters, Distribution boxes, interconnecting cables etc. as per this specification, data sheets that meet the critical load requirement.

1.3 The exact number of solar electric power systems along with loads connected to each system and the load rating of each system shall be as indicated in the equipment Data Sheet, SLD, Project scope of works.

1.4 Each solar Electric power system when installed in accordance with Vendor's instructions shall form self-sufficient power system to meet the power requirements of continuous loads.

2.0 REFERENCE DOCUMENTS

2.1 The equipment supplied shall comply with the requirements of the latest revision of the relevant standards of the followings: -

IS-12762 (Pt.1) 2010 : Photovoltaic devices: Part 1. Measurement of PV current and voltage characteristics.

IS-12762 (Pt.2) 2013 : Photovoltaic devices: Part 2: Requirement for reference solar cells.

IS -12763:2013 : Procedure for temperature and irradiance correction to measure I-V characteristics of crystalline silicon PV devices.

IS- 12834: 1989 : Solar photovoltaic energy system-Terminology.

IS- 14153:1994 : Guide for General Description of Photovoltaic (PV) Power Generating System.

IS-4244: 1995 : Characteristics parameters of standalone photovoltaic (PV) system.

IS-14286: 2010 : Crystalline Silicon Terrestrial Photovoltaic (PV) modules - Design Qualification and type Approval

IEC 61215 : PV module design and type approval

IEC 62259 : Battery Bank (Ni-Cd)

IS-1554:1988 : Specification for PVC insulated (heavy duty) electric cables.

IS-3043:1987 : Code of practice for earthing.

IEC: 62257 : Recommendations for small renewable energy and hybrid systems for rural electrification

IEC: 61427 : Secondary cells and batteries for photovoltaic energy systems (PVES) – General requirements and methods of test

IEC: 62257 : Selection of batteries and battery management systems for stand-alone electrification systems – Specific case of automotive flooded lead-acid batteries available in developing countries

IEC: 60364 : Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems

IEC: 61386 : Solar photovoltaic energy systems – Terms, definitions and symbols

IEC: 62124 : Photovoltaic (PV) stand-alone systems – Design verification

IEC: 60904 : Measurement of photovoltaic current-voltage characteristics

IEC: 61727 : Photovoltaic (PV) systems-Characteristics of the utility interface

IEC: 62116: Test Procedure of islanding prevention measures of utility-interconnected photovoltaic inverters

IEC: 60068 : Environmental test

IS/IEC 61730 (Part 1 & 2): 2004 Photovoltaic (PV) Module Safety Qualification Part 1 Requirements for Construction Photovoltaic (PV) Module Safety Qualification Part 2 Requirements for Testing

IS 16221 (Part 1) : 2016 IS 16221 (Part 2) : 2015 Safety of Power Converters for use in Photovoltaic Power Systems Part 1- General Requirements Safety of Power Converters for Use in Photovoltaic Power Systems Part 2-Particular Requirements for Inverters

IEC 62446 : Grid connected photovoltaic systems – Minimum requirements for system documentation, commissioning tests and inspection

SP 30 2011 : National Electrical Code (first revision)

Note- Latest edition of all applicable standards shall be considered

3.0 GENERAL REQUIREMENTS

3.1 SOLAR POWER SYSTEMS.

a) Cathodic Protection, Telecom, SCADA, Instrumentation, FA system & CO2 Flooding system.

b) Outdoor lighting (Stand-alone solar street lighting poles)

c) On-Grid System

d) OFF Grid system

e) Hybrid System (Combination of ON and OFF Grid)

3.2 BASIC PARTICULARS FOR DESIGN

a) Basic Details

i. Suitable for industrial application.

ii. The system shall be designed as per Schedule of Quantity/MR at 50°C /2 °C ambient and load specified.

iii. The charge controller must be of Maximum Power Point Tracking (MPPT) type and shall be capable to charge the battery from SPV array & simultaneously feed the load.

iv. Battery shall be suitable to store the energy as per specified autonomy.

v. DC-DC Converters as per data sheet & drawing.

vi. DC Distribution boards as per data sheet.

vii. Interconnecting cables & Equipment's earthing- Cu plate type.

b) System Voltage

Differences of potential normally existing between conductors and between conductors and earth as follows:

i. Extra-low Voltage: not exceeding 50 V A.C. or 120 V ripple-free D.C.;

ii. Low voltage : exceeding extra-low voltage, but not exceeding 1000 V A.C. or 1500 V D.C.

iii. High voltage : Exceeding low voltage.

NOTE In consideration of ELV status, VOC ARRAY must be used.

Voltage domain	Voltage (volts)	
	Alternating current	Smoothed direct current
ELV	*Un ≤ 50 V*	*Uoc ≤ 120 V*
LV	*50 V < Un ≤ 1000 V*	*120 V < Uoc ≤ 1500 V*

c) Batteries in systems

i. Batteries in PV systems can be a source of high prospective fault currents. The location of fault current protection related to battery systems is generally between the battery and charge controller and as close as practical to the battery. This protection can be used to provide overcurrent protection for PV array cables provided the PV array cable is rated to withstand the same current as the battery overcurrent protection device.

ii. Accordingly, the system shall be designed & The value of effective/prospective fault current shall be calculated & the calculation shall be submitted during the approval of the design document.

NOTE- The current rating of string cables must be much higher in battery systems if no individual over current protection is provided. In this case, the nearest downstream over current protection may be the battery fuse.

d) Marking

Each PV module used in the solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module Laminate, but must be able to withstand harsh environmental conditions.

I) Name of the manufacturer of PV Module

ii)Name of the Manufacturer of Solar cells of PV Module

iii)Month and year of the manufacture (separately for solar cells and module).

iv) Country of origin (separately for solar cells and module)

v) I-V curve for the module

vi) Peak Wattage, Im, Vm and field factor (FF)for the module

vii)Unique Serial No. and Model No. of the module

viii) Date and year of obtaining IEC/BIS PV module qualification certificate

ix) Name of the test lab issuing IEC/BIS Certificate

x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.

xi) Polarity of terminals or leads (colour coding is permissible as per standard practice);

xii) Maximum system voltage for which the module is suitable.

The date and place of manufacture shall be marked on the module or be traceable from the serial number.

e) Warranty of PV Module

The warranty of the solar module is the measurement of the power after a certain time of working, warranty of the Module should be for the 20 years @ 80% of guaranteed power output of Module at the time of purchase.

f) Solar Photovoltaic Modules

SPV modules manufactured using Crystalline Silicon solar cells shall be used for power generation. SPV modules should have excellent durability to withstand extreme temperature and weather conditions. The photovoltaic solar array (2X50%), charge controller(2X100%), shall be sized to meet battery (2X50%), back-up, load cycle requirement (as per scope of work/PJS) of connected load with availability of solar energy. SPV array shall be connected in series-parallel combination to obtain required voltage and current rating of a solar module. However, the rating of solar system shall not be less than as specified in SOR/MR.

4.0 ESSENTIAL FEATURE OF SOLAR POWER SYSTEM

a) Crystalline silicon cells shall be mono/poly Crystalline shall be used in solar module for power generation.

b) Suitable for DC 96V/48V system

c) Encapsulation of cells using UV stabilized polymer (EVA) and protective back cover using Tedler- Polyster-Tedler.

d) High transmission toughened glass and anodized aluminium/hot dip galvanized Steel frame for mounting.

e) Total dimensions of solar array panels shall be such that it can be accommodated in existing space/roof as indicated in data sheet.

f) Solar module must comply with IEC 61215/IS:14286

g) Bird spikes shall be provided to avoid bird setting on solar module/array.

h) Solar module shall be able to withstand following environment conditions

i) Wind Velocity –Min. 170 Km/Hr or as per site survey

j) Max Relative Humidity – 98%

k) Long service life (20 Years).

4.1 Protection against electric shock and fire- (As per IEC: 62257)

a) Protection by extra-low voltage systems shall be classified as Class III or better as per IEC.

b) For all other systems, protection by double or reinforced insulation between any live conductor and any earthed or exposed conductive part (i.e., Class II modules and double or reinforced insulation for the whole PV array) is required.

4.2 Protection against over current to be provided for Modules/Array/String/Sub Arrays-

a) Fault currents due to short circuits in modules, in junction boxes or in module wiring or earth faults in array wiring can result in overcurrent in a PV array. PV modules are current limited sources but because they can be connected in parallel and also connected to external sources (e.g., batteries), they can be subjected to over currents caused by either multiple parallel adjacent strings or from external sources or both.

b) The over current protection shall be provided as per IEC: 62257.

4.3 Protection against Lightning & Over-Voltages

a) The protection shall be provided as per IEC: 62257 & 62305.

b) When a PV array is protected by a lightning protection system, the metal structure of the PV array should be bonded to the lightning protection system, unless the minimum safety clearances as specified in IEC 62305-3 can be achieved.

4.4 Surge arresters

a) Surge arresters shall be provided for protecting electrical systems and equipment against over-voltages. When these devices are used the recommendations of IEC 61643-12 should be observed.

b) Over-voltage protection with surge arresters should be provided when the PV power system meets any of the following criteria:

c) Supply of critical loads (e.g., telecommunication repeater stations), or

d) The PV array has a rated capacity greater than 500 W, or

e) The PV array is protected with a lightning protection system.

4.5 Specification Requirements

The recommended specifications for surge arresters to protect PV arrays from over-voltages caused by indirect lightning strikes are as follows: (refer to list of parameters for surge arrester selection in IEC 61643-12:

a) Maximum continuous operating voltage (UC): UC > 1.3 x VOC STC GEN
b) Maximum discharge current (I max): I max ≥ 5 kA
c) Voltage protection level (Up): UC < Up < 1.1 kV

5.0 SOLAR CHARGE CONTROLLER

A charge controller is an important system component that regulates the power generated from renewable energy system and charges the battery and simultaneously feed the load at specified voltage level. It should protect specified type of batteries from being over/under charged and ensures maximum battery life. Each Charge controller (2x200% of each system PV capacity) shall be connected to respective PV panel and battery as shown in the Block drg attached so as to make whole system Parallel Redundant. Charger I/O is specified in Data sheet. Remote Monitoring of battery voltage & current, load Voltage & current, solar array Voltage & current, fault status and charging of battery from solar charger controller or grid charger, hook up with Owner's SCADA system through RS232/485.

a) Charger size shall be based on the maximum Array capacity & Battery Bank Ah.

b) Charger shall be MPPT type.

c) Automatic and Manual boost and float charging control through Keypad/selector switch.

d) The threshold for the Boost & Float charging shall be decided during the approval of the design documents as per the recommendation of the Battery Manufacturer.

e) Provision to isolate individual battery bank from charge controller for maintenance purpose.

f) Protection to Short circuit currents due to shadow & short-circuit shall be provided.

