PURCHASE SPECIFICATION FOR 4 PAIR 0.5 SQMM OVERALL SHIELDED PVC CABLE

Enclosures:

1) PQR
2) Purchase specification ED28584
3) Datasheet Sample
4) Quality Plan Sample

Note:

Vendor shall provide following documents for evaluation of offer

1) PQR for Non- PMD Vendors (Not registered with BHEL)
2) Signed copy of Purchase specification ED28584
3) Technical Datasheet
4) No Deviation Certificate

Date : 22 Feb 2025	**BHEL ELECTRONICS DIVISION**	**CE-ENGG-TGC**

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GENERAL PQR for CABLES

Prequalification requirements for bidders of 4 PAIR 0.5 SQMM PVC Overall Shielded as per Purchase specification ED28584

S.NO	Criteria	Document Required
1	The bidder should be a manufacturer of 4 PAIR 0.5 SQMM PVC Overall Shielded cable for 2 years or more.	Purchase order copy for supply of same / similar item for 2 years or more to any corresponding power plant or process industry
2	The Bidder shall submit valid type test certificates complying with relevant standards mentioned in the specification on the date of submission of Offer against this tender. The following type tests must be included in the test report. a) Annealing Test of Cu Cond.(Before Stranding) b) Conductor Resistance c) High Voltage Test d) Tensile Strength of Insulation& Sheath e) Elongation of Insulation & Sheath f) Ageing test on Insulation & Sheath g) Shrinkage test on Insulation & Sheath h) Thermal Stability on PVC Sheath i) Heat Shock test for PVC Sheath j) Volume Resistivity Test k) Oxygen Index Test ***OR*** The supplier should have supplied same category and same conductor cross sectional area cable as mentioned in the bid to BHEL against an earlier purchase order	Type test certificates conducted in a NABL accredited laboratory ***OR*** Purchase order copy for supply of the item to BHEL
3	The bidder should have supplied same category Purchase order copies product for 30% of total bid quantity in last 3 financial years, to any corresponding power plant or process industry.	Purchase order copy for supply of similar item with at least 30% of current bid quantity to any corresponding power plant or process industry

REVISION HISTORY SHEET

REV NO	DATE	NATURE OF CHANGE	REASONS	PREPARED BY	APPROVED BY
00	18/08/92	Supersedes PS/EAST/057	-	SKVR,AV,MRV	N.J
01	04/03/93	GENERAL	F.B FROM CORPORATE	SHG	N.J
02	01/07/93	CL 15.3.1 & 15.3.2 removed	F.B FROM QC	SHG	N.J
03	24/03/94	Totally revised	Ref.stds reissued	SHG	N.J
04	15/05/95	Frls properties corrected. IEC ref std changed	F.B from engg. IEC-811 P3 superseeds IEC-540	SHG	N.J
05	06/07/96	Totally Revised	F.B From MM	RS	N.J
06	30/12/97	OD in Table-1 SL.No.10 Recalculated	F.B from Supplier	SHG	N.S
07	29/01/03	REAFFIRMATION	-	CCR	NS
08	24/02/03	Cl.19.1 Revised	F.B From Main Assy	HRN	NS
09	21/06/03	Cl.19.1&19.2 Revised	-Do-	HRN	NS
10	16/10/08	Generally Revised	Committee review	HRN	MTR

APPROVED :
M.THARAK RAJ

PREPARED : HRN | ISSUED : STDS GROUP | DATE : 16/10/08

FRLS PVC SHEATHED PVC INSULATED PAIRED SHIELDED COPPER CABLE (GRADE 6OO VOLTS)

1.0 GENERAL:

This specification governs the quality of FRLS (flame retardant low smoke) polyvinyl chloride (PVC) sheathed polyvinyl chloride (PVC) insulated paired overall shielded tinned copper cable for operation up to a voltage of 6OO volts and temperature of 70^0 C.

2.0 APPLICATION:

The cable is used for transmission of signals of low magnitude, which requires protection against disturbances caused by stray fields in C & I systems as well as Data processing systems. The cable should be suitable for following terminations:

(a) Solder
(b) Maxi-termi point
(c) Solderless crimping
(d) Screw termination to terminal blocks.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

Assistance has been taken from VDE 0815 "Wiring cables for telecommunication and data processing systems".

