Proposed for inclusion of UP-PWD (SOR)

Proposed Energy Efficient materials for UPPWD (SOR) in UTTAR PRADESH

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Uttar Pradesh New and Renewable Energy Development Agency

Uttar Pradesh State Designated Agency

GLOBAL EVOLUTIONARY ENERGY DESIGN

Energy Efficient Materials for UPECBC-2018

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SECTION I-ENERGY EFFICIENT MATERIALS

S.No.	Ref.No.	Description	Unit	Rate
		BUILDING ENVELOPE		
1	8561	Extruded polystyrene rigid *insulation board***50 mm** thick	sqm	525.00
2	8562	Expanded Polystyrene ***insulation board* 120 mm** thick confirming to IS 4671-1984, ***Fire retardant*** property self-extinguishing type as per EN 13501-1	sqm	800.00
3	12.34	Providing fixing ***thermal insulation*** of ceiling (***under deck insulation*****) with Resin Bonded Fibre glass wool** conforming to IS : 8183, density 24kg /m3, **50mm** thick, wrapped in 200 G Virgin Polythene bags, fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5 mm x 24 gauge wire mesh, for top most ceiling of building.	sqm	580.25
4	12.35	Providing and fixing ***thermal insulation*** with Resin **Bonded Fibre glass wool** conforming to IS: 8183. Density 16 kg/m³, **50 mm** thick, wrapped in 200G Virgin Polythene bags placed over existing ***false ceiling*** and held in position by crisscrossing GI wire	sqm	247.80
5	12.36	***Thermal Insulation*** of roofing with **Expanded polystyrene** fixed with suitable adhesive to the ***false ceiling*** as per the directions of the Engineer-in-charge:		
	12.36.1	With Type ***N - Normal*****50 mm** thick	sqm	275.10
	12.36.2	With Type ***SE - Self Extinguishing*** type **50 mm** thick	sqm	311.85
6	25.5	Providing, fabricating and supplying shadow box of required size and shape, for fixing in the spandrel portion of the structural glazing, in linear as well as curvilinear portions of the building by providing semi -rigid, inorganic, non-combustible ***fibre glass wool insulation* 50 mm** thick, conforming to IS: 8183 and BS: 3958 Part 5. The insulation layer shall have facing (factory bonded on surface # 1 of the ***fibre glass insulation layer***), of black non-woven fibre glass tissue of nominal thickness 0.5 mm and nominal mass not less than 60 gm /sqm, made of randomly oriented glass fibres distributed in a binder by a wet-lay process including fixing 1.5 mm thick solid aluminum sheet backing using, 6 mm thick cement board including SS rivets, nuts, bolts, washers etc complete.	sqm	1883.55

7	26.7	Providing and fixing **50 mm** thick extruded **polystyrene rigid *insulation board*** of required size ***between cavity wall***, complying with ISO 4898:2008 & ASTM C 578-08b - type VI, having thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350 kPa listed as per ASTM D 1621, density of 34-36 kg/m³ as per ASTM D 1622, water absorptions < 1% by volume as per ASTM D 2842, oxygen index of 24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576. ***Fire retardent property*** as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A, fixed with suitable water based adhesive and fastener, complete in all respect as per the direction of Engineer- in-Charge.	sqm	807.20
8	26.8	Providing and fixing **50 mm** thick **extruded polystyrene rigid insulation board** of required size ***underdeck on ceiling surface***, complying with ISO 4898:2008 & ASTM C 578-08b - type VI, having thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350 kPa listed as per ASTM D 1621, density of 34-36 kg/cum as per ASTM D 1622, water absorptions < 1% by volume as per ASTM D 2842, oxygen index of 24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576. ***Fire retardant*** property as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A, fixed with suitable water based adhesive and fastener, complete in all respect as per the direction of Engineer-in-Charge.	sqm	871.20
9	26.67	Providing and fixing of ***external thermal insulation*** and composite system with First layer of self-extinguishing type **Expanded Polystyrene (EPS) *insulation boards*** of **120 mm** thick (max 1mX0.5m section), confirming to IS 4671:1984, having thermal conductivity of 0.034 W/mK, (measured as per IS 33461980), density of 20-24 kg/m³ measured as per IS 5688-1982, ***Fire retardant*** property self-extinguishing type as per EN 135011, bonded with special polymer modified cementitious adhesive confirming to EOTA ETAG 004 (European Technical Approval) formulated to bond polystyrene insulation boards to typical mineral substrate (according to ETAG 004) and Polypropylene mechanical fasteners with plastic pin confirming to EOTA ETAG 014 (European Technical Approval) having dia 10mm & L=200mm on finished level wall and the junction between two adjacent EPS boards to be sealed with low expansion moisture cure Polyurethane Foam. Second layer consists of Fiberglass mesh covered with alkali-resistant coating, mass per unit area > 145 gm/m2, mesh size: 3.9x4.0 mm ±10% embedded in special polymer modified cementitious Base Coat with hydrophobes and the corners will be protected with Corner-beads with alkali-resistant mesh wings at least 10 cm wide, mesh mass per unit area min 145 gm/m2. The surface will be levelled, finished, made smooth complete in all respect as per manufactures specification and as per directions of Engineer-in-Charge.	sqm	3366.60