5.1 PROTECTIVE FEATURES- (As per manufacturer's standard however minimum is below)

a) Maximum current limit (Over Load trip)

b) Over Temperature Trip (Heat Sink Temp)

c) Over charging Trip

d) Boost charging and float charging current limiting (Adjustable from 10%-100% of the rating of the

e) Charge controller) with back up protection against overcharging & deep discharge of battery

f) Protection against transient/surge.

g) Battery open circuit protection.

h) Protection against transient & surge

i) Battery reverse polarity

j) Reverse flow of power from battery to PV system

k) Annunciation for deep discharge of battery [Through SCADA also]

l) Provision for charging of battery from grid supply through grid charger automatically when no sun power is available or battery is deep discharged or provision of manually transfer on grid charger shall also be provided.

m) Automatic/Manual selection of Float & Boost Mode.

5.2 INDICATIONS (As per manufacturer's standard)

a) All indications shall be LED type.

b) Indication for charging by solar panels or by Grid power.

c) Battery deep discharge/ Low Battery

d) Float/Boost Charging

e) Battery Full

f) Battery Low

g) Fuse failure

h) Other are as per the manufacturer standard

5.3 METERS (Digital Type)

a) Load voltage and current

b) PV Voltage and Current.

c) MPPT Charger O/P amps /Battery Charging current

d) MPPT Charger O/P Voltage

e) AH Meter

f) KW meter

5.4 CONSTRUCTIONAL FEATURES OF CHARGE CONTROLLER

a) Dust and vermin proof, IP-31 with forced cooling if required (Refer ambient condition as mentioned in the specification/PJS).

b) Sheet steel clad- Minimum 2 mm thick for panels- Minimum 1.6 mm thick for doors and side covers

c) Units shall be self-contained and serviceable.

d) The arrangement and layout shall facilitate easy and convenient supervision of the unit while running as well as quick detection of disturbances and troubleshooting.

e) Copper earth bus bar shall run throughout the length of Panels. All doors & non-current carrying parts shall be suitably earthed.

f) Dimensions of panels shall be such that it can be accommodated in existing room if indicated in data sheet.

g) The maximum and minimum operating height of the switches shall be 1800mm and 300mm respectively

5.5 ENCLOSURES AND VENTILATION

a) Enclosure conforming to minimum IP-31 class.

b) Units shall be provided with cooling fans with thermostat etc as per manufacturer's standard.

6.0 BATTERY UNIT

6.1 The battery shall be Ni-Cd type & in combination of two banks (Capacity shall be divided into two banks).

6.2 Ampere-hour capacity of the battery shall be selected on the following basis:

a) Aging factor of 0.8

b) Battery Depth of Discharge 0.7

c) Minimum ambient temperature as specified in data sheet

d) Backup time as specified in data sheet

e) Minimum end cell voltage/Cut Off shall be 1.1V per cell for Ni-Cd battery or as per manufacturer recommendation/As calculated from IEEE: 1115.

f) Battery calculations done as per IEEE:1115 standard

g) Capacity of the battery to conform C5 discharge rating

h) Any further details please refer standard specification of Battery banks.

6.3 Sets of Indoor Stationary batteries of type as per enclosed data sheet complete with all required accessories as applicable shall be supplied with each battery set as specified in specification of Ni-Cd Batteries.

6.4 Overall dimensions of complete battery set shall be such that it can be accommodated in existing room, as indicated in data sheet.

7.0 FCBC CHARGER & PCU-MPPT INVERTER

7.1 FCBC CHARGER

Please refer standard specification of FCBC Charger.

7.2 PCU-MPPT INVERTER

PCU / MPPT and 3 phase inverters shall be supplied as integrated unit depending upon the size of the solar power system. It should conform to IEC61683 and must additionally conform to the relevant national / international Electrical Safety Standards IEC600682. To minimize power losses, the PCU should be microprocessor based having inverter, which converts DC energy produced by the solar array to 3 phase AC energy. The combined wattage of all inverters should not be less than rated capacity of power plant under STC. Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.

a) PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to the power conditioning unit/inverter output should be compatible with the grid frequency.

b) The inverter shall have internal protection arrangement against any sustained fault in the feeder. The inverter shall have provision for input & output isolation.

c) Inverter shall be tested for islanding protection performance.

d) The PCU/solar inverter shall be capable of complete automatic operation, including wake-up, synchronization & shut down.

e) The software for performance monitoring of the system along with Laptop (at each plant) for remote monitoring (RS-485 serial communication, protocol-Modbus) and required hardware for interfacing the plant are to be supplied.

f) The PCU/ inverters should be type tested from the MNRE approved test centres / NABL /BIS /IEC accredited testing- calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses.

7 . 3 TOOLS & TACKLES AND SPARES:

a) After completion of installation & commissioning of the power plant, necessary tools & tackles are to be provided free of cost by the bidder for maintenance purpose. List of tools and tackles to be submitted by Bidder for approval

b) A list of requisite spares in case of PCU/inverter comprising of a set of control logic cards, IGBT driver cards etc. Junction Boxes. Fuses, MOVs / arrestors, MCCBs etc along with spare set of PV modules be indicated, which shall be supplied along with the equipment.

8.0 DISTRIBUTION BOARDS COSTRUCTION FEATURES-

8.1 MECHANICAL DESIGN-

a) Non-draw out type, floor mounted/wall mounted as specified in SLD & data sheet.
b) Sheet steel clad, front operation and maintenance type.
c) Minimum sheet steel thickness: Doors & covers – 2.0mm cold rolled for load bearing and 1.6mm for non-load bearing members
d) Degree of protection IP 41.
e) Cable entry from bottom, 2mm thick removable and un-drilled gland plates f) Tinned-Cu Bus Bar of suitable size.
g) No. of I/C and O/G MCB feeders with fuses as per SLD & data sheet.

8.2 INDICATIONS/METERS

a) Voltmeter- (Incoming Voltage)
b) Ammeter- (Incoming Current)
c) Incomer supply ON (LED type)

9.0 INTERCONNECTING CABLES

9.1 General requirements

a) Cu conductor, XLPE insulated, PVC sheathed, armoured/unarmoured, FRLS type cables as per relevant IS/IEC standard, used for interconnection among arrays, charge controller, battery bank, junction boxes and distribution boxes etc.

b) IR/UV protected Cables shall be used. (Solar Grade)

c) Double compression type cable glands, tinned Cu lugs, cable tags, cable marker for underground cables.

d) Cable sizes for PV string cables, PV sub-array cables and PV array cable shall be determined with regard to both, the minimum current capacity and the maximum voltage drop requirements-

9.2 Voltage drops criteria

It is recommended that under maximum load conditions the voltage drop from the most remote module in the array to the terminals of the application circuit should not exceed 1% of the nominal system voltage for DC system & 2% for AC system. The necessary voltage drops calculations to be submitted for approval.

9.3 Max. Current requirement Criteria

Current carrying capacity (CCC)-The minimum cable sizes for PV array wiring, based on CCC, shall be based upon a current rating calculated from below table, and the current carrying capacity of cables as specified in IEC 60287/ IS-7098/1554.

NOTE In some PV module technologies *I*sc MOD is higher than the nominal rated value during the first weeks or months of operation. This should be taken into account when establishing cable ratings

Type of cable	**Minimum current upon which cable cross sectional area should be chosen* ** **
PV string cable (PV string overcurrent protection not provided)	Trip current *** of the nearest downstream overcurrent protection device + 1.3 x Isc MOD x (*S*PO – 1) Where: *S*PO is the number of parallel connected strings

	protected by the nearest overcurrent protection device. NOTE When no overcurrent protection is used *S*PO is the total number of parallel connected strings in the PV array; and the trip current of the nearest overcurrent protection device is replaced by zero.
PV string cable (PV string overcurrent protection provided)	Trip current *** of the PV string overcurrent protection device
PV sub-array cable (PV sub-array overcurrent protection not provided)	The greater of the following: a) Trip current*** of the PV array overcurrent protection device + 1.3 sum of short circuit current of all other sub-arrays b) 1.3 x *I*sc S-ARRAY (of relevant array) NOTE When PV array overcurrent protection is not used, the corresponding parameter is replaced by zero in equation
PV sub-array cable (PV sub-array overcurrent protection provided)	Trip current*** of the PV sub-array overcurrent protection device
PV array cable (PV array overcurrent protection not provided)	1.3 x Isc ARRAY
PV array cable (PV array overcurrent protection provided)	Trip current*** of the PV array overcurrent protection device
* The operating temperature of PV modules and consequently their associated wiring can be significantly higher than the ambient temperature. A minimum operating temperature of maximum expected ambient temperature + 45° C should be considered for cables installed near or in contact with PV modules. ** The location and method of installation (i.e., enclosed, clipped, buried etc) of cables also needs to be considered in establishing a cable rating. Cable manufacturers recommendations need to be taken into account in establishing the rating according to installation method. ***Trip current is the nominal current at which the overcurrent protection device is calibrated to operate. The current at which the device trips will generally be greater than the nominal rated current.	

NOTE PV modules frequently operate at temperatures of the order of 45 °C above ambient temperature. Cable insulation of wiring installed in contact or near PV modules shall be rated accordingly.

The calculation for the selection of the conductor sizes & insulation thickness to be submitted for approval

9.4 Insulation of Cable

a) The insulation of cables used within the PV array shall Have a voltage rating of at least 1.2 x Voc ARRAY,

NOTE The use of single core insulated and sheathed cable is recommended for wiring of LV PV arrays, to minimise the risk of faults within the wiring.

b) Cable has temperature rating according to the application,

NOTE PV modules frequently operate at temperatures of the order of 45 °C above ambient temperature. Cable insulation of wiring installed in contact or near PV modules shall be rated accordingly.
The calculation for the selection of the conductor sizes & insulation thickness to be submitted for approval

9.5 Switching Devices

All switching devices, shall comply with the following requirements:

c) rated for D.C. use (especially when voltage is over 30 V due to the risk of arcs);

d) have a voltage rating equal to or greater than 1.2 x *V*oc ARRAY;

e) not have exposed live metal parts in connected or disconnected state;

f) interrupt all poles, except in the case of a pole connected either to earth or to a protective conductor.

9.6 Disconnectors

In addition to the requirements of switching devices, disconnectors shall have a current rating equal to or greater than the associated overcurrent protection device, or in the absence of such device, have a current rating equal to or greater than the required current carrying capacity of the circuit to which they are fitted. (Refer to Table for current calculation) In addition, circuit breakers and any other load breaking disconnection devices used for protection and/or disconnecting means shall comply with the following requirements-

Not be polarity sensitive (Fault currents in a PV array may flow in the opposite direction of normal operating currents).

a) Be rated to interrupt full load and prospective fault currents from the PV array and any other connected Power sources such as batteries, generators and the grid if present.

b) When overcurrent protection is incorporated, the trip current shall be rated according to IEC 62257

c) Plug connections for interruption under load may also be used if equivalent level of safety can be assured.