4.0 SIZES:

Sizes shall be as per Table-1.

5.0 CONDUCTOR:

5.1 The conductor shall be composed of tinned annealed high conductivity copper wire with electrical and mechanical properties in accordance with IS:8130. The details of the conductor shall be as per Table-1.

5.2 The resistance of the conductor at 20^0 C shall not exceed the appropriate maximum value given in the Table-1

5.3 Whenever a conductor is broken, the supplier can join the same by welding or brazing process only. Tensile strength of such joined conductor shall not be less than 90% of the value of the conductor without joint. The conductor resistance measured for a length of 25cm and compared with the resistance of the conductor without any joint shall not be more than 5% of the resistance of the adjacent conductor

6.0 INSULATION:

6.1 The insulation shall be provided with polyvinylchloride compound conforming to the requirements of Type-A compound of IS:5831.

6.2 Joining of core insulation material is not acceptable and repair work on insulation of core also is not acceptable.

6.3 Colour of Insulation:
Colour shall be as per IS:9938 and colour coding shall be as given below:

PAIR	CORE	COLOUR
1 st	1 st	Blue
1 st	2 nd	Red
2 nd	1 st	Grey
2 nd	2 nd	Yellow
3 rd	1 st	Green
3 rd	2 nd	Brown
4 th	1 st	White
4 th	2 nd	Black

The units shall be identified by taping them with different colour polyethylene terephthalate (mylar) tapes as explained in cl.16.3 and Table 2. All the eight cores of the first unit shall be bound together with white colour tape and subsequent units to be taped with different colour tapes as explained in Table 2.

Eg : A Grey wire in a bunch taped with pink colour tape is the first core of a second pair of the seventh unit

7.0 SHIELD:

7.1 The shield shall be composed of aluminised polyethylene terephthalate (aluminised mylar) tape.

7.2 The minimum thickness of shield shall be 0.06 mm.

8.0 SHEATH:

8.1 The sheath shall be provided with Flame retardant low smoke polyvinylchloride (FRLS PVC).

8.2 Joining of sheath material is not acceptable and repair work on sheath also is not acceptable.

8.3 Colour of outer sheath:
The colour of outer sheath shall be Grey.

8.4 Marking on outer sheath: The cable shall be marked at every one meter length with the following:
Manufacturer's Name:
Voltage grade : 600 V RMS.
Size :
Type : FRLS
Progressive marking over the length of the cable at every one meter length of the cable.

9.0 OVERALL DIAMETER:
The overall diameter shall be as per Table-1.
Compliance shall be checked in line with clause 11.2 of BS:6231.

10.0 ELECTRICAL TESTS:

10.1 High voltage test: IS:10810 (part-45):
Between conductors : 2000 V RMS for 1 minute.
Between conductor and shield: 1000 V RMS for 1 minute.

10.3 Insulation Resistance: (IS:5831)
Insulation resistance test shall be carried out at 500 volt D.C. The value of volume resistivity when calculated from the measured insulation resistance value shall not be less than $1.0X10^{13}$ Ohm-cm at
27^0C and $1.0X10^{10}$
Ohm-cm at 70^0C.

11.0 PHYSICAL TEST ON INSULATION (Type Test):
Tensile strength, elongation at break, Heat aging, heat shock and shrinkage test shall meet the requirements of Type - A of IS:5831.

12.0 EFFECTIVE CAPACITANCE: VDE 0472 (Part-504)
1OO nF/km at O.8 KHz, maximum.

13.0 CAPACITY UNBALANCE: VDE 0472 (Part-506)
2OO pF/1OOm at O.8 KHz, maximum.

14.0 BENDING TEST: VDE 0472 (Part-610)
The complete cable shall be flexible such that the minimum bending radius shall be twelve(12) times the overall diameter of the cable.

15.0 TESTS FOR FRLS PROPERTIES

15.1 Oxygen Index Test(OI)

Minimum oxygen index at 25 deg C as per ASTM-D-2863 — 29

15.2 Temperature Index Test

Minimum temperature Index at OI=21 calculating by method of extrapolation as per ASTM-D-2863 & BICC handbook — 250 deg C

15.3 Hcl Acid Gas Estimation

Maximum acid gas generation by weight as per IEC-60754 part I — 20%

15.4 Smoke Density Test

Maximum smoke density rating as per ASTM-D-2843 — 60%

15.5 Flammability Tests

a)As per IEC-60332 - 1
b)As per IEEE-383 (Vertical tray flame test) — The flame shall not propagate and burn the total ht. Of the eight foot tray.