10	12.56	Providing and laying ***roof insulation*** with **40 mm** thick impervious sprayed, closed cell free **Rigid Polyurethane foam *over deck insulation*** conforming to IS - 12432 Pt. III (density of foam being 40-45 kg/ cum), over a coat of polyurethane primer applied @ 6-8 sqm per litre, laying 400 G polythene sheet over PUF spray and providing a wearing course of 40 mm thick cement screed 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 20 mm nominal size) in chequered rough finish, in panels of 2.5 m x 2.5 m and embedding with 24 G wire netting and sealing the joints with polymerized mastic, all complete as per direction of Engineer-in-Charge.	sqm	1412.20
11	12.57	Providing and fixing ***thermal insulation*** with ***Resin Bonded Fibre glass wool*** conforming to IS: 8183 having density 24 kg/m3, **50 mm** thick, wrapped in 200G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held in position by crisscrossing GI wire etc. complete as per directions of Engineer-in-Charge.	sqm	316.40
12	12.6	Providing and fixing ***thermal insulation of ceiling (under deck insulation)*** with Resin **Bonded Rockwool** conforming to IS: 8183,density 48 kg/ m3, **50 mm** thick, wrapped in 200 G Virgin Polythene bags fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5mm x 24 gauge wire mesh, for top most ceiling of building.	sqm	546.40
13	12.61	Providing and fixing ***thermal insulation*** with ***Resin bonded rock wool*** conforming to IS: 8183, density 48 kg/m3, 50 mm thick, wrapped in 200 G virgin Polythene bags placed over existing ***false ceiling*** and held in position by crisscrossing Gl wire.	sqm	277.20
14	12.62	Providing and fixing ***thermal insulation*** with ***Resin Bonded rock wool*** conforming to IS: 8183, having density 48 kg/m3,**50 mm** thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by crisscrossing GI wire etc. complete as per directions of Engineer-in Charge.	sqm	282.55
15	6.3	Brick work with common burnt clay machine moulded **perforated bricks** of class designation 12.5 conforming to IS: 2222 in superstructure above plinth level up to floor five level in cement mortar 1:6 (1 cement : 6 coarse sand) :		
	6.3.1	With F.P.S.(non modular) bricks	cum	7722.65
	6.3.2	With Modular bricks	cum	7501.50
16	6.34	Brick work with non modular ***fly ash bricks*** conforming to IS:12894, class designation 10 average compressive strength in super structure above plinth level up to floor V level in :		
	6.34.1	Cement mortar 1:4 (1 cement : 4 coarse sand)	cum	7473.25
	6.34.2	Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	7280.70

