




<b>NAME &amp; ADDRESS OF MANUFACTURER WORKS</b>  APAR INDUSTRIES LIMITED (Unit:Uniflex Cables) Khata No. 1932, Survey No. 82/2 P1, 88, 861/1, 862/1,863/1 , Manekpur Road, Khatalwada , Dist: Valsad, Gujarat-396120  Tel No: 0260 - 2406100 Fax No: 0260 - 2406100 E- Mail: uniflex.works@apar.com			<b>MANUFACTURING QUALITY PLAN</b>					<b>Project :</b> West Bengal Renewable Energy Development Agency, 10 MWP Solar power project,Krishnaganj, Block Bhajanghat, Nadia District West Bengal- 741507.  <b>Customer :</b> M/s LUMINO JUPITER SOLAR FOR WBREDA  <b>PO No. :</b> LUMINO/WBREDA/2019-20/005 DATED : 02-08-2019							
			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 01 of 08									
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
<b>A. RAW MATERIAL</b>															
1	Copper Rod	Tensile strength Elongation Elect. Resistivity	Meas. Meas. Meas.	Phy. Phy. Elect.	Sampling plan AIL/QA/SM PL/01 Table-2			IS:191/ ASTM B49, IEC 60228, Supplier TC	Min. 210 N/mm² Min. 30% Max. 17.241 Ohm mm²/Km Min. 7.8 mm EN spec. EN 50618:2014	Incoming Inspection Report, AIL/QA/RD/02- 13		P P P	V V V	V V V	
2	EB Cross- linked Polyolefin Halogen free ( Moulded sheet)	Diameter Tensile Strength Elongation at break Hot set test Colour	Meas. Meas. Meas. Meas. Visual	Phy. Phy. Phy. Phy. Visual	One Sample Each Lot		EN spec. EN 50618:2014	EN spec. EN 50618:2014	Raw Material Test report AIL/QA/RD/02 104/105	- -	P P P	V V V	V V V		
3	Wooden Drum	Dimension Finishing  Nail protrusion	Meas. Visual  Visual	Phy. Visual  Visual	10% of each lot		RM specification for wooden drum	Product data sheet	Incoming inspection report for cable drum AIL/QA/RD/02 79		P P P	V V V	V V V		
<b>LEGEND:-</b> <u>D*</u> Records identified with tick (p) shall be essentially included by supplier & manufacturer in Quality Documentation package. ** M: Manufacturer / Sub-Supplier, C: Main Supplier, A: Customer their authorized representative. Use the following term as appropriate in columns 10. <b>P:</b> Perform, <b>V:</b> verification and <b>H:</b> Customer Hold Point to be witnessed and work shall not proceeded till it is witnessed and cleared in writing.															
For Manufacturer					For Main Supplier					For QA /FQA					

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APAR INDUSTRIES LIMITED(Unit:Uniflex Cables)  Khata No. 1932, Survey No. 82/2 P1, 88, 861/1, 862/1,863/1 , Manekpur Road, Khatalwada , Dist: Valsad, Gujarat-396120  Tel No: 0260 - 2406100 Fax No: 0260 - 2406100 E- Mail: uniflex.works@apar.com			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 02 of 08			Customer : M/s LUMINO JUPITER SOLAR FOR WBREDA  PO No. : LUMINO/WBREDA/2019-20/005 DATED : 02-08-2019						
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
<b>B. INPROCESS INSPECTION</b>															
1	Wire Drawing	Diameter of wire Surface finish	Meas. Visual	Phy. Visual	One sample Each setting & during process			IEC 60228, GTP	Spec. EN 50618:2014			P P	- -	- -	
2	Annealing	% of Elongation Surface finish	Meas. Visual	Phy. Visual	One sample Each setting & during process			IEC 60228, GTP	Spec. EN 50618:2014	Inprocess Inspection report AIL/QA/RD/03- 17		P P	- -	- -	
3	Tinning	Persulphate test	Meas.	Chemical	One sample Each setting & during process			IEC 60228	Spec. EN 50618:2014			P	-	-	
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APAR INDUSTRIES LIMITED (Unit: Uniflex Cables) Khata No. 1932, Survey No. 82/2 P1, 88, 861/1, 862/1, 863/1, Manekpur Road, Khatalwada, Dist: Valsad, Gujarat-396120  Tel No: 0260 - 2406100 Fax No: 0260 - 2406100 E- Mail: uniflex.works@apar.com			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 03 of 08			Customer : M/s LUMINO JUPITER SOLAR FOR WBREDA  PO No. : LUMINO/WBREDA/2019-20/005 DATED : 02-08-2019						
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
4	Conductor Bunching/ Stranding	No & Diameter of wires  Lay Direction & lay length Diameter Over Conductor D.C resistance	Counting /Meas  Meas. Meas. Meas.	Phy.  Phy. Phy. Elect.	One sample Each setting & during process			IEC 60228, GTP	Spec. EN 50618:2014			P	-	-	
5	Insulation / Sheath	Material Radial Thickness Ovality Overall Diameter Surface Finish	Visual Meas. Meas. Meas. Visual	Visual Phy. Phy. Phy. Visual	One sample Each setting & during process			IEC 60228, GTP	Spec. EN 50618:2014	Inprocess Inspection report AIL/QA/RD/03-17		P	-	-	
6	Electron Beam Cross Linking (EBXL)	Spark Test Tensile strength & Elongation test Hot set & Permanent set test	Counting Meas. Meas.	Elect. Phy. Phy.	100% One sample Each setting & during Bobbin			EN spec. 50618:2014	Spec. EN 50618:2014 Table 4			P	-	-	

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For Manufacturer	For Main Supplier	For QA /FQA
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SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
7	Cable Identification / Printing	Printing Matter Distance between printing	Visu Meas.	Visual Phy.	One sample Each setting & during process			GTP	Spec. EN 50618:2014	Inprocess Inspection report AIL/QA/RD/03-17		P P	- -	- -	
<b>C. TEST ON FINISHED CABLE</b>															
1	Routine Test	Conductor resistance test	Meas.	Elect.	100%	2 drums	2 drums	EN spec. 50618:2014	Spec. EN 50618:2014	Routine Test Report AIL/QA/RD/04-03		P P	W W	W W	
2	Acceptance Test	High Voltage test	Meas.	Elect.				EN spec. 50618:2014	Spec. EN 50618:2014	Acceptance Test Report AIL/QA/RD/04 04		P P	W W	W W	
		Conductor resistance te	Meas.	Elect.								P P	W W	W W	
		Test for thickness of insulation & sheath	Meas.	Phy.								P P	W W	W W	
		Hot set test	Meas.	Phy.								P P	W W	W W	
		Tensile strength & elongation & break for insulation & sheath	Meas.	Phy.								P P	W W	W W	
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06.08.19


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			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 05 of 08									
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
	Continued ---	High voltage test Overall diameter Ovality Sheath Colour Sheath Marking Insulation resistance Flame Propagation test	Meas. Meas. Meas. Meas. Meas. Meas.	Elect. Phy. Phy. Phy. Elect. Phy.	One Sample / Offered Lot / Size / Colour			EN spec. 50618:2014	Spec. EN 50618:2014	Acceptance Test Report AIL/QA/RD/04-04		P P P P P P	W W W W W W	W W W W W W	
3	Type Test <b>Electrical Test</b>	DC resistance test Voltage Test on complete cable Surface resistance of sheath	Meas. Meas Meas	Elect. Elect. Elect.	One Sample Once Per Type			EN spec 50618:2014	Spec EN 50618:2014	Type Test Report AIL/QA/RD/04-02		P P P	V V V	V V V	
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			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 06 of 08									
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
3	Type Test Electrical Test	Insulation resistance (VR) at room temp. & at 90°C	Mea s	Elect.	One Sample Once per Type			EN spec. 50618:2014	EN Spec 50618:2014			P	V	V	
	Constructional & Dimensional Test	DC High Voltage Test	Mea	Elect.						Type Test Report AIL/QA/RD/04- 02		P	V	V	
		Checking of constructional provisions	Mea s	Phy.	One Sample Once per Type			EN spec 50618:2014	EN spec. 50618:2014			P	V	V	
		Measurement of thickness of insulation & Sheath	Mea s	Phy.								P	V	V	
		Overall Diameter	Mea	Phy.								P	V	V	
		Ovality	Mea	Phy.								P	V	V	
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<div style="text-align: right;">  </div>															
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APAR INDUSTRIES LIMITED (Unit: Uniflex Cables) Khata No. 1932, Survey No. 82/2 P1, 88, 861/1, 862/1, 863/1, Manekpur Road, Khatalwada, Dist: Valsad, Gujarat-396120 Tel No: 0260 - 2406100 Fax No: 0260 - 2406100 E- Mail: uniflex.works@apar.com			ITEM: Solar Cable as per Specn. EN 50618:2014			QPNO: AIL/QP/Customer/01 REV.NO.00 DATE: 06/08/2019 PAGE: 07 of 08		Customer : M/s LUMINO JUPITER SOLAR FOR WBREDA PO No. : LUMINO/WBREDA/2019-20/005 DATED : 02-08-2019							
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		INSPECTION AGENCY			REMARKS
					M	C	A				D*	M	C	A	
1	2	3	4	5	6			7	8	9	D*	**10			11
	Type Test continued ----	Sheath Colour Damp heat test Resistance to acid & alkaline solution Compatibility Test Ageing Test Insulation & sheath Cold impact test /Bend test Ozone resistance Weathering/UV resistance test Dynamic penetration test Shrinkage test at complete cable	Visual Meas Meas Meas Meas Meas Meas Meas Meas	Visual Phy. Phy. Phy. Phy. Phy. Phy. Phy. Phy.	One Sample Once per Type			EN spec. 50618:2014	EN spec. 50618:2014	Type Test Report AIL/QA/RD/04-02		P P P P P P P P P	V V V V V V V V V	V V V V V V V V V	

