



संवाद
Samvaad

Online Workshop

for **Development of Local Suppliers**
for sourcing of engineering items & raw materials

#AatmaNirbharBharat

Date : 22-01-2021

Ninth Workshop on 'Components – Solar'
Hosted by Solar Business Division (SBD) , BHEL , Bangalore

Introduction and Need of the Day



- To make AatmaNirbhar Bharat by Development of Local Suppliers and enhance Make In India products.

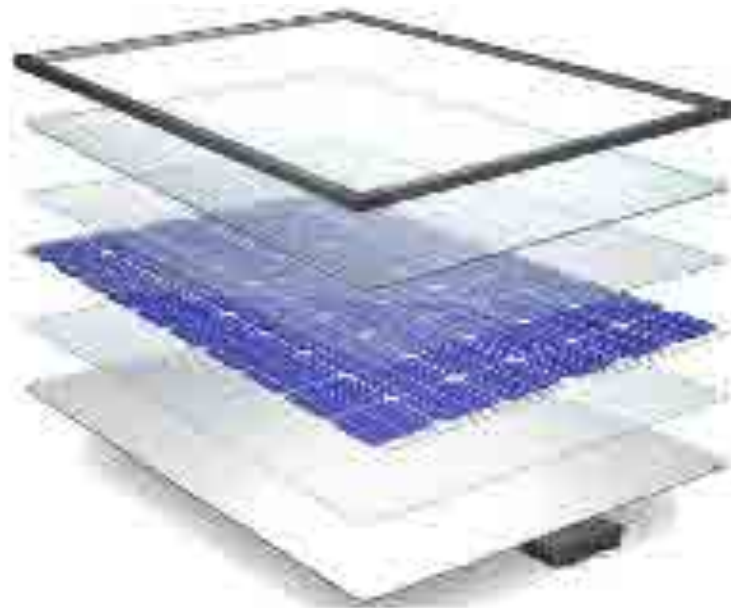


SBD - Solar Components



Solar PV Module

- Details:
 - 1) Dimension: 1965 mm x 986 mm
 - 2) 5BB, Polycrystalline, 1-1.5 kV system



List of Solar Components procured by BHEL

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
Solar Wafers	Raw Material required for Solar Cells	30	38180010	Yes , Required by other Clients for Solar PV Module Manufacturing.
Aluminium Paste (Back)		1	32129030	
Silver Paste (Front /Back)		10	35061000	
Phosphorous Oxychloride (POCL ₃)		0.2	2812	
Alkaline Additive		0.3	2805	

List of Solar Components procured by BHEL (Cont.)

Classification	Application	Requirement p.a. (Rs Cr)	HSN Code	Whether required by other clients
PV Solar Cell	Raw Material required for Photovoltaic Modules	61.2	85414011	Yes, Required by other Clients for Solar PV Module Manufacturing.
Anodized Aluminium Frames		6.07	76100000	
Anti-Reflection Coating (ARC) Glass		5.75	70070000	
Polymer Back sheet		2.03	39200000	
Ethylene Vinyl Acetate (EVA)		2.07	39200000	
Junction Box		5.43	85359040	
Cell Interconnect		5.78	74099000	

Solar Wafer – 158.75 mm Square Diamond Wire Saw Multi Crystalline Back (MCCE)

Silicon Wafer (Spec. No. PS- 439 – 423 R00)

TECHNICAL SPECIFICATION

1. MATERIAL : 158.75 mm Square Diamond Wire Saw Multi Crystalline Back (MCCE) Silicon wafer
2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production

SL NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
1.0	Base Wafer	Diamond Wire Saw		Unaided Visual
1.1	Surface Treatment	Metal Catalysed Chemical etching (MCCS) on one side for making it as Black Silicon Wafer		
1.2	Textured Surface Reflectivity	17.5 % \pm 2.5 %		



SOLAR CELL



SOLAR WAFER

Solar Wafer – 157 mm Square Diamond Wire Saw Multi Crystalline Solar Silicon Wafer (Spec. No. PS- 439 – 407 R01)

TECHNICAL SPECIFICATION

1. MATERIAL : 157 mm Square Diamond Wire Saw Multi Crystalline Solar Silicon wafer

2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
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1.0	APPEARANCE	As cut cleaned	Unaided Visual	Diamond Wire Saw inspection.
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1.1 SURFACE CONDITION

Wafers shall be free from surface stains, water marks, chips, breakages and pin holes.



