



TAMILNADU GENERATION AND DISTRIBUTION CORPORATION
2 X 660 MW ENNORE SEZ SUPERCRITICAL THERMAL POWER PROJECT
COAL HANDLING & ASH HANDLING PLANT

**TECHNICAL ENQUIRY SPECIFICATION
FOR INSTRUMENTATION CABLE**

BHARAT HEAVY ELECTRICALS LIMITED
INDUSTRIAL SYSTEMS GROUP BANGALORE

NOTE:

1. Bidder to note that the acceptance of the offer is subjected to the "Bidder approval from our customer- TANGEDCO/ Consultant".
2. In case Bidder is not an approved supplier of M/s TANGEDCO for 2X660MW Ennore STPP, Bidder has to submit the credentials properly indexed, for seeking approval of customer. The list of required credentials will be informed at the time of technical scrutiny of offer. In case customer does not approve the credentials of the bidder, the bidder will be technically rejected.

Tripti Singh		D Malathi		T I Santha	
Name	Signature	Name	Signature	Name	Signature
Designation	Sr. Engineer	Designation	Sr. Manager	Designation	Sr. DGM
Prepared by		Checked by		Approved by	



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SECTION-I GENERAL SITE INFORMATION

A. Project Information & Location

Project Title	Ennore SEZ project of 2 x 660 MW Coal Based Super Critical Thermal Power Project at ash dyke of NCTPS
Plant capacity	1320 MW (2 units of 660 MW each)
Type of project	Green field
Owner	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)
Consultant	DESEIN
Plant site location	Ash dyke of North Chennai Thermal Power Station (NCTPS)
Location co-ordinates	Latitude : 13°17' N to 13°18' N Longitude : 80°18' E to 80°19' E
Nearest Village	Vayalur
Nearest Town & City	Chennai (35 Km)

B. Meteorological Condition

Climate	Tropical, very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind
Site Elevation	(+) 10.0 Meter above Mean Sea Level
Ambient Temperature	
a) Annual Maximum Mean Temperature	32°C
b) Annual Minimum Mean Temperature	24°C
c) Design ambient temperature	35°C
Relative Humidity	
a) Maximum	100%
b) Minimum	36%
c) Design	75%
Annual Rainfall	
Maximum	2540 mm
Average	1600 mm
Minimum	1175 mm
Prevailing Wind Direction	November to January – From NW & NE February to March – From East & SE April to May – From South & SE June – From SW July to August – From NW September to October – From SE & SW
Wind Speed	11.8 kmph (Avg), 50m/s max)
Seismic zone	Zone: III as defined in IS:1893-2002
Design ambient temperature (For Electrical equipments)	Air: 50°C Ground: 30°C



C. POWER SUPPLY SYSTEM

LT power supply	
i) Voltage	415 V AC 3 Ph, 4 Wire 50 Hz
ii) Voltage variation	±10%
iii) Frequency variation	+3% to - 5%
iv) Combined Voltage & Frequency Variation	10% (absolute sum)
v) Fault level	50kA RMS for 1 second
vi) Earthing	Solidly grounded

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**SECTION-II
APPLICABLE STANDARDS**

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS: codes, standards, IEC etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:

IS :1554 - I	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.
IS : 3961	Recommended current ratings for cables
IS : 3975	Low Carbon Galvanized steel wires, formed wires and tapes for armouring of cables.
IS : 4905	Methods for random sampling.
IS : 5831	PVC insulation and sheath of electrical cables.
IS : 8130	Conductors for insulated electrical cables and flexible cords.
IS : 10418	Specification for drums for electric cables.
IS : 10810	Methods of tests for cables.
ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.
ASTM-D-2863	Standard method for measuring the minimum oxygen concentration to support candle like combustion of plastics.
IEC-754 (Part-I)	Test on gases evolved during combustion of electric cables.
IEEE-383	Standard for type test of Class IE Electric Cables.
IEC -332	Tests on Electric cables under fire conditions. Part-3 : Tests on bunched wires or cables (category -B)
SS-4241475 classF3	Swedish Chimney test
NES-715-1	Temperature index

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**SECTION-III
SCOPE OF SUPPLY**