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SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	CATE-GORY OF CHECK#	TYPE OF CHECK	QUANTUM OF CHECK			REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY			REMARKS	
					M	C	A				M	C	A		
1	2	3	4	5	6			7	8	9	D*	**10			11
4	Type Test continued ----	Flame Propagation Test	Meas	Phy.	One Sample Once per Type			EN 60332-1-2	EN Spec 50618:2014	Type Test Report AIL/QA/RD/04-02		P	V	V	
		Test Under fire Conditions (Assesment of Halogens)	Meas	Chem				EN spec. 50618:2014	EN spec 50618:2014			P	V	V	
		Smoke Emission test of complete cable	Meas.	Phy.				EN spec 50618:2014	EN spec 50618:2014			P	V	V	
	Packing/ Marking / End Sealing	Printing Matter Stenciling on Box/Drum	Meas. Meas.	Visual Visual	100%			GTP / EN spec 50618:2014	GTP / EN spec 50618:2014	Packing Check list	P P	- -	- -		
		End Sealing	Meas.	Visual							P	-	-		

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MANUFACTURER'S NAME & ADDRESS			MANUFACTURING QUALITY PLAN			LEGENDS :					
<div>APAR INDUSTRIES LTD (UNIT : UNIFLEX CABLES) Plot:158-163, GIDC, Umbergaon, Gujarat email: rk.pawar@apar.com</div> <div> </div>			ITEM : LT PVC Insulated,PVC Inner sheathed,Round or strip armoured & FR-LSH outer sheathed cable Name of consultant : Name of CONTRACTOR Name of customer :M/s LUMINO JUPITER SOLAR FOR WBREDA  PO NO : LUMINO/WBREDA/2019-20/005, DATED : 02-08-2019			QAP NO.: AIL/QAP/LT-LUMINO-01  REV. NO. 00 DATE : 06.08.19  IS: 1554 PART 1					
			Project Location :West Bengal Renewable Energy Development Agency, 10 MWP Solar power Block Bhajanghat, Nadia District West Bengal- 741507,								
Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING AGENCY			Remarks
								M	C	A	
1	2	3	4	5	6	7	8	9			
A.	RAW MATERIALS										
1.	ALUMINIUM ROD/COPPEER ROD	a) Make	Maj.	visual	100%	Factory Standard	Reg./Sheet	P			P = Perform
		b) Resistivity at 20°C	Maj.	Elec.	AQL 4 %S'3' (IS:2500-1)	IS 613-2000/ IS 5484-1997	Reg./Sheet	P			R = Review
		c) Diameter	Maj.	Phy.	-----DO-----	IS 613-2000/ IS 5484-1997	Reg./Sheet	P			V = Verify
		d) Tensile strength ( for AL only)	Maj.	Phy.	-----DO-----	IS 613-2000/ IS 5484-1997	Reg./Sheet	P			W = Witness
		e) Elongation (for Cu only)	Maj.	Phy.	-----DO-----	IS 613-2000	Reg./Sheet	P			
		f) Chemical composition	Maj.	CHEM	SUPPLIER CERTIFICATE	SUPPLIER CERTIFICARE	S.C.	R			
		g) Surface finish	Maj.	visual	AQL 4 %S'3' OF IS 2500 Part 1	Factory Standard	Reg./Sheet	P			
2.	PVC COMPOUND FOR INSULATION	a) Make	Maj.	Visual	100%	Factory standard	Reg./sheet	P			
		b) Type/Grade	Maj.	Visual	100%	Factory Standard	Reg./Sheet	P			
		c) Volume & surface resistivity	Maj.	Ele	AQL 4 %S'3' OF IS 2500 Part 1	IS : 5831-1984	Reg./Sheet	P			
		a) Thermal stability	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS : 5831-1984	Reg./Sheet	P			
		b) specific Gravity	Maj.	Phy.	S.C.	Factory Standard	S.C.	P			
		c) Tensile strength and Elongation	Maj.	Phy.	AQL 4 %S'3' OF IS 2500 Part 1	IS : 5831-1984	Reg./Sheet	P			
3	PVC COMPOUND FOR INNER SHEATH	a) Make	Maj.	Visual	100%	Factory standard	Reg./sheet	P			
		b) Type/Grade	Maj.	Visual	100%	Factory Standard	Reg./Sheet	P			
		C) Thermal Stability	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS : 5831-1984	Reg./Sheet	P			
		D) Tensile strength and Elongation	Maj.	Phy.	AQL 4 %S'3' OF IS 2500 Part 1	IS : 5831-1984	Reg./Sheet	P			
4	STEEL WIRE /STRIP ARMOUR	a) Make	Maj.	Visual	100%	Factory standard	Reg./sheet	P			
		b) Dimensions	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-36	Reg./Sheet	P			
		c) Tensile strength & elongation test	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-37	Reg./Sheet	P			
		d) Torsion test for round wire	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-38	Reg./Sheet	P			
		e) Winding test for formed wires	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-39	Reg./Sheet	P			
		f) Uniformity of Zinc coating	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-40	Reg./Sheet	P			
		g) Mass of Zinc coating	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-41	Reg./Sheet	P			
		h) Resistivity test	Maj.	Phy.	AQL 4 %S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-42	Reg./Sheet	P			
		d) Chemical composition	Maj.	CHEM	SUPPLIER CERTIFICATE	SUPPLIER CERTIFICATE / IS:3975:1999	SC	R			

  
 06.08.19

Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING AGENCY			Remarks
								M	C	A	
1	2	3	4	5	6	7	8	9			
4	<b>FR-LSH PVC COMPOUND FOR OUTERSHEATH</b>	a) Thermal Stability	Maj.	Phy.	AQL 4 %'S'3' (IS:2500-1)	IS : 5831-1984	Reg./Sheet	P			
		b) T.S. & Elongation	Maj.	Phy.	-----DO-----	IS : 5831-1984/IS:10810: Pt-7	Reg./Sheet	P			
		c) specific gravity	Maj.	chem	AQL 4 %'S'3' (IS:2500-1)	IS : 5831-1984/factory standard	Reg./Sheet	P			
		d) Oxygen Index/Temperature index Test	Maj.	FRLS	AQL 4 %'S'3' (IS:2500-1)	IS:1554-1/IS : 10810: Pt-58/ASTM D 2863	Reg./Sheet	P			
		e) Test for specific optical density of smoke	Maj.	FRLS	AQL 4 %'S'3' (IS:2500-1)	ASTM D 2843	Reg./Sheet	P			
		f) Test for halogen acid gas evolution	Maj.	FRLS	AQL 4 %'S'3' (IS:2500-1)	IS:1554-1/IS:10810: Pt-59/IEC-60754-1	Reg./Sheet	P			
B.	<b>IN PROCESS</b>										
1.	<b>WIRE DRAWING</b>	a) Diameter of Wire	Maj.	Phy.	10% OF A LOT	IS:8130-1984	Reg./Sheet	P			
		b) Surface Finish	Maj.	Vis.	100%	Smooth Surface	--	P			
		c) Tensile Strength(FOR Al only)	Maj.	Phy.	10% OF A LOT	IS:8130-1984/IS:10810-2	Reg./Sheet	P			
		d) Elongation at break/Annealing (for CU only)	Maj.	Phy.	10% OF A LOT	IS:8130-1984/IS:10810-1	Reg./Sheet	P			
		e) Wrapping Test (forAl only)	Maj.	Phy.	10% OF A LOT	IS:8130-1984/IS:10810-3	Reg./Sheet	P			
2.	<b>STRANDING</b>	a) Dia/ number of strand	Maj.	Count	At the time of M/C setting	IS:8130/84, T.P., F.S	Reg./Sheet	P			
		b) Lay Length	Maj.	Phy.	-----DO-----	Factory Standard	Reg./Sheet	P			
		c) Direction of lay	Maj.	Phy.	-----DO-----	Factory Standard	Reg./Sheet	P			
		d) Conductor Resistance at 20°C	Maj.	Elec.	-----DO-----	IS:7098-1/IS:8130-1984/IS:10810:Pt-5	Reg./Sheet	P			
		e) Surface Appearance	Min.	Vis.	100%	No. surface defects	----	P			
		f) Dia/ depth of conductor	Maj.	Phy.	once in each shift	Factory Standard	Reg./Sheet	P			
		g) Records of strand breakage/welding	Maj.	Phy.	once in each shift	Factory Standard	Reg./Sheet	P			
3	<b>INSULATION (PVC)</b>	a) Radial Thickness & concentricity	Maj.	Phy.	During m/c Setting after atabilisation	IS:1554(I)1988, IS:10810:Pt-6	Reg./Sheet	P			
		b) Thermal stability Test	Maj.	Phy.	ONE SAMPLE EACH DRUM	IS:5831 - 1984	Reg./Sheet	P			
		c) T.S. & Elongation	Maj.	Phy.	During M/c Setting after atabilisation	IS:1554(I)1988/IS : 10810-7	Reg./Sheet	P			
		d) Colour of insulation	Maj.	Vis.	100%	IS:1554(I)1988	Reg./Sheet	P			
		e) Spark test	Maj.	Elec.	100%	Factory Standard	Reg./Sheet	P			
		f) Shrinkage test	Maj.	Phy.	One sample per Size	IS:7098(I)1988/IS:10810-12	Reg./Sheet	P			
		b) Surface Finish	Min	Vis.	100%	Surface shall be smooth	----	P			
3	<b>LAYING-UP</b>	a) Direction of lay	Maj.	Vis.	During m/c Setting after atabilisation	IS:1554(I)1988	Reg./Sheet	P			
		b) Diameter ove laid-up core	Maj.	Phy.	During m/c Setting after atabilisation	Factory Standard	Reg./Sheet	P			
		c) Lay length	Maj.	Phy.	During m/c Setting after atabilisation	Factory Standard	Reg./Sheet	P			
4	<b>INNER-SHEATH</b>	a) Radial Thickness	Maj.	Phy.	During m/c Setting after atabilisation	IS:1554(I)1988, IS:10810:Pt-6	Reg./Sheet	P			
		b) Diameter over inner sheath	Maj.	Phy.	During m/c Setting after atabilisation	Factory Standard	Reg./Sheet	P			
		c) Surface Finish	Min	Vis.	100%	Surface shall be smooth	----	P			



