



Proposed Development

At

Ile aux Cocos, Rodrigues

Procurement Reference No: - DIS/IAC/02/2019-2020

OPEN NATIONAL BIDDING

BIDDING DOCUMENT

(VOLUME 2 OF 3)

EMPLOYER

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Mechanical & Electrical Installations

Volume 2

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BILL NO. 3 - MECHANICAL & ELECTRICAL INSTALLATIONS

Proposed Development at Ile Aux Cocos

Lot 1: Electrical Installations at Ile Aux Cocos

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT(Rs)
	<i>Supply, deliver to site, install, connect, test and commission the following all in accordance with specifications and drawings.</i>				
A.	EARTHING				
A.1	3 Nos. Solid Copper rods Ø16mm x 3mts for earthing of Main DB01 c/w coupler as required and clamp for connection of bare copper cable 4.0mm ² between the Rods and from the Rod to Main DB01. Earthing Rod and connection accessories to be high corrosion resistant (Sea Water). Earth resistance to be < 5.0 Ohm	Lot	1		
B.	ELECTRICAL DISTRIBUTION BOARDS				
	Distribution Boards c/w main isolator, contactors, digital meters, cabling accessories, distribution blocks, outgoing terminals, busbars and engraved labels. DB to include lock and Keys. DBs to be as per schematic drawings and specifications and include 30% spare capacity.				
B.1	<u>Distribution Board</u>				
B.1.1	DB Main 02	No.	1		
B.2	Allow for cable glands, lugs, terminal blocks, engraved labels and other accessories for DB & SDB.	Lot	1		
C.	SLEEVES				
C.1	Pressure type PVC pipe buried underground: LV services (50 mm dia)	m	30		
D.	POWER CABLES				
	Power cables in trenches, ducts, sleeves or onto cable trays. Allow for proper cable fixation and protection. Include all necessary accessories such as cable glands, terminals, etc. Terminate and connect properly.				
	Note: All quantities indicated are subject to remeasurement.				
D.1	From Solar Inverter to DB Main 02 3Cx4.0 mm ² Cu XLPE/SWA/PVC	m	10		
D.2	From DB Main 02 to Kiosk Lights 3Cx1.5 mm ² Cu XLPE/SWA/PVC	m	60		
	TO COLLECTION				