15.6 Thermal Heat Stability Test

At 200 deg C as per IEC-60811 P3

15.7 Anti termite and Rodent Test

On outer sheath for detection of lead napthonate and sodium Napthonate.

16.0 CONSTRUCTION:

16.1 The conductor shall consists of stranded, tinned, high conductivity copper wires.

16.2 The insulation shall be applied directly over the conductor by extrusion method, in such a way that it fits closely on the conductor and it shall be possible to remove it easily without damage to the conductor. Two cores shall be twisted to form a pair (20 to 25 lays per metre) and four such pairs shall be twisted together to form a unit.

16.3 Each unit shall be taped with polyethylene terephthalate (mylar) tape of different colours for the purposes of binding and identification of units as per the scheme explained in Table 2. The requisite number of such units shall be stranded in layers to form the group cable. Necessary filler chords shall be placed in between the units and if necessary, the group shall be wrapped with mylar tape to make firm and round formation. The filler chords shall not absorb moisture.

16.4 The group shall be then shielded with aluminised mylar tape to provide 1OO% coverage. Taping shall be done with at least 2O% overlapping. A continuous drain wire of tinned copper of diameter O.8 mm shall also be provided for termination of shield connection.

16.5 The cable shall be then sheathed with FRLS PVC by extrusion method. The shielding and sheathing shall be so done that it fits firmly on to the cable and are easily removable without damage to the cores.

17.0 INSPECTION:

17.1 Supplier shall furnish compliance to core stage internal inspection certificate and other internal test reports before offering for final inspection.

18.0 TEST CERTIFICATE:

Three copies of **Type & Routine test** certificates shall be supplied (Routine test certificate shall be furnished for each batch)giving the following information:
ED 28584: FRLS PVC sheathed PVC insulated paired shielded copper cable (grade 600 volts).
Material code number :
BHEL Order number :
Size and length of cable:
Batch / lot number :

Test results obtained for all the properties and dimensional tolerances as per the specification. Supplier shall certify in the test certificate that the cable supplied does not have any joints in the insulation.

Type test certificate shall be considered valid for a period of three years from the date of test certificate. These tests shall be valid at the time of placement of purchase order. However if the type test requirement is specifically mentioned in the purchase order, the same has to be conducted as per purchase order terms.

19.0 PACKING AND MARKING:

19.1 Packing: A tolerance of +5% shall be allowed on the quantity of each type of cable ordered. That is, the supplier shall be allowed to dispatch maximum 5% excess quantity on each type of cable. The cable shall be dispatched in 5OO to 55O metres in suitable non returnable plastic bobbins. Maximum 1O% of the ordered quantity of each type of cable can be dispatched in shorter length. But pieces less than 125 metres will not be accepted.

19.2 Marking: The label which is securely attached to the bobbin shall have the following information:
ED 28584: FRLS PVC sheathed PVC insulated paired shielded copper cable (grade 600 volts).
Material code number :
BHEL order no. :
Manufacturer's / Supplier's Name:
Size :
Length :
Weight :
Batch / Lot No. :

TABLE-1

SL NO	DETAILS	2 PAIR	4 PAIR	8 PAIR	12 PAIR	32 PAIR
1.	NO. OF CORES	4	8	16	24	64
2.	NO. OF UNITS	-	1	2	3	8
3.	CONDUCTOR CROSS SECTIONAL AREA NOMINAL (sq.mm)	0.50	0.50	0.50	0.50	0.50
4.	NO. OF STRANDS & DIAMETER OF EACH STRAND NOMINAL (mm).	7/0.30	7/0.30	7/0.30	7/0.30	7/0.30
5.	DIAMETER OF BUNCHED CONDUCTOR MAXIMUM (mm)	0.9	0.9	0.9	0.9	0.9
6.	CONDUCTOR RESISTANCE AT 20^0C. MAXIMUM (Ohms/km)	40.1	40.1	40.1	40.1	40.1
7.	CORE DIAMETER (mm)	1.4-1.65	1.4-1.65	1.4-1.65	1.4-1.65	1.4-1.65
8.	DIAMETER BELOW SHEATH NOMINAL (mm) (+ / - 2mm)	4.00	6.50	9.00	11.00	17.50
9.	OUTER SHEATH THICKNESS NOMINAL (mm)	1.00	1.00	1.00	1.20	1.40
10	OVERALL DIAMETER NOMINAL (mm) (+ / - 2mm)	7.0	9.5	12.0	14.5	22.5