06.03.19

Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING AGENCY			Remarks
								M	C	A	
1	2	3	4	5	6	7	8	9			
5	<u>ARMOURING (GI wire / strips)</u>	a) Dimension of wires/ strips	Maj.	Phy.	During m/c setting	IS:1554(I) ,T.P.S	Reg./Sheet	P			
		b) No. of Wires/Strips	Min	Count	-----DO-----	Factory standard	Reg./Sheet	P			
		c) Direction of Lay	Maj.	Vis.	-----DO-----	IS:1554(I):1988	Reg./Sheet	P			
		d) Coverage / Quality of armour	Maj.	Phy.	-----DO-----	IS:1554(I):1988	Reg./Sheet	P			
		e) Diameter over armouring	Maj.	Phy.	During m/c Setting after atabilisation	Factory standard	Reg./Sheet	P			
		f) Conductor resistance test corrected at 20°C	Maj.	Elect	100%	IS:1554(I)1988/IS:8130/1984/IS:10810-5	Reg./Sheet	P			
		g) Insulation resistance(Volume resistivity)test	Maj.	Elect	100%	IS:1554(I)1988/IS:10810-43	Reg./Sheet	P			
		h) High voltage test	Maj.	Elect	100%	IS:1554(I)1988/IS:10810-45	Reg./Sheet	P			
6	<u>PVC SHEATHING (FR-LSH)</u>	a) Radial Thickness	Maj.	Phy.	During m/c setting & once in each shift	IS:1554(PT-2)1985, IS:10810-6	Reg./Sheet	P			
		b) Overall Diameter	Maj.	Phy.	-----DO-----	T.P.S.	Reg./Sheet	P			
		c) Surface Appearance	Maj.	Vis.	100%	Surface shall be smooth	----	P			
		d) Embossing	Maj.	Vis.	During m/c setting	IS:1554(PT-1)1988, T.P.S.	Reg./Sheet	P			
		e) Clour of sheath	Maj.	Vis.	During m/c setting	IS:1554(PT-1)1988, T.P.S.	Reg./Sheet	P			
		f) T.S. & Elongation	Maj.	Phy.	During M/c Setting after atabilisation	IS:1554(I)1988/IS : 10810-7	Reg./Sheet	P			
		g) Shrinkage test	Maj.	Phy.	During m/c setting	IS:1554(I)1988/IS:10810-12	Reg./Sheet	P			
		h) Thermal stability	Maj.	Phy.	During m/c setting	IS : 5831-1984	Reg./Sheet	P			
		i) Oxygen index & temperature index test	Maj.	FRLS	During m/c setting	IS:1554(I)1988/IS:109810-58	Reg./Sheet	P			
		j) Halogen acid gas generation test	Maj.	FRLS	During m/c setting	IS:1554(I)1988/IS:10810-59	Reg./Sheet	P			
		k) Smoke density test on cube sample	Maj.	FRLS	Cube cut from Outer Sheath of one sample	ASTM D 2843	Reg./Sheet	P			
C.	<u>FINAL CABLE TESTING</u>					IS:1554(I) ,T.P.S					
1.	<u>ROUTINE TEST</u>	a) Conductor Resistance Test at 20°C	Maj.	Elec.	100%	IS : 8130-1984/IS:10810-5	Reg./Sheet	P		V	
		b) High Voltage Test at room temperature	Maj.	Elec.	100%	IS:1554(I)1988/IS:10810-45	Reg./Sheet	P		V	
2.	<u>TYPE TEST</u>	The manufacturer shall conduct internal type tests and and reports will be submitted to party.									
	A) Test on Conductor	a) Conductor Resistance at 20°C	Maj.	Elec.	One sample per Size	IS : 8130-1984/IS:10810-5	TTC	P		V	
		b) T.S. & wrapping (before stranding) for Aluminium conductor only	Maj.	Mech.	One sample per Size	IS : 8130-1984/IS:10810-2&3	TTC	P		V	
		c) Annealing (before stranding) for Copper only	Maj.	Maj.	One sample per Size	IS : 8130-1984/IS:10810-1	TTC	P		V	
	Test on PVC Insulation	a) Insulation Resistance Test	Maj.	Elec.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-43	TTC	P		V	
		b) Test for thickness of Insulation	Maj.	Phy.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-6	TTC	P		V	
		c) T.S. & Elong before & after ageing	Maj.	Mech.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-7	TTC	P		V	
		d) Loss of mass in Air Oven	Maj.	Mech.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-10	TTC	P		V	
		e) Variation in T.S & E.B	Maj.	Mech.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-11	TTC	P		V	
		f) Hot Deformation	Maj.	Phy.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-15	TTC	P		V	
		g) Heat Shock Test	Maj.	Phy.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-14	TTC	P		V	
		h) Shrinkage Test	Maj.	Ther	One sample per Size	IS:1554 Pt-1/1988/IS:10810-12	TTC	P		V	
		i) Thermal Stability Test	Maj.	Ther	One sample per Size	IS: 5831-1984	TTC	P		V	
	Test on armour (Wire / Strip )	a) Dimension of wires/ strips	Maj.	Phy.	One sample per Size	IS : 3975 : 19999/IS:19810-36	TTC	P		V	
		b) Tensile strength & elongation	Maj.	Mech.	One sample per Size	IS : 3975 : 19999/IS:19810-37	TTC	P		V	
		c) All acceptance test as per IS :3975:1999	Maj.	Phy/Elec & Chem	One sample per Size	IS : 3975 : 19999/IS:10810	TTC	P		V	

Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING AGENCY			Remarks
								M	C	A	
1	2	3	4	5	6	7	8	9			
	Tests on Sheath (FR-LSH)	a) Thickness of sheath	Maj.	Phy.	One sample per Size	IS:1554 Pt-1/IS:10810-6	TTC	P		V	
		b) T.S. & Elong before & after ageing	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-7	TTC	P		V	
		c) Variation in T.S & E.B	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-11	TTC	P		V	
		d) Shrinkage	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-12	TTC	P		V	
		e) Hot Deformation	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-15	TTC	P		V	
		f) Loss of mass in Air Oven	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-10	TTC	P		V	
		g) Heat Shock Test	Maj.	Phy.	One sample per Size	IS:5831-1984/IS:10810-14	TTC	P		V	
		h) Thermal Stability Test	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		i) Flammability Test	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-53	TTC	P		V	
		j) Flammability Test on Single cable	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-61	TTC	P		V	
		k) Flammability test on bunched cable	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-62	TTC	P		V	
		l) Oxygen index	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-58	Reg./Sheet	P		V	
		m) Halogen acid gas generation test	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-59	Reg./Sheet	P		V	
		n) Test for specific optical density of smoke	Maj.	FRLS	Cube cut from Outer Sheath of one sample	ASTM D 2843	Reg./Sheet	P		V	
		o) Smoke density	Maj.	FRLS	One sample per Size	IS : 1554-1/IS:10810Pt-63	Reg./Sheet	P		V	
		p) Temperature index test	Maj.	FRLS	One sample per Size	ASTM D 2863	Reg./Sheet	P		V	
		q) High Voltage Test	Maj.	Elec.	One sample per Size	IS:1554 Pt-1/1988/IS:10810-45	TTC	P		V	
	Additional Special Tests	i) UV RADIATION TEST	Maj.	ENVIR.	-----do-----	Factory Standard	TTC	P		V	
		ii) Anti-Termite & Rodent repulsion Test on outer sheath	Maj.	Chem	-----do-----	Factory Standard	TTC	P		V	
3.	<u>ACCEPTANCE TEST</u>										
	A) Electrical	a) Conductor Resistance test 20°C	Maj.	Elec.	IS:1554 Pt-1/1988	IS : 8130-1984/10810-5	INSPECTION	P		W	
		b) High Voltage Test	Maj.	Elec.	IS:1554 Pt-1/1988	IS:1554 Pt-1/1988/10810-45	----- DO -----	P		W	
		c) Insulation Resistance Test	Maj.	Elec.	IS:1554 Pt-1/1988	IS:1554 Pt-1/1988/10810-43	----- DO -----				
	B) Non-Electrical	d) Thickness of Insulation and Outer Sheath	Maj.	Phy.	IS:1554 Pt-1/1988	IS:1554 Pt-1/1988/10810-6	----- DO -----	P		W	
		e) Tensile Strength & Elongation at break for insulation & Sheath	Maj.	Phy.	IS:1554 Pt-1/1988	IS:1554 Pt-1/1988/10810-7	----- DO -----	P		W	
		f) Dimensions	Maj.	Phy.	IS:1554 Pt-1/1988	IS:1554 Pt-1/1988	----- DO -----	P		W	
	C) FRLS Test	a) Oxygen index	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-58	INSPECTION	P		W	
		b) Halogen acid gas generation test	Maj.	FRLS	One sample per Size	IS : 1554-1/IS 10810Pt-59	INSPECTION	P		W	
		c) Test for specific optical density of smoke	Maj.	FRLS	Cube cut from Outer Sheath of one	ASTM D 2843	INSPECTION	P		W	
		d) Smoke density	Maj.	FRLS	One sample per Size	IS : 1554-1/IS:10810Pt-63	INSPECTION	P		W	
		e) Temperature index test	Maj.	FRLS	One sample per Size	ASTM D 2863	INSPECTION	P		W	
5	<u>PACKING &amp; MARKING</u>	a) Cable end sealing	Maj.	Vis.	100 %	F.S. & IS : 1554 (I)1988	--	P		--	
		b) Stencilling/Marking	Min.	Vis.	100 %	F.S. & IS : 1554 (I)1988	--	P		--	