TOTAL COLLECTION

Electrical Installations

Total brought down from priced Bill of Quantities :-

Page 1 Rs _____

Page 2 Rs _____

Total Rs _____

Proposed Development at Ile Aux Cocos

Lot 2: Public Health Installations at Ile Aux Cocos

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT(Rs)
	<i>Supply, deliver to site, install, connect, test and commission the following all in accordance with specifications, drawings, conditions of contract, etc.</i>				
A.	INCOMING PIPES TO RAINWATER TANK AND ACCESSORIES				
A.1	<u>Collection Pipes /Branch pipes</u>				
A.1.1	Dia 110mm uPVC PN6 c/w fittings	m	10		
A.1.2	Dia 160mm uPVC PN6 c/w fittings	m	10		
A.2	Hangers/Supports/Angle Bars to support pipes to tank	Lot	1		
B.	WATER TANK AND ACCESSORIES				
B.1	PE Water Tank of Capacity 1m ³ - (manually filled by visitors)	No.	1		
B.2	PE Water Tank of Capacity 4m ³ - (Rainwater tank) with integrated filter system.	No.	1		
B.3	Quarter Turn Valves (Brass with s/s lever Handle)				
B.3.1	Dia 63/50 at manual valve (cleaning)	No.	2		
B.3.2	Dia 63/50 at suction to filter system	No.	2		
C.	SUCTION PIPE FROM COLLECTION TANKS TO PUMP ROOM				
C.1	HDPE pipe rated PN6, Φ 63/50mm	m	10		
D.	OVERFLOW PIPINGS AND ACCESSORIES				
D.1	uPVC non pressure pipe, rated to PN6, Φ 250mm (overflow pipe to soak away)	m	10		
D.2	Reducer sections, Tees, Elbows, Wyes, Unions, Adaptors, etc. uPVC non pressure fittings, solvent welded (rated to PN6) ALL DIMENSIONS FOR COMPLETE INSTALLATION	Lot	1		
D.3	Saddles, hangers and other holding accessories to pipes ALL DIMENSIONS FOR COMPLETE INSTALLATION	Lot	1		
	TO COLLECTION				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT(Rs)
E.	FILTRATION PUMPS, UV TREATMENT AND ACCESSORIES				
E.1	FILTRATION PUMP				
E.1.1	Centrifugal pump with pre-filter, glass reinforced polypropylene construction. SS mechanical seal and axle. Horizontal axis with electrical motor. Self priming type connection 1½", 230V, 50Hz, IP55. Capacity per pump = 5m³/h at 20m head (Side mounted monobloc with sand filter)	Set	1		
E.1.2	Anti-vibration rubber mountings for pumps.	Set	1		
E.1.3	Level sensor / float switch for control of pumps, non- mercury type (230V, 50Hz) c/w power cabling and control cabin <u>Pump starts</u> : When roof tank is below 40% and collection tank is above low level <u>Pump stops</u> : When collection tank is below low level or roof tank is above 95% capacity.	Lot	1		
E.2	SAND FILTER AND ACCESSORIES				
E.2.1	Laminated polyester and fibreglass body with lid and polypropylene base c/w pressure gauge, water drain plug, air vent, multiport valve. Filtration velocity = 50 m³/h/m² Capacity per filter = 6 m³/h Diameter = 500mm (minimum) C/W MULTIPOINT VALVE (mounted as monobloc with pump)	No.	1		
E.3	UV STERILIZER				
E.3.1	UV Sterilizer: suitable for flow rate of 6m³/hr average (Lamp Life: Minimum 12,000 hours) (UV-C light) Stainless Steel Body	No.	1		
E.3.2	Spare UV Lamp for Sterilizer	No.	1		
E.4	BACKWASH WATER PIPE TO SOAKAWAY				
E.4.1	Backwash uPVC PN 10 Dia 63/50 c/w fittings to nearest soakaway	m	10		
F.	WATER PIPE TO WATER TANK, ROOF TANK & DISTRIBUTION				
F.1	PIPE TO WATER TANKS AT HIGH LEVEL				
F.1.1	uPVC PN 10 c/w fittings Dia 50/40mm	m	5		
F.1.2	Non Return Valve Dia 50/40mm	No	1		
F.1.3	Brass QT Valve (Stainless Steel Lever Handle) (dia 50/40)	No	1		
F.1.4	Supports for vertical and horizontal pipes at roof level	Lot	1		
	TO COLLECTION				

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT(Rs)
F.2	WATER TANK AT HIGH LEVEL				
F.2.1	Water Tank in PE (UV Stabilized) - Capacity 500L	No.	1		
F.2.2	Ball Cock at Tank inlet (Heavy Duty) 1½"	No.	1		
G.	DISTRIBUTION PIPING FROM ROOF TANK TO COLD WATER POINTS (BY GRAVITY)				
G.1	Pressure pipe, rated to PN16				
G.1.1	Φ25/20mm uPVC	m	10		
G.1.2	Φ20/15mm uPVC	m	5		
G.1.3	Φ25/20mm HDPE	m	15		
G.2	uPVC pressure fittings, rated to PN16. Solvent welded. Reducers, Tees, Elbows, Unions, male adaptors, female adaptors, transition fittings, threaded sockets at all valves and flexible pipes,etc. (ALL DIMENSIONS FOR COMPLETE INSTALLATION)	Lot	1		
G.3	Saddles, hangers and all other holding accessories to pipes (ALL DIMENSIONS FOR COMPLETE INSTALLATION)	Lot	1		
G.4	Quarter turn valve, Brass				
G.4.1	25/20	No.	2		
G.4.2	20/15	No.	2		
G.5	Non Return Valve Dia 25/20mm	No	1		
G.6	Miniball valve ½" connection (High Quality) at sink	No.	1		
G.7	Flexible pipes (200mm long) ½" connection (High Quality)	No.	1		
H.	WASTE				
H.1	uPVC pipe, solvent welded, diameter (horizontal pipes)				
H.1.1	50mm PN6	m	5		
H.1.2	50mm PN10	m	3		
H.2	uPVC fittings, rated to PN6 and PN10. Solvent welded. Reducers, Tees, Elbows, Y-Tees, Rodding Eyes, etc. (ALL DIMENSIONS FOR COMPLETE INSTALLATION)	Lot	1		
H.3	Supports, saddles, screws, rawl bolts and all sundries for COMPLETE INSTALLATION of sewer and waste pipes	Lot	1		
H.4	P-traps (vertical inlet, horizontal outlet), 50 mm at sinks	No.	1		
H.5	PVC Floor Traps 150x150 mm with s/s cover	No.	1		
	TO COLLECTION				