SOLAR CELL



SOLAR WAFER

Solar Wafer – 157 mm Square Diamond Wire Saw Multi Crystalline Black (MCCE) Silicon Wafer (Spec. No. PS- 439 – 411 R01)

TECHNICAL SPECIFICATION

1. MATERIAL : 157 mm Square Diamond Wire Saw
Multi Crystalline Black (MCCE) Silicon wafer
2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
1.0	Base Wafer	Diamond Wire Saw		Unaided Visual
1.1	Surface Treatment	Metal Catalysed Chemical etching (MCCE) on one side for making it as Black Silicon Wafer		
1.2	Textured Surface Reflectivity	17.5 % \pm 2.5 %		
1.3	SURFACE CONDITION			

Wafers shall be free from surface stains, water marks, chips, breakages and pin holes. MCCE etching done on one side.



SOLAR CELL



SOLAR WAFER

Solar Wafer – 158.75 mm Square Diamond Wire Saw Multi Crystalline Solar Wafer (Spec. No. PS- 439 – 422 R00)

TECHNICAL SPECIFICATION

1. MATERIAL : 158.75 mm Square Diamond Wire Saw
Multi Crystalline Solar Silicon wafer
2. APPLICATION : It is used as starting material for Solar Photovoltaic
cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
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1.0	APPEARANCE	As cut cleaned	Unaided Visual	Diamond Wire Saw inspection
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1.1 SURFACE CONDITION

Wafers shall be free from surface stains, water marks, chips, breakages and pin holes.



SOLAR CELL



SOLAR WAFER

Aluminium Paste (Back)

BACK ALUMINUM PASTE FOR SOLAR CELLS

1. Description: Back side aluminum paste for mono and polycrystalline silicon solar cell wafers. Should be designed to form excellent back surface field, good adhesion properties, lower bowing, no bubbles on sintering and wider process window.
2. Application: For Screen printing (metalization) of back aluminium paste on Silicon Solar Cells.
3. Technical Specifications:

Parameter	Range
1. Viscosity (Hauke, RV 1, Cone: 35/01, $D=12\text{ s}^{-1}$, $T=25^{\circ}\text{C}$)	20 – 50 Pa.s
2. Fineness of Grind	$< 25\text{ }\mu\text{m}$
3. Solid content	73 -80 % mass
4. Rheology	Thixotropic, screen printable paste
5. Appearance	Grey
6. Resistivity	$< 50\text{ m}\Omega\text{m/Sq.}$
7. Bowing on 156.75 mm wafers	$< 1.5\text{ mm}$



Silver Paste (Front)

FRONT SILVER PASTE FOR SOLAR CELLS

1. Description: Front side silver paste for Diamond Wire Saw Multi Crystalline silicon solar cell wafers. Should be designed for excellent electrical features, good aspect ratio, fine grid line printing, high adhesion strength, better ink transfer and wider process window.
2. Application: DWS Multi Crystalline Solar cell screen printing process.
3. Technical Specifications

Parameter	Range
1. Viscosity (Hake, RV-1, Cone 35/91, D-12 s°, T-21 °C)	85-110 Pa.s
2. Fineness of Grind	50% S & L, Average < 30 µm
3. Solid content	90 to 92 % mass
4. Rheology	Thixotropic, screen printable paste
5. Appearance	Silver Grey
6. Resistivity	< 5 mΩ/cm / Sq
7. Finest grid line printing	Suitable for 80 to 55 µm



Silver Paste (Back)

BACK SILVER PASTE FOR SOLAR CELLS

1. Description: back side silver paste for Diamond Wire Saw Multi Crystalline silicon solar cell wafers. Should be designed for excellent electrical features, good aspect ratio, high adhesion strength, better ink transfer and wider process window.
2. Application: DWS Multi Crystalline Solar Cell screen printing process.
3. Technical Specifications:

Parameter	Range
1. Viscosity	50 – 100 Pa.s
2. Fineness of Grind	$< 15 \mu\text{m}$
3. Solid content	50 % mass



PHOSPHOROUS OXYCHLORIDE (POCl_3)

1. ITEM	: PHOSPHOROUS OXYCHLORIDE (POCl_3)
2. APPLICATION	: It is used as a liquid dopant in the Diffusion Furnace for Solar Silicon Wafers.
3. PURITY	: IC GRADE (99.9999 %)
4. FILLED VOLUME	: 1000 CC

NOTE: The above POCl_3 shall be filled in the Quartz Subtler by the supplier.

