

ANNEXURE-II

SCOPE & SKILL MATRIX OF JOB CONTRACT FOR MATERIAL HANDLING & ASSISTANCE IN MANUFACTURING OF SPV MODULES

SI No	Main Activity/ Equipment Station	Activities/ Scope of Work	Rated/ Expected output per shift	Estimated Qty to be Transported			Desired Skill Level	Number of workmen proposed for deployment
				Unit	Per Shift	Per Day		
1	Transportation of raw materials:		Nos of SPV Modules					Per Shift
1.01	Cells to Tabber & Stringer	<ol style="list-style-type: none"> 1. Unloading and unpacking from larger pallets / cartons. 2. Stack the unit boxes / packings as required onto transportation trolleys 3. Transport and place near the tabber & stringers. 4. Bring back the empty boxes, packing material and broken cells from the shop. 5. Dispose the packing material, broken cells and other material as per the directions. 	697 panels	Boxes	539	1616	Unskilled workers	
1.02	Interconnects to Tabber & Stringer	<ol style="list-style-type: none"> 1. Unpacking from larger pallets / cartons / packed boxes. 2. Stack the spools as required onto transportation trolleys 3. Transport and place near the tabber & stringers. 4. Bring back the empty spools from the shop. 5. Dispose the spools, packing material and other material as per the directions. 		Kg.	27	81.4	Unskilled workers	
1.03	Flux to Tabber & Stringer	<ol style="list-style-type: none"> 1. Unpacking from larger pallets / cartons. 2. Carry the unit tanks as required for the tabber & stringers. 3. Topup the liquid solder flux in the tabber & stringers 4. Dispose the empty cans, packing material and other material as per the directions. 		Ltr.	14	42	Unskilled workers	
1.04	ARC Glass to glass loading station	<ol style="list-style-type: none"> 1. Unload the glass pallet from the storage racks. 2. Remove the wooden packing in the top and sides 3. Clear off all the broken wooden pieces, debris and dirt. Dust off the glass pallet. 4. Transport the glass pallet into the shop using electric fork lift / stacker. 5. Position the glass pallet in the glass loading equipment. 6. Bring back the used pallet and interleaving paper. 7. Dispose the wooden pallet, interleaving paper, broken glass and other material as per the directions. 		No.	733	2200	Unskilled workers	
1.05	EVA to EVA cutting & layup station	<ol style="list-style-type: none"> 1. Unload the EVA rolls from the AVRS. 2. Stack on the trolleys and transport to the shop. 3. Unpack the vacuum packing of each roll and load onto the machine. 4. Bring back the used roll tube, packing material and cut waste EVA 5. Dispose the packing material, cut waste EVA and other materials as per directions. 		Roll	15	44	Unskilled workers	

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1.06	Cutting of EVA & Backsheet manually at layup station	<ol style="list-style-type: none"> 1. Unload the EVA & Backsheet rolls from the AVRS and storage racks. 2. Stack on the trolleys and transport to the shop. 3. Unpack the vacuum packing of each roll at a time and load onto the machine. 4. Cut the EVA and Backsheet as per the requirement and direction. 5. Transport the cut sheets to the layup station and stack as per the requirement. 6. Bring back the used roll tube, packing material and cut waste EVA 7. Dispose the packing material, cut waste EVA and other materials as per directions. 		Roll	15	44	Unskilled workers	
1.07	Bus bar	<ol style="list-style-type: none"> 1. Unload the Bus-bar spools from the racks & packing 2. Load the spools to bus-bar cutting machine and cut as per the length 3. Bend the bus bars using the jigs & fixtures as per the drawing & directions. 4. Stack the cut & bent bus bars into trays as required. 5. Transport the trays to bussing station 6. Bring back the empty trays from bussing station. 7. Dispose the used spools, cut bus bars and other materials as per directions. 		Kg.	33	98	Unskilled workers	
1.08	Cell alignment tape	<ol style="list-style-type: none"> 1. Unload and unpack the cell alignment tape rolls from the racks. 2. Unpack the rolls as required, stack the cut tapes in trays and transport to the bussing and layup stations. 4. Bring back the used trays from the bussing & layup station. 5. Dispose the packing material and used spools as per directions. 		Roll	11	33	Unskilled workers	
1.09	Insulation sheet for PV Module	<ol style="list-style-type: none"> 1. Unload and unpack the insulation sheet rolls from the racks. 2. Unpack each of the roll at a time and cut the tapes as per the drawing and requirement. 3. Stack the cut tapes in trays and transport to the bussing and layup stations. 4. Bring back the used trays from the bussing & layup station. 5. Dispose the packing material and waste tape material as per directions. 		Sq. Mtr.	23	70	Unskilled workers	
1.10	JB	<ol style="list-style-type: none"> 1. Unload and unpack the Junction boxes from the carton / pallets from the racks. 2. Unpack each of the box, connect the box housing with the cable connectors. 3. Stack in the containers as required for the shift / day and transport to the shop. 4. Bring back the used containers 5. Dispose the packing material, rejects and other waste material as per directions. 		No.	733	2200	Unskilled workers	