NOTE Only specially constructed plugs and sockets are capable of interrupting load safely. All systems with an open circuit voltage greater than 30 V can experience D.C. arcs. Plugs and sockets which are not specially constructed for load interruption if disconnected under load represent a safety risk and generally incur damage to the connection which will compromise the quality of the electrical connection and could lead to overheating of the connection.

9.7 Fuses

Fuses used in PV arrays shall comply with the following requirements: Be rated for D.C. use

a) Have a voltage rating equal or greater than 1.2 x *V*oc ARRAY

b) Be rated to interrupt full load and prospective fault currents from the PV array and any other connected power sources such as batteries, generators and the grid, if present.

NOTE When fuses are provided for over current protection, the use of fused switch-disconnectors (fuse combination units) is recommended.

9.8 Fuse holders

Fuse holders shall comply with the following requirements:

a) Have a voltage rating equal or greater than 1.2 x Voc ARRAY.

b) Have a current rating equal or greater than the corresponding fuse.

c) Provide a degree of protection not less than IP 2X.

9.9 By-pass diodes

By pass diodes may be used to prevent PV modules from being reverse biased and consequent hot spot heating. If by-pass diodes are used, and they are not embedded in the PV module encapsulation, they shall comply with the following requirements-

a) Have a voltage rating at least 2 X Voc MOD of the protected module.

b) Have a current rating of at least 1.25 X Isc MOD.

c) Installed according to module manufacturer's recommendations.

d) Installed so, no live parts are exposed.

e) Protected from degradation due to environmental factors.

9.10 Blocking diodes

Blocking diodes may be used but they are not a substitute for overcurrent protection. In systems containing batteries it is recommended that some device will be implemented to avoid reverse current leakage from the batteries into the array at night. A number of solutions exist to achieve this including blocking diodes.
If used, blocking diodes shall comply with the following requirements: Have a voltage rating at least 2 x Voc ARRAY
Have a current rating of at least 1.25 times the short circuit current at STC of the circuit that they are intended to protect; that is-

a) 1.25 x *I*sc MOD for PV strings

b) 1.25 x *I*sc S-ARRAY for PV sub-arrays

c) 1.25 x *I*sc ARRAY for PV arrays

d) Installed so no live parts are exposed

e) Protected from degradation due to environmental factors.

If there is a special recommendation from the manufacturer or from local regulation to use blocking diodes in PV strings of the PV array, these diodes shall be installed as per their recommendations

Blocking diodes are used, their reverse voltage shall be rated for 2 x Uoc STC of the PV string. The blocking diodes shall be connected in series with the PV strings

9.11 Junction Boxes

The junction boxes shall be dust vermin and waterproof and made of FRP/Thermo Plastic with IP65 protection with adequate size current collection terminals. Rating of the JB's shall be suitable with adequate safety factor to interconnect the solar PV array. Metal oxide arrestor shall be provided inside the array junction boxes.

PV array and PV sub-array junction boxes, where installed, shall be readily available. The arrangement of JBs for collection of current from the SPV arrays is Sub array JBs with test point for quick fault location, then Main Junction Box. 20% Spare terminal shall be provided in JB's.

10.0 ARRAY SUPPORT STRUCTURE

The photovoltaic array support structure forms part of installation and must be constructed of anodized aluminium or hot dipped galvanized Steel. The support frame shall hold the array at the optimum angle and orientation for the site and shall be roof/ground mounted.

The PV array support structures should comply with national standards and regulations with respect to loading characteristics. Particular attention should be given to wind loads on PV arrays.

Support structures and module mounting arrangements should comply with applicable building codes (including earthquake requirements where relevant), regulations and standards.

10.1 Corrosion-

When possible, all structures shall be made of corrosion resistant materials e.g., aluminium or galvanizad steel. If the structure is metallic, aluminium or hot dipped galvanized steel are well suited to this type of use. If the array is installed in a marine or other highly corrosive environment, aluminium shall be anodized. The same applies to all bolts, nuts and fasteners.

Provisions shall be made in order not to create electrochemical corrosion between the structures and the building on the one hand, and the structures and photovoltaic modules on the other. If the system is earthed, it is recommended that the negative conductor be connected to the earth electrode as this arrangement will reduce electro-chemical degradation of the electrode and other metallic parts.

10.2 Wind load-

Wind force applied to the PV array will generate a significant load for building structures. This overload should be accounted for in assessing the capability of the building to withstand the resulting forces.

On assessing this component, the maximum wind speed observed (or known) on site

shall be used, with due consideration for punctual wind events (cyclones, tornadoes, hurricanes, etc.). The PV array structure shall be secured in an appropriate manner or in accordance with local building standards.

The minimum wind flow requirement as per local area site, however it shall be observed at site & accordingly the effective loading capacity of the structure on the roof to be calculated.

10.3 Total Load on the roof of the building

The Bidder shall submit the total weight of structure, array & other accessories taking care of wind load on the roof, according the strength of the roof to be designed.

11.0 EARTHING SYSTEM

11.1 PV array earthing General

The earthing of the PV system is classified as follows-

1. Earthing of the main current carrying conductors of the array (system earthing)
2. Earthing of exposed conductive parts for lightning protection and/or equi-potential bonding.

11.2 PV array system earthing

In the following Table several configurations are considered. No consideration is given to earthing of exposed conductive parts, which is covered in the following clause.

11.3 PV system earthing configurations

Photovoltaic array earthing equipment	**Application circuit**	**Consequence on the status of the PV array**
Unearthed	Unearthed DC loads	Floating
	Earthed DC loads	Fixed to earth
	AC loads connected via isolated PCU	Floating
	AC loads connected via a nonisolated power conditioning unit	Fixed by the status of the neutral of the application circuit
Earthed * **	Unearthed DC loads	Fixed to earth
	Earthed DC loads	
	AC loads connected via isolated PCU	

	AC loads connected via a nonisolated power conditioning unit PCU	Not permitted

* In non-center-tapped, earthed PV arrays, either the positive or negative pole could be connected to the earth, but the preferred configuration is to earth the negative, because connecting the positive to earth could result in corrosion of the earthing electrode.
** In a center-tapped earthed PV array where the PV array is equally divided into two segments connected in series and the midpoint connected to earth. The "consequences on the status of the PV array" column is not changed whether the array is center-tapped earthed or earthed on only one pole.

11.4 Earthing of exposed conductive parts and equipotential bonding

There are three possible reasons for earthing exposed conductive parts of a PV array-

a) Protective earthing to provide a path for fault currents to flow

b) Lightning protection

c) Equipotential bonding to avoid uneven potentials across an installation.

PV array frame earthing shall be done in accordance with the IEC: 62257/IS: 3043.

11.5 Earthing electrode

If a separate earthing electrode is provided for the PV array, this electrode shall be bonded to the installation earth. See recommendations on the design of electrodes for lightning protection.

11.6 Equipment earthing

Equipment earthing refers to the bonding to earth of all exposed conductive parts and frames of the PV array including any structural metalwork. PV array frame earthing shall be done in accordance with the IEC: 62257.

11.7 Earthing conductors

All PV array earthing conductors shall comply with the material, type, insulation, identification, installation and connection requirements specified in IEC 60364-5-54.

11.8 Earthing terminal of PV system

When the PV array is earthed, the connection to earth shall be made at a single point and this point shall be bonded to the installation earth.

In systems without batteries, this connection point shall be between the PV array disconnection device and the power conditioning unit and as close as possible to the power conditioning system.

In systems containing batteries, this connection point shall be between the charge controller and the battery protection device.

NOTE: - This is to allow for interruption of any earth fault current.

11.9 PV system earthing conductor

If the PV array is earthed, the PV system earthing conductor shall be sized to carry 1.25 x Isc ARRAY continuously, and comply with the provisions for earthing conductors specified in national wiring standards or in absence of such standards, with the provisions set out in IEC 60364-5-54/IS: 3043 with respect to material and type, insulation, identification, installation, connections and aluminium conductors.

12.0 INSTALLATION REQUIREMENTS

PV array production optimization too optimize the PV array production it is necessary to fulfil the following requirements:

12.1 Orientation, tilt angle and flatness

In so far as possible, the orientation and tilt angle of the modules shall optimize the production of energy in relation to the needs. The north or south orientation of the modules is hemisphere dependent. However, the building may not necessarily allow ideal orientation of these two parameters (roof not orientated south or north, vertical front…) and therefore they shall be clearly accounted for in the production calculation at the sizing design phase. Whatever the array latitude, it is generally recommended that the slope shall keep to a minimum value of ten degrees (10°) in relation to the horizontal, thus preventing stagnation and allowing rain water to carry away dust deposits. Moreover, periodical cleaning actions shall be performed, however, as need be. The surface for fitting photovoltaic modules to structures shall be perfectly flat in order not to induce mechanical stresses on securing the modules in order to avoid risks of module rupture.

12.2 Environmental Location: accounting for shadow

Shadowing of the PV array should be minimized or preferably eliminated over the whole day with consideration given to all seasons of the year. A shadow blanking off a photovoltaic cell may cause loss of almost the whole production of this module, significantly reducing the performance of a string of modules.

12.3 One line of photovoltaic modules over the other

On flat roofs, photovoltaic modules are arranged in rows. The first row is fully exposed to sunshine and therefore, the shadow thus generated may affect the next row and so on.
As a basic rule, no shadow should be generated from one row to another. It may occur that the available space will not allow to have this rule readily applied: an energy production study versus the various structure configurations should be conducted (e.g., more or less high, hence more or less spaced structures, acceptance of shadow early in the morning and end of the afternoon, change of orientation and/or of slope.)
A compromise should be retained allowing to best fulfil the site requirements for useful energy site. NOTE Where a row comprises several modules along height, care shall be exercised in order to connect the modules to one another as a function of their height along this row. For example, lower modules will constitute a branch and upper modules will constitute another branch. This will make it possible for upper modules to continue producing energy even though lower modules are in the shadow.

12.4 Maintaining the integrity of the covering

The attachment of structures to the building must keep to the sealing efficiency of the covering and mechanical integrity of the building. Special care shall be exercised with terrace fitted units where the quality of the covering and related structure is often very poor. It is advisable to have structures laid onto the building instead of attached to it.

12.5 Safety

Attention should be given in the operation and maintenance procedures to the following safety requirements:
a) Emergency shutdown procedure;

b) Obey all warning signs;

c) Shut system down and interrupt PV array currents according to the manual shutdown procedure;

d) Split strings into extra low voltage sections (if relevant);

e) Warn of the live parts that cannot be de-energised during daylight.