Quartz Subtler shall include transparent protective coating, Teflon valve (Inlet : 1/4 inch, outlet : 3/8 inch), can and shipping container.



Alkaline Additive

TEXTURIZATION ADDITIVE FOR DWS WAFERS

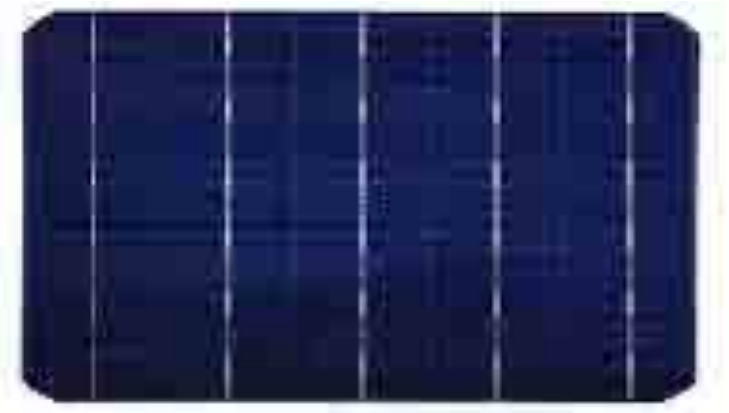
1. Application: As additive chemical for texturization of multi-crystalline DWS (Diamond Wafer-Sawn) solar silicon wafers.

PV Solar Cells

- Solar cell are used for manufacture of Solar Photovoltaic modules for terrestrial applications.
- Solar cells convert sunlight into electricity and are a source of Renewable energy for protecting the environment from pollution. Solar cells are manufactured from Silicon wafer which further processed viz., Texturisation, p-n Junction formation by Diffusion process, Junction removal, Screen printing of grid pattern and contacts.
- The Silicon Solar cells are generally standard size of 157 mm, 158.75 mm, 161 mm & 210 mm, and thickness of 180 - 220 microns. The SPV cells comes with different Bus-bar arrangement viz., Five & Multi Bus-bar & contacts.
- Cell shall be 100% PID Resistant
- Cell wattage from 4.67 Wp for Multi / Poly & Cell wattage from 5.22 Wp for MonoPERC with 5BB



Multi / Poly

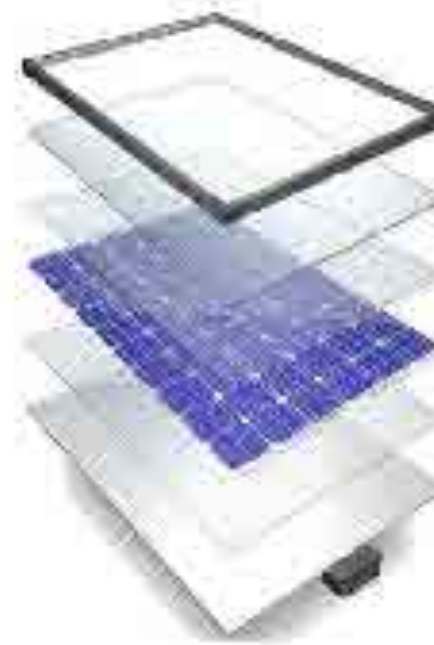


MonoPERC)

Anodized Aluminium Frames

- Aluminium frame with Corner block are used for framing of solar module laminates for Mechanical support. The basic material used is Aluminium alloy is extruded to desired section as per the drawing. These are further fabricated as per the drawing and Anodized to 15 to 20 microns thick to protect from corrosion and provides aesthetic look. This Aluminium frame deployed outside environment when the Solar Photovoltaic Modules are exposed to the sun radiation.
- The Aluminum frame with Corner block are supplied in multiples in sets. The standard size with Longer member ~2000mm, Shorter member – 1000mm and overall height of 35 – 50 mm.
- Total Requirement per Annum : **531250 Nos**

PV Module Components



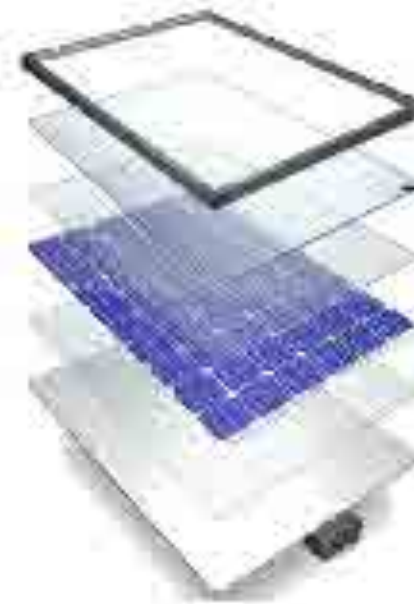
• Aluminium Frames & Corner Block:

- 1) Dimension: 1992 mm x 35mm x 25 mm
- 2) Composition: Aluminium Extrusion

Anti-Reflection Coating (ARC) Glass

- Anti-Reflection coated, Toughened glass for PV Modules – 3.2 and 4.0mm thick
- Item: Anti-Reflection (AR) coated, Toughened glass for PV Modules
- Purpose: For lamination of solar cells in the PV Module manufacturing process
- Anti-Reflection (AR) coated, Toughened glass with a size of 1960x980x3.2 / 4.0 mm is used for lamination of Solar cells in the Photovoltaic module manufacturing process. It acts as a superstrate and allows higher light transmission into the solar cells for maximizing power output from the solar cells. The lamination of solar cells with glass protect the solar cells from outside environment like UV and moisture when the photovoltaic modules are exposed to the sun radiation and provide structural strength.
- Anti-Reflection coated glass is also known as toughened glass required for manufacture of Photovoltaic (PV) modules.
- Total Requirement per Annum : **531250 Nos**

PV Module Components



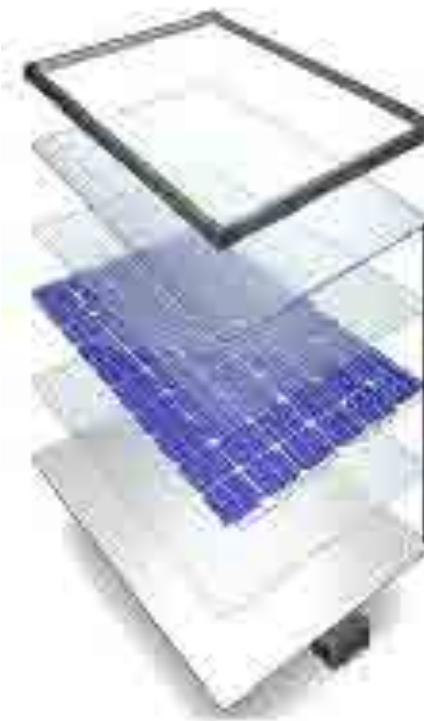
• ARC Glass:

- 1) Dimension: 1960 mm x 980mm x 3.2mm
- 2) Weight: 14.5 Kg
- 3) ARC (TiO₂) Coated

Polymer Back sheet

- **Back Sheet for Solar Photovoltaic Module :**
- Back sheets are used for lamination of Solar cells (Solar Photovoltaic modules) with glass as superstrate and PV module back sheet as substrate. The back sheets melt at a lamination cum curing temperature of over 140 Deg. C and forms a bonding of solar cells with glass and back sheets. This lamination with back sheet protect the solar cells from outside environment like UV and moisture when the photovoltaic modules are exposed to the sun radiation.
- The Back sheet are available in required widths in roll form with thickness of 300 microns. Total Requirement per Annum : **2125000 Sq.M**

PV Module Components



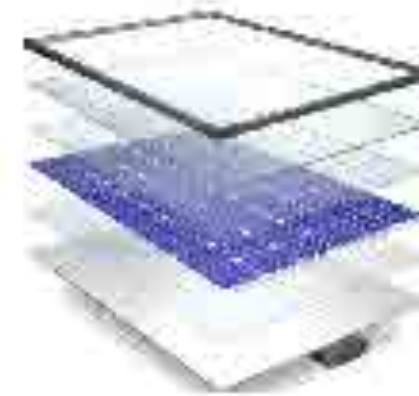
• Back Sheet:

- 1) Dimension: 985 mm x 0.34 mm
- 2) Composition: PET

Ethylene Vinyl Acetate (EVA)

- **EVA (ETHYLENE VINYL ACETATE) SHEETS :**
- EVA sheets are used for lamination of Solar cells (Photovoltaic modules) with glass as superstrate and PV module back sheet as substrate. The EVA sheets melt at a lamination cum curing temperature of over 140 Deg. C and forms a bonding of solar cells with glass and back sheets. This lamination with EVA sheets protect the solar cells from outside environment like UV and moisture when the photovoltaic modules are exposed to the sun radiation.
- The EVA sheets are available in required widths in roll form, the visual thickness of 0.4 – 0.5 mm.
- Total Requirement per Annum(include both side) : **2125000 Sq.M**