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1.11	Frame with corner block 35 mm	<ol style="list-style-type: none"> 1. Unload and unpack the Aluminum frames from the carton / pallets from the racks. 2. Match the long edge and short edge in equal quantity and bundle. 3. Transport the bundles as required for the shift / day and transport to the shop. 4. Dispose the packing material, rejects and other waste material as per directions. 		Set	733	2200	Unskilled workers	
1.12	Silicone adhesive for JB	<ol style="list-style-type: none"> 1. Unload and unpack the adhesive drum from the pallets on the racks. 2. Open the seal and prepare for fixing the suction cap. 3. Transport the container drum as required for the shift / day to the shop. 4. Bring back the used container drums. 5. Dispose the used container drum and other waste material as per directions. 		Tube	128	385	Unskilled workers	
1.13	Silicone adhesive for framing	<ol style="list-style-type: none"> 4. Bring back the used container drums. 5. Dispose the used container drum and other waste material as per directions. 		Kg.	99	297		
1.14	Sl. No. sticker	<ol style="list-style-type: none"> 1. Unload and unpack the stickers and tags from the cartons / pallets on the racks. 2. Open the individual containers as needed for the day / shift. 		No.	733	2200	Unskilled workers	
1.15	RFID tag	<ol style="list-style-type: none"> 3. Stack in the identified boxes and transport to the shop and place in the designated places. 		No.	733	2200		
1.16	Rating sticker	<ol style="list-style-type: none"> 4. Bring back the used boxes and wastes / rejects. 5. Dispose the containers / boxes and other waste material as per directions. 		No.	733	2200		
2	Auto glass loading and Auto EVA Cutting & layup station.	<ol style="list-style-type: none"> 1. Alignment and placement of glass stack beneath auto glass loading gantry. 2. Removal of debris and displaced glass and interleaving paper sheets. 3. Assist in loading of EVA roll onto the auto EVA cutting and layup station. 4. Cleaning and upkeep of the glass loading and EVA cutting and layup station and surroundings. 					Skilled Workers	
3	Tabber-Cum-Stringer	<ol style="list-style-type: none"> 1. Unpacking of the individual solar cell boxes, remove the vacuum seal and carefully stack cells from 2 boxes into the Tabber & Stringer cassette. 2. Keep the spare cassettes always loaded for feeding into the machine. 3. Unpack the ribbon spools from the packing. 4. Assist in loading the spools into the machine for replacing the spent spools. 5. Assist in soldering, alignment and setting of old interconnect to the new interconnect strings. 6. Cleaning and upkeep of the tabber & stringers and surroundings. 					Skilled Workers	
4	Robotic Layup Station	<ol style="list-style-type: none"> 1. Periodic removal of reject strings and transportation to string repair table. 2. Carry out string repairs at string repair table 3. Transportation of repaired strings and placement in the pickup tray. 4. Removal of debris and broken PV Cells and in the robotic layup area, pack / stack and dispose as per directions. 5. Cleaning and upkeep of robotic layup area and surroundings. 					Skilled Workers	