Note :  
1) Tests at Raw Material stage, in-process stage and during final inspection shall be carried out as applicable to the construction of cables.  
Abbreviations used in the above quality plan are as under.

Legends / Abbreviations used in the above quality plan are as under.

M= MANUFACTURER / SUB-SUPPLIER

C: CLIENT / OWNER

A: Third party / Client

F.S.- Factory Standard

Min - Minor Elec- Electrical

Maj.-Major Vis - Visual

Chem -- Chemical

Reg -- Register

S.C. -- Supplier Certificate

T.P. -- Technical Particular

Phy. -- Physical



ENV -- Environmental

TEC .. Type test certificate

Mech -- Mechanical


FRLS -- Fire retardant low smoke



MANUFACTURER'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN				LEGENDS :					
<div>APAR INDUSTRIES LTD (UNIT : UNIFLEX CABLES) Plot:158-163, GIDC, Umbergaon, Gujarat email: rk.pawar@apar.com</div> <div> </div>		ITEM : HT XLPE Insulated,PVC Inner sheathed,Round or strip armoured & FR-LSH outer sheathed cable Name of customer :M/s LUMINO JUPITER SOLAR FOR WBREDA  PO NO : LUMINO/WBREDA/2019-20/005, DATED : 02-08-2019				QAP NO.: AIL/QAP/HT LUMINO/02  REV NO : DATE : 6-8 -19					
		Project Location :West Bengal Renewable Energy Development Agency, 10 MWP Solar power Block Bhajanghat, Nadia District West Bengal- 741507,				M= MANUFACTURER      C= CLIENT      A= THIRD PARTY  P= PERFORM      V = VERIFY      W= WITNESS					
Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	AGENCYT			Remarks
								M	C	A	
A.	<u>RAW MATERIALS</u>										
1.	<u>ALUMINIUM ROD/COPPEER ROD</u>	a) Make b) Resistivity at 20°C c) Diameter d) Tensile strength e) Elongation (for Cu only) f) Chemical composition g) Surface finish	Maj. Maj. Maj. Maj. Maj. Maj. Maj.	Visual Elec. Phy. Phy. Phy. CHEM visual	100% AQL 4 %S'3' OF IS 2500 Part 1 -----DO----- -----DO----- -----DO----- SUPPLIER CERTIFICATE AQL 4 %S'3' OF IS 2500 Part 1	Factory Standard IS 613-2000/ IS 5484-1997 IS 613-2000/ IS 5484-1997 IS 613-2000/ IS 5484-1997 IS 613-2000 SUPPLIER CERTIFICATE SUPPLIER CERTIFICATE Factory Standard	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P P P P P P P			
2.	<u>XLPE COMPOUND</u>	a) Make b) Type/Grade c) Volume & surface resistivity d) Hot Set e) specific Gravity f) Tensile strength and Elongation	Maj. Maj. Maj. Maj. Maj. Maj.	Visual Visual Ele Phy. Phy. Phy.	100% 100% SUPPLIER CERTIFICATE SUPPLIER CERTIFICATE S.C. AQL 4 %S'3' OF IS 2500 Part 1	Factory standard Factory Standard SUPPLIER CERTIFICATE SUPPLIER CERTIFICATE Factory Standard Factory Standard	Reg./sheet Reg./Sheet Reg./Sheet Reg./Sheet S.C. Reg./Sheet	P P P P P P			
3.	<u>SEMI-CONDUCTING COMPOUND</u>	a) Volume Resistivity	Maj.	Elec.	S.C.	Factory Standard	S.C.	P			
4.	<u>COPPER TAPE</u>	a) Thickness b) Resistivity at 20°C	Maj. Maj.	Phy. Elec.	-----DO----- -----DO-----	Factory Standard Factory Standard	Reg./Sheet Reg./Sheet	P P			
5.	<u>PVC COMPOUND FOR INNER SHEATH</u>	a) Make b) Type/Grade c) Thermal Stability d) Tensile strength and Elongation	Maj. Maj. Maj. Maj.	Visual Visual Phy. Phy.	100% 100% AQL 4 %S'3' (IS:2500-1) AQL 4 %S'3' OF IS 2500 Part 1	Factory standard Factory Standard IS : 5831-1984 Factory Standard	Reg./sheet Reg./Sheet Reg./Sheet Reg./Sheet	P P P P			
6.	<u>ARMOUR WIRE/STRIPS</u>	a) Dimensions b) Resistivity at 20°C c) T.S. & Elongation d) Mass and Uniformity of Zinc coating e) Torsion Test/winding Test	Maj. Maj. Maj. Maj. Maj.	Phy. Elec. Phy. Chem. Phy.	AQL 4 %S'3' OF IS 2500 Part 1 -----DO----- -----DO----- -----DO----- -----DO-----	IS 3975 / 10810-36 IS 3975 / 10810-42 IS 3975 / 10810-37 IS 3975 / 10810-40 & 41 IS 3975 / 10810-38 & 39	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P P P P P			
7.	<u>PVC COMPOUND ( FRLSH)</u>	a) Thermal Stability b) T.S. & Elongation c) Specific Gravity d) Loss of mass in Air Oven (O/SH)	Maj. Maj. Maj. Maj.	Phy. Phy. Phy. Phy.	AQL 4 %S'3' OF IS 2500 Part 1 -----DO----- -----DO----- -----DO-----	IS : 5831-1984 IS : 5831-1984 / 10810-7 Factory Standard IS:5831-1984 / 10810-10	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P P P P			
	<u>SPECIAL TEST ON FRLS COMPOUND</u>	a) Oxygen Index Test b) Temperature Index test C) Acid gas generationtest d) Smoke density rating	Maj. Maj. Maj. Maj.	ENVIR. ENVIR. ENVIR. ENVIR.	AQL 4 %S'3' OF IS 2500 Part 1 -----DO----- -----DO----- -----DO-----	ASTM 2863/10810-58 ASTM 2863/10810-58 IEC : 754-1/10810-59 ASTM D 2843	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P P P P			

Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	AGENCYT			Remarks
								M	C	A	
B.	<u>IN PROCESS</u>										
1.	<u>WIRE DRAWING</u>	a) Diameter of Wire b) Surface Finish c) Tensile Strength (for aluminum only) d) Annealing test e) Wrapping Test	Maj. Maj. Maj. Maj. Maj.	Phy. Vis. Phy. Phy. Phy.	10% OF A LOT 100% 10% OF A LOT 10% OF A LOT 10% OF A LOT	IS:8130 Smooth Surface IS:8130/10810 - 2 IS:8130/10810 - 1 IS:8130/10810 - 3	Reg./Sheet -- Reg./Sheet Reg./Sheet Reg./Sheet	P	P	P	For Aluminium conductor only For copper conductor only For Aluminium conductor only
2.	<u>STRANDING</u>	a) Dia/ number of strand b) Lay Length /Direction of lay c) Conductor Resistance at 20°C d) Surface Appearance e) Dia/ depth of conductor f) Records of strand breakage/welding	Maj. Maj. Maj. Maj. Maj. Maj.	Count Phy. Elec. Vis. Phy. Phy.	At the time of m/c setting -----DO----- -----DO----- 100% once in each shift once in each shift	IS:8130, T.P., Factory Standard Factory Standard IS:8130/10810 - 5 No. surface defects Factory Standard Factory Standard	Reg./Sheet Reg./Sheet Reg./Sheet ---- Reg./Sheet Reg./Sheet	P	P	P	
3.	<u>INSULATION (XLPE)</u>	a) Radial Thickness b) Hot Set c) T.S. & Elongation d) Colour of insulation e) Spark test f) Shrinkage test g) Surface Finish	Maj. Maj. Maj. Maj. Maj. Min	Phy. Phy. Phy. Vis. Elec. Phy. Vis.	During m/c Setting after atabilisation ONE SAMPLE EACH DRUM During m/c Setting after atabilisation 100% 100% One sample per Size 100%	IS:7098(II)2011,T.P.S IS:7098(PT-2)2011/IS:10810-30 IS:7098(PT-2)2011/IS:10810-7 IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011/IS:10810-12 Surface shall be smooth	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet ----	P	P	P	
4.	<u>SEMICONDUCTING COMPOUND</u>	a) Radial Thickness b) Surface Finish over semi conducting Insulation screen. c) Resistivity	Maj. Maj. Maj.	Phy. Vis. Elec.	ONE SAMPLE EACH DRUM During m/c setting after stabilisation ONE SAMPLE EACH DRUM	Factory Standard ,T.P.S surface should be smooth IS:7098(II)2011	Reg./Sheet Reg./Sheet Reg./Sheet	P	P	P	
5.	<u>COPPER TAPING</u>	a) Thickness b) Overlap c) No. of Tapes d) Identification of cores	Maj. Maj. Maj. Maj.	Phy. Phy. Vis. Vis.	During m/c setting -----DO----- -----DO----- 100%	Factory Standard ,T.P.S Factory Standard ,T.P.S Factory Standard ,T.P.S IS:7098(II)2011 ,T.P.S	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P	P	P	
6.	<u>LAYING - UP OF CORES</u>	a) Core sequence b) Direction of lay c) Laid-up diameter	Maj. Maj. Maj.	Vis. Vis. Phy.	During m/c setting -----DO----- -----DO-----	Factory Standard ,T.P.S Factory Standard ,T.P.S Factory Standard ,T.P.S	-- --- Reg./Sheet	P	P	P	
7.	<u>PVC INNER SHEATHING(ST 2)</u>	a) Radial Thickness b) Surface Finish c) Diameter over Inner sheath	Maj. Min Min	Phy. Vis. Vis.	During m/c setting 100% 100%	IS:7098(II)2011 ,T.P.S Surface shall be smooth Factory standard,T.P.S	Reg./Sheet ---- ----	P	P	P	
8.	<u>ARMOURING(Wire/Strips)</u>	a) Dimension of wires/ strips b) No. of wire/Strips c) Direction of Lay d) Lay Length e) Coverage/Quality of armour f) Diameter over Armourig	Maj. Min Maj. Min Maj. Min	Phy. Count Vis. Vis. Phy. Phy.	During m/c setting -----DO----- -----DO----- -----DO----- -----DO----- -----DO-----	IS:7098(II)2011 ,T.P.S Factory standard IS:7098(PT-2)2011 Factory standard Factory standard Factory standard	Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P	P	P	

06.08.19

Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	AGENCY			Remarks	
								M	C	A		
11.	PVC OUTER SHEATHING  (FRLS)	a) Radial Thickness  b) Overall Diameter c) Surface Appearance d) Embossing e) Clour of sheath f) T.S. & Elongation  g) Shrinkage test h) Thermal stability i) Oxygen index & temperature index test j) Halogen acid gas generation test k) Smoke density test on cube sample	Maj.  Maj. Maj. Maj. Maj.  Maj. Maj. Maj. Maj. Maj.	Phy.  Phy. Vis. Vis. Vis. Phy.  Phy. Phy. FRLS FRLS FRLS	During m/c setting & once in each shift -----DO----- 100% During m/c setting During m/c setting During M/c Setting after atabilisation  During m/c setting During m/c setting During m/c setting During m/c setting Cube cut from Outer Sheath of one sample	IS:7098(PT-2)2011, T.P.S.  T.P.S. Surface shall be smooth IS:7098(PT-2)2011, T.P.S. IS:7098(PT-2)2011, T.P.S. IS:7098(PT-2)2011/IS : 10810-7  IS:7098(PT-2)2011/IS : 10810-12 IS : 5831-1984 IS:7098(PT-2)2011/IS:109810-58 IS:7098(PT-2)2011/IS:109810-59 ASTM D 2843	Reg./Sheet  Reg./Sheet ---- ---- Reg./Sheet Reg./Sheet  Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet Reg./Sheet	P  P P P P  P P P P P				
C.	<u>FINAL CABLE TESTING</u>											
1.	<u>ROUTINE TEST</u>	a) Conductor Resistance Test at 20°C b) Partial discharge Test c) High Voltage Test	Maj. Maj. Maj.	Elec. Elec. Elec.	100% 100% 100%	IS : 8130 IS:7098(PT-2)2011/10810-46 IS:7098(PT-2)2011/10810-45	Reg./Sheet Reg./Sheet Reg./Sheet	P P P		V V V		
2.	<u>TYPE TEST</u>											
	A) Electrical	a) Conductor Resistance Test at 20°C  b) Tensile & wrapping (before stranding)  c) Annealing Test(before stranding) d) Partial discharge Test e) Bending Test followed by Partial discharge Test f) Dielectric Power factor Test 1) As a function of Voltage 2) As a function of Temperature Max. g) Insulation Resistance Test 1) Volume Resistivity at Ambient 2) Volume Resistivity at 90°C h) Heating Cycle Test k) Impulse withstand Test l) High Voltage Test (RMS)	Maj.  Maj. Maj. Maj.  Maj. Maj. Maj. Maj. Maj. Maj. Maj. Maj. Maj.	Elec.  Mech.  Maj. Elec. Phy. & Ele.  Elec. Elec. Elec. Elec. Elec. Elec. Elec.	One sample per Size  One sample per Size  One sample per Size One sample per Size One sample per Size  One sample per Size One sample per Size One sample per Size One sample per Size One sample per Size One sample per Size One sample per Size	IS : 8130  IS : 8130  IS : 8130 IS:7098(PT-2)2011 IS:7098(PT-2)2011  IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011	TTC  TTC  TTC TTC TTC  TTC TTC TTC TTC TTC	P  P  P P P  P P P P P		V  V  V V V  V V V V V	For Aluminium conductor only For Copper conductor only	
	B) Non-Electrical	a) Test for thickness of Insulation Eccentricity and sheath  b) Test for armour wire Tensile strength Mass& uniformity of Zinc coating  c) Physical Test for Insulation i) Tensile Strength & Elongation at break before & after Ageing ii) Variation in T.S & E.B iii) Hot Set Test iv) Shrinkage Test v) Water absorption (Gravimetric) Test	Maj.  Maj. Maj. Maj.  Maj. Maj. Maj. Maj. Maj.	Phy.  Phy. Mech. Chem  Phy. Phy. Phy. Phy. Phy.	One sample per Size  One sample per Size One sample per Size One sample per Size  One sample per Size One sample per Size One sample per Size One sample per Size	IS:7098(PT-2)2011  IS : 3975 IS : 3975 IS : 3975  IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011 IS:7098(PT-2)2011	TTC  TTC TTC TTC  TTC TTC TTC TTC TTC	P  P P P  P P P P P		V  V V V  V V V V V		
												



Sr.No.	COMPONENT AND OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	AGENCYT			Remarks
								M	C	A	
3.	C) FRLS TEST FOR OUTER SHEATH	d) Physical Test for Outer Sheath									
		i) Tensile Strength & Elongation at break before & after Ageing	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		ii) Variation in T.S & E.B	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		iii) Shrinkage Test(O/SH)	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		iv) Hot Deformation Test(O/SH)	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		v) Loss of mass in Air Oven (O/SH)	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		vi) Heat Shock Test(O/SH)	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		vii) Thermal Stability Test(O/SH)	Maj.	Phy.	One sample per Size	IS:5831-1984	TTC	P		V	
		viii) Flammability Test	Maj.	Phy.	One sample per Size /lot	IEC 60332(P-1)	TEC	P		V	
		a) Oxygen Index Test	Maj.	ENVIR.	One sample per Size /lot	ASTM 2863	TTC	P		V	
		b) Temperature Index Test	Maj.	ENVIR.	One sample per Size /lot	ASTM 2863	TTC	P		V	
		C) Acid gas generationtest	Maj.	ENVIR.	One sample per Size /lot	IEC : 754-1	TTC	P		V	
		d) Smoke density rating	Maj.	ENVIR.	One sample per Size /lot	ASTM D 2843	TTC	P		V	
	<b>3. ACCEPTANCE TEST</b>										
	A) Electrical	a) Conductor Resistance test 20°C	Maj.	Elec.	AS PER IS:7098(II)2011	IS : 8130	INSPECTION	P		W	
		b) Partial discharge Test	Maj.	Elec.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		c) High Voltage Test	Maj.	Elec.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		d) Insulation Resistance Test	Maj.								
		1) Volume Resistivity at Ambient	Maj.	Elec.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		2) Volume Resistivity at 90°C	Maj.	Elec.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		Thickness of Insulation and Outer									
		a) Sheath	Maj.	Phy.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
4.	B) Non-Electrical	b) Hot Set Test for Insulation	Maj.	Phy.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		Tensile Strength & Elongation at									
		c) break for insulation & Sheath	Maj.	Phy.	AS PER IS:7098(II)2011	IS:7098(PT-2)2011	----- DO -----	P		W	
		d) Flammability Test	Maj.	Phy.	AS PER IS:7098(II)2011	IEC 60332(P-1)	DO	P		W	
	C) Special Test on FRLS Outer Sheath	a) Oxygen Index Test	Maj.	ENVIR.	1 SAMPLE PER LOT	ASTM 2863	DO	P		W	
		b) Temperature Index Test	Maj.	ENVIR.	1 SAMPLE PER LOT	ASTM 2863	DO	P		W	
		C) Acid gas generationtest	Maj.	ENVIR.	1 SAMPLE PER LOT	IEC : 754-1	DO	P		W	
		d) Smoke density rating	Maj.	ENVIR.	1 SAMPLE PER LOT	ASTM D 2843	DO	P		W	
	<b>4 PACKING &amp; MARKING</b>										
		a) Cable end sealing	Maj.	Vis.	100 %	Factory Standard & IS : 7098 (II)2011	--	P		--	
		b) Stencilling/Marking	Min.	Vis.	100 %	Factory Standard & IS : 7098 (II)2011	--	P		--	

