Section 6. Bill of Quantities

Preamble to Bill of Quantities

1. The complete description for the work items listed in the Bill of Quantities is given in Section-06 of the Bid Documents.

2. The works shall be measured in accordance with the Measurement and Payment Sub-Clauses given at the end of each section of the specifications unless otherwise stated, together with any additional items included in the Bill of Quantities. The rates for these items should include all costs, including work of an ancillary or temporary nature, Test Fees, overheads and profit, required by the Bidder and shall (except insofar as is otherwise provided in the Contract) cover all his obligations under the Contract for the complete construction and maintenance of the works.

3. The quantities shall be computed net. In measuring earthworks no allowance shall be made for temporary batters, working space, shoring, Temporary works or bulking of the soil and the Bidder should make due allowance in his rates.
4. The rates inserted against each item are to include for the provision and operation of all equipment necessary to meet the specifications. The Bidder shall be responsible for supplying the equipment.
5. The Bidder should not assume that equipment will be available from the BEZA and shall allow for obtaining equipment from other sources.
6. If the Bidder fails to enter a price against an item in the Bill of Quantities the amount shall be deemed to be included elsewhere in his rates.
7. The Bidder's attention is drawn to Clauses of the Conditions of Contract, which deal with variations in quantities.
8. No additional item of work of any nature shall be undertaken before a written order by the Engineer has been issued to the Bidder in this respect and a rate agreed. If there is no agreement between the Bidder and the Engineer on the rate, then the Engineer may instruct the Bidder to proceed with the work at a rate fixed by the Engineer.

9. The Bidder is responsible for ensuring the necessary tests and measurements are carried out field and at the laboratory fixed by BEZA in order to ensure that the work complies with the specifications. The Bidder shall give 24 hours notice of each item of work, which is due for testing. Any item of work, which is covered or buried without tests being carried out, may be rejected by the Engineer. Bidder's quoted rate for each item of work shall be inclusive of such test fees.

10. Only materials and work complying fully with all specified requirements shall be eligible for payment under the Contract.

11. Usable materials salvaged from within the site are the property of the BEZA and shall be applied to the works as indicated in the Bill of Quantities.

General Notes for Bidder:

01. Manufacturer authorization and following certifications of Solar Panel, Battery, Controller & LED light will be submitted along with Bid documents.
02. Preshipment Inspection(PSI) required for solar panel, controller, battery & LED light by third party or 3(three) representative of the Client.
03. All cost for PSI will be born by the contractor.

Certification:
Solar Panel:

- IEC 61701, IEC 62716, IEC 62804-1, ISO 9001, ISO 14001, ISO 18001, IEC 62941
- RoHS
- International Electrotechnical Committee (IEC) 61215: Crystalline Silicon Terrestrial PV Modules Design Qualification and Type Approval
- IEC 61646: Thin Film Silicon Terrestrial PV Modules Design Qualification and Type Approval
- IEC 60904-1: Photovoltaic Devices Part 1 Measurement of PV Current-Voltage Characteristics
- IEEE 1262: Recommended Practice for Qualification of Photovoltaic Modules
- PV GAP Recommended Standards are preferred.

LED Light, Charge Controller & Battery:

ISO 9002, ISO 14001, SASO, RoHS, IEC & SGS
Third Party Certificate(TUV certificate or equivalent certificate)
LM Certificate(LM70 or LM80)
IP Certificate(IP65 & IP68)

Bill of Quantities
Name of Works: Street Lighting by Renewable Energy in BSMSN
IFT No. 02/2020-21, Package No. : BEZA WD-1212, Lot No. : 01

Item No.	Description of Item	Unit	Quantity	Unit Rate (BDT)		Amount (BDT)	
1	*2*	*3*	*4*	*5*	*6=5*	*7=4x5*	*8=7*
1	Excavation & Backfill for Structures	Cum	712.03				
2	Concrete Class as Detailed on Drawings (Class10) (Concrete Mixer)	Cum	35.04				
3	Concrete Class-25 (Foundation) as Detailed on Drawings (Concrete Mixer)	Cum	162.49				
4	High Yield Reinforcement Bars	Tonne	19.92				
5	Supply, Fitting & Fixing of 30 watt LED Solar Street Light complete fitting with Solar panel and unique optics and photometric design optimize the light distribution to comply with safety and road lighting standards in terms of luminance, uniformity, glare control etc. **Light Pole:** 7.62 M (25′) long hot dip galvanized steel telescopic light pole, bottom diameter 150mm (6″) , top diameter 100mm (4") & required bracket thickness 5.00mm with base plate 300mm×300mm×12mm size welded and Nut bolt at the bottom, two coat aluminium/desired colour painting. The pole will be installed as per drawing, refilling and RCC 0.3M (1′) Zebra colour above ground. **(Single pipe - Joint should not be allowed)** **Solar Panel:** Max Power: 12V/150WP, Cell Type: Polycrystalline/Monocrystalline, Voltage at Maximum Power (Vmpp): To be mentioned, Current at Maximum Power (Impp): To be mentioned, Open Circuit Voltage (Voc): To be mentioned, Short Circuit Current (Isc): To be mentioned, Cell Efficiency: 18.0%, Grade of Solar cell: A Grade Junction Box Protection Class: IP 65, Power Tolerance: ± 2%, Lifespan: 25years. **Warranty: 25 years** **Battery:** AH Lithium iron phosphet battery,	Each	552.00				