Cables – Design Criteria

1. This specification covers the Design, Manufacture, Inspection and Testing at Bidder's works, proper packing and delivery to site of INSTRUMENTATION CABLES.
2. Except where specified otherwise all materials , cables and construction shall conform to the Indian Electricity Act and Rules and the Indian and other international standards with latest revisions and amendments issued up to date.
3. All materials shall be new and of tested quality conforming to applicable National and Manufacturer's Standards and Indian Electricity Rules.
4. All materials shall be transportable to and suitable for installation at site with ease and without any damage. It shall give continuous reliable operation over long period under worst specified site conditions.
5. All materials shall be designed to withstand extremes of all magnetic, electrical, mechanical and thermal stresses which may be encountered during normal and abnormal operating conditions.
6. Cables shall be so designed and manufactured that damage does not occur in handling, during transit, storage, installation and operation under any or all the climatic and operating conditions which they may be subjected to.
7. Cables shall be suitable for laying in conduits, ducts, trenches, trays or for direct burial in ground in both and wet locations
8. Cables shall be capable of operating satisfactorily under the power supply voltage and frequency variations as specified in the specification. Current ratings and ratings factors of cables shall not be worse than the ones specified in IS: 3961
9. Performance characteristics of cables shall be based on the following conditions of laying:
 - 9.1 All cables shall be laid in multilayer and touching each other.
 - 9.2 Cables shall be suitable for laying in duct or burying in ground upto a depth of 1.5 meters with uncontrolled back fill and chances of flooding by water.
10. The Instrumentation cables shall function without breakdown for surges experienced in the control system.

It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.

BILL OF QUANTITY: The bidder to quote for items as per '**BOQ-cum-Unpriced format**' (Annexure-c)



SECTION IV TECHNICAL SPECIFICATION FOR INSTRUMENTATION CABLE

SL.NO.	ITEM	TECHNICAL PARTICULARS
1	Voltage Grade	1.1 KV
	IS Reference	IS: 1554 (Part-I Generally)
2	CONDUCTOR	
(a)	Material	Annealed tinned high conductivity Electrolytic Copper conductor 1. Multipair overall shielded armoured instrumentation cable (G-type) Nominal 0.5 Sq.mm. area concentric lay: cables single length =< 500 meters Stranded 7 x 0.307 mm dia. Nominal 1.5 Sq. mm Area concentric lay: cables single length > 500 meters Stranded 7x0.53 mm dia. 2. Multipair individual pair and overall shielded armoured instrumentation cable (F-type) Nominal 0.5 Sq.mm. area concentric lay stranded 7 x 0.307 mm dia. Conductor size: Overall dia of each conductor including insulation should be between 1.4 to 1.65 mm. For 0.5 sq mm. size conductor.
3	INSULATION	
(a)	Material	Extruded HR PVC type – C
(b)	Standard Applicable	IS:5831
(c)	Maximum continuous operating temperature under normal operation	85°C
4	SHIELDING	
(a)	Type of shielding	Aluminium mylar tape
(b)	Individual pair shielding	To be provided for type-F cable only
(c)	Overall shielding	To be provided for both type-F & type-G cables
(d)	Minimum thickness of individual pair shielding	0.06 mm
(e)	Minimum thickness of overall cable assembly shielding	0.075 mm
(f)	Shielding coverage	100% coverage with at least 25% overlap
(g)	Drain wire provided	0.8 mm dia tin coated copper drain wire (7 stranded)
5	INNER SHEATH	
(a)	Material	FRLS HR PVC type ST-2
(b)	Standard Applicable	IS:5831/VDE 0207
(c)	Colour	Black
(d)	Rip cord	Non-metallic rip cord under the inner sheath
6	FILLERS	Flame retardant and moisture resistant
7	ARMOUR	
(a)	Material	Galvanized steel round wire/strip
(b)	Standard Applicable	IS:3975 & IS 1554 Part I