Note :

1) Tests at Raw Material stage, in-process stage and during final inspection shall be carried out as applicable to the construction of cables.  
Abbreviations used in the above quality plan are as under.



TTC.-- Type test certificate

Min - Minor Elec- Electrical  
Maj. -Major Vis - Visual

Chem -- Chemical  
Reg -- Register

S.C. -- Supplier Certificate  
T.P. -- Technical Particular

Phy. -- Physical  
ENV -- Environmental

Mech -- Mechanical



<b>MANUFACTURER'S NAME &amp; ADDRESS</b> M/s APAR INDUSTRIES LTD. (UNIT: Uniflex Cables ) Plot No.158 -163 ,GIDC ,Umbergaon -396171  Phone : 0260-2562412 , 2563412			<b>MANUFACTURING QUALITY PLAN</b> <b>1100V: LT- XLPE - POWER CABLE</b> <b>CLIENT/CONTRACTOR NAME: M/s LUMINO JUPITER SOLAR FOR WBREDA</b> <b>ITEM : 1100V Grade Cu/AL. Conductor XLPE Insulated, AL Armoured , FRLS PVC Sheathed Power Cables as per IS:7098 Part-2/1988 , 1.9/33.3 kv</b>  QAP NO. : LT-11-2015/001 Date-06.08.2019 <b>PO NO : LUMINO/WBREDA/2019-20/005, DATED : 02-08-2019</b>  <b>Project Location : West Bangal Renewable Energy Development Agency, 10 MWP Solar power project,Krishnaganj, Block Bhajanghat, Nadia District West Bangal- 741507,</b>			<b>LEGENDS :</b>  <b>M = MANUFACTURER/SUB-CONTRACTOR</b> <b>A- Third Party/Client; P- Perform</b>  <b>V -Verification , R: Review; W = Witness</b> <b>C - Contractor</b> <b>Third Party/Client shall be identified in Column "A" as a "W"</b>					
Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS	CATEGORY OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
1	2	3	4	5	6 & 7	8	9	10			11
<b>A. RAW MATERIALS</b>											
1	<b>COPPER ROD/AL ROD</b>	a) Resistivity at 20°C	Maj.	Elec.	AQL 4 %S'3' OF IS 2500 Part 1	IS:12444 / IS:8130	Reg./Sheet	P			on drawn wire
		b) Diameter	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			
		c) Annealing test for Cu.	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			for cu rod
		d) Tensile test for aluminium	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			for cu rod
<b>2 XLPE COMPOUND</b>											
		a) Hot Set	Maj.	Phy.	S.C.	IS-7098 Part-I/1988	S.C.	P			
		b) specific Gravity	Maj.	Phy.	S.C.	Factory Standard	S.C.	P			
		c) T.S. & Elong.	Maj.	Phy.	S.C.	Factory Standard	S.C.	P			
<b>3 Galvanized Steel Wire/Strips (Wherever applicable)</b>											
		a) Dimensions	Maj.	Phy.	AQL 4 %S'3' OF IS 2500 Part 1	IS:3975	Reg./Sheet	P			
		b) Resistivity at 20°C	Maj.	Elec.	-----DO-----	IS:3975	Reg./Sheet	P			
		c) Tensile Strength	Maj.	Phy.	-----DO-----	IS:3975	Reg./Sheet	P			
		d) Elongation	Maj.	Phy.	-----DO-----	IS:3975	Reg./Sheet	P			
		f) Torsion / Winding Test	Maj.	Phy.	-----DO-----	IS:3975	Reg./Sheet	P			
		g) Mass & Uniformity of Zinc Coating	Maj.	Chem	-----DO-----	IS:3975	Reg./Sheet	P			

Sr. No.	COMPONENT AND OPERATION		CHARACTERISTICS		CATEGOR Y OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
										M	C	A	
1	2		3		4	5	6 & 7	8	9	10			11
	4	Aluminium Wire/Strips (Wherever applicable) for Armouring of Single Core	a)	Dimensions	Maj.	Phy.	AQL 4 %S'3' OF IS 2500 Part 1	IS:3975	Reg./Sheet	P			
			b)	Resistivity at 20°C	Maj.	Elec.	-----DO-----	IS:8130	Reg./Sheet	P			
			c)	Tensile Strength	Maj.	Phy.	-----DO-----	IS:8130	Reg./Sheet	P			
			e)	Wrapping only for Al. armour	Maj.	Phy.	-----DO-----	IS:8130	Reg./Sheet	P			
	5	PVC COMPOUND ST-2 FOR INNER AND OUTER SHEATH	a)	Thermal Stability	Maj.	Phy.	One sample per batch of 10MT	IS : 5831-1984	Reg./Sheet	P			
			b)	T.S. & Elongation (Before & after ageing)	Maj.	Phy.	-----DO-----	IS : 5831-1984	Reg./Sheet	P			
			c)	Specific Gravity	Maj.	Phy.	-----DO-----	Factory Standard	Reg./Sheet	P			
			d)	Loss of mass	Maj.	Phy.	-----DO-----	IS : 5831-1984	Reg./Sheet	P			
		Special Test on FRLS PVC ST-2 Outer Sheathing Compound wherever applicable	a)	Oxygen Index Test	Maj.	ENVIR.	AQL 4 %S'3' OF IS 2500 Part 1	ASTM 2863	Reg./Sheet	P			Applicable on FRLS Compound Only
			b)	Temperature Index	Maj.	ENVIR.	-----DO-----	ASTM 2863	Reg./Sheet	P			
			c)	Smoke density	Maj.	ENVIR.	-----DO-----	ASTM 2843	Reg./Sheet	P			
			d)	Acid Gas Generation (HCL) Test	Maj.	Chemical	-----DO-----	IEC:60754-1	Reg./Sheet	P			
B. IN PROCESS													
	1.	WIRE DRAWING (CU)	a)	Diameter of Wire	Maj.	Phy.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			
			b)	Surface Finish	Maj.	Vis.	100%	Smooth Surface	--	P			
			c)	Annealing (Cu)	Maj.	Phy.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			
			d)	Resistivity at 20°C	Maj.	Elec.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			On Drawn Wire
	2.	STRANDING	a)	Dia/ number of strand	Maj.	Count	At the time of m/c setting	IS:8130/84, TP., Factory Standard	Reg./Sheet	P			
			b)	Lay Length	Maj.	Phy.	-----DO-----	Factory Standard	Reg./Sheet	P			
			c)	Conductor Resistance at 20°C	Maj.	Elec.	-----DO-----	IS:8130-1984	Reg./Sheet	P			
			d)	Surface Appearance	Maj.	Vis.	100%	No. surface defects	----	P			
			e)	Dia/ depth of conductor	Maj.	Phy.	once in each shift	Factory Standard /T.P.	Reg./Sheet	P			
	3	INSULATION (XLPE)	a)	Radial Thickness	Maj.	Phy.	During m/c Setting after stabilisation	IS:7098(I)1988,TP	Reg./Sheet	P			
			b)	Hot Set	Maj.	Phy.	ONE SAMPLE EACH DRUM	IS:7098(I)1988,T.P	Reg./Sheet	P			
			c)	T.S. & Elongation	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Reg./Sheet	P			