13.0 SOLAR STREET LIGHTING SYSTEM

A standalone dusk-dawn solar photovoltaic street lighting system comprises of solar PV module, LED Light, lead acid battery, control electronics, Inter-connecting wire/cables, Battery box, Module mounting hardware, Hot Dipped GI-Pole.

14.0 INSPECTION

Inspection and testing of equipment shall be carried out by the owner/ consultant at the works of the contractor and performance test at site on final product to ensure conformity of the same with the acceptable criteria of technical specification, approval drgs. and reference national/ international standards.

14.1 The contractor shall submit Quality Assurance Plan (QAP) for respective equipment's within 3 weeks of award of contract.

QAP shall be prepared and furnished by the contractor in attachment along with internal in process quality checks.

14.2 Tests as per international standard for solar system and grid charger at manufacturer works.

14.3 Batteries shall be tested for `Acceptance Test at manufacturer's works as per IS. Type and routine test reports shall be submitted for review.

14.4 Final integrated testing (Full load test) along with solar array, charge controller and the batteries & PCU shall be done at site. Site acceptance test procedure shall be submitted by the Contractor along with QA.

15.0 TESTING OF SOLAR MODULES

Solar modules shall be tested as per the test sequence mentioned in the IEC: 61215 & IEC: 60904.

Insulation test of Modules-

a) 500V DC+2 x Max System Voltage (For Modules less than 0.1 m² area)

b) 1000V DC+2 x Max System Voltage (For Modules area greater than 0.1 m² area) Value of Insulation Resistance should be as per IEC; 61215

16.0 DRAWINGS AND DOCUMENTS

16.1 The following documents shall be submitted along with the offer:

a) Filled up data sheet.

b) List of two years operation and maintenance spare.

c) Solar array sizing, charge controller sizing and battery sizing calculations.

d) 3 phase grid charger sizing calculations.

e) Total load/weight calculation of the PV system (Structure, Modules etc) on the roof

f) Approx. dimensions of the system

g) Catalogues for solar array, charge controller, 415V 3ph grid charger and battery bank

16.2 The following drawings (in three sets) shall be submitted for approval within 3 weeks of award of contract.

a) Geographical survey report required for solar system design, tilt angle calculations etc.

b) Geo Graphical Data of the site (Avg Insolation, Wind Flow, Solar Radiation data (Monthly), Weather Conditions etc as required in the design)

c) Solar array sizing, charge controller sizing, FCBC Charger, PCU and battery sizing calculations.

d) Data sheets & specification of SPV Modules, FCBC Charges, MPPT Chargers, Ni-Cd Battery, DC-DC Converter, DCDBs, Solar Street Lights

e) STAAD analysis report of SPV structure

f) SPV array installation & foundation drawings

g) PV System Simulation reports for On-grid & Off-Grid systems.

h) 3x 1 phase grid charger sizing calculations

i) Earthing & Lightning calculations & drawings

j) Complete Hybrid solar system working philosophy.

K Hybrid FCBC (Bidirectional) system working philosophy.

l) Cable size selection calculation considering the voltage drop & insulation along with voltage grade, type, size and Cable schedule

m)System protections provided at various stages of the system

n) G.A. of solar panel, charge controller and battery bank.

o) G.A. drawing of street lighting pole

p) G.A. drawing of 415V 3 x 1 Ph charger, PCU & Hybrid FCBC

q) Schematic

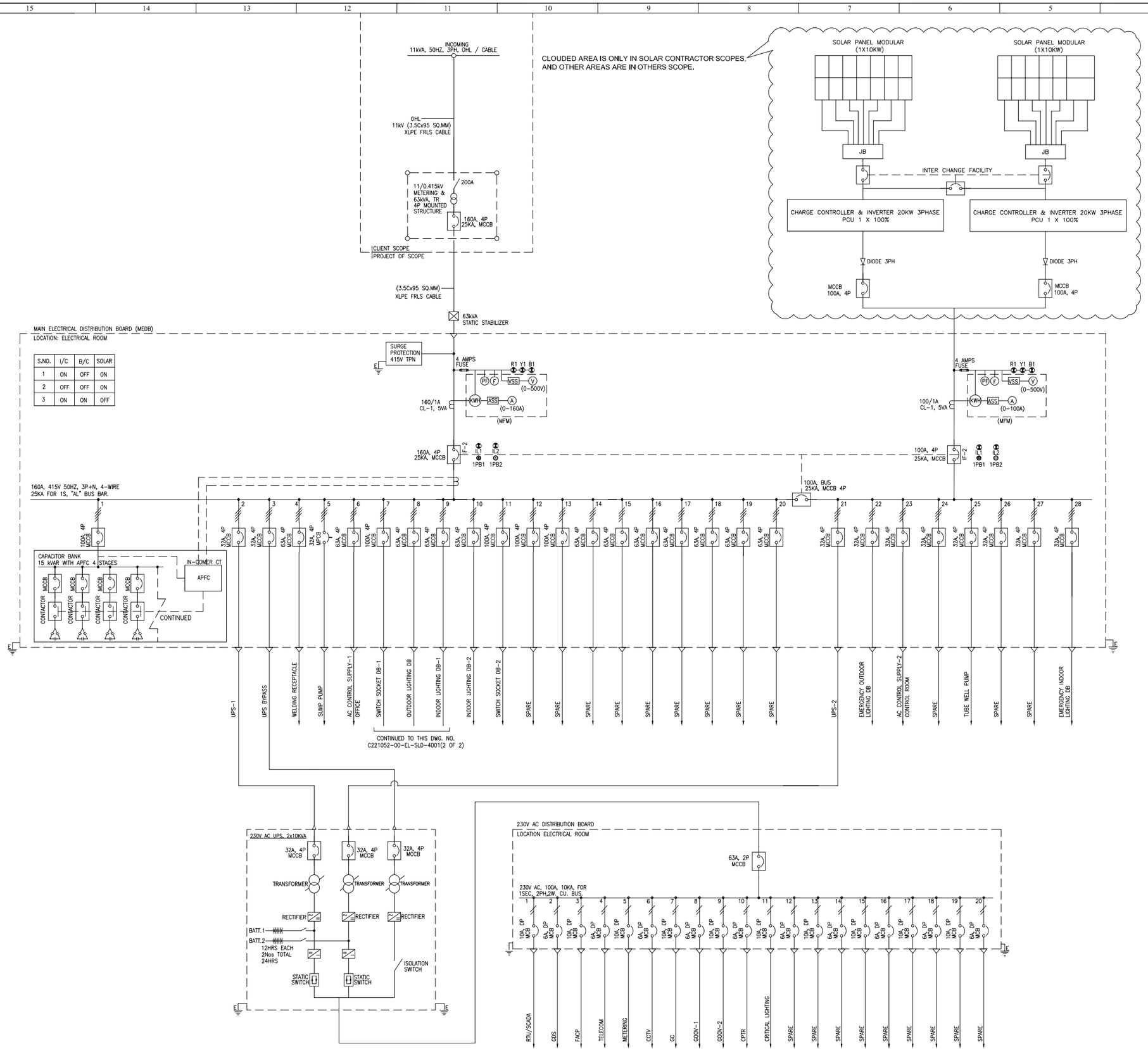
r) Bill of Material

s) Installation manual

t) Operation & Maintenance Manual

u) Wiring diagram for reference.

15.3 Final drawings/data sheets, operation & maintenance manual and erection instructions shall be submitted in six prints / One Soft Copy.



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-RT-EL-LST-4001
ELECTRICAL DESIGN BASIS	C221052-00-EL-DB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL. AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM WITH MFM & SMALL CONTROL OPERATION FOR LOCAL & REMOTE MONITORING.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING OF UPS BATTERY BANKS.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY. IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.		PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	KWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ILL	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	09.06.22	ISSUED FOR BID	SY	VV/RD	AA

CLIENT: INDRADHANUSH GAS GRID LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

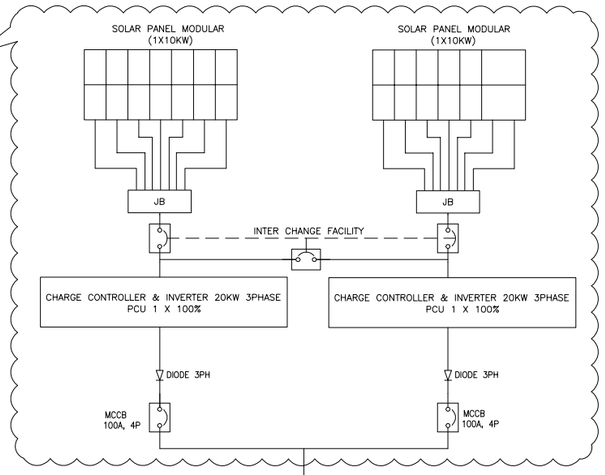
PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL

TITLE: ELECTRICAL SLD FOR RECEIPT STATION

SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 2
SIZE	JOB NO.	DRAWING NUMBER	REV.
A1	C221052	C221052-00-EL-SLD-4001	D1

FORMAT NO C221052-FMT-005_00

CLOUDED AREA IS ONLY IN SOLAR CONTRACTOR SCOPES, AND OTHER AREAS ARE IN OTHERS SCOPE.



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-IP-EL-LST-4001
ELECTRICAL DESIGN BASIS	C221052-00-EL-DIB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL, AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM WITH MFM & SMALL CONTROL OPERATION FOR LOCAL & REMOTE MONITORING.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING OF UPS BATTERY BANKS.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY. IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.		PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	KWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ILL	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	09.06.22	ISSUED FOR BID	SY	VV/RD	AA

CLIENT: INDRADHANUSH GAS GRID LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

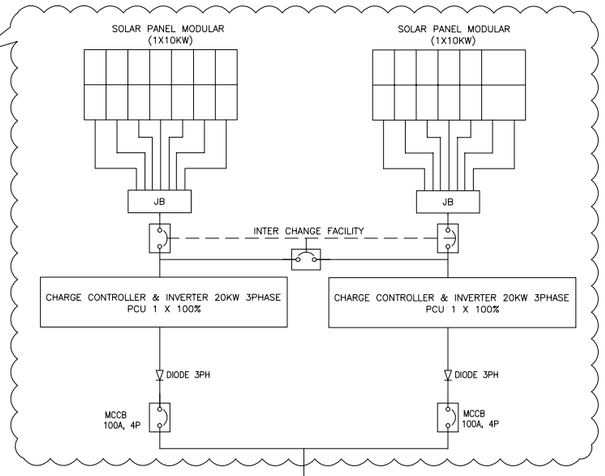
PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL

TITLE: ELECTRICAL SLD FOR IP STATION

SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 2
SIZE	JOB NO.	DRAWING NUMBER	REV.
A1	C221052	C221052-00-EL-SLD-4002	D1

FORMAT NO C221052-FMT-005_00

CLOUDED AREA IS ONLY IN SOLAR CONTRACTOR SCOPES, AND OTHER AREAS ARE IN OTHERS SCOPE.



REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-DT-EL-LST-4001
ELECTRICAL DESIGN BASIS	C221052-00-EL-DB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA.
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL. AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM WITH MFM & SMALL CONTROL OPERATION FOR LOCAL & REMOTE MONITORING.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING OF UPS BATTERY BANKS.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY, IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.		PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	KWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ELI	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
D1	09.06.22	ISSUED FOR BID	SY	VV/RD	AA

CLIENT: INDRADHANUSH GAS GRID LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL

TITLE: ELECTRICAL SLD FOR DISPATCH STATION

SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 2
SIZE	JOB NO.	DRAWING NUMBER	REV.
A1	C221052	C221052-00-EL-SLD-4003	D1

FORMAT NO C221052-FMT-005_00

CLOUDED AREA IS ONLY IN LAYING CONTRACTOR SCOPES, AND OTHER AREAS ARE IN OTHERS SCOPE.

INCOMING
11kVA, 50HZ, 3PH, OHL / CABLE

OHL/OR
11kV (3Cx95 SQ.MM) XLPE FRLS HT CABLE

11/0.415kV METERING & 25kVA, TR 4P MOUNTED STRUCTURE

200A

100A, 4P 25KA, MCCB

CLIENT SCOPE
PROJECT OF SCOPE

(3.5Cx95 SQ.MM) XLPE FRLS CABLE

25kVA STATIC STABILIZER

SOLAR PANEL MODULAR
2 X 10KW

JB

CHARGE CONTROLLER & INVERTER 20KW 3PHASE PCU 2 X 100%

BATT.BANKS 12?KWH

BATT.

BATT.BANKS 12?KWH

BATT.

MAIN ELECTRICAL DISTRIBUTION BOARD (MEDB)
LOCATION: ELECTRICAL ROOM

SURGE PROTECTION 415V TPN

4 AMPS FUSE

R1 Y1 B1

PF F VSS V (0–500V)

100/1A CL–1, 5VA

KWH ASS A (0–100A)

(MFM)

100A, 4P 25KA, MCCB

IF–2 IL1 IL2

1PB1 1PB2

4 AMPS FUSE

R1 Y1 B1

PF F VSS V (0–500V)

100/1A CL–1, 5VA

KWH ASS A (0–100A)

(MFM)

100A, 4P 25KA, MCCB

IF–2 IL1 IL2

1PB1 1PB2

100A, 415V 50HZ, 3P+N, 4–WIRE 25KA FOR 1S, "AL" BUS BAR.

100A BUS 25KA, MCCB 4P

100A 4P MCCB

CAPACITOR BANK 10 kVAR WITH APFC 4 STAGES

CONTACTOR MCCB

IN–COMER CT

APFC

CONTINUED

63A, 415V 50HZ, 3P+N, 4–WIRE 19KA FOR 1S, "CU" BUS BAR.

63A 4P MCCB

20A DP MCB

SW–SOCKET–1

SW–SOCKET–2

SW–SOCKET–3

SPARE

SPARE

SPARE

SPARE

SOLAR BATTERY CHARGER–1

AC CONTROL PANEL

WELDING RECEPTACLE

SPARE

OUTDOOR LIGHTING–1

OUTDOOR LIGHTING–2

OUTDOOR LIGHTING–3

SPARE

SPARE

SPARE

SUMP PUMP

SOLAR BATTERY CHARGER–2

32A, 415V 50HZ, 3P+N, 4–WIRE 19KA FOR 1S, "CU" BUS BAR.

32A 4P MCCB

CONTACTOR WITH MANUAL BYPASS 50A, 4P

PHOTOCELL / TIMER CONTROL WITH MANUAL BYPASS

16A DP MCB

OUTDOOR EMERGENCY LIGHTING–1

OUTDOOR EMERGENCY LIGHTING–2

SPARE

SPARE

50A 4P

PHOTOCELL / TIMER CONTROL WITH MANUAL BYPASS

32A, 415V 50HZ, 3P+N, 4–WIRE 19KA FOR 1S, "CU" BUS BAR.

10A DP MCB

INDOOR LIGHTING–1

INDOOR LIGHTING–2

INDOOR LIGHTING–3

SPARE

SPARE

SPARE

SPARE

SPARE

TUBE WELL

DC TO DC CONVERTER

32A, DP MCCB

96V TO 24V 2KW DC TO DC CONVERTER

100A, DP MCCB

(A) (0–100A)

(V) (0–100V)

24V DC, 100A, 10KA, FOR 1SEC, DPH,2W. CU. BUS.

32A DP MCB

25A DP MCB

RTU/SCADA

SPARE

FIRE ALARM CONTROL PANEL

INSTRUMENTATION

RTU/SCADA

GAS DETECTION SYSTEM

GOV

CCTV

DC TO DC CONVERTER

32A, DP MCCB

96V TO –48V 2KW DC TO DC CONVERTER

63A, DP MCCB

(A) (0–100A)

(V) (0–100V)

–48V DC, 100A, 10KA, FOR 1SEC, DPH,2W. CU. BUS.

25A DP MCB

16A DP MCB

TELECOM–1

SPARE

SPARE

SPARE

TELECOM–2

SPARE

SPARE

SPARE

DC–DB

63A, DP MCCB

INTER LOCK

(A) (0–63A)

(V) (0–150V)

96V DC, 63A, 19KA, FOR 1SEC, DPH,2W. CU. BUS.

32A DP MCB

DC TO DC CONVERTER–1

DC TO DC CONVERTER–1

SPARE

SPARE

DC TO DC CONVERTER–2

DC TO DC CONVERTER–2

SPARE

SPARE

REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-SV-EL-LST-4001
ELECTRICAL DESIGN BASIS	C221052-00-EL-DIB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL, AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY, IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.		PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	KWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ELI	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
C2	17.08.22	ISSUED FOR REVIEW	SY	VV/RD	AA
C1	17.05.22	ISSUED FOR REVIEW	SY	VV/RD	AA

CLIENT: **INDRADHANUSH GAS GRID LIMITED**

PMC: **VCS QUALITY SERVICES PVT. LTD.**

PROJECT: **NORTH EAST GAS GRID PHASE-III OF IGGL**

TITLE: **ELECTRICAL SLD FOR SV STATION**

SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 1
SIZE	JOB NO.	DRAWING NUMBER	REV.
A1	C221052	C221052-00-EL-SLD-4004	C2

FORMAT NO C221052-FMT-005_00

CLOUDED AREA IS ONLY IN LAYING CONTRACTOR SCOPES, AND OTHER AREAS ARE IN OTHERS SCOPE.

INCOMING
11kVA, 50HZ, 3PH, OHL / CABLE

OHL/OR
11kV (3Cx95 SQ.MM) XLPE FRLS HT CABLE

11/0.415kV METERING & 25kVA, TR 4P MOUNTED STRUCTURE

200A

100A, 4P 25KA, MCCB

CLIENT SCOPE
PROJECT OF SCOPE

(3.5Cx95 SQ.MM) XLPE FRLS CABLE

25kVA STATIC STABILIZER

MAIN ELECTRICAL DISTRIBUTION BOARD (MEDB)
LOCATION: ELECTRICAL ROOM

SURGE PROTECTION 415V TPN

4 AMPS FUSE

R1 Y1 B1

PF, F, VSS, V (0–500V)

100/1A CL–1, 5VA

KWH, ASS, A (0–100A)

(MFM)

100A, 4P 25KA, MCCB

IF–2, IL1, IL2

1PB1 1PB2

100A, 415V 50HZ, 3P+N, 4–WIRE 25KA FOR 1S, "AL" BUS BAR.

100A BUS 25KA, MCCB 4P

CAPACITOR BANK 10 kVAR WITH APFC 4 STAGES

IN–COMER CT

APFC

CONTACTOR

CONTINUED

63A, 415V 50HZ, 3P+N, 4–WIRE 19KA FOR 1S, "CU" BUS BAR.

32A, 415V 50HZ, 3P+N, 4–WIRE 19KA FOR 1S, "CU" BUS BAR.

CONTACTOR WITH MANUAL BYPASS 50A, 4P

PHOTOCELL / TIMER CONTROL WITH MANUAL BYPASS

SW–SOCKET–1
SW–SOCKET–2
SW–SOCKET–3
SPARE
SOLAR BATTERY CHARGER–1
AC CONTROL PANEL
WELDING RECEPTACLE
OUTDOOR LIGHTING–1
OUTDOOR LIGHTING–2
OUTDOOR LIGHTING–3
SUMP PUMP
SOLAR BATTERY CHARGER–2
OUTDOOR EMERGENCY LIGHTING–1
OUTDOOR EMERGENCY LIGHTING–2
INDOOR LIGHTING–1
INDOOR LIGHTING–2
INDOOR LIGHTING–3
TUBE WELL

SOLAR PANEL MODULAR 2 X 14KW

JB

CHARGE CONTROLLER & INVERTER 28KW 3PHASE PCU 2 X 100%

BATT.BANKS 181KWH

BATT.

DC TO DC CONVERTER

32A, DP MCCB

96V TO 24V 2KW DC TO DC CONVERTER

100A, DP MCCB

(0–100A)

(0–100V)

24V DC, 100A, 10KA, FOR 1SEC, DPH,2W. CU. BUS.

RTU/SCADA
SPARE
FIRE ALARM CONTROL PANEL
INSTRUMENTATION
RTU/SCADA
GAS DETECTION SYSTEM
GDV
CCTV

DC TO DC CONVERTER

50A, DP MCCB

96V TO (–48V–0–+48V) 3KW DC TO DC CONVERTER

63A, DP MCCB

(–48V–0–+48V) DC, 100A, 10KA, FOR 1SEC, DPH,2W. CU. BUS.

TELECOM–1
SPARE
SPARE
CATHODIC PROTECTION
TELECOM–2
SPARE
SPARE
SPARE

DC–DB

INTER LOCK

(0–150V)

150V DC, 160A, 19KA, FOR 1SEC, DPH,2W. CU. BUS.