8	OUTERSHEATH	Outer sheath of cables shall have rodent and termite repulsion property.
(a)	Material	FRLS HR PVC type ST-2
(b)	Standard Applicable	IS:5831/VDE 0207/ IEC 60332
(c)	Colour	0.5 sq mm. Conductor size: Black 1.5 sq mm. Conductor size: Blue
(d)	Marking	Cable identification shall be provided by embossing on every meter on the outer sheath the following: a) Owner's Name b) Bidder's name or trademark c) Voltage grade d) Year of manufacture Type of cable e) Type of insulation and sheath as applicable. Word 'FRLS' at every metre – To be embossed f) No. of pairs and size of cables (cross section area of conductor) g) IS number & ISI Mark h) Sequential marking of length of the cable in metres at every 1m throughout the length of the cable. To be embossed / printed. The embossing / printing shall be progressive, automatic, in line and marking shall be legible and indelible.
9	Lay	Twisted pair with 25 - 40lay/mt
10	Tests for FRLS Properties	
(a)	Flammability Test	The cables shall pass the requirement of IEEE-332 part B fire propagation test
(b)	Smoke generation by Sheath under fire	The cable shall meet the requirement (60%) smoke density as per ASTM-2843
(c)	Acid gas generation of sheath during fire	Maximum Acid gas should be less than 20% by weight as per IEC-754-1
(d)	Oxygen Index Test	The oxygen index when tested under ASTM D 2863 shall be minimum 29
(e)	Water immersion test	as per VDE 0815
(f)	Swedish Chimney Test	Yes
11	ELECTRICAL PROPERTIES AT 20 DEG.C:	
(a)	Conductor resistance of the loop not greater than	78.4 Ohms/Km: 0.5 sq mm. Conductor size. 24.6 Ohms/Km: 1.5 sq mm. Conductor size.
(b)	Insulation resistance not less than	100 MegOhms/Km
(c)	Mutual capacitance at 0.8 KHz not greater than	100 nF/Km
(d)	Test Voltage-cond/cond. and cond/shield	2000 Vrms
(e)	Characteristic impedance at 0.8 KHz	370 Ohms: 0.5 sq mm. Conductor size. 230 Ohms: 1.5 sq mm. Conductor size.
(f)	Image attenuation at 0.8 KHz	0.11 dB/100 m
(g)	Image attenuation at 10 KHz	0.29 dB/100 m
(h)	Cross talk attenuation at 0.8 KHz greater than	70 dB/Km
(i)	Coupling capacitance at 0.8 KHz not greater than	200 pF/100 m
(j)	Min Vol. Resistivity	3.5×10^{14} at 27 deg C 3.5×10^{11} at 85 deg C
(k)	High Voltage Test	Duration
	Conductor to Conductor	2000 Vrms, 50 Hz for 1 min.
	Conductor to Shield	2000 Vrms, 50 Hz for 1 min.