	Battery Type: LifePO4, Capacity: 36Ah, 460.8Wh Rated Working Voltage: 12.8V, Efficiency: Min. 95%, Operating Temperature Range: -10°C ~ 70°C, Life Span: Min. 12Years. **Warranty: 5 years** **Controller:** Type: MPPT, Capacity: 15A, Rated voltage: 11.0V-14.6V, Self-Consumption (Av.): ≤5mA, HVD: 17.0V×2/24V, Efficiency: Minimum 95%, Lifespan: Min. 12Years, Protection: Load short circuit protection, Polarity reverse polarity protection, Reverse discharge protection. IP Rating: IP68 **Warranty: 5 years** **Street Light:** LED Light: (30W) LED Solar Street Light i) Lamp Efficiency : Min. 130 lm/Watt ii) LED Type : SMD (PHILIPS/CRI/NICHA) iii) CRI : >80 iv) Input Voltage : DC 12V v) Beam Angle : 120° vi) LifeSpan : Min. 12 years vii) Color Temperature : 6000-6500K viii) Working Temperature : -10°C ~70°C viiii) Lamp Fixture : High Pressure Die casting Aluminum Corrosion resistant alloy heat sink. x) IP Rating : IP65 **Warranty: 5 years**						
	Total						
	In Word:						

This Bill of Quantities contains [insert number] corrections duly initialled and signed by the authorised person
of the Tenderer

Note

1. It is suggested that the Tenderer uses these sheets of the BOQ in order to avoid any manipulation,
   distortion and inadvertent mistakes or omissions in course of preparing the Tender by the Tenderer
2. Follow the Guidance notes under Section 6 in filling this Schedule

Section 7. General Specifications

ABBREVIATIONS

AASHTO American Association of State Highway and Transportation Officials
ASTM American Society of Testing and Materials
BSTI Bangladesh Standards Testing Institute
BR Bangladesh Railways
REB Rural Electrification Board
BRRL Bangladesh Road Research Laboratory
BS British Standard
CBR California Bearing Ratio
HWL High Water Level
IP Ingress Protection
JIS Japan Industrial Standard
LWL Low Water Level
MSL Mean Sea Level
PVC Polyvinyl Chloride
RHD Roads and Highways Department
ROW Right of Way
STP Standard Laboratory Test Procedures for Quality Control Laboratories,

5.2.3.4 Cutting and Bending

Bars shall be cut and bent cold to the dimensions indicated and with equipment and methods approved by the Engineer.

Stirrups and tie bars shall be bent around a pin having a diameter not less than four times the minimum thickness of the bar. Bends for other bars, where full tension in the bar may occur, shall be made around a pin having a diameter not less than twenty times the bar diameter. Hooks shall conform to American Concrete Institute Standard Building Code Requirements for reinforced concrete ACI 318-83, or as shown on the Drawings.

5.2.3.5 Placing, Supporting and Fastening

All bar reinforcement shall be placed, supported and secured prior to any concreting operations. The reinforcement shall be checked and approved by the Engineer before pouring of concrete.

Cover blocks required for ensuring that the reinforcement is correctly positioned shall be as small as possible, consistent with their purpose, of a shape and material acceptable to the Engineer, and designated so that they will not overturn when the concrete is placed. If made of concrete, the maximum size of aggregate shall be 6 mm and the mix proportion shall be one part of Portland cement to 2 parts of sand by weight. Wire shall be cast in the block for the purpose of tying it to the reinforcement. The wire must not be closer than 30 mm from the concrete surface. The use of small stones or wood blocks shall not be permitted.