DC TO DC CONVERTER–1
DC TO DC CONVERTER–1
SPARE
SPARE
DC TO DC CONVERTER–2
DC TO DC CONVERTER–2
SPARE
SPARE

REFERENCE DRAWINGS

DRAWING TITLE	DRAWING NUMBER
ELECTRICAL LOAD LIST	C221052-SV-EL-LST-4002
ELECTRICAL DESIGN BASIS	C221052-00-EL-DIB-4001

NOTES :-

1. ALL ELECTRICAL EQUIPMENT BE TROPICALISED IN COMPLIANCE WITH LOCAL SITE CONDITION.
2. THE METERS INSTALLED IN SOLAR POWER SET LOCAL PANEL SHALL BE DIGITAL MULTIFUNCTIONAL METERS.
3. R.Y.B. INDICATIONS ARE FEED TO SCADA SYSTEM FROM MEDB FOR PANEL & SOLAR SUPPLY.
4. THE CAPACITOR BANK FEEDER SHALL BE USED FOR FUTURE POWER FACTOR IMPROVEMENT AS PER GEB REQUIREMENT.
5. THE SIZE OF ALL INSTRUMENTS SHALL BE 95mm x 95mm FOR FULL & HALF SIZE MODULES AND 72mm x 72mm FOR LOWER SIZE MODULES.
6. ALL AMMETER & VOLTMETERS SHALL BE DIGITAL TYPE AND OF CLASS 1.5 ACCURACY.
7. POWER & CONTROL CABLES SHALL BE 1.1kV GRADE, STRANDED COPPER / ALUMINUM CONDUCTOR, PVC INNER SHEATH & PVC OUTER SHEATH WITH FRLS CHARACTERISTICS CABLES SHALL CONFIRM TO IS:7000.
8. OUTDOOR ELECTRICAL MATERIALS SHALL BE PROVIDED IN COMPLIANCE WITH THE RELEVANT HAZARDOUS AREA CLASSIFICATION.
9. THE CABLE SIZE ARE CALCULATED ACCORDING TO CABLE SIZING CALCULATION SHEET.
10. ALL INDOOR DB'S SHALL BE PROVIDED WITH IP53 PROTECTION AND FOR OUTDOOR IP55.
11. MCCB'S SHALL BE 3P, 25kA AND MCB'S SHALL BE DP, 10kA
12. CPTR UNIT SHALL BE CONSIDERED ACCORDING TO APPROVED PCP DESIGN.
13. THE INCOMER TO ILDB SHALL BE PROVIDED WITH EARTH LEAKAGE CIRCUIT BREAKER.
14. OUTDOOR LIGHTING SHALL BE PROVIDED WITH PHOTO CELL FOR AUTO CONTROL, AND PHOTOCELL SHALL BE LOCATED AT THE ROOF OF THE BUILDING IN DIRECT SUN LIGHT.
15. ALL PANEL SHALL BE FIXED TYPE SWITCHGEAR CONTROL SYSTEM.
16. SOLAR BATTERY WILL START THE CHARGING FROM GRID SOURCES, BELOW 30% DISCHARGE CONDITION AND 80% WILL BE STOP THE CHARGING.
17. THIS SLD INDICATES THE MINIMUM REQUIREMENT OF ELECTRICAL PANEL, SPARES FEEDERS SHALL BE AS PER SOR REQUIREMENTS IT MAY CHANGES THE Nos OF FEEDERS & RATING ALSO AS PER PROJECTS REQUIREMENTS.
18. PLEASE NOTE THAT SLD IS INDICATIVE ONLY, IF ANY PROTECTION & ITS RELATED REQUIRED ITEMS/MATERIALS ARE NOT INDICATED IN SLD, BUT REQUIRED AS PER PROJECT REQUIREMENTS, DATA SHEET, SPECIFICATIONS, OISD'S ENGINEERING CODES & STANDARDS REQUIREMENTS ARE COMPLETE SCOPE OF WORKS OF SLD.

LEGENDS :-

S.NO.	LEGENDS	DESCRIPTION
1.	CP/TR	CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT
2.		DC TO DC CONVERTER
3.		SWITCH
4.		BATTERY
5.		INDICATION LAMP
6.		PUSH BUTTON
7.	F	FREQUENCY METER
8.	PF	POWER FACTOR METER
9.	V	VOLTMETER
10.	A	AMMETER
11.	KWH	ENERGY METER
12.	ASS	AMPERE SELECTOR SWITCH
13.	VSS	VOLTAGE SELECTOR SWITCH
14.	ILL	ELECTRICAL INTERLOCK
15.	SSVS	SOLID STATE VOLTAGE STABILIZER
16.		MCCB
17.		MCB
18.		CONTACTOR
19.		CURRENT TRANSFORMER
20.		ISOLATION TRANSFORMER
21.	MFM	MULTIFUNCTION METER
22.		EARTH
23.	O/L	OVER LOAD
24.	S/C	SHORT CIRCUIT
25.		NO. OF CORE IN CABLE
26.		ISOLATOR
27.		DIODE

REV.	DATE	DESCRIPTION	PREP.	CHKD.	APPD.
C2	17.08.22	RE-ISSUED FOR REVIEW	SY	VV/RD	AA
C1	17.05.22	ISSUED FOR REVIEW	SY	VV/RD	AA

CLIENT: INDRADHANUSH GAS GRID LIMITED

PMC: VCS QUALITY SERVICES PVT. LTD.

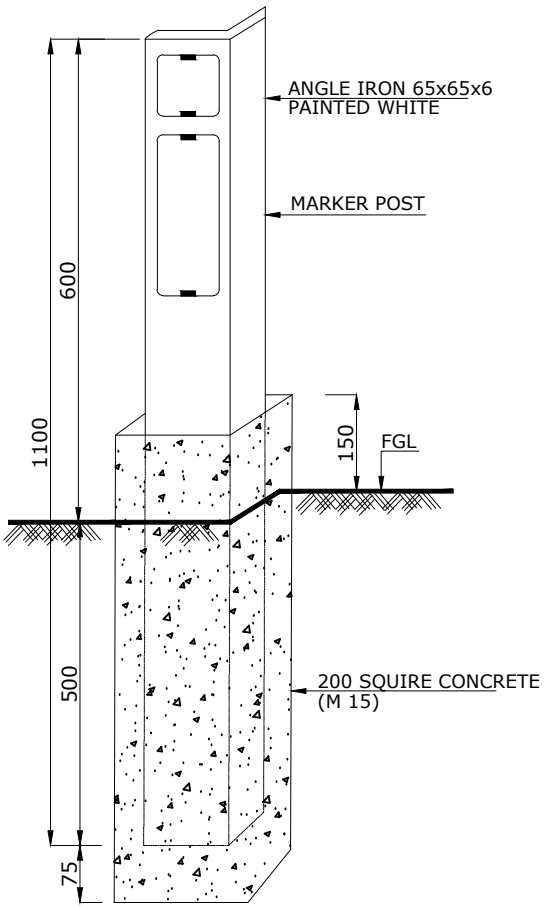
PROJECT: NORTH EAST GAS GRID PHASE-III OF IGGL

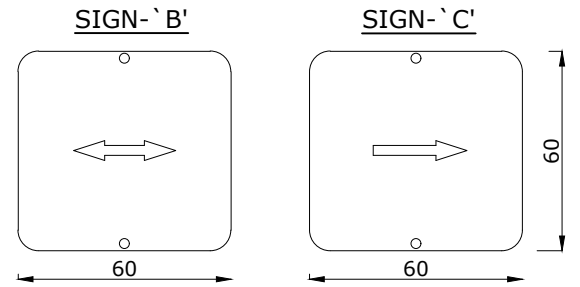
TITLE: ELECTRICAL SLD FOR SV STATION (CP)

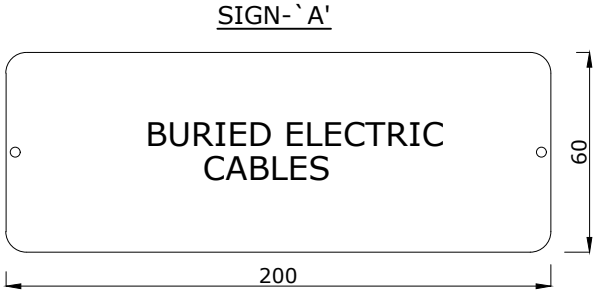
SCALE:	SCALE	TOTAL NO. OF SHTS:	SHT.NO 1 OF 1
SIZE	JOB NO.	DRAWING NUMBER	REV.
A1	C221052	C221052-00-EL-SLD-4005	C2

FORMAT NO C221052-FMT-005_00

VCS QUALITY SERVICES PRIVATE LIMITED	MARKING OF TRENCHES FOR ELECTRIC CABLES	STANDARD DRAWING NO.		REV.	SIZE
		VCS-STD-EL-4308		02	A4
		SHEET NO.	1 OF 1		

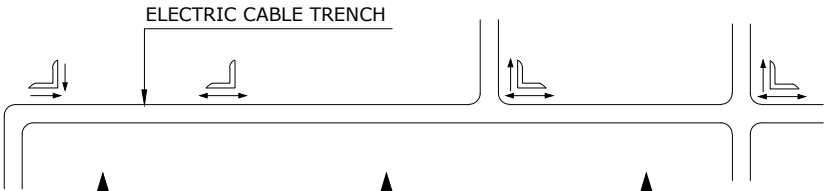






TYPICAL ARRANGEMENT OF MARKER

(SEE NOTE-1)



	L 65x65x6-1.10M LONG	L 65x65x6-1.10M LONG	L 65x65x6-1.10M LONG	L 65x65x6-1.10M LONG
ASSEMBLY CONSISTING OF	SIGN.-A-1 NO. SIGN.-C-2 NO.	SIGN.-A-1 NO. SIGN.-B-1 NO.	SIGN.-A-1 NO. SIGN.-B-1 NO. SIGN.-C-1 NO.	SIGN.-A-1 NO. SIGN.-B-2 NO.