TOTAL COLLECTION TO SUMMARY

Total brought down from priced Bill of Quantities :-

Page 1	Rs	_____
Page 2	Rs	_____
Page 3	Rs	_____
Page 4	Rs	=====
TOTAL SUMMARY	Rs	=====

TOTAL COLLECTION TO SUMMARY

Total brought down from priced Bill of Quantities :-

Page 1

Rs _____

TOTAL SUMMARY

Rs _____

**Proposed Development
at
Ile aux Cocos, Rodrigues**

BILL NO	DESCRIPTION	PAGE NO	AMOUNT (MUR EXCL. VAT)
3	MECHANICAL & ELECTRICAL INSTALLATIONS		
	ELECTRICAL INSTALLATIONS	3
	PUBLIC HEALTH INSTALLATIONS	5
	SOLAR PANEL INSTALLATIONS	2	
TOTAL CARRIED FORWARD TO MAIN SUMMARY MUR			

SPECIFICATIONS

Electrical Specifications For Proposed Development at Ile Aux Cocos

1. INTRODUCTION
2. STANDARDS
3. EXTENT OF PRESENT SPECIFICATIONS
4. DRAWINGS
5. DETAILED ELECTRICAL SPECIFICATIONS
 - 5.1 DISTRIBUTION BOARDS
 - 5.2 SWITCHGEARS
 - 5.3 POWER CABLES
 - 5.4 WIRING CABLES
 - 5.5 CONDUITS
 - 5.6 WIRING ACCESSORIES
 - 5.7 PVC TRUNKING
 - 5.8 LUMINAIRES
 - 5.9 EARTHING & BONDING
6. SCHEDULE OF LUMINAIRES

1. INTRODUCTION

This section shall relate to the description of the installations and the specifications of materials and equipment to be used on the project. It should be noted that all installation and materials proposed should

2. STANDARDS

All parts of the installation shall conform in all respects to the Requirements for Electrical Installations BS 7671:2008, IEE Wiring Regulations Seventeenth Edition. This document shall serve as a reference throughout to determine acceptability of materials, techniques and workmanship.

Where the installation of a particular material or equipment is described by the manufacturer, the Contractor shall submit these information to the M&E Engineer before the start of the works. The Contractor shall also ascertain that the procedures laid down are properly followed.

Where an item or subject within the contract has not been covered either under the BS 7671:2008, or in the specifications contained within the section, the relevant British Standards Codes of Practice shall be referred to.

3. EXTENT OF PRESENT SPECIFICATIONS

The following items shall be covered within the present specifications.

1. Distribution Boards
2. Switchgears
3. Power Cables
4. Wiring cables
5. Conduits
6. Electrical & Wiring Accessories
7. PVC trunking
8. Luminaires
9. Earthing and Bonding

4. DRAWINGS

Drawings, as listed in the relevant section, are supplied for tender purposes only.

The M&E Engineer shall submit new drawings, incorporating the latest requirements of the Client, if any, to the successful Tenderer. The latter will be required to prepare necessary working drawings for approval by the M&E Engineer before implementation.