The reinforcement shall be held securely in place at the exact position and at the exact spacing as indicated on the Drawings by the use of wire ties at bar intersections, supports and cover blocks. Wire ties shall be securely tied and folded so that they do not project beyond the planes formed by the reinforcing bars. The adequacy of the supports and ties to secure the reinforcement properly shall be subject to the approval of the Engineer.

5.2.3.6 Splicing

Reinforcement shall be furnished in the lengths indicated on the Drawings. When the Contractor wishes to use more splices than are indicated and/or necessary, the Contractor shall furnish Working Drawings to the Engineer for approval in accordance with the guidelines provided on the Contract Drawings. If such additional splices are approved, the extra weight occasioned by such splices shall not be included in the measurement of reinforcement for payment.

All splices for high yield deformed steel bars and mild steel plain steel bars shall have lap lengths as shown on the Drawings. Lap splices shall generally be located at points of minimum tension in bars. Except where otherwise shown on the Drawings lap splices shall be made with the bars placed in contact and securely wired together.
Welding of reinforcing steel shall be done only if detailed on the Drawings or approved in writing by the Engineer. Before the Engineer may approve of such welding, the Contractor shall submit and test any samples as the Engineer may require and make due allowance for the time elapsing before results are available.

5.2.3.7 Substitutions

Substitutions of bars shall be permitted only with specific authorisation by the Engineer and at the expense of the Contractor. If bars are substituted they shall have a cross sectional area equivalent to the design area, or larger. If substitutions of bars are permitted, the Contractor shall produce working drawings and reinforcing detailing at his own expense and to the approval of the Engineer.

5.2.4 Measurement

The quantity of reinforcement to be measured under this Section shall be the computed weight in tonnes of material used and accepted as shown on the Drawings provided that the quantity shall not include the reinforcement in any item of work for which the basis of payment includes the reinforcement. In computing the weight to be measured, the theoretical weights of bars of the cross section shown on the Drawings or authorised, shall be used. The weight shall be calculated based on a constant mass of 0.00785 kg/mm^2 per metre run.

The computed weight shall not include the extra material incurred when bars larger than those specified are used, or the extra material necessary for splices when bars shorter than those specified are used with the permission of the Engineer, or the weight of any devices used to support or fasten the reinforcement in the correct position including any necessary chairs.

However, payment shall be allowed for lap splices not shown when the bars are longer than 12 metres. Only one lap splice per every started 12 metres will be paid for.

5.2.5 Payment

This work measured as provided above, shall be paid for at the Contract unit price per metric tonne of reinforcement of the particular type. The payment shall be full compensation for furnishing and placing reinforcement of any size and for all labour, binding wire, equipment, tools and incidentals necessary to complete the work prescribed in this Section.

Pay items shall be:

High Yield Deformed Steel Reinforcing Bars Tonne

6.0 Supply, Fitting & Fixing of 30 watt LED Solar Street Light complete fitting with Solar panel and unique optics and photometric design optimize the light distribution to comply with safety and road lighting standards in terms of luminance, uniformity, glare control etc. The work shall be completed as per direction/approval of the Engineer.

6.1 Light Pole:
7.62 M (25′) long hot dip galvanized steel telescopic light pole, bottom diameter 150mm (6″) top diameter 100mm (4") & required bracket, thickness 5.00mm with base plate 300mm×300mm×12mm size welded and Nut bolt at the bottom, two coat aluminium/desired colour painting. The pole will be installed as per drawing, refilling and RCC 0.3M (1′) Zebra colour above ground. **(Single pipe - Joint should not be allowed).**

6.1.1 Galvanizing of Light Pole

The light pole shall be hot-dip galvanized in accordance with BS 729. Articles for galvanizing shall be fabricated to provide faces which can be readily cleaned and coated. No cutting, reaming, drilling, grinding or welding shall be permitted after galvanizing.

6.2 Solar Panel:
Max Power: 12V/150WP,
Cell Type: Polycrystalline/Monocrystalline,
Voltage at Maximum Power (Vmpp): To be mentioned,
Current at Maximum Power (Impp): To be mentioned,
Open Circuit Voltage (Voc): To be mentioned,
Short Circuit Current (Isc): To be mentioned,
Cell Efficiency: 18.0%,
Grade of Solar cell: A Grade

Junction Box Protection Class: IP 65,
Power Tolerance: ± 2%,
Lifespan: 25years.
Warranty: 25 years

6.3 Battery:
AH Lithium iron phosphet battery,
Battery Type: LifePO4,
Capacity: 36Ah, 460.8Wh
Rated Working Voltage: 12.8V,
Efficiency: Min. 95%,
Operating Temperature Range: -10°C ~ 70°C,
Life Span: Min. 12Years.
Warranty: 5 years