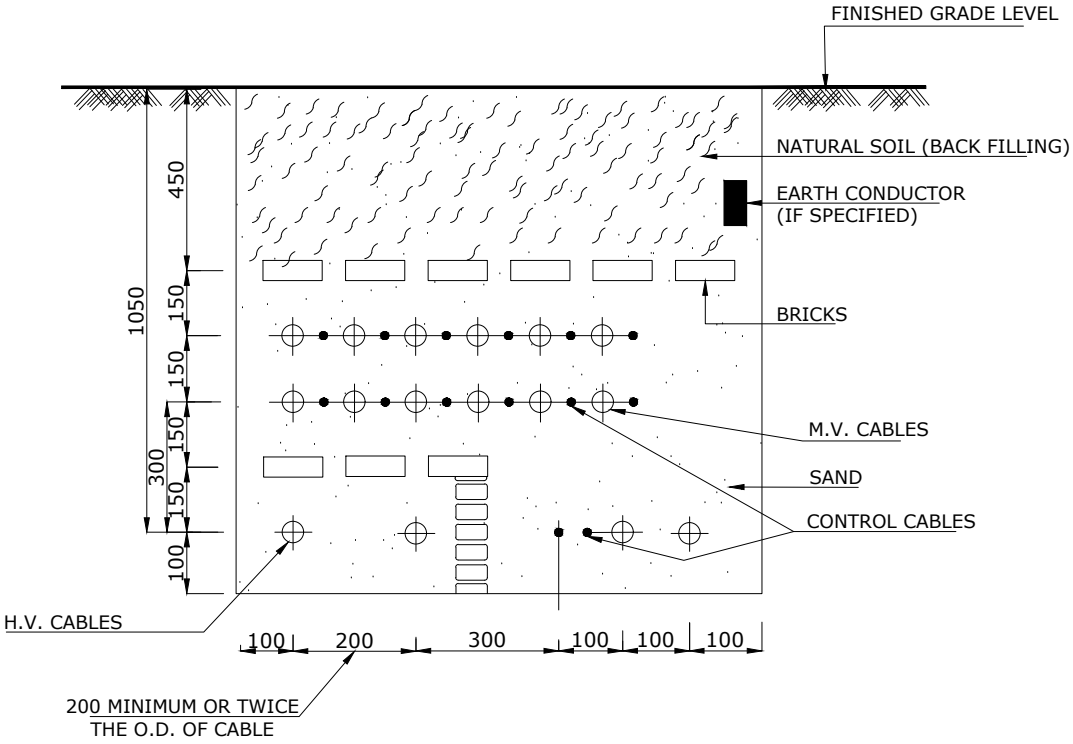
NOTES:

1. TRENCHES SHALL BE MARKED AT ALL DIRECTION CHANGES, INTERSECTIONS AND STRAIGHT RUNS.
2. SIGN BOARDS SHALL BE MADE OF 14G ENAMELLED STEEL PLATE WHITE LETTERING SHALL BE ON JADE GREEN BACKGROUND

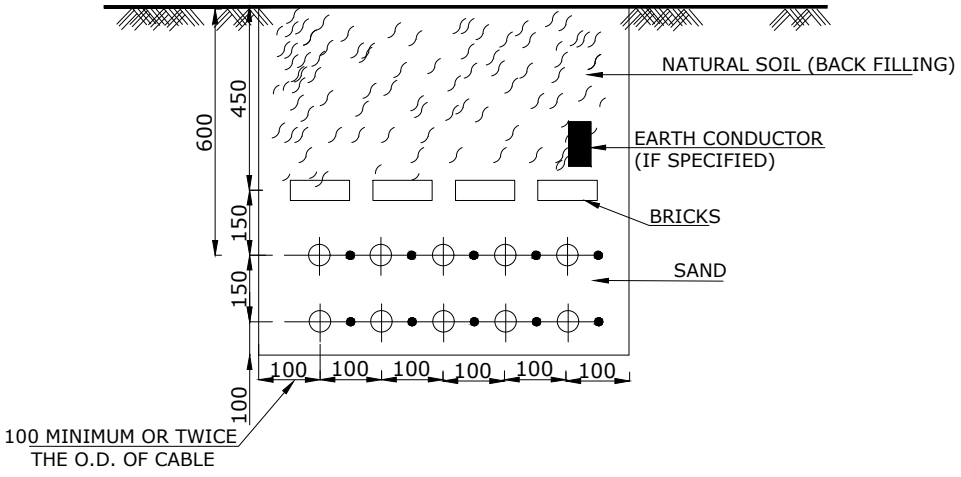
REV NO.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	AUTHORIZED BY
02	22.03.22	RE-ISSUED AS STANDARD DRAWING	SY	RD	AA	HK
01	11.12.19	RE-ISSUED AS STANDARD DRAWING	SY	VV	AD	SK
0	15.05.17	ISSUED AS STANDARD	SY	RD	AD	SK

VCS QUALITY SERVICES PRIVATE LIMITED	TYPICAL SECTION OF CABLE TRENCH IN UNPAVED AREAS	STANDARD DRAWING NO.		REV.	SIZE
		VCS-STD-EL-4309		02	A4
		SHEET NO.	1 OF 1		

TYPICAL SECTION WITH H.V. AND M.V. CABLES



TYPICAL SECTION WITH M.V. CABLES ONLY

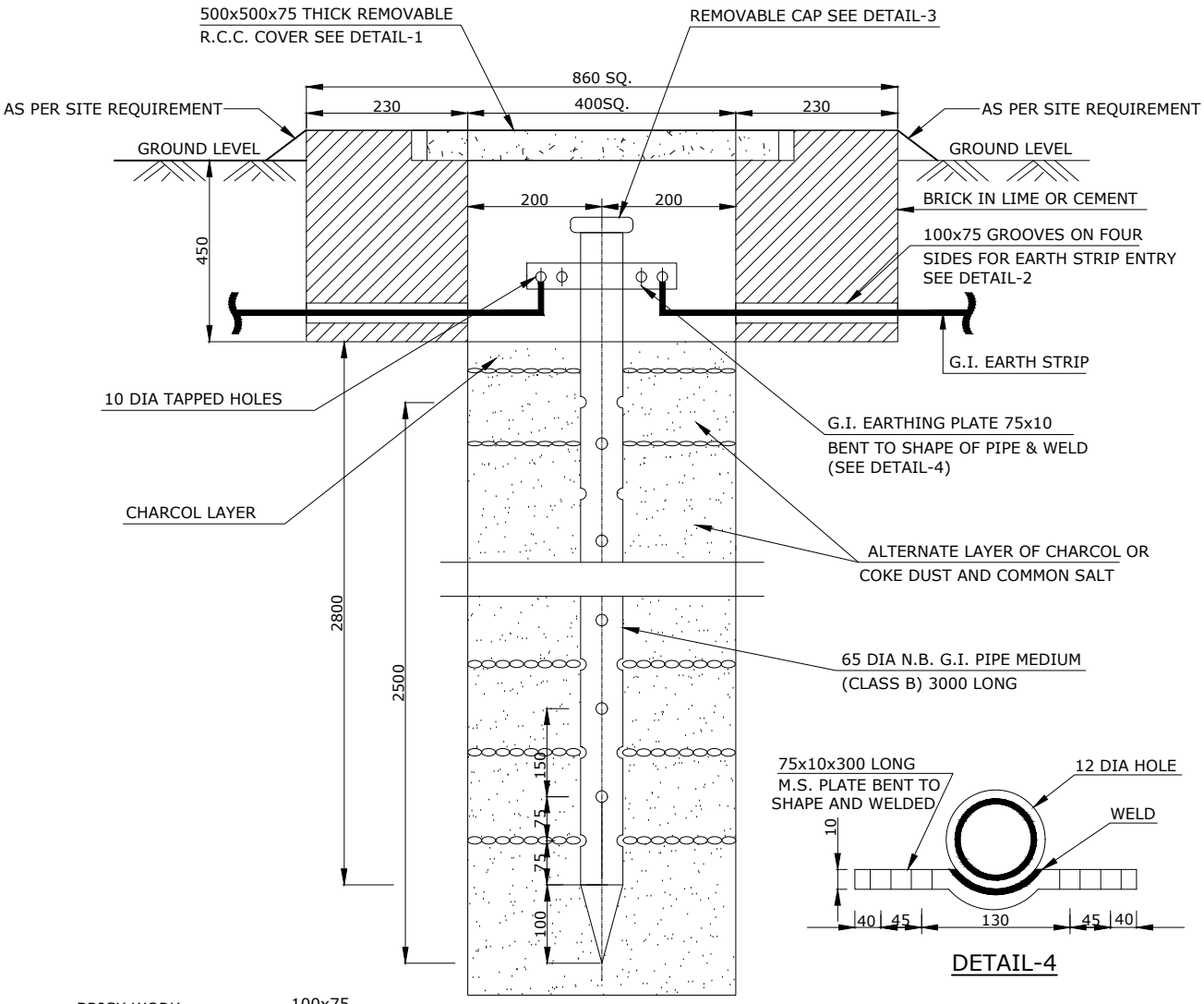


NOTES:

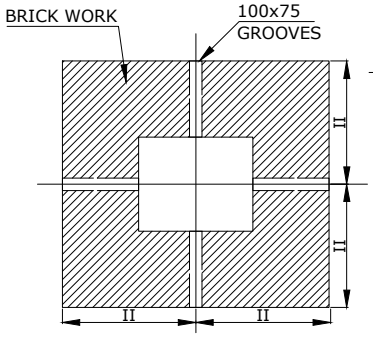
1. LEAVE SPACE FOR LATER ADDITION OF AT LEAST 2 CABLES OR 15% AVERAGE SPARE SPACE REGARDLESS OF FUTURE EXPANSION.
2. IF FIRE ALARM AND COMMUNICATION CABLES ARE LAID IN THE SAME TRENCH A CLEARANCE OF 300mm (MINIMUM) AWAY FROM

REV NO.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	AUTHORIZED BY
02	22.03.22	RE-ISSUED AS STANDARD DRAWING	SY	RD	AA	HK
01	11.12.19	RE-ISSUED AS STANDARD DRAWING	SY	VV	AD	SK
0	15.05.17	ISSUED AS STANDARD	SY	RD	AD	SK

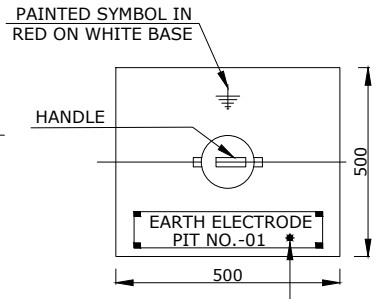
VCS QUALITY SERVICES PRIVATE LIMITED	EARTH ELECTRODE IN TEST PIT	STANDARD DRAWING NO.		REV.	SIZE
		VCS-STD-EL-4103		02	A4
		SHEET NO.	1 OF 1		