17	6.45	Half brick masonry with non modular ***fly ash bricks*** of class designation 10, conforming IS: 12894, in super structure above plinth and upto floor V level.		
	6.45.1	Cement mortar 1 : 3 (1 cement : 3 coarse sand)	sqm	941.50
	6.45.2	Cement mortar 1 : 4 (1 cement : 4 coarse sand)	sqm	917.00
18	7737	***Fly ash bricks*** conforming to I.S. 12894	1000 Nos	4300.00
19	6.5	Extra for brick work / ***AAC block*** masonry / Tile brick masonry in superstructure above floor V level, for each four floors or part thereof by mechanical means.	cum	236.65
20	6.47	Providing and laying ***autoclaved aerated cement blocks*** masonry with ***150mm/230mm/300 mm thick AAC blocks*** in super structure above plinth level up to floor V level with RCC band at sill level and lintel level with approved block laying polymer modified adhesive mortar all complete as per direction of Engineer-in-Charge. (The payment of RCC band and reinforcement shall be made for separately).	cum	6636.95
21	7902	Machine moulded common burnt clay modular **perforated bricks** of class designation 12.5	1000 Nos	5200.00
22	8655	Autoclaved aerated cement (AAC) blocks		2600.00
23		**Hollow Burnt Clay Block**		
		Providing and constructing hollow burnt clay block masonry with minimum crushing strength 35 kg/cm2 and maximum water absorption 15%, in cement mortar in ratio 1:6 for 200 & 150 mm thick block and 1:4 ratio for 100 mm thick block, stiffing bands are required every 5th course for 100 mm thick wall, including required formwork complete with striking and raking out joints, at all lead, depths and heights, curing and required independent double legged scaffolding etc. complete to the approval of the engineer-in-charge.		
		100mm Thick Wall - U value - 1.0 W/m2K	cu.m	5,660.00
		150mm Thick Wall - U value - 1.2 W/m2K	cu.m	6,230.00
		200mm Thick Wall - U value - 1.7 W/m2K	cu.m	7,565.00

24		**Insulated Burnt Clay Block** Providing and constructing insulated hollow burnt clay block masonry with minimum crushing strength 35 kg/cm2 , in cement mortar in ratio 1:6 for 200 mm thick, including required formwork complete with striking and raking out joints, at all lead, depths and heights, curing and required independent double legged scaffolding etc. complete to the approval of the engineer-in-charge.		
		200mm Thick Wall - U value - 0.6 W/m2K	cu.m	8,330.00
25		**Hollow Concrete Block** Hollow Concrete Block [1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)] Providing and fixing up to floor five level precast cement concrete hollow block, including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete	cu.m.	7,130.00
26		**Hollow Concrete Block** Hollow Concrete Block [1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)] Providing and fixing up to floor five level precast cement concrete hollow block, including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete	cu.m.	6,840.00
27		**Truss Reinforced Insulated Concrete (TRIC) Wall** Providing & fixing in position, ….mm thick 3D wall panels made of 3 mm dia G.I. wire mesh of 50X50 mm grid on both faces of the wall. Both the meshes are to be kept at 120-130 mm gap and connected by the zig zag G.I. wire of 3 mm dia at alternate row by welding (between an angle of 50-70 degree). The gap between the mesh to be filled with 100 mm thick EPS of density not less than 16 kg/cum and both faces finished manually with 50 mm thick cement concrete 1:1.5:3 (1cement:1.5 coarse sand: 3 stone aggregate of 6-10 mm nominal size) in two layers as done in grit wash plastering including plastered finish., complete as per the direction of the engineer-in-charge		
		150 mm thick	sq.m.	3,500.00
		200 mm thick	sq.m.	3,775.00
28	2626	**Glass wool** of denisity @ 48 Kg / cum with black glass tissue (BGT)	sqm	250.00