TABLE-2

Unit No.	Colour of Mylar tape to be used
Unit 1	White
Unit 2	Yellow
Unit 3	Brown
Unit 4	Blue
Unit 5	Grey
Unit 6	Black
Unit 7	Pink
Unit 8	Green

TECHNICAL DATSHEET SAMPLE

VENDOR LOGO* **VENDOR NAME & ADDRESS***

CUSTOMER : BHEL EDN BANGALORE
DOC.No.: *
Date : *

	TECHNICAL DATA SHEET		
S. No.	**DESCRIPTION**	**UNIT**	**4P x 0.5 sq.mm**
1	**NAME, PLACE & COUNTRY OF MANUFACTURER**		*
2	**CABLE TYPE**		Annealed Bare copper conductor, HR PVC insulated, Overall screened, HR PVC inner Sheathed, armoured and overall FRLS HR PVC sheathed signal cable.
3	**APPLICABLE STANDARDS**		Gen.conf.to BS:5308-2, IS: 8130/1984, IS: 3975, ASTMD-2863, ASTMD-2843, IEC-754-1, Purchase specification
4	**No. of Pairs**	Nos.	4P
5	**Voltage grade**	V	600
6	**Operating Temperature**	˚C	70
7	**CONDUCTOR**		
a)	Material		Annealed Bare copper conf to IS: 8130/1984
b)	Grade		Electrolytic
c)	Size	Sq.mm	0.5
d)	No. of strands/Appx dia of each strand (before stranding)	No./mm	7/0.3
e)	Shape of Conductor		stranded & Circular
f)	Diameter of Bunched Conductor	mm	*
8	**INSULATION**		
a)	Material		HR PVC Type-A conf to IS:5831/1984
b)	Type		Extruded
c)	Thickness (nom)	mm	0.25-0.375
d)	Core dia to be maintained	mm	1.4-1.65
d)	Pair Identification		1st pair: Blue+Red, 2nd pair: Grey+Yellow, 3rd pair: Green+Brown, 4th pair: White+Black
e)	Min number of twists of cores in a pair	No.	10 Twists/metre
9	**OVERALL SHIELDING**		
a)	Material		Aluminium-Mylar Tape
b)	Type		Helical
c)	Thickness (min.)	mm	0.06
d)	Overlap	%	20
e)	Coverage	%	100
10	**DRAIN WIRE (For individual & overall shielding)**		
a)	Material		Annealed Tinned Copper
b)	Size	Sq.mm	0.5
c)	No. of strands/approx. dia of each strand	No./mm	1/0.8
11	**OUTER SHEATH**		
a)	Material		HR PVC compound (Type ST2) conf to IS:5831/1984 with FRLS properties
b)	Type		Extruded
c)	Thickness (Min)	mm	1
d)	Colour of outer sheath		Grey
e)	Overall diameter(Approx)	mm	*
f)	Tolerance on overall diameter	mm	+/-2
g)	Marking on outer sheath		Vendor Name, Year of manufacturing, No of Pairs x cross sectional area of conductor, voltage grade & "FRLS PVC" shall be provided on outer sheath of cables. Also Sequential length marking shall be printed on outer sheath of cables at every 1 meter interval.