Sr. No.	COMPONENT AND OPERATION		CHARACTERISTICS		CATEGOR Y OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
1	2		3		4	5	6 & 7	8	9	10			11
4	Laying up of Cores		a)	Core Sequence	Maj.	Vis	At the time of m/c setting	IS:7098(I)1988	Reg./Sheet	P			
			b)	Laid up diameter	Maj.	Meas	-----DO-----	Factory Std.	Reg./Sheet	P			
			c)	Laylength	Maj.	Meas	-----DO-----	Factory Std.	Reg./Sheet	P			
			d)	Direction	Maj.	Vis	-----DO-----	IS:7098(I)1988	Reg./Sheet	P			
5	PVC INNER SHEATHING ST-2 (wherever applicable)		a)	Radial Thickness	Maj.	Phy.	During m/c Setting after stabilisation	IS:7098(I)1988,T.P	Reg./Sheet	P			
			b)	Surface Finish	Min	Vis.	100%	Surface shall be smooth	----	P			
			c)	Dia over Inner sheath	Min	Phy.	During m/c setting (once in shift)	as per TPS	Reg./Sheet	P			
6	ARMOURING (wherever applicable)		a)	Dimension of wires/ strips	Maj.	Phy.	During m/c setting	IS:7098(I)1988,T.P	Reg./Sheet	P			
			b)	No. of wire/Strips	Min	Count	-----DO-----	Factory standard	Reg./Sheet	P			
			c)	Direction of Lay	Maj.	Vis.	-----DO-----	IS:7098(I)1988	Reg./Sheet	P			
			d)	Lay Length	Min	Vis.	-----DO-----	Factory standard	Reg./Sheet	P			
7	PVC OUTER SHEATHING		a)	Radial Thickness	Maj.	Phy.	During m/c setting & once in each shift	IS:7098(I)1988,T.P	Reg./Sheet	P			
			b)	Overall Diameter	Maj.	Phy.	-----DO-----	T.P.S.	Reg./Sheet	P			
			c)	Surface Appearance	Maj.	Vis.	100%	Surface shall be smooth	----	P			
			d	Colour of sheath	Maj.	Vis.	100%	T.P.S.	----	P			
			e)	Embossing	Maj.	Vis.	100%	IS:7098(I)1988,T.P	----	P			
C. FINAL CABLE TESTING													
1.	ROUTINE TEST		a)	Conductor Resistance Test at 20°C	Maj.	Elec.	100% Drums	IS : 8130-1984	Reg./Sheet	P			R
			b)	High Voltage Test at room temp.	Maj.	Elec.	100% Drums	IS:7098(I)1988,T.P	Reg./Sheet	P			R
2.	TYPE TEST		The Manufacturer will conduct Internal Type Tests and Reports will be submitted for reviewed at the time of Inspection										
	A) Electrical Tests		a)	Conductor d.c Resistance Test at 20°C	Maj.	Elec.	One Sample of Each size once in PO	IS : 8130-1984	Type Test Report	P			R
			e)	Insulation Resistance Test									
			1) Volume Resistivity at Ambient		Maj.	Elec.	-----DO-----		Type Test Report	P			R
			2) Volume Resistivity at 90°C		Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P			R
			i) High Voltage Test		Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P			R

Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS		CATEGOR Y OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
									M	C	A	
1	2	3		4	5	6 & 7	8	9	10			11
	B) Non-Electrical	a)	Test for thickness of Insulation & sheath	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
		b)	Test for armour wire	Maj.	Phy.	-----DO-----	IS : 3975	Type Test Report	P		R	
			1.Dimensions	Maj.	Phy.	-----DO-----	IS:3975	Type Test Report	P		R	
			2.Resistivity at 20°C	Maj.	Elec.	-----DO-----	IS:3975 for galvanized Steel wire/strip, and IS:8130 for AL. wire/straps	Type Test Report	P		R	
			3.Tensile Strength	Maj.	Phy.	-----DO-----	IS:3975 for galvanized Steel wire/strip, and IS:8130 for AL. wire/straps	Type Test Report	P		R	
			4.Elongation for galvanized Steel wire/strip	Maj.	Phy.	-----DO-----	IS:3975	Type Test Report	P		R	
			5.Torsion / Winding Test for galvanized Steel wire/strip	Maj.	Phy.	-----DO-----	IS : 3975	Type Test Report	P			
			6.Mass & Uniformity of Zinc Coating for galvanized Steel wire/strip	Maj.	Chem	-----DO-----	IS : 3975	Type Test Report	P		R	
		c)	Physical Test for Insulation									
		i)	Tensile Strength & Elongation	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
			at break before & after									
			Ageing in air oven									
		ii)	Variation in T.S & E.B	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
		iii)	Hot Set Test									
		1)	Elongation & Permanent set	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
		iv)	Shrinkage Test	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
		v)	Water absorption (Gravimetric) Test	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	Type Test Report	P		R	
		d)	Physical Test for Outer Sheath									
		i	Tensile Strength & Elongation	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
			at break before & after									
			Ageing in air oven									
		ii	Variation in T.S & E.B	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
		iii	Loss of mass test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
		iv	Thermal Stability	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
		v	Shrinkage Test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
		vi	Heat Shock test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	



Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS		CATEGOR Y OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
									M	C	A	
1	2	3		4	5	6 & 7	8	9	10			11
		vii	Hot Deformation test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test Report	P		R	
		viii	Flammability Test	Maj.	ENVIR.	-----DO-----	IEC 60332-1	Type Test Report	P		R	
	C) Special Test on FRLS PVC ST-2 Outer Sheath wherever applicable	a)	Oxygen Index Test	Maj.	ENVIR.	-----DO-----	ASTM 2863	Reg./Sheet	P		R	Applicable on FRLS Outer Sheath Only
		b)	Temperature Index	Maj.	ENVIR.	-----DO-----	ASTM 2863	Reg./Sheet	P		R	
		c)	Smoke density	Maj.	ENVIR.	-----DO-----	ASTM 2843	Reg./Sheet	P		R	
		d)	Acid Gas Generation (HCL) Test	Maj.	Chemical	-----DO-----	IEC:60754-1	Reg./Sheet	P		R	
	D) Anti termite & Anit rodent		. Anti Termite and Rodent test		Chemical	--DO--	Plant Standard	Plant Standard	P	R		
	3. ACCEPTANCE TEST											
	A) Electrical tests	a)	Conductor Resistance test 20°C	Maj.	Elec.	As per Sampling Plan of IS:7098-1/1988	IS : 8130-1984	INSPECTION	P		W	
		c)	High Voltage Test	Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
		d)	Insulation Resistance Test	Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
			1) Volume Resistivity at Ambient	Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
			2) Volume Resistivity at 90°C	Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
	B) Non-Electrical	a)	Dimensional check, Thickness of Insulation and Outer Sheath, overall dia of cable.	Maj.	Elec.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
		b)	Tensile Strength & Elongation at break for insulation & Outer Sheath	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
		c)	Hot Set Test for Insulation for XLPE insulation only	Maj.	Phy.	-----DO-----	IS:7098(I)1988,T.P	---- DO ----	P		W	
	C) Special Test on FRLS PVC ST-2 Outer Sheath wherever applicable	a)	Oxygen Index Test	Maj.	ENVIR.	One Sample per Lot	ASTM 2863	INSPECTION	P		W	Applicable on FRLS Outer Sheath Only
		b)	Temperature Index	Maj.	ENVIR.	-----DO-----	ASTM 2863	INSPECTION	P		W	
		c)	Smoke density	Maj.	ENVIR.	-----DO-----	ASTM 2843	INSPECTION	P		W	
		d)	Acid Gas Generation (HCL) Test	Maj.	Chemical	-----DO-----	IEC:60754-1	INSPECTION	P		W	
		e)	Smoke density	Maj.	ENVIR.	-----DO-----	ASTM 2843	INSPECTION	P		R	
	4 PACKING & MARKING	a)	Cable end sealing	Maj.	Vis.	100 %	Factory Standard/ IS:7098(I)1988	--	P			
		b)	Stencilling/Marking	Min.	Vis.	100 %	Factory Standard/ IS:7098(I)1988	--	P			

Note : 1) Tests at Raw Material stage, in-process stage and during final inspection shall be carried out as applicable to the construction of cables.

Legends / Abbreviations used in the above quality plan are as under.

M= MANUFACTURER/SUB-CONTRACTOR,

Third Party/Client shall be identified in Column "A" as a "W"