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12	OTHER TESTS:																																								
(a)	Fire resistance test (PVC insulation & sheath)	IS-5831 for 20 minutes																																							
(b)	Thermal stability	at 200 deg. C to IEC-540 for100mts.																																							
(c)	Rodent and termite proof	Yes																																							
(d)	Heat shock test	IEC-502																																							
13	Outer most cable layer	Anti termite, Anti Rodent & moisture resistant properties. The cables shall also have anti-fungal properties.																																							
14	Both the ends of the cables	Properly sealed with heat shrinkable PVC/ rubber caps secured by ‘U’ nails so as to eliminate ingress of water during transportation, storage and erection																																							
15	CONDUCTOR AND PAIR	The wires of pairs shall be coded by base colours on insulation which are repeated in every unit. Base colours of the pairs in a unit shall be as follows: <table><tr><td>Pair</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>a) wire</td><td>Blue</td><td>Grey</td><td>Green</td><td>White</td></tr><tr><td>b) wire</td><td>Red</td><td>Yellow</td><td>Brown</td><td>Black</td></tr></table> The units shall be coded by colours of rings on the insulation cores as tabulated below in order to distinguish between wires of various units in cables : ----- Unit: Ring Colour: Ring Group ----- <table><tr><td>1.</td><td>PINK</td><td>I</td></tr><tr><td>2.</td><td>PINK</td><td>II</td></tr><tr><td>3.</td><td>PINK</td><td>III</td></tr><tr><td>4.</td><td>PINK</td><td>IIII</td></tr><tr><td>5.</td><td>PINK</td><td>IIIII</td></tr><tr><td>6.</td><td>ORANGE</td><td>IIIIII</td></tr><tr><td>7.</td><td>ORANGE</td><td>IIIIIII</td></tr><tr><td>8.</td><td>ORANGE</td><td>IIIIIIII</td></tr></table> The vertical lines under column (Ring Group) in the above table indicate number of rings at intervals of approx 60 mm length of the wires of the units. For cables above 4 pair, each 4 pair units shall be open helically lapped with numbered binder taped for the purpose of binding & unit identification.	Pair	1	2	3	4	a) wire	Blue	Grey	Green	White	b) wire	Red	Yellow	Brown	Black	1.	PINK	I	2.	PINK	II	3.	PINK	III	4.	PINK	IIII	5.	PINK	IIIII	6.	ORANGE	IIIIII	7.	ORANGE	IIIIIII	8.	ORANGE	IIIIIIII
Pair	1	2	3	4																																					
a) wire	Blue	Grey	Green	White																																					
b) wire	Red	Yellow	Brown	Black																																					
1.	PINK	I																																							
2.	PINK	II																																							
3.	PINK	III																																							
4.	PINK	IIII																																							
5.	PINK	IIIII																																							
6.	ORANGE	IIIIII																																							
7.	ORANGE	IIIIIII																																							
8.	ORANGE	IIIIIIII																																							
16	CABLE DRUMS (PACKING)																																								
(a)	Type of Drum	Non returnable wooden drums																																							
(b)	Standard applicable	IS: 10418.																																							
(c)	Surface of drum	Should have water proof cover																																							
(d)	Wood preservative anti-termite treatment	Yes																																							
(e)	Length per drum tolerance	1000 m +/- 5% up to & including 12 pair cables 500 m +/- 5 % for above 12 paired cables +/-2% in overall length. Employer shall have the option of rejecting cable drums with shorter lengths																																							
(f)	Marking on drum	Each drum shall carry a) Bidder’s name or trademark b) Owner’s name c) Address and contract number d) BHEL-ISG e) Type of cable & voltage grade f) Year of manufacture g) Type of insulation / sheath as applicable h) No. of core and size of cables i) Cable code																																							

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		j) Length of cable on drum k) No. of length on drum, if more than one l) Direction of rotation, by arrow m) IS number & ISI Mark n) Approx. gross mass The above information should be stenciled on both side of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
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SECTION V QUALITY ASSURANCE, INSPECTION & TESTING

A. QUALITY ASSURANCE REQUIREMENTS:

- a) QAP (Manufacturing Quality Plan) shall be submitted for customer (owner) approval. Any test not listed below but required as per latest standards shall be done without any price implication to BHEL.
- b) In these approved Quality Plans, Owner shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Owner's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Owner in writing.
- (c) If owner identify CHP in Quality plans then, Necessary accommodation & local travel shall be arranged free of cost for the TANGEDCO inspecting officers by the bidder during inspection, testing at the premises.

B. TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

GENERAL POINTS:

- a) An indicative list of **TESTS** is given in the table below. This list of tests is not exhaustive and owner may ask for submission of test report of any other test as per standards.
- b) During the manufacture of cables, bidder's standard tests shall be performed and record / test report shall be made available to purchaser's representative during inspection / testing.
- c) After completion of manufacture of cables, type, routine and acceptance tests shall be performed strictly as per relevant IS & other applicable standards amended up to date. Charges for these shall be deemed to be included in the equipment price

TYPE TEST:

- a) All equipments to be supplied shall be of type tested design. The bidder shall submit the type tests reports for the tests conducted on the cables similar to all the cables (as mentioned in the BOQ) to be supplied under this contract and the test(s) should have been conducted at an independent laboratory not earlier than five (5) years prior to supply under this contract.
- b) In case the bidder is not able to submit valid report of the type test(s) or in case type test report(s) are not found to be meeting the specification requirements, or not including all specified tests the bidder shall conduct all such tests under this contract. The cost of such test shall be deemed to be included in the price & such tests needs be done within the delivery period. The owner shall have right to witness the type tests. Waiver of type tests will not be entertained in normal circumstances.
- c) Even if the supplier furnishes valid test reports, owner may get some type test conducted under this contract as specified in the table below for bidder shall include in his total equipment price the cost of carrying out all such type tests.
- d) In case, facilities of any of the type tests are not available at the works of the supplier, then such type tests shall be carried out by the supplier at independent recognized Govt. approved laboratory at the cost of supplier.
- e) The type tests shall be carried out on one drum out of every 10 drums or less for each size of cable in each lot, in presence of Owner's representative as per applicable standards in Govt. approved Laboratory if adequate testing facility is not available at works of the supplier.