	7274	Glass wool 50 mm thick	sqm	238.00
29	7231	**Resin Bonded Glass wool** 16 kg/m³ : 50 mm thick	sqm	100.00
	7232	Resin Bonded Glass wool 24 kg/m³ : 50 mm thick	sqm	143.00
	7273	Resin Bonded Rockwool 48 kg/m3	sqm	120.00
30	12.34	Providing fixing ***thermal insulation of ceiling (under deck insulation)*** with **Resin Bonded Fibre glass wool** conforming to IS : 8183, density 24kg / m3, **50mm** thick, wrapped in 200 G Virgin Polythene bags, fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5 mm x 24 gauge wire mesh, for top most ceiling of building.	sqm	580.25
31	12.35	Providing and fixing ***thermal insulation with Resin Bonded Fibre glass wool*** conforming to IS: 8183. Density 16 kg/m³, **50 mm** thick, wrapped in 200G Virgin Polythene bags placed over existing ***false ceiling*** and held in position by crisscrossing GI wire.	sqm	247.80
32	12.57	Providing and fixing ***thermal insulation with Resin Bonded Fibre glass wool*** conforming to IS: 8183 having density 24 kg/m3, **50 mm** thick, wrapped in 200G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held in position by criss crossing GI wire etc. complete as per directions of Engineer-in-Charge.	sqm	316.40
33	12.61	Providing and fixing ***thermal insulation with Resin bonded rock wool*** conforming to IS: 8183, density 48 kg/m3, **50 mm** thick, wrapped in 200 G virgin Polythene bags placed over ***existing false ceiling*** and held in position by crisscrossing Gl wire.	sqm	277.20
34	12.62	Providing and fixing ***thermal insulation with Resin Bonded rock wool*** conforming to IS: 8183, having density 48 kg/m3,**50 mm** thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by crisscrossing GI wire etc. complete as per directions of Engineer-in Charge.	sqm	282.55

COOL ROOFS				
35	12.63	Providing and applying two coats of ***High Albedo paint*** having minimum ***Solar Reflective Index (SRI)*** 108 (with solar reflectance & thermal emittance tested as per ASTM) C 1549 and ASTM C 1371 respectively), VOC less than 10 cc/gm. The coating thickness and the methodology of application shall strictly as per manufacturer's specifications and as approved by Engineer-in-Charge. Surface preparation includes cleaning with metal wire brush to remove all dust, fungus etc., and washing with water all complete. The contractor shall give guarantee for the performance of SRI and also the durability of coating, all complete as per direction of Engineer-in-Charge.	sqm	314.85
	7238	High Albedo paint	kg	230.00
36	1204	Precast ***heat resistant terrace tiles*** (size 300x300 mm) and 20 mm thick	sqm	409.00
	12.55	Providing and fixing ***Heat Resistant Terrace Tiles*** (300 mm x 300 mm x 20 mm) with SRI (solar refractive index) > 78, solar reflection > 0.70 and initial emittance > 0.75 on waterproof and sloped surface of terrace, laid on 20 mm thick cement sand mortar in the ratio of 1:4 (1 cement : 4 coarse sand) and grouting the joints with mix of white cement & marble powder in ratio of 1:1, including rubbing and polishing of the surface upto 3 cuts complete, including providing skirting upto 150 mm height along the parapet walls in the same manner.	sqm	1374.10

		GLAZING		
37	2617	6 mm thick **High performance glass**	sqm	1000.00
38	8648	Hermetically **sealed double glazed unit** made with 6 mm thick clear float glass both side having 12 mm air gap	sqm	2150.00
39		**Double High Performance Glazing** Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6-126 mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface #2 of approved colour and shade, an inner heat strengthened clear float glass 6mm thick, spacer tube 12mm wide, desiccants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The IGUs shall be assembled in the factory/ workshop of the glass processor. (Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.26.2) For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm. (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Air gap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 0.13 to 50 %, Solar Heat Gain Coefficient (0.20- 0.51) and U-value of 3.0 to 3.3 W/m2.K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.	sq.m.	4,090.00
40		Installation & maintenance of integrated **green roof system** with surface preparation, surface repair, with heavy-duty acrylic polymer modified cementitious waterproofing, epoxy based anti-fungal plant root barrier treatment, recyclable HDPE drainage medium, 200 GSM geo-textile, Heavy duty filter medium for roof gardens and waterproof coating protection. Light weight high performance growing medium, roof lawn installed through matting or non-invasive shrubs as per design. The work will include 10 year warranty against leaks & one year maintenance.	sq.m.	2,587.00