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5	Bussing Station	<ol style="list-style-type: none"> 1. Checking the layup for proper alignment and spacing. 2. Securing the strings with cell alignment tapes 3. Sticking the RFID tag and SI No. bar-code sticker, 4. Setting the cell interconnect and string interconnect with the help of designated jig & fixture. 5. Insertion of intermediate insulation sheet 7. Cutting of excess interconnects. 8. Soldering of cell interconnect to string interconnect 9. Checking the completed panel and forwarding to the next station. 10. Rework observed if any, divert the panel for repair station for repair and re-introduce in the line. 11. Other supportive and sundry activities for bussing operation. 					Skilled technicians - preferably electronic mechanics, electricians.	
6	Second Lay-up : EVA	<ol style="list-style-type: none"> 1. Layup the second EVA sheet 2. Take out the bus-bar terminals through the die cut 3. Check for the alignment of the EVA sheet, correct if required and forward to the next station. 					Skilled Workers	
7	Second Lay-up : Backsheet	<ol style="list-style-type: none"> 1. Layup the back sheet 2. Take out the bus-bar terminals through the die cut 3. Check for the alignment of the backsheet, correct if required and forward to the next station. 					Skilled Workers	
8	Mirror Inspection	<ol style="list-style-type: none"> 1. Check for the alignment of cells and strings 2. Check for the defective cells 3. Check for interconnect grids for, bends, alignment and continuity 4. Check for foreign material. 5. Check for cell color uniformity. 6. Check for proper positioning of barcode sticker, RFID Tag, insulation tape etc. 					Skilled Workers	
9	EL Tester before Lamination	<ol style="list-style-type: none"> 1. Check for the alignment of the panel inside the EL Tester 2. Check for the termination alignment and correct if required. 3. Remove the reject panel for rework 4. Recording of test results digitally/manually 					Semi-skilled workers	
10	Module Laminator	<ol style="list-style-type: none"> 1. Periodic cleaning of laminator belt of molten EVA by careful scraping and removing. 2. Top up of thermic fluid and vacuum pump lubricant as required 3. Cleaning and upkeep of the surroundings of the Laminator. 					Skilled Workers	

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11	Trimming & Framing Station	1. Periodic cleaning and removal of shavings 2. Assist in periodic replacement of trimming blades 3. Loading of sealant drum to the suction equipment 4. Loading of frame elements to the table 5. Regular cleaning of spilled and overflowing sealant. 6. Cleaning and upkeep of the surroundings.					Skilled Workers	
12	JB Assembly Station	1. Placement of Junction Boxes onto the dispensing unit 2. Dispensing the sealant on the junction boxes. 3. Placement of junction box on the module by taking the termination through the junction box. 4. Insertion of the termination through the clips.					Skilled Workers	
13	Module Cleaning and de- burring	1. Cleaning of the module for removal of spilled sealant, dirt and other foreign material. 2. De-burring of the frame edges as required. 3. Cleaning of the Junction Box terminal connections. 4. Forwarding the module for further testing					Semi-skilled workers	
14	Support EL Inspection & IV Tester (Sun Simulator)	1. Check for the alignment of the panel inside the EL Tester & Sun Simulator 2. Check for the termination alignment and correct if required. 3. Remove the reject panel for rework 4. Flash the IV Data onto the RFID Tag.					Semi-skilled workers	
15	Auto Packing	1. Place the pallets with module stack onto the autopacking conveyor. 2. Place the holding strap and tighten. 3. Operate the conveyor and flippers 4. Place the empty carton from the top using pneumatic handling device 5. Remove the metallic pallet and insert wooden pallet 6. Place the lid and close. 7. Operate the conveyor, strapping units and film wrapping machine. 8. Unload the packed carton and transport to the shipment area.					Skilled Workers	
16	Modules to FG Store	1. Transport the packed carton from shipment area to FG store with the help of a forklift. 2. Place the packed carton inside at the entry of FG Store. 3. Bring in fresh pallets and carton stacks for packing operation.					Skilled Workers/ Forklift Driver	
17	FG Store stocking	1. Place the packed carton inside the drive-in racking system as per the module rating and as per the directions, using a fork lift / loading system					Skilled Workers/ Forklift Driver	
18	House Keeping	1. Cleaning & upkeep of SPV shopfloor & office					Unskilled workers	

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19	SUPERVISION	1.Supervising and monitoring the activity of deployed workers at various stations. Observing for the activity for compliance with the issued work instructions and report & correct the deviations if any. Co-ordinate with the BHEL shift supervisors and executives for ensuring the implementation of the instructions. Ensuring the continuity of the work by managing the relieving personnel deployment as required within the shift and during the shift change over. Maintaining the overall work discipline and harmony.					Able to communicate by writing and verbal in English and Kannada and having knowledge of computer for general work.	

NOTE :

1. While BHEL engages the contractor for 2 or more shifts operation, the number of workmen proposed by the contractor shall be proportionately enhanced.
2. The rate quoted shall be per good module output, accordingly when 2 or more shifts operation is engaged, the billing will be for the total number of good module output.