Min - Minor Elec- Electrical

Maj.-Major Vis - Visual

ENV -- Environmental

Chem -- Chemical

Reg -- Register

Phy. -- Physical

S.C. -- Supplier Certificate

TP. -- Technical Particular

Mech -- Mechanical



MANUFACTURER'S NAME & M/s APAR INDUSTRIES LTD.			MANUFACTURING QUALITY PLAN				LEGENDS				
(UNIT: Uniflex Cables ) Plot No.158 -163 ,GIDC ,Umbergaon -396171  Phone : 0260-2562412 , 2563412 e-mail: rk.pawar@apar.com;			ITEM : 1100 VOLTS COPPER CONDUCTOR, FR-LSH PVC FLEXIBLE SINGLE CORE UNSHEATHED CABLE AS PER IS:694/2010  Name of customer: M/s LUMINO JUPITER SOLAR FOR WBREDA QAP NO. : QAP-HW-XLPE- dt 06.08.19 PO NO : LUMINO/WBREDA/2019-20/005, DATED : 02-08-2019  <i>Project Location :West Bengal Renewable Energy Development Agency, 10 MWP Solar power project,Krishnaganj, Block Bhajanghat, Nadia District West Bengal- 741507,</i>				M = MANUFACTURER/SUB-CONTRACTOR A- Third Party/Client; P- Perform  V -Verification , R: Review; W = Witness C - Contractor Third Party/Client shall be identified in Column "A" as a "W"				
Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS	CATEGOR Y OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
1	2	3	4	5	6 & 7	8	9	M	C	A	11
<b>A. RAW MATERIALS</b>											
1.	COPPEER ROD	a) Resistivity at 20°C	Maj.	Elec.	AQL 4 %S'3' OF IS 2500 Part 1	IS:12444 / IS:8130	Reg./Sheet	P			
		b) Diameter	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			
		c) Tensile strength	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			
		d) Annealing test	Maj.	Phy.	-----DO-----	-----DO-----	Reg./Sheet	P			
2	PVC INSULATION TYPE-D (FR-LSH)	a) T.S. and Elong.before & after Ageing	Maj.	Phy.	One sample per batch of 10MT	IS-5831 (1984)	Reg./Sheet	P			
		b) Thermal Stability	Maj.	Visual	-----DO-----	IS-5831 (1984)	Reg./Sheet	P			
		c) Specific Gravity	Maj.	Phy.	-----DO-----	Factory Standard	Reg./Sheet	P			
		d) Loss of mass	Maj.	Phy.	-----DO-----	IS-5831 (1984)	Reg./Sheet	P			
		e) Oxygen Index Test	Maj.	ENVIR.	One Sample per Batch	ASTM 2863	Reg./Sheet	P			
		f) Temperature Index	Maj.	ENVIR.	-----DO-----	ASTM 2863	Reg./Sheet	P			
		g) Smoke Density Rating	Maj.	ENVIR.	-----DO-----	ASTM 2843	Reg./Sheet	P			
		h) Acid Gas Generation	Maj.	Chem	-----DO-----	IEC-754-1/94	Reg./Sheet	P			
<b>B. IN PROCESS</b>											
1.	WIRE DRAWING COPPER WIRE	a) Diameter of Wire	Maj.	Phy.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			on Drawn Wire
		b) Surface Finish	Maj.	Vis.	100%	Smooth Surface	--	P			
		d) Annealing	Maj.	Phy.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			
		f) Resistivity at 20°C	Maj.	Elec.	5% OF A LOT	IS:8130-1984	Reg./Sheet	P			



Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS	CATEGORY OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
1	2	3	4	5	6 & 7	8	9	10			11
2.	Conductor Bunching /stranding (if applicable)	a) Dia/ number of strand	Maj.	Count	At the time of m/c setting	IS:8130/84, T.P., Factory Standard	Reg./Sheet	P			
		b) Conductor Resistance at 20°C	Maj.	Elec.	-----DO-----	IS:8130-1984	Reg./Sheet	P			
		c) Surface Appearance	Maj.	Vis.	100%	No. surface defects	----	P			
		d) Dia of conductor	Maj.	Phy.	During m/c Setting & once in Shift	Factory Standard /T.P.	Reg./Sheet	P			
3	PVC INSULATION TYPE D	a) Radial Thickness	Maj.	Phy.	During m/c Setting & once in Shift	IS:694/1990,T.P.	Reg./Sheet	P			
		b) Surface Appearance	Maj.	Vis.	100%	No. surface defects	----	P			
		c) Core Identification / Colour	Maj.	Phy.	-----DO-----	IS:694/1990,T.P.	Reg./Sheet	P			
		d) T.S. & Elongation of core	Maj.	Phy.	At the time of m/c setting	IS:5831	Reg./Sheet	P			
		e) Spark test	Maj.	Elect	100%	IS:694/1990	----	P			
<b>C. FINAL CABLE TESTING</b>											
1.	ROUTINE TEST	a) Conductor Resistance Test at 20°C	Maj.	Elec.	100% Drums	IS : 8130-1984	Reg./Sheet	P		R	
		b) High Voltage Test at room temp.	Maj.	Elec.	100% Drums	IS:694/1990,T.P.	Reg./Sheet	P		R	
2.	TYPE TEST	The Manufacturer will conduct Internal Type Tests and the reports will be reviewed at the time of inspection									
	A) Electrical Tests	a) Conductor Resistance Test at 20°C	Maj.	Elec.	One sample of Each size & Type once in PO	IS : 8130-1984	Type Test CER.	P		R	
		b Insulation Resistance Test									
		1) Volume Resistivity at Ambient	Maj.	Elec.	-----DO-----	IS:5831,T.P.	Type Test CER.	P		R	
		2) Volume Resistivity at max. rated temp.	Maj.	Elec.	-----DO-----	IS:5831,T.P.	Type Test CER.	P		R	
		c High Voltage Test (RMS)	Maj.	Elec.	-----DO-----	IS:694/1990,T.P.	Type Test CER.	P		R	
		d AC High Voltage Water Immersion Test	Maj.	Elec.	-----DO-----	IS:694/1990,T.P.	Type Test CER.	P		R	
		e DC High Voltage Water Immersion Test	Maj.	Elec.	-----DO-----	IS:694/1990,T.P.	Type Test CER.	P		R	
	B) Non-Electrical	a) Test for thickness of Insulation	Maj.	Phy.	-----DO-----	IS:694/1990,T.P.	Type Test CER.	P		R	
		b) Physical Test for Insulation									
		i Tensile Strength & Elongation Before & After Ageing in Air Oven	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		ii Variation in T.S & E.B after Ageing	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		iii Loss of mass test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		iv Thermal Stability	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		v Shrinkage Test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		vi Heat Shock test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		vii Hot Deformation test	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	
		viii Cold Bend/ Cold Impact	Maj.	Phy.	-----DO-----	IS:5831-1984	Type Test CER.	P		R	



Sr. No.	COMPONENT AND OPERATION	CHARACTERISTICS	CATEGORY OF	TYPE OF CHECK	QUANTUM OF CHECK	ACCEPTANCE NORMS / REF. STANDARDS	FORMAT OF RECORD	TESTING			REMARKS
								M	C	A	
1	2	3	4	5	6 & 7	8	9	10			11
	C) FLAME RETARDANCE TEST	ix Flame retardance Test on single cable	Maj.	ENVIR.	-----DO-----	IS: 10810 Part-53	Type Test CER.	P		R	
	D) FRLS TESTING	a) Oxygen Index Test	Maj.	ENVIR.	One sample per lot	Min : 29 , IS: 10810 Part-58/ASTM 2863	Type Test CER.	P		R	
		b) Temperature Index Test	Maj.	ENVIR.	One sample per lot	Min : 250 , IS: 10810 Part-58/ASTM 2863	Type Test CER.	P		R	
		c) Smoke Density Test	Maj.	ENVIR.	One sample per lot	Max : 60 % ,ASTM 2843	Type Test CER.	P		R	
		d) Acid Gas Generation	Maj.	CHEM.	One sample per lot	max 20 % , IEC-754(1/94)	Type Test CER.	P		R	
3.	ACCEPTANCE TEST										
	A) Electrical tests	a) Conductor Resistance test 20°C	Maj.	Elec.	As per Sampling Plan of IS:694/1990	IS : 8130-1984	Acceptance Test Report	P		W	
		b) High Voltage Test	Maj.	Elec.	-----DO-----	IS:694/1990,T.P.	---- DO ----	P		W	
		c) Insulation Resistance Test	Maj.	Elec.	-----DO-----	IS:5831-1984	---- DO ----	P		W	
		i Volume Resistivity at Ambient	Maj.	Elec.	-----DO-----	IS:5831-1984	---- DO ----	P		W	
		ii Volume Resistivity at max. rated temp.	Maj.	Elec.	-----DO-----	IS:5831-1984	---- DO ----	P		W	
	B) Non-Electrical	a) Dimensional check, Thickness of Insulation and overall dia of cable.	Maj.	Elec.	-----DO-----	IS:694/1990,T.P.	---- DO ----	P		W	
		b) T.S. & Elong for insulation (without Ageing)	Maj.	Phy.	-----DO-----	IS:5831-1984	---- DO ----	P		W	
	C) FLAME RETARDANCE TEST	Flame retardance Test on single cable	Maj.	ENVIR.	on one sample /each size and Type of cable	IS: 10810 Part-53	---- DO ----	P		W	
	D) FRLS TESTING	a) Oxygen Index Test	Maj.	ENVIR.	One sample per lot	Min : 29 , IS: 10810 Part-58/ASTM 2863	---- DO ----	P		W	
		b) Temperature Index Test	Maj.	ENVIR.	One sample per lot	Min : 250 , IS: 10810 Part-58/ASTM 2863	---- DO ----	P		W	
		c) Smoke Density Test	Maj.	ENVIR.	One sample per lot	Max : 60 % ,ASTM 2843	---- DO ----	P		W	
		d) Acid Gas Generation	Maj.	CHEM.	One sample per lot	max 20 % , IEC-754(1/94)	---- DO ----	P		W	
4	PACKING & MARKING	a) Cable end sealing	Maj.	Vis.	100 %	Factory Standard/IS:694/1990	--	P		-	
		b) Stencilling/Marking	Min.	Vis.	100 %	Factory Standard/IS:694/1990	--	P		-	

Legends / Abbreviations used in the above quality plan are as under.

M= MANUFACTURER/SUB-CONTRACTOR, A-Third Party/Client

Third Party/Client shall be identified in Column "A" as a "W"

Min - Minor Elec- Electrical Chem -- Chemical  
Maj. -Major Vis - Visual Reg -- Register

Mech -- Mechanical  
ENV -- Environmental  
Phy. -- Physical

R =Review  
S.C. -- Supplier Certificate  
T.P. -- Technical Particular

W = Witness  
P= Perform  
C -Contractor