41		**FLAT PLATE COLLECTOR** Supplying, installation, testing and commissioning of flat plate collector solar hot water heater comprising of aluminum/Copper plate collectors and Copper pipes coated with selective coating having absorptivity of 0.95 ± 0.02, emissivity of 0.5 ± 0.02 and high transmission glass cover with aluminum/stainless steel/ fiber reinforced plastic coated cladding material, with Rockwool insulation of 100 mm thickness and an aluminum sacrificial anode, connected with a SS 304 or 316 grade stainless steel hot water storage tank with anti-corrosive coating electrical back up arrangement, designed for minimum efficiency in accordance with the standard IS:13129(Part 1& 2).		
		100 Liters per day	Nos.	53,940.00
		200 Liters per day	Nos.	64,770.00
		300 Liters per day	Nos.	85,275.00
		500 Liters per day	Nos.	97,400.00
		1000 Liters per day	Nos.	3,28,750.00
		2000 Liters per day	Nos.	5,63,830.00
		3000 Liters per day	Nos.	10,06,285.00
		5000 Liters per day	Nos.	10,71,000.00
		10000 Liters per day	Nos.	17,73,820.00
42		**EVACUATED TUBE COLLECTOR** Supplying, installation, testing and commissioning of evacuated tube collector solar hot water heater comprising of 3 layer solar selective tubes (with No. of tubes/absorber area to be 1.50 sq. m for a 100 liter tank system) with a storage tank of SS 304/316 grade or any other material with anti-corrosive coating and of an interior thickness of 0.5 mm, if argon arc welded/metal inert gas welded or 0.8 mm, for other welding types, having an insulation made of Rockwool insulation of 48 kg/m3 insulation of 50 mm thickness, Al/FRP coated outer cladding and frames, designed for the minimum efficiency in accordance with the IS 13129 (Part 1 &2).		
		100 Liters per day	Nos.	23,400.00
		200 Liters per day	Nos.	36,490.00
		300 Liters per day	Nos.	78,970.00
		400 Liters per day	Nos.	91,380.00

		500 Liters per day	Nos.	1,22,690.00
		1000 Liters per day	Nos.	3,02,650.00
		2000 Liters per day	Nos.	4,33,535.00
		3000 Liters per day	Nos.	5,25,940.00
		5000 Liters per day	Nos.	6,60,000.00
		10000 Liters per day	Nos.	12,19,200.00
43		**UPVC Frame** The UPVC profiles of frames and sash shall be metered cut and fusion welded at all corners, including drilling of hole for fixing hardware and drainage of water etc., making arrangement for fixing hardware, EPDM gasket, with 1.2 ± 0.2 mm thick galvanized steel profile to be inserted in required profile, frame shall be fixed to the wall with 8 mm X 100 mm long fasteners, all complete as per direction of Engineer-In-Charge. All screws to be used shall be of S.S. of make as approved by Engineer-In-Charge. i. Casement frame of size 67 mm X 62 mm. ii. Casement window sash/Mullion (67 mm X 75 mm) iii. Casement glazing bead (35 mm X 18 mm) iv. S.S.-304 grade, friction hinges of size 250 X19 X 1.9 mm vi. Multi point lock with handle.	m	175.00
44		**Aluminum Frame with Thermal Break** Extruded Aluminum Section in Alloy 63400 and Temper T6, insulation conforming to IS: 733 and IS: 1825 .All Rubber, gaskets to be weather resistant (400C to 800C), EPDM gaskets.	m	210.00

SECTION II-ENERGY EFFICIENT MATERIALS
(ELECTRICAL AND MECHANICAL BASED ON UPECBC)