Note: All * marked fields to be filled by Vendor

TECHNICAL DATSHEET SAMPLE

S.No.	DESCRIPTION	UNIT	4P x 0.5 sq.mm
12 (a)	**Drum Length (Packing shall be done in non-returnable wooden drum)**	mtrs	As per PO Quantity in min of 500 meter drums
b)	**Tolerance of individual drum length & overall quantity**	%	+5%
13	**ELECTRICAL PARAMETERS**		
a)	Max.DC resistance of conductor of completed cable at 20 Deg. C	ohm/Km	40.10
b)	Min. Insulation resistance at 20 Deg.C of completed cable	MΩ/km	100
c)	High voltage test	kV rms	2 kV rms for 1 minute (core to core) 1 kV rms for 1 minute (conductor to shield)
d)	L/R ratio [max]	microH/ Ohm	25
e)	Max. Mutual capacitance between conductors at 0.8kHz	nF/km	120
f)	Min.Cross-talk figure at 0.8kHz	dB	60
g)	Max. Characteristic Impedance at 1kHz	Ω	320
h)	Max. Attenuation figure at 1kHz	db/km	1.2
i)	Capacitance unbalance (max) at 0.8kHz		200 pF/100 m
14	**FRLS Properties for outer sheath**		
a)	Min.oxygen index as per ASTMD-2863	%	29
b)	Min.temperature index as per ASTMD-2863	^{0}C	250
c)	Max.HCL emission as per IEC-754-I	%	20% by weight
d)	Max.smoke density rating as per ASTMD-2843	%	60
e)	Flammability test		As per IEC-60332-1-2, IEEE-383, IEC-60332-3 cat-C, Swedish chimney test as per SS-4241475-CL(F3)
f)	Thermal Heat Stability Test At 200 deg C	%	As per IEC-60811 P3
15	Rodent & termite repulsion test		Presence of lead shall be confirmed (Black precipitate)

Note: All * marked fields to be filled by Vendor

VENDOR'S NAME & ADDRESS :-

MANUFACTURING QUALITY PLAN SAMPLE

QAP Ref.:
Rev No :
Date:

CUSTOMER : BHEL EDN BANGALORE

S.No.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	* D	AGENCY P	AGENCY W	AGENCY V	Remarks
1	2	3	4	5	6	7	8	9					10
(A)	**RAW MATERIAL INSPECTION & BROUGHT OUT ITEMS**												
1	Copper Wire	Diameter	Major	Measurement	Plant Standard/ Data Sheet	IS:8130 - 1984		F/QA/01		1			
		Annealing test (For Copper)	-do-	Mechanical	-do-	-do-				1			
		Resistivity for Copper Conductor	-do-	Electrical	-do-	-do-				1			
2	PVC Insulation Compound	Tensile Strength	Major	Mechanical	Plant Standard/ Data Sheet	IS:5831-1984 / IS: 7098-I/88		F/QA/02		1			
		Elongation	-do-	-do-	-do-	-do-				1			
		Thermal Stability(For PVC)	-do-	Physical	-do-	-do-				1			
		General conditions of packing	-do-	Visual	100%	-do-				1			
		Make, Type & Batch No.	-do-	-do-	-do-	-do-				1			
3	FRLS PVC Sheathing Compound	Temperature Index	-do-	-do-	-do-	-do-				1			
		Tensile Strength	-do-	Mechanical	-do-	IS:5831-1984				1			
		Elongation	-do-	-do-	-do-	-do-				1			
		Thermal Stability	-do-	Physical	-do-	-do-				1			
		General Conditions of Packing	-do-	Visual	100%	-do-				1			
4	Wooden		-do-	-do-	-do-	IS:10418 / Data sheet		F/QA/006		1			
		Surface Finish	-do-	Visual	-do-	-do-				1			
		Surface of drum	-do-	-do-	-do-	-do-				1			

LEGEND : P - PERFORM, W - WITNESS, V - VERIFICATION, INDICATE 1 FOR VENDOR/SUBVENDOR, 2 FOR NOMINATED AGENCY;
AS APPROPRIATE AGAINST EACH COMPONENTS/CHARACERISTIC SUBMITTED TO RECORDS. UNDER P, W & V COLUMNS
* FOR ITEM MARKED (TICK) IN COLUMN " D " TEST CERTIFICATES SHALL BE SUBMITTED FOR RECORDS.