PV Module Components



- **EVA Sheet (Front):**
- 1) Dimension: 980mm x 0.45 mm
- 2) Composition: Ethylene Vinyl Acetate sheet

PV Module Components



- **EVA Sheet (Back):**
- 1) Dimension: 978 mm x 0.45 mm
- 2) Composition: Ethylene Vinyl Acetate sheet

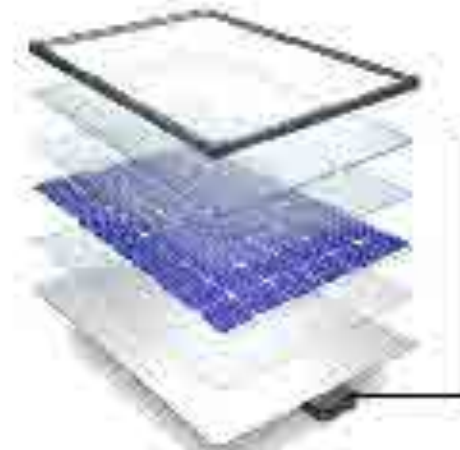
Junction Box

JUNCTION BOX FOR SOLAR PHOTOVOLTAIC MODULE (SPV)

- Junction box for electric connection of bus bar on Solar Photovoltaic Module (SPV) with By-pass diodes. The box is mounted to the SPV module with Silicone Adhesive having optimized structure and effective anti-aging performance. The box is high degree protection for dustproof and severe weather resistance.
- The box will stand long-term UV, Ozone resistance and moisture when the Solar Photovoltaic Modules are exposed to the Sun radiation.
- The Junction box are available in Assembled kit form having Junction box, Cable duly mounted with Connector.

Total Requirement per Annum : **531250 Nos**

PV Module Components



• Junction Box:
11 IP-67, 1.0 kV, 15 A



Cell Interconnect

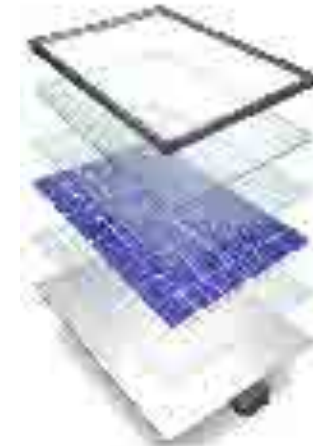
ITEM DESCRIPTION: SPV INTERCONNECTS

Three types of SPV Interconnects are used for during soldering of Silicon Solar cells to form interconnection strings in the Solar Photovoltaic Module manufacturing process.

SPV Interconnects is manufactured with “**Electrolytic Tough Pitched Copper**” as basic material and coated with 16 to 25 microns of Tin : Lead : Silver (62:36:2) for easy solderability during interconnection Silicon Solar cells.

Total Requirement per Annum : **129 MT**

PV Module Components



- Cell Interconnect:
- 1) Dimension: 1mm x 0.25 mm
- 2) Composition: FTP Coated (Coated with Lead and Tin)



BHEL support for Development of Suppliers



24x7 Online portal for registration

- Simple registration form
- Timebound evaluation



Product development support

- Drawings, specifications
- Tooling



Hand holding with R&D and type testing



No LD/ penalty for developmental orders

BHEL support for MSMEs

MSMEs



PURCHASE PREFERENCE

As per Public Procurement Policy and MSMED ACT

ITEM PREFERENCE

358 items currently reserved for MSEs. When developed, items being imported can also be added to this list.

BILL DISCOUNTING

Payments through **TReDS** platform extended to all MSMEs

- RXIL Limited
- Invoice Mart
- M1Xchange

INTERACTIONS

Regular supplier meets.

BENEFITS

- EMD waived
- No elimination in RA
- Relaxation in prior experience and prior turnover to MSEs
- Time bound payments

BHEL support for Start-ups



BENEFITS

**Relaxation in prior
experience and turnover**



STARTUP RUNWAY

**BHEL is tendering its
requirements on GeM
wherein Startups can
supply goods as per the
Startup Runway on GeM**

BHEL SBD extend their support for the development of the Local Vendors for our product range and expect co-operation from all the vendors.

**Together WE can build the
AATMANIRBHAR BHARAT
in all respect !**



“Thank You”