45. LIGHTING-DIMMERS

S.no.	Item no.	Description	Unit	Rates
45.1		Dimmers with metallic front plates with 1 gang (RF based with load capacity 300-600W)		As per market rate
45.2		Dimmers with metallic front plates with 2 gang (RF based with load capacity 300-600W)		As per market rate
45.3		Dimmers with front plates as plastic with 1 gang (RF based with load capacity 300-600W)		As per market rate
45.4		Dimmers with plastic front plates with 2 gang (RF based with load capacity 300-600W)		As per market rate
45.5		Dimmers - Group of modular products for controlling of lights and load 300W Residential dimmers		As per market rate
45.6		Dimmers - Group of modular products for controlling of lights and load 1200W Commercial dimmers		As per market rate
45.7		Dimmers - with mechanical technology- Clipsal opale (Mechanical dimmer with load capacity 400W)		As per market rate
45.8		Dimmers - with mechanical technology- Clipsal opale (Mechanical dimmer with load capacity 1200W)		As per market rate
45.9		Dimmers - based on RF technology- Clipsal Ulti Ez install (load capacity 300W)		As per market rate

46. LIGHTING-SENSOR

S.no.	Item no.	Description	Unit	Rates
46.1		Lighting Sensors – Wipro Occupancy Sensors (using Passive Infra-red as well as Microwave sensingtechnology)		As per market rate
46.2		Lighting Sensors – Wipro Occupancy Sensors (using Passive Infra-red as well as Microwave sensingtechnology) Microwave based		As per market rate
46.3		Lighting Sensors - Crompton Greaves SCGI3360 ECO- PIR motion sensor (Supported BMS protocol is DALI/ Analogue (0-10V))		As per market rate
46.4		Lighting Sensors - Crompton Greaves SCGIS345-PIR motion sensors for corridors (Supported BMS protocol is DALI/ Analogue (0-10V))		As per market rate
46.5		Lighting Sensors - Crompton Greaves SCGIS345 MX-high bay PIR motion sensor (Supported BMS protocol is DALI/ Analogue (0-10V))		As per market rate

46.6		Lighting Sensors - Crompton Greaves SCGIR Quarttro-Presence Detector and Lux regulator (Supported BMS protocol is DALI/ Analogue (0-10V))		As per market rate

46.7		Lighting Sensors - Crompton Greaves SCG2160 -ECOPIR motion Sensors for walls (Supported BMS protocol is DALI/ Analogue (0-10V))		As per market rate
46.8		Lighting Sensors – Panasonic Electric Works WTKMM2311 (Passive Infrared Ceiling Unit with Photo- sensor and Infrared I/O type similar to Panasonic, protocol used is Modbus)		As per market rate
46.9		Lighting Sensors - Panasonic Electric Works WRT3657-8 (Day Light Sensor: Ceiling day light sensor, Lux level of the sensor adjusted from 100 lux to 2000 lux can be disabled to enable overriding of ON/OFF switching, protocol used is Modbus)		As per market rate
46.10		Lighting Sensors – Lutron Quantum Occupancy sensor, supports DALI protocol with advance features		As per market rate
46.11		Lighting Sensors – Lutron Quantum Occupancy sensor, supports DALI protocol with advance features		As per market rate
46.12		Lighting Sensors – Lutron Quantum Combined daylight and interior light sensor, programmable and supports DALI software with advanced features		As per market rate
46.13		External Lighting Technologies - PIR Based Occupancy sensors for closed cabins, Dimmable Luminaires with Analogue ballast to be used along with dimmable sensors for daylight harvesting for energy saving upto 40%. Scene Select system for Conference / Board Room for energy saving, flexibility of lighting and user convenience		As per market rate
46.14		Natural Ventilation Sensor/HVAC/Lighting - Schneider - STR350 and STR351, having an extra analog input that can be connected to a CO2-, relative humidity- or occupancy sensor.		As per market rate

47. ELECTRIC MOTORS

S.no.	Item no.	Description	Unit	Rates
		Three phase induction motors shall conform to Indian Standard (IS) 12615 and shall fulfil the following efficiency requirements: 1) IE 2 class (high efficiency), 2) IE 3 class (premium efficiency), 3) IE 4 class (super premium efficiency).		