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ACCEPTANCE TEST:

a) Acceptance tests shall be carried out on 1 drum out of every 10 drums or less for each size of cables in each lot, in presence of owner's representative.

ROUTINE TEST:

a) Routine tests shall be carried out as per relevant standard for each drum of cables of all types and sizes.

SL.NO.	TEST	STANDARD	REMARKS
TYPE TESTS			
	For Conductor		
1	Annealing test (for copper)	IS : 8130	
2	Conductor resistance test & Diameter test	IS : 10810	
3	Per sulphate test (for tinned copper wire)	IS : 8130	
	For Armour Wire/ Strip		
4	Test for armours wires / strips	IS : 3975	
5	Test for measurement of DC resistance of armour	IS: 1554 (I)	
	For PVC Insulation & Sheath		
6	Test for measurement of thickness of insulation & sheath & other dimensions	IS : 1554 (I)	
7	Measurement of volume resistivity of HRPVC insulation	IS : 5831	i. 3.5×10^{14} Ohm-cm at 27 deg C / room temp.(Min) ii. 3.5×10^{11} Ohm-cm at 85 deg C.(Min)
8	Tensile strength and elongation test for insulation & sheath.	IS:5831	
9	Ageing test for insulation & sheath.	IS:5831	
10	Loss of mass test for PVC insulation & sheath.	IS:5831	
11	Shrinkage test for PVC insulation & sheath.	IS:5831	
12	Hot deformation test for PVC insulation & sheath	IS:5831	
13	Cold bend test for PVC insulation.	IS:5831	
14	Cold impact test for PVC sheath.	IS:5831	
15	Heat shock test for PVC insulation & sheath.	IS:5831	
16	Thermal stability test for PVC insulation and sheath.	IS:5831	
17	Test for bleeding and blooming of pigments for PVC insulation of sheath.	IS:5831	
18	Colour fastness to water.	IS:5831	
19	Colour fastness to day light	IS:5831	
20	High voltage test (water immersion test)	IS:1554(I)	
21	Test for rodent & termite repulsion property of sheath.		Presence of lead shall be detected.
22	Oxygen index test on inner & outer sheath material.	ASTM:D-2863/77	Min.29
23	Temp. index test on inner & outer sheath material	ASTM:D-2863/77	Min.250 degC
24	Acid gas emission test on inner & outer sheath material.	IEC-754-1	Acid gas generation shall be less than 20% by weight.

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25	Smoke Density test on inner & outer sheath material	ASTM-D-2843/77	Min. 40% light transmission during test.
26	Flammability test on finished cable samples as per following methods: i. Swedish chimney test ii Vertical tray flame propagation test. iii. Single vertical cable fire resistance test.	SS-424-14-75 Cl. F-3 IEEE-383 IEC-332-1	
27	Tests for all electrical properties at 20oC & maximum operating temp. as per GTP.		
28	Oxygen index test & Acid Gas generation test for Fillers	ASTMD – 2863, IEC 60754-1	
29	Continuity test, Shield thickness, Overlap test of Al Mylar shield		
30	Noise interference test, Cross talk test, Mutual capacitance, Drain wire continuity test.	IEEE Transaction, VDE 0472	