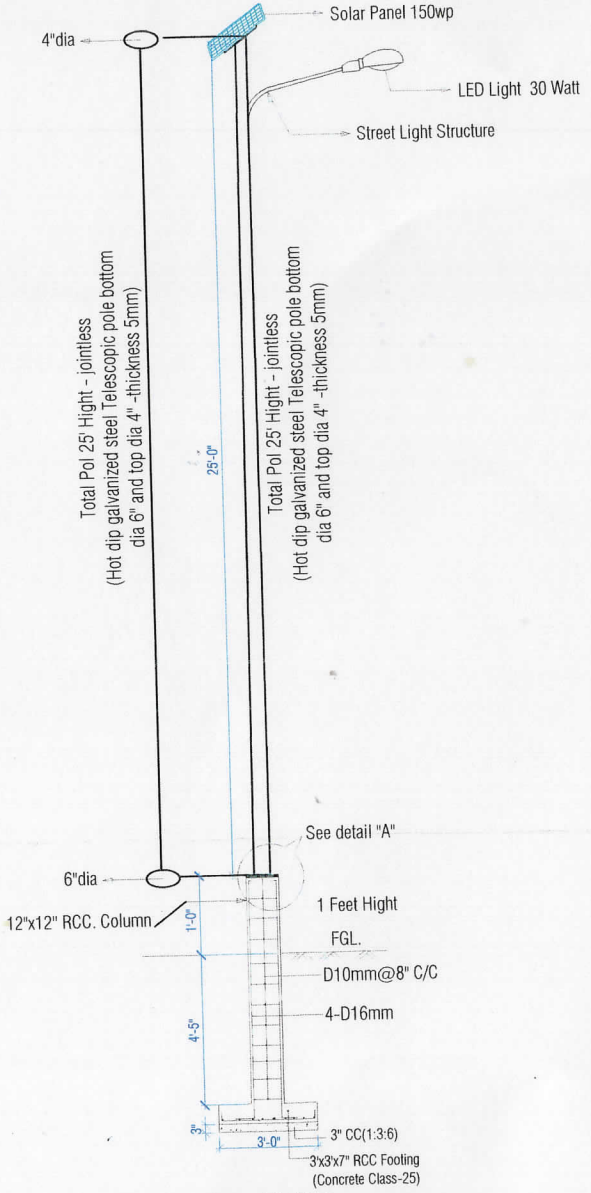
6.4 Controller:
Type: MPPT, Capacity: 15A,
Rated voltage: 11.0V-14.6V,
Self-Consumption (Av.): ≤5mA,
HVD: 17.0V×2/24V,
Efficiency: Minimum 95%,
Lifespan: Min. 12Years,
Protection: Load short circuit protection,
Polarity reverse polarity protection,
Reverse discharge protection.
IP Rating: IP68
Warranty: 5 years

6.5 Street Light:
LED Light: (30W) LED Solar Street Light
i) Lamp Efficiency : Min. 130Im/Watt
ii) LED Type : SMD (PHILIPS/CRI/NICHA)
iii) CRI : >80
iv) Input Voltage : DC 12V
v) Beam Angle : 120°
vi) LifeSpan : Min. 12 years
vii) Color Temperature : 6000-6500K
viii) Working Temperature : -10°C ~70°C
viiii) Lamp Fixture : High Pressure Die casting Aluminum
Corrosion resistant alloy heat sink.
x) Classification : IP65
Warranty: 5 years