48. DISEL-GENERATOR SET				
S.no.	**Item no.**	**Description**	**Unit**	**Rates**
		BEE star rated DG set shall be used in all UPECBC Compliant building. 1)minimum 3 star rating 2) 4-star rating 3) 5-star rating		as per market rate

49. UNINTERRUPTED POWER SUPPLY (UPS)				
S.no.	**Item no.**	**Description**	**Unit**	**Rates**
		Any Standards and Labeling program by BEE shall take precedence over requirements listed below. UPS shall meet or exceed the energy efficiency requirements listed below. **UPS Size Energy Efficiency Requirements at 100% Load** **kVA< 20 90.2%** **20<=kVA <= 100 91.9%** **kVA > 100 93.8%**		

50. CHECK-METERING and SMART MERTERING SYSTEMS				
S.no.	**Item no.**	**Description**	**Unit**	**Rates**
		(a) Services exceeding 1000 kVA shall have permanently installed electrical metering to record demand (kVA), energy (kWh), and total power factor. The metering shall also display current (in each phase and the neutral), voltage (between phases and between each phase and neutral), and total harmonic distortion (THD) as a percentage of total current. (b) Services not exceeding 1000 kVA but over 65 kVA shall have permanently installed electric metering to record demand (kW), energy (kWh), and total power factor (or kVARh). (c) Services not exceeding 65 kVA shall have permanently installed electrical metering to record energy (kWh).		

51. POWER FACTOR CORRECTION				
S.no.	**Item no.**	**Description**	**Unit**	**Rates**
		For the selection of the Automatic Power Factor Correction system (capacitor bank) as per the compensation require to get the desired value of power factor, to achieving different level of efficiency. 1) 0.97 2) 0.98 3) 0.99		

52.Transformer				
S.no.	**Item no.**	**Description**	**Unit**	**Rates**
		Power transformers of the proper ratings and design must be selected to satisfy the minimum acceptable efficiency at 50% and full load rating. Permissible total loss values shall not exceed (a) 5% of the maximum total loss values mentioned in IS 1180 for oil type transformers in voltage class above 11 kV but not more than 22 kV (b) (b) 7.5% of the maximum total loss values mentioned in above IS 1180 for oil type transformers in voltage class above 22 kV and up to and including 33 kV (c) for dry type transformers kindly refer Table 7.1 from UPECBC		

UPPWD SOR METHODOLOGY

The motive of updating UPPWD SOR is to incorporate ECBC compliance material and equipment which will set a benchmark of rates for such materials or equipment's, in the tender or contracts for UPPWD in Uttar Pradesh.

While working on Energy Efficient projects of Uttar Pradesh different materials were suggested to Developers to incorporate in there building to make it Energy Efficient, since there was scarcity of Energy Efficient material in the UPPWD SOR therefore we face issues to suggest the incorporation of the materials.

According to the study and research carried on UPPWD, the lack of energy efficient materials was discovered. Therefore, the need of incorporating energy efficient was identified along with the rates of materials or equipment's. To identify the energy efficient equipment's and material to be incorporated in UPPWD, the study was carried out on SOR of the different states out of which SOR of three states were considered to be incorporated to make the final UPWD SOR.

The list of these energy efficient materials and equipment's were taken from

1. Delhi Schedule of Rates 2018 - Vol-I, Vol-II,
2. Karnataka PWD 2018.

The list contains thermal insulating material will lower down solar heat gain reducing cooling load of the building, energy efficient equipment's will consume less energy compared to outdated equipment's and solar energy equipment's will run on solar power from the sun and will run without the help of external supply of electricity and will also generate electricity to meet the demand of the building.

These materials can be used in building construction to retain heat which will further help lower down the cooling load of the building, resulting in Energy Efficient Buildings.

The incorporation of these building In UPPWD SOR will help Authorities suggest materials and equipment to their client along with the rates which will help in developing an Energy Efficient Building