5. DETAILED ELECTRICAL SPECIFICATIONS

5.1 DISTRIBUTION BOARDS

These units shall be designed and constructed electrically as per the respective one-line diagrams. They shall be wall mounted, of polyester finish complete with din rail and earth terminals.

The distribution board shall be modular, of standard dimensions and be made by reputable manufacturers. It shall be supplied complete with incoming switchgears, outgoing MCBs, mounting rails, terminal blocks, perforated / plain plates, engraved labels and other accessories. The distribution board proposed shall have lock and keys.

Detailed drawings of the boards shall be approved by the M&E Engineer before order. All DBs shall be supplied with a minimum of 20% spare capacity.

5.2 SWITCHGEARS

All switchgears shall also be from reputable manufacturers and be strictly to BS norms. They shall be designed for fixed installation. Switchgear used must be such that neutral lines are always interrupted at the same time as phase lines.

The Contractor must ensure that the breaking capacity of each switchgear is appropriate for the purpose it will be used. This shall be calculated and indicated on all working drawings.

5.3 POWER CABLES

All power cables (unless otherwise specified) shall be PVC insulated, PVC sheathed with copper conductors. They shall be steel wire armoured, rated at 600/1000V and manufactured to the appropriate MS or BS standards.

Conductors shall be stranded copper of high conductivity.

Core identification shall be:

Brown, Black, Grey and Blue for 4-core cables.

Where single core power cables are specified, the colour shall be according to the phase to which it shall be connected, ie. brown, black or grey for the phases, blue for neutral and green or yellow/green for earth.

The earth continuity conductor shall always be green or yellow/green.

Cables not meeting the above core identifications will not be accepted under any circumstances.

All power cables shall be terminated suitably using proper glands, lugs and terminals.

The Contractor shall allow for all draw boxes as required.

Underground power cables including those for external lighting shall be laid in yellow/orange PVC pipes of appropriate diameter at a minimum of 800mm below ground level.

On top of this layer, yellow/orange plastic warning tape 200mm wide at least 0.5mm thick marked "DANGER ELECTRICITY" at no more than 300mm interval shall be laid along all run.

The Contractor shall allow for supply and laying of all PVC pipes, plastic warning tape complete with proprietary accessories, etc.

5.4 WIRING CABLES

All wiring within polyethylene conduits shall generally be PVC insulated single core copper conductor cables. Minimum size of cable shall be 1.5 mm² for lighting circuits and 2.5 mm² for socket circuits.

Cables sizes for other circuits shall be as specified on the one-line diagram of the relevant distribution or sub-distribution boards.

Colour coding shall be strictly implemented all over the building as follows:

Brown for phase

Blue for neutral

Green or yellow/green for earth

All wiring cables to be used must be manufactured to the relevant MS or BS standards.

5.5 CONDUITS

Conduits to be embedded into concrete or chased into blockwalls shall be plastic, flexible and be specially manufactured for this purpose. Suitable accessories shall be used for the implementation of the conduit network.

Where conduits are surface mounted or laid within dry wall partitions, etc. only non-fire propagating ones shall be used. Locally manufactured conduits not meeting EN norms shall not be accepted on this project.

During implementation of the project the Contractor shall ensure that all necessary precautions are taken for the protection of the conduits from breakage or blockage. The appropriate accessories shall consequently be used.

Unless otherwise stated, conduit sizes shall be as follows:-

- For lighting circuits - 20mm or equivalent
- For socket circuits - 25mm or equivalent

For all other circuits, conduits shall be laid as specified on the respective layout drawings.

5.6 WIRING ACCESSORIES

They shall be flush mounted using appropriate mounting accessories.

Final point user accessories shall be equivalent to Model Plexo from Legrand or model Sollysta from Hager. They shall conform to the appropriate BS standards.

The Contractor shall provide for appropriate proprietary back boxes or clip-on support frames and associated accessories for mounting of these either flush to walls or in partitions or in PVC trunking.

Minimum ampere rating for light switches shall be 10A. For BS sockets minimum rating shall be 13A.