PREPARED BY	APPROVED BY	APPROVED BY
VENDOR'S SIGNATURE & STAMP	**Pipeline** QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS :-

MANUFACTURING QUALITY PLAN SAMPLE

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1	2	3	4	5	6	7	8	9					10
(B)	**INPROCESS TESTING**												
1	Conductor	Dia of wires	Major	Measurement	Setting & completion	Plant Standard / Data sheet / IS:8130		Log Book		1			
		No. of wires	-do-	Counting	-do-	-do-				1			
		Winding of Conductor	-do-	Visual	Each Spool	-do-				1			
		Surface Finish	-do-	-do-	Setting & Completion	-do-				1			
		Resistance	-do-	Electrical	sample	-do-				1			
2	Insulation	Type of Compound	Major	Visual	Each length	IS:5831-1984 / IS: 7098-I/88 / Data Sheet		Log Book		1			
		Insulation Thickness	-do-	Measurement	Both ends of each length	-do-				1			
		Dia/ Periphery of core	-do-	-do-	Setting & completion	-do-				1			1 Sample from each
		Colour of core	-do-	Visual	Each length	-do-				1			Batch/ Lot.
		Volume resistivity	Major	Electrical	sample	As per relevant standard / approved datasheets				1			
		Surface Finish	Major	Visual	Setting & Completion	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet				1			
3	Laying of Cores	Core Colour Sequence	Major	Visual	At the time of setting	Plant Standard		Log Book		1			
		Direction of Lay	-do-	-do-	-do-	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet				1			
		Laid up Diameter	-do-	Measurement	Setting & Completion	Plant standard				1			
		Lay Length	-do-	-do-	-do-	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet				1			
4	Screening	Visual	Major	Visual	100%	Approved Data Sheet / BS : 5308 Part-2		F/QA/28		1			As applicable as per data sheet
		Thickness of Polyester Tape	Major	Physical	1 Sample/Shift/Size					1			
		Thickness of Alum. Mylar Tape	Major	Physical	do					1			
		Overlap %	Major	Visual	do					1			
		Dia over screen	Major	Physical	do					1			
5	Outer Sheath	Type of Compound	Major	Visual	Each length	IS:5831 / Data Sheet		Log Book		1			
		Thickness of Sheath	-do-	Measurement	Both ends of each length	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet				1			
		Overall Diameter	-do-	-do-	-do-	-do-				1			
		Marking on Outer Sheath	-do-	Visual	-do-	-do-				1			
		Colour of Sheath	-do-	-do-	-do-	-do-				1			
		Surface Finish	Major	-do-	Setting & Completion	-do-				1			

LEGEND : P - PERFORM, W - WITNESS, V - VERIFICATION, INDICATE 1 FOR VENDOR/SUBVENDOR, 2 FOR NOMINATED AGENCY;
AS APPROPRIATE AGAINST EACH COMPONENTS/CHARACERISTIC SUBMITTED TO RECORDS. UNDER P, W & V COLUMNS
* FOR ITEM MARKED (TICK) IN COLUMN " D " TEST CERTIFICATES SHALL BE SUBMITTED FOR RECORDS.

PREPARED BY	APPROVED BY	APPROVED BY
VENDOR'S SIGNATURE & STAMP	**Pipeline** QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS :-

MANUFACTURING QUALITY PLAN SAMPLE

QAP Ref.:
Rev No :
Date:

CUSTOMER : BHEL EDN BANGALORE

S.No.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	* D	AGENCY P	AGENCY W	AGENCY V	Remarks
1	2	3	4	5	6	7	8	9					10
C	PACKAGING	Winding of length / Drum	Major	Measurement		IS:1554-I/88/ IS: 7098-I/88/ Appvd. Data Sheet		Log Book					
		Condition of winding on drum	-do-	Visual	-do-	-do-				1			
		End Sealing	-do-	-do-	-do-	-do-				1			
		Drum Marking	-do-	-do-	-do-	IS:1554 Part-1(1988)				1			
D	**FINAL TESTING**												
1	ROUTINE TEST	Conductor Resistance	Cr.	Electrical	100%	IS:8130 (1984) / Data Sheet		Log Book		1		2	Internal Routine test
													Reports for all Items
		High Voltage Test at room temp.	-do-	-do-	-do-	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet		Log Book		1		2	to be Submitted for
													Review by
													Inspecting Officer
2	TYPE TEST	Annealing Test of Cu Cond.(Before Stranding)	Cr.	Mechanical	One Sample of each type	IS:8130(1984)		Log Book		1		2	
		Conductor Resistance	-do-	Electrical	-do-	IS:8130-1984/ Data Sheet				1		2	
		High Voltage Test (Room temp.)	-do-	-do-	-do-	IS:1554-I/88/ IS: 7098-I/88 / Data Sheet				1		2	
		Colour Coding	Cr.	Visual	-do-	-do-				1		2	
		Check for dimensions	Major	Measurement	-do-	-do-				1		2	Internal Type test
		(Measurement of Thickness	-do-	-do-	-do-								Reports for each cable
		of Insulation & Sheath)	-do-	-do-	-do-	Data Sheet				1		2	type to be Submitted for
		Tensile Strength of Insulation & Sheath	-do-	Mechanical	-do-	IS:5831-1984				1		2	
		Elongation on Insulation & Sheath	-do-	-do-	-do-	-do-				1		2	
		Ageing test on Insulation & Sheath	-do-	-do-	-do-	-do-				1		2	
		Shrinkage test on Insu. & Sheath	-do-	Physical	-do-	-do-				1		2	
		Thermal Stability on PVC Sheath	-do-	Visual	-do-	-do-				1		2	
		Heat Shock test for PVC Sheath	-do-	Mechnical	-do-	-do-				1		2	
		Volume Resistivity Test	-do-	-do-	-do-	-do-				1		2	