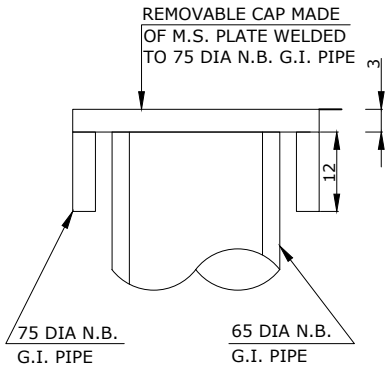
DETAIL-4



DETAIL-2



DETAIL-1



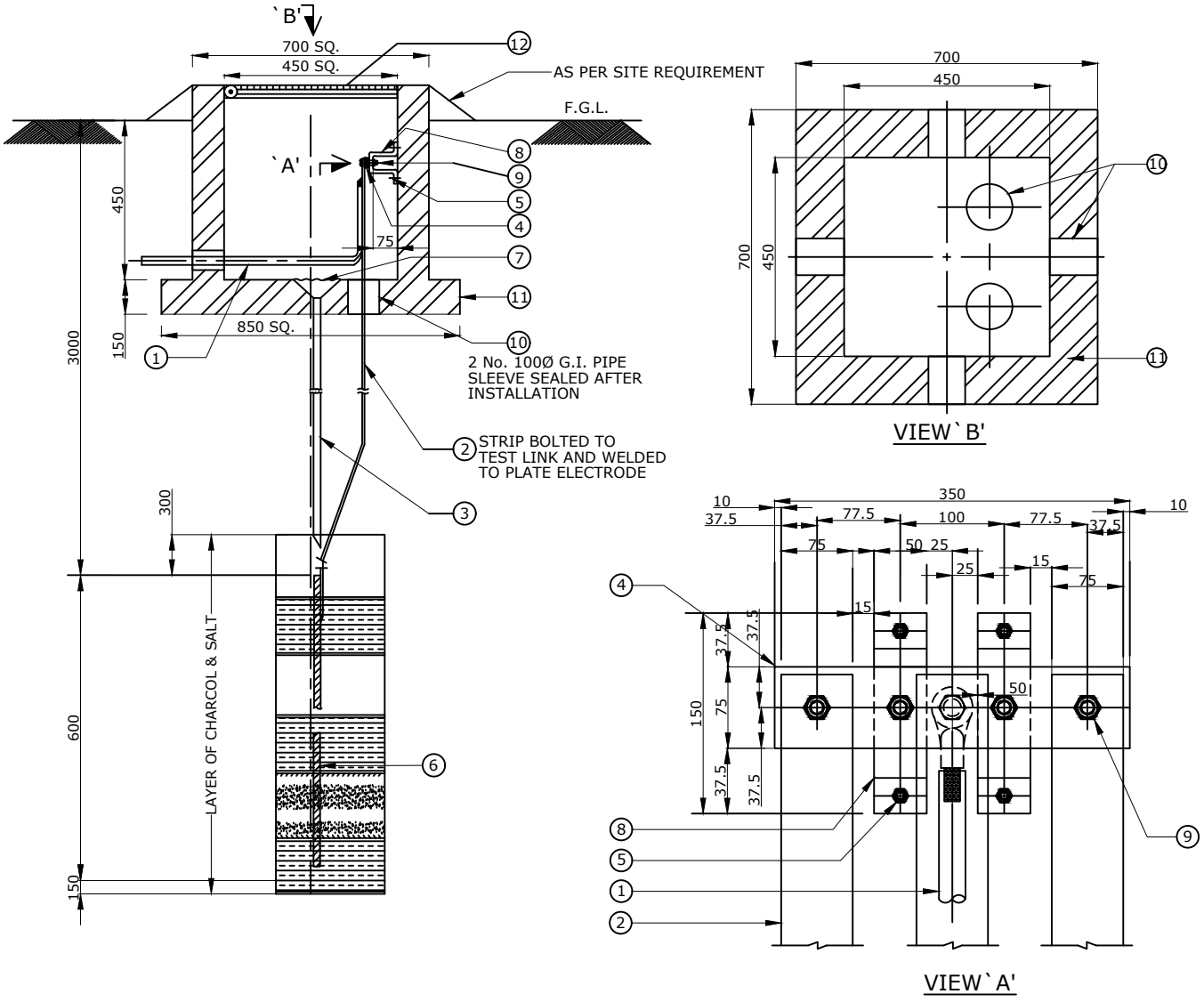
DETAIL-3

NOTES:

1. THE PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.
2. BRICK WORK SHALL BE DONE AFTER COMPACTING THE SOIL.

REV NO.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	AUTHORIZED BY
02	01.02.22	RE-ISSUED AS STANDARD DRAWING	SY	RD	AA	HK
01	05.12.19	RE-ISSUED AS STANDARD DRAWING	SY	VV	AD	SK
0	15.05.17	ISSUED AS STANDARD	SY	RD	AD	SK

VCS QUALITY SERVICES PRIVATE LIMITED	TYPICAL DETAILS OF PLATE EARTH ELECTRODE	STANDARD DRAWING NO.		REV.	SIZE
		VCS-STD-EL-4118		02	A4
		SHEET NO.	1 OF 1		



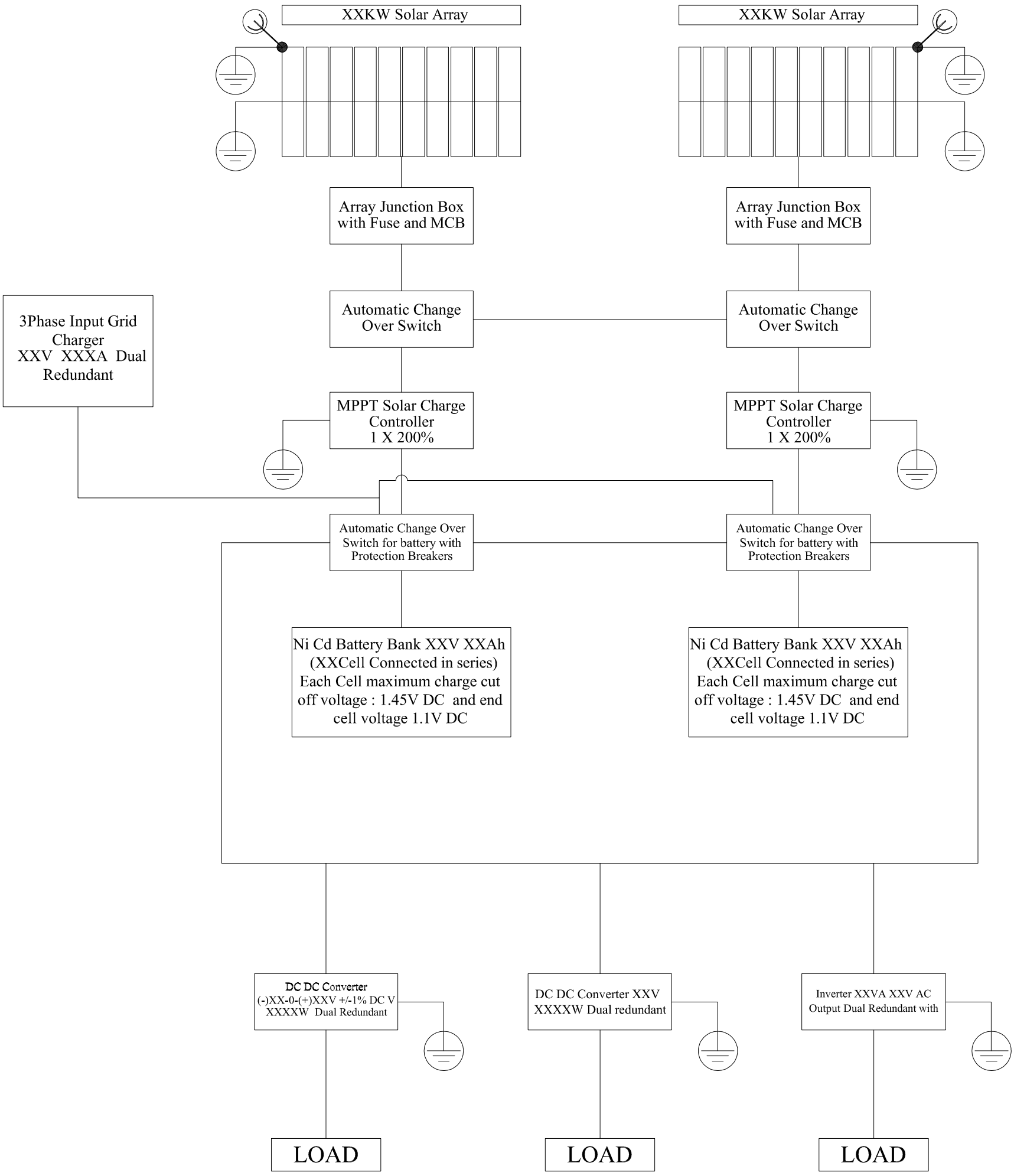
MATERIAL TAKE-OFF

ITEM No.	DESCRIPTION	QUANTITY	REMARKS
1.	75x10mm G.I. STRIP/ 25x3mm COPPER STRIP/ 1C PVC INSULATED CABLES AS SPECIFIED IN CONTRACT DOCUMENTS.	AS REQUIRED	
2.	75X8mm G.I. STRIP/ 25x3mm COPPER STRIPS	2 No.	
3.	25Ø G.I. PERFORATED PIPE FOR WATERING.	1 No.	
4.	350x75x10 mm THICK G.I. TEST LINK	1 No.	
5.	MB STAINLESS STEEL ANCHOR STUD WITH BOLT AND WASHER	4 No.	
6.	600x600x10 mm THICK G.I./3mm THICK COPPER EARTH ELECTRODE.	1 No.	
7.	WIRE MESH	1 No.	
8.	50x6 mm THICK 350 LONG G.I. SADDLE.	2 No.	
9.	M10 STAINLESS STEEL BOLT WITH 2 No. PLAIN & 1 No. SPRING WASHERS.	5 No.	
10.	100Ø G.I. PIPE SLEEVE SEALED AFTER INSTALLATION.	6 No.	
11.	BRICK WATERING CHAMBER WITH PLASTER FINISH INSIDE & OUTSIDE	1 No.	
12.	C.I. REMOVABLE COVER HINGED TO CAST IRON FRAME.	1 No.	

REV NO.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	AUTHORIZED BY
02	08.02.22	RE-ISSUED AS STANDARD DRAWING	SY	RD	AA	HK
01	05.12.19	RE-ISSUED AS STANDARD DRAWING	SY	VV	AD	SK
0	15.05.17	ISSUED AS STANDARD	SY	RD	AD	SK

VCS QUALITY SERVICES PRIVATE LIMITED	SOLAR POWER SYSTEM	STANDARD DRAWING NO.		REV.	SIZE
Energising Quality		VCS-STD-EL-4602		0	A4
		SHEET NO.	1 OF 1		

Design, Detailed Engineering, procurement of materials, Inspection/FAT (Factory acceptance test), Supply of materials, Transportation, loading/unloading, insurance, Storage at warehouse/store (hired by bidder) of complete Solar PV based Power source with project required autonomy, load for operation as per tender SLD, specification, data sheet, scope of work and block diagram enclosed including commissioning spares as required at each station.



0	04.08.22	ISSUED AS STANDARD	SY	RD	AA	HK
REV NO.	DATE	PURPOSE	PREPARED BY	CHECKED BY	APPROVED BY	AUTHORIZED BY