Samples of all fittings and accessories shall be submitted to the M&E Engineer for approval prior to order.

Unless otherwise stated on the drawings, all switches are to be 1200 mm above finished floor level and all switch sockets shall be fixed at a height of 300 mm above finished floor level.

5.7 PVC TRUNKING

All PVC trunking shall be supplied and installed complete with proprietary covers, cover joints, clip-on partitions, inner and outer 90° bends, flat angles, tees, end caps, adaptors etc. Appropriate clip-on staples for retaining cables shall also be provided.

5.8 LUMINAIRES

Luminaires shall be as listed in the Bill of Quantities and described in the schedule given at the end of this section. They shall be of LED type with energy efficient performance.

Bidders may propose luminaries equivalent to the specified ones for consideration by the M&E Engineer/Architect.

Catalogues and full technical specifications of all luminaires must be submitted with the bid.

Samples of each luminaire shall be submitted for final approval by the M&E Engineer and Architect before order.

5.9 EARTHING & BONDING

New earthing stations must be provided and executed as specified in the bill of quantities. Earth electrodes shall be at least 600mm long and buried not less than one metre below the ground level. Bare copper conductor of appropriate size as indicated in the bill of quantities shall link the earth electrodes to the earth terminals of the distribution boards.

The earth rod and connection accessories proposed should be high corrosion resistant (Sea Water).

The earthing resistances to be achieved shall be 5.0 ohm.

The Contractor shall allow in his price for all additional works or materials including non-soluble earth enhancing compounds required to achieve the desired earth resistances. Earth tests must be carried out to the satisfaction of the M&E Engineer prior to backfilling and / or concreting.

All electrical distribution boards shall be connected to the earth bar using suitable insulated earth conductors of appropriate cross-section.

The Contractor shall provide necessary identification plates on all earth terminals and also provide for bonding of the solar panels and structures to a main earth bar in the electrical room.

6. SCHEDULE OF LUMINAIRES

TYPE	DESCRIPTION	EQUIVALENT OR SIMILAR TO:
LM1	Wall Mounted Light, Polycarbonate White finish, Sea side suitable, IP65, LED Luminaires, 3000K, 7.2W, 820Lm.	FORLIGHT ARA
LM2	Surface Mounted Light, Polycarbonate White finish, Sea side suitable, IP65, LED Luminaires, 4000K, 18W, 1750Lm	FORLIGHT PROPPER
LM3	Surface Mounted Light, Polycarbonate White finish, Sea side suitable, IP65, LED Luminaires, 4000K, 39W, 3550Lm	FORLIGHT PROPPER
LM4	Wall Mounted Light, Polycarbonate White finish, Sea side suitable, IP65, LED Luminaires, 3000K, 10W, 1100Lm.	PXF LIGHTING, MODENA MINI LED
EM1	Surface mounted Light, IP20, LED Luminaires, 3500K, 3W, 300Lm, Non maintained 3hrs battery with Legend Kit to ISO7010.	COOPER VISTRAL

Plumbing Specifications For Proposed Development at Ile Aux Cocos

1. Plumbing & Sewer Installations
 - 1.1 PIPINGS
 - 1.1.1 COLD WATER PIPINGS
 - 1.1.2 WASTE PIPES
 - 1.1.3 SUPPORTS, HANGERS, ETC
 - 1.2 PAINTING

1. PLUMBING & SEWER INSTALLATIONS

1.1 PIPINGS

1.1.1 COLD WATER PIPINGS

1.1.1.1 *Internal*

Water supply pipings shall be in uPVC pressure type, rated to withstand a pressure of 16 bars minimum. uPVC pipes shall conform to relevant International Standards (ISO R 161), BS 4514. These shall be generally used at ceiling soffits.

Joints on uPVC pressure pipes shall be solvent welded by use of appropriate PVC solvent glue. Parts to be joined shall be cleaned first to remove all traces of grease and dirt before being glued together.

Solvent welded screwed fittings shall be used wherever required, at stop valve, flexible pipes etc.