ROUTINE TESTS

1	High voltage test	IS:1554 (I)	2 KV (RMS) for one minute
2	Conductor Resistance Test	IS:8130	

ACCEPTANCE TESTS

1	High voltage test	IS:1554 (I)	2 KV (RMS) for one minute
2	Conductor Resistance Test	IS:8130	
3	Volume Resistivity	IS:5831	i. 3.5×10^{14} Ohm-cm at 27 deg C / room temp.(Min) ii. 3.5×10^{11} Ohm-cm at 85 deg C.(Min)
4	Measurement of Mutual capacitance at 0.8 KHZ		100 NF/Km (max)
5	Calculation & Verification of Characteristic impedance on the basis of value obtain for mutual capacitance at 0.8 KHZ with the help of following formula $Z = R / 2fc$ where Z = characteristic impedance in ohm R = Loop resistance of cable per km in ohms at 20 °C f = Frequency of test in Hz (800) c = mutual capacitance per km		320 Ohms(nominal)
6	Measurement of thickness of insulation and sheath & other dimensions	IS:1554 (I)	
7	Tensile strength and elongation at break of insulation & sheath	IS:5831	
8	Oxygen index test on inner & outer sheath at room temp	ASTM-D-2863	Min.29
9*	Temp. index test on inner & outer sheath	ASTM-D-2863	Min.250° C
10*	Acid gas emission test on inner sheath & outer sheath	TEC-754-1	Max.20% by weight
11	Smoke density test on inner sheath & outer sheath	ASTM-D-2843	Min.40% light transmission during test
12	Flammability test	SS-424-14-75 Class F-3	
13	Additional Test	IEC 331	for fire survival characteristics

NOTE:



*(If no. of drums selected for acceptance test for a particular cable size are more than one, the tests marked with * i.e. 9 & 10 under acceptance tests shall be carried out on one drum only.)

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**SECTION-VI
TECHNICAL DOCUMENTATION REQUIREMENT**

A. Documents to be submitted during event of order

- a) Manufacturer's catalogues giving cable construction details and characteristics.
- b) Cross sectional drawing of cable.
- c) Cable current ratings for different types of installation, inclusive of derating factors for ambient temperature, grouping etc.
- d) Write-up on Manufacturer's recommended method of splicing, jointing, termination, etc. of the cables.
- e) Type test reports
- f) Filled-up proposal particulars

B. The following documentation shall be supplied to BHEL at different stages of the Project.

Sl. No.	TYPE OF DOCUMENTS	No.of Hard/Soft Copies (for each document)	Submission Schedule	STATUS
1.	GTP & QAP (As per Annexure-a & b) catalogues, installation details, Type test procedures	PDF files+ 2 Hard Copies of each document (For each submission)	Within 1 Week from the date of LOI	For Approval
2.	GTP & QAP (As per Annexure-a & b) catalogues, installation details, Type test procedures	8 Hard copies+3 CD ROMs	After final approval	For Distribution
3.	Type test certificates	PDF files+ 2 Hard Copies of each document	Within a week from the date of conduction of Type Test	For Approval
4.	Routine & Acceptance Test Certificate	4 Hard Copies of each document	Immediately after testing	For Approval
5.	Storage, preservation, erection, operation & maintenance and safety instructions	4 Hard copies+2 CD ROMs	With dispatch documents	For Information
6.	QA Documentation for eg. Final type, acceptance, routine test certificates, etc	1 Hard copy	Before despatch	For Information
7.	QA Documentation for eg. Final type, acceptance, routine test certificates, etc	2 Hard copies+2 CD ROMs	Within 3 weeks from the date of despatch	For Distribution
8.	As built drawings	6 Hard copies+6 CD ROMs	Within 1 week from final inspection and acceptance	For Distribution

NOTE:

1. Test Certificates shall be strictly in A4 size. All documents/text information shall be in PDF.
2. Test certificates shall have all the information as per IS & all documents are required to be in English.
3. Test Certificates shall be marked "Certified" and shall be signed by competent authority from supplier side.

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4. The list of Technical particulars in GTP (Annexure-a) is indicative. Any Technical particular not listed but required as per specification & standard should be added in the GTP.

5. All documents shall show the following particulars in the title block :-

Name of the customer :

Project title :

Equipment number :

Suppliers reference number :

Number of sheets :

Revision number :

Date :

7. Revised documents incorporating customer comments shall be re-submitted within 4 days for approval. All documents shall be neatly printed in font size not less than 12(twelve) and legible. Photo copies shall be clean prints. Delay in submission of documents and submission of revised documents shall be considered as delay and subject to delay calculation for LD purpose.

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SECTION-VII
INFORMATION TO BE FURNISHED ALONG WITH OFFER

S.NO	DESCRIPTION
1	Duly signed and stamped copy of BOQ cum Unpriced format (as per Annexure-c) mentioning the prices are “ Quoted ”
2	Duly Signed and stamped copy of “ Deviation Sheet “ by mentioning “ NO DEVIATION “ in the Technical Column
3	Signed and stamped copy of complete enquiry specifications (From Sheet No. 01 to 21).