LEGEND : P - PERFORM, W - WITNESS, V - VERIFICATION, INDICATE 1 FOR VENDOR/SUBVENDOR, 2 FOR NOMINATED AGENCY;
AS APPROPRIATE AGAINST EACH COMPONENTS/CHARACERISTIC SUBMITTED TO RECORDS. UNDER P, W & V COLUMNS
* FOR ITEM MARKED (TICK) IN COLUMN " D " TEST CERTIFICATES SHALL BE SUBMITTED FOR RECORDS.

PREPARED BY	APPROVED BY	APPROVED BY
VENDOR'S SIGNATURE & STAMP	**Pipeline** QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS :-

MANUFACTURING QUALITY PLAN SAMPLE

QAP Ref.:
Rev No :
Date:

CUSTOMER : BHEL EDN BANGALORE

S.No.	Component & Operation	Characteristics	Class	Type of check	Quantum of check	Reference Documents	Acceptance Norms	Format of Record	* D	AGENCY P	AGENCY W	AGENCY V	Remarks
1	2	3	4	5	6	7	8	9					10
		TESTS FOR FRLS PVC SHEATH								1		2	
		Oxygen Index test	Cr.	Chemical	One Sample of each size	ASTM-D-2863 / Data Sheet		Log Book		1		2	
		Temperature Index test	-do-	Thermal	-do-	-do-				1		2	
		Smoke Density Rating	-do-	Chemical	-do-	ASTM-D-2843 / Data Sheet				1		2	
		Halogen Acid Gas Generation	-do-	Chemical	-do-	IEC-60754 (Part-1)				1		2	
		Flammability Tests				As per IEC-60332-1-2, IEEE-383, IEC-60332-3 cat-C, Swedish chimney test as per SS-4241475-CL(F3)							
3	ACCEPTANCE TEST	Annealing test for Cu Cond.	Cr.	Mechanical	**Sampling as per Note-1***	Plant Standard / Data Sheet		Final Report		1	2		**Solid Conductor only**
		Colour Coding	-do-	Visual	-do-	-do-		Format		1	2		
		Conductor Resistance	-do-	Electrical	-do-	IS:8130-1984/ Data Sheet				1	2		
		High Voltage Test at Room Temp.	-do-	-do-	-do-	IS:1554 Pt-1/ Data Sheet				1	2		
		Volume Resistivity	-do-	-do-	-do-	-do-				1	2		
		Check for dimensions (Tests for Thickness	Major	Measurement	-do-	-do-				1	2		
		of Insulation & Sheath	-do-	-do-	-do-	-do-				1	2		
		Tensile Strength on Insul.& sheath	-do-	Mechanical	-do-	-do-				1	2		
		Elongation on Insulation & Sheath	-do-	-do-	-do-	-do-				1	2		
		Insulation Resistance	Cri	Electrical	-do-	APPROVED DATA SHEET		-do-		1	2		
		Mutual Capacitance	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		L/R ratio [max] for signal cables	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		Cross-talk	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		Characteristic Impedance	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		Attenuation figure	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		Capacitance unbalance (max)	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		
		Max. Characteristic Impedance	-do-	Electrical	-do-	BS:5308-2 / Approved Data Sheet		-do-		1	2		

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