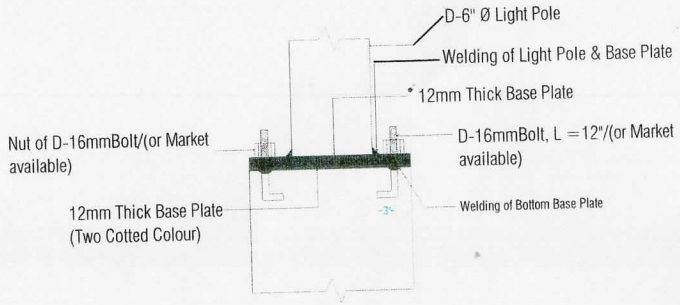
Test Frequency

Item No.	Description of Item	Test	Test Frequency
1	*2*	*3*	*4*
1	Concrete Class-25 (Foundation) as Detailed on Drawings (Concrete Mixer)	FM	One per 75 m^3
		W/A (Coarse Aggregate)	One per 75 m^3
		LAA/ACV	One per 75 m^3
		Gradation of CA	One per 75 m^3
		Setting Time of Cement	One per 75 m^3
		CS of Cement (3,7,28 days)	One per 75 m^3
		CS of Concrete	One per 75 m^3
2	High Yield Reinforcement Bars	Unit wt., Elongation & Tensile Strength	One per 10 ton
3	Supply, Fitting & Fixing of 30 watt LED Solar Street Light complete fitting with Solar panel and unique optics and photometric design optimize the light distribution to comply with safety and road lighting standards in terms of luminance, uniformity, glare control etc. **Light Pole:** 7.62 M (25′) long hot dip galvanized steel telescopic light pole, bottom diameter 150mm (6″) , top diameter 100mm (4") & required bracket, thickness 5.00mm with base plate 300mm×300mm×12mm size welded and Nut bolt at the bottom, two coat aluminium/desired colour painting. The pole will be installed as per drawing, refilling and RCC 0.3M (1′) Zebra colour above ground. **(Single pipe - Joint should not be allowed)** **Solar Panel:** Max Power: 12V/150WP, Cell Type: Polycrystalline/Monocrystalline, Voltage at Maximum Power (Vmpp): To be mentioned, Current at Maximum Power (Impp): To be mentioned, Open Circuit Voltage (Voc): To be mentioned, Short Circuit Current (Isc): To be mentioned, Cell Efficiency: 18.0%, Grade of Solar cell: A Grade Junction Box Protection Class: IP 65, Power Tolerance: ± 2%, Lifespan: 25years. **Warranty: 25 years**		01. Preshipment Inspection by third party or 3(three) representatives of the Client of respective manufacturing facilities. 02.After delivery at site One test per Lot per shipment : Light Sample & light pole sample Test by BUET/CUET/KUET/RUET **A. Light Sample** i. Solar Panel Test ii. LED Street Light Test **B. Light Pole Sample** i. Chemical composition Test ii. Thickness Test iii. Diameter Test

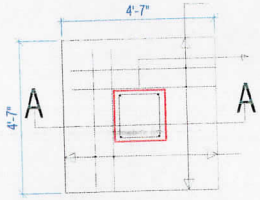
Item No.	Description of Item	Test	Test Frequency
1	*2*	*3*	*4*
	Battery: AH Lithium iron phosphet battery, Battery Type: LifePO4, Capacity: 36Ah, 460.8Wh Rated Working Voltage: 12.8V, Efficiency: Min. 95%, Operating Temperature Range: -10°C ~ 70°C, Life Span: Min. 12Years. **Warranty: 5 years** **Controller:** Type: MPPT, Capacity: 15A, Rated voltage: 11.0V-14.6V, Self-Consumption (Av.): ≤5mA, HVD: 17.0V×2/24V, Efficiency: Minimum 95%, Lifespan: Min. 12Years, Protection: Load short circuit protection, Polarity reverse polarity protection, Reverse discharge protection. IP Rating: IP68 **Warranty: 5 years** **Street Light:** LED Light: (30W) LED Solar Street Light i) Lamp Efficiency : Min. 130Im/Watt ii) LED Type : SMD (PHILIPS/CRI/NICHA) iii) CRI : >80 iv) Input Voltage : DC 12V v) Beam Angle : 120° vi) LifeSpan : Min. 12 years vii) Color Temperature : 6000-6500K viii) Working Temperature : -10°C ~70°C viiii) Lamp Fixture : High Pressure Die casting Aluminum Corrosion resistant alloy heat sink. x) IP Rating : IP65 **Warranty: 5 years**		



Details of Light Pole
With RCC Foundation(Section A-A)



Details of "A"



Plan of Footing

D10mm@8" C/C

1'x1' R C C Column

D10mm@8" C/C

CLIENT: BANGLADESH ECONOMIC ZONES AUTHORITY (BEZA)	PROJECT NAME : Supply & Instalation of Street Light for Mirsarai EZ (14.20 Km)	SUBMITTED BY: Aarvee-BETS(JV) (BEZA-CS-2211)	DRAWN BY: SK KALIM UDDIN CAD operator	DRAWING CHECKED BY: Subrata Kumar Sarkar Office Engineer	DESIGNED BY: Md. Sujatul Islam Electrical Design Egnr.	CHECKED BY: Dr. V.G. Hiremath Team Leader	APPROVED BY: BEZA	REVISION: NO / REVISION / DATE: 01, 02, 03, 04
BANGLADESH ECONOMIC ZONES DEVELOPMENT	DRAWING TITLE:	August, 2020						DRAWING STATUS: FOR CONSTRUCTION; Sheet No: S-01