At all user ends, chrome plated ringed flexible pipes of appropriate lengths shall be used.

At each branch out from the mains underground pipe, a Quarter turn valve with stainless steel handle shall be provided in a valve chamber. All valves shall be of high quality to BS1010.

Mini ball valve shall be fixed at each supply to WHB's and sinks. The valves shall be full bore valves with finger handles and shall be brass and nickel plated.

Chrome plated angle valves to the highest quality shall be provided at WC cistern supplies and jet washers.

Water pipings shall be pressure tested to 8 bars at completion of installation works. A certificate to that effect is to be submitted.

1.1.1.2 *External*

The external underground cold water pipings shall be in High Density Polyethylene pipe (HDPE), rated to PN16.

The cold water pipes shall be properly and neatly laid underground. Trenching shall be by others. Compacting and laying of pipes shall be the Plumbing Contractor's responsibility.

HIGH DENSITY POLYETHYLENE PIPES (HDPE)

High density polyethylene pipes (HDPE) shall have a normal pressure rating of 16 bars at +20°C.

The pipes shall have **electrofusion** joints.

POLYETHYLENE FITTINGS

Polyethylene fittings to be supplied shall be of the electrofusion types and shall be as described below.

TRANSITION FITTINGS - POLYETHYLENE / OTHER PIPE CONNECTIONS

The polyethylene side shall have integral heating coil or provided with long end with electrofusion couplers. Electrofusion safety voltage specifications shall apply the metal-side shall be manufactured as per specifications of relevant pipe connector.

The transition fittings shall be a monolithic product guaranteed to axial bursting and internal pressure rightness.

HDPE TAPPINGS TEES SADDLES

The saddles shall be supplied in two anti-corrosion bolts and nuts for right clamping on the HDPE pipes.

The saddles shall be fitted with integral heating coil to enable electrofusion jointing. Electrofusion safety voltage specifications shall apply.

The saddles shall be supplied complete with tapping device, appropriate key including all fittings / couplers for connection with 20mm HDPE service pipes or otherwise as directed by the Engineer. These fittings / couplers for connection shall also be fitted with heating coil to enable electrofusion jointing.

The tapping shall be internally threaded to the nominal diameter given for the ferrule as specified.

Spigot surfaces can be scrapped off again to permit the insertion and more freely as far as the marker line of the insertion depth.

1.1.2 WASTE PIPES

All internal waste pipes, waste water and sewer, shall be in uPVC, PN6 type of the appropriate dimensions.

Underground sewer pipes shall be in uPVC, SN8, rubber ring push fit type (Brown or Pink colour) to MS6 Standards.

Joints shall be solvent welded on the uPVC internal pipes by use of appropriate solvent glue. Parts to be joined shall be cleaned thoroughly to remove all traces of grease and dirt prior to joining.

All joints are to be tested for leaks. A certificate to that effect is to be submitted.

PVC bottle traps, with vertical inlets and horizontal outlets, are to be connected at discharges from wash hand basins, sinks. These shall be of renowned make and quality.

Floor traps shall be provided at toilets (wherever possible) for draining of overflow or cleaning water. They shall have low height and have horizontal discharge,

The floor traps shall be of renowned make and quality.

Individual waste pipe and sewer pipe shall run in the duct risers. The waste pipes shall be connected to the sewer pipes at soffit of ground floor through a “U” or “P” Trap so as to prevent foul odour rising in the pipes.

1.1.3 SUPPORTS, HANGERS, ETC

All pipes are to be properly and solidly supported at reasonable distances along their whole lengths, and along walls.

A rail type supporting system shall be used. The rail frame shall be fixed to the wall of the risers and ceilings and individual tackles and studs with saddles at their ends shall be used to support the pipes. The fixation items shall be of renowned make. (SIKLA / MUPRO)
The supports, hangers etc shall permit frequent expansion and contraction of the pipes.

1.2 PAINING

All exposed pipes (uPVC) and fittings shall be painted with white UV paint.

Solar System Specifications For Proposed Development at Ile Aux Cocos

1. INTRODUCTION
2. STANDARDS
3. DRAWINGS
4. DETAILED ELECTRICAL SPECIFICATIONS
 - 4.1 PV MODULES
 - 4.2 INVERTERS
 - 4.3 BATTERY PACK

1. INTRODUCTION

Scope of works for Solar System installations shall consists of the following:

- (i) Supply and installation of solar panels on the slant roof of the Watchman Quarters on Ile Aux Cocos Island.
- (ii) Supply and Installation of an off grid inverter with lithium batteries backup.
- (iii) Supply and fixing of any structure required to support the solar panels on the slanted roof.

Note that all part of the solar system proposed should take into consideration that, solar panels shall be installed near sea side condition and be operating within tropical island temperature and humidity.

2. STANDARDS

All parts of the installation shall conform in all respects to the Requirements for Electrical Installations BS 7671:2008, IEE Wiring Regulations Seventeenth Edition. This document shall serve as a reference throughout to determine acceptability of materials, techniques and workmanship.

Where the installation of a particular material or equipment is described by the manufacturer, the Contractor shall submit these information to the M&E Engineer before the start of the works. The Contractor shall also ascertain that the procedures laid down are properly followed.

Where an item or subject within the contract has not been covered either under the BS 7671:2008, or in the specifications contained within the section, the relevant British Standards Codes of Practice shall be referred to.

3. DRAWINGS

Drawings, as listed in the relevant section, are supplied for tender purposes only.

The M&E Engineer shall submit new drawings, incorporating the latest requirements of the Client, if any, to the successful Tenderer. The latter will be required to prepare necessary working drawings for approval by the M&E Engineer before implementation.

The North shown on the architectural drawing should be taken into consideration while proposing the number of solar panels.

4. DETAILED SPECIFICATIONS

4.1 PV MODULES

These modules are to be standard solar panels of standard dimensions with Peak Power Watts rating of $W_p = 250W$ for a total Peak PV capacity of 3kW peak and yearly energy production of more than 4600kWh. Number of solar panels proposed with all technical specifications should be mentioned in the tender submission. Bidder to check Architectural drawings to understand the slant roof of the Watchman quarters.

The PV modules shall be Mono Crystalline type with an efficiency greater than 15%.

The PV modules shall offer a performance warranty of at least 12 years for 90% of nominal output power and 25 years for 80% of nominal output power.

Detailed drawings on installation of PV modules on the roof should be submitted to the Engineer for vetting before proceeding to installations.

4.2 INVERTERS

The inverter proposed shall be a pure sine Wave inverter type from a reputable manufacturer and be strictly to BS/EN norms.

It shall allow connection of two MPPT solar charge controller for each solar panels from each side of the roof. And also have in built smart battery charger to optimised battery performance and lifetime.

It shall contains internal resettable Overload and short circuit protections for both inlet and outlet of the inverter.

Its operating voltage shall be 230Vac within a tolerance of 6% and frequency of 50Hz with a tolerance of 0.5Hz. (similar to CED tolerance limit)

The overall efficiency of the proposed Inverter should be between the range 93% – 95%. It shall work normally near sea side environment and within tropical conditions.

It shall include a LCD display showing the followings:

- (i) PV input voltage,
- (ii) Battery Voltage,
- (iii) Charging Current,
- (iv) Load in percent & in VA/Watt,
- (v) Battery Level,
- (vi) Output voltage, frequency, current,
- (vii) Faults

The inverter shall come with a warranty of at least 5 years.

4.3 BATTERY PACK

The battery pack proposed shall consist of individual modular batteries connected together to have a total capacity of 10,800Wh.

It shall contain built-in battery protection system to keep the battery running at peak performance and protects the battery for more than 2000 full charge-discharge cycles for a DOD of 80%.

The battery shall have a depth of discharge of 80-100%.

The working temperature of proposed battery pack should be suitable to the ambient temperature of the Island.

The batteries shall come with a warranty of at least 5 years.