Notes:

1. M/s BHEL shall not entertain any technical clarification after submitting the offer. Technical clarification (if any) pertaining to the Technical Specification must be obtained from M/s BHEL by the vendor before submitting the offer. Once the offer is received from the vendor it is deemed as offer is in line with the technical requirement.
2. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.



ANNEXURE – (a)
GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

SL.NO.	ITEM	UNIT	SIZE OF CABLE
1	Manufacturer's name		
2	Reference standard		
3	Conductor size		
4	Conductor material		
5	Number of pairs/cores		
6	Insulation		
(a)	Individual conductor Insulation material		
(b)	Inner sheath material		
(c)	Outer sheath material		
(d)	Individual conductor insulation thickness		
(e)	Outer sheath insulation Thickness		
(f)	Applicable design standard for outer sheath		
(g)	Applicable design standard for conductor insulation		
7	Voltage grade		
8	Continuous operating temperature		
9	Shield material and thickness		
10	Drain Wire:		
(a)	Size		
(b)	Number of strands		
(c)	Material		
11	Individual pair shielded		
12	Cable accessories are flame Retardant		
13	Capacitance imbalance/mutual capacitance		
14	Characteristic impedance		
15	Noise reject level		
16	Cable drums		



16.1	Dimensions		
	a. Flange diameter	mm	
	b. Barrel diameter	mm	
	c. Traverse	mm	
16.2	Shipping weight of drum for standard drum length	kg	
16.3	Standard cable length for drum for each size of cable (single length)		
16.4	Tolerance on packing length		



MANUFACTURING QUALITY PLAN (ANNEXURE-b)

ANNEXURE-b

 BHEL Industrial System Group, Bengaluru		JOB NO.	MANUFACTURING QUALITY PLAN				Project Name					
		PO NO. & DATE										
		SUPPLIER NAME & ADDRESS	SUB SYSTEM	REV NO.	Package							
				DATE	Contract No.							
			PAGE:	Main Supplier								

SL. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY			REMARKS
									M	B	C	
1	2	3	4	5	6	7	8	9	*D	10		11

Supplier's Signature & Seal	BHEL's Signature & Seal	Legends:	 DOC. NO.: REV..... CAT..... Name, Seal & Sign of Approving Authority REVIEWED BY APPROVED BY APPROVAL SEAL FOR OWNER USE
		*D: RECORDS, IDENTIFIED WITH "TICK" (V) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.	
		MTC-Material Test Certificate, IR-Inspection Report	
		P-Perform M-Manufacturer/supplier	
		V-Verification B-BHEL/BHEL TPI	
		W-Witness C-Customer/customer's TPIA	
CHP: THE OWNER SHALL IDENTIFY IN COLUMN "C"			

Note :



TECHNICAL ENQUIRY SPECIFICATION FOR INSTRUMENTATION CABLE

BOQ CUM UNPRICED FORMAT (ANNEXURE-c)

SL.NO.	ITEM DESCRIPTION	QUANTITY (in Mtrs.)	UNIT PRICE (IN ₹) (inclusive of packing & forwarding and Freight charges)	TOTAL PRICE (IN ₹)
1.	1.1 KV 2P X 0.5 (F TYPE) SCREEN CABLE	16500		
2.	1.1 KV 4P X 0.5 (F TYPE) SCREEN CABLE	6000		
3.	1.1 KV 6P X 0.5 (F TYPE) SCREEN CABLE	1500		
4.	1.1 KV 8P X 0.5 (F TYPE) SCREEN CABLE	1500		
5.	1.1 KV 2P X 1.5 (F TYPE) SCREEN CABLE	5500		
6.	1.1 KV 4P X 1.5 (F TYPE) SCREEN CABLE	1000		
7.	1.1 KV 3P X 0.5 (G TYPE) SCREEN CABLE	1500		
8.	1.1 KV 4P X 0.5 (G TYPE) SCREEN CABLE	500		
9.	1.1 KV 6P X 0.5 (G TYPE) SCREEN CABLE	8500		
10.	1.1 KV 8P X 0.5 (G TYPE) SCREEN CABLE	28000		
11.	1.1 KV 10P X 0.5 (G TYPE) SCREEN CABLE	15500		
12.	1.1 KV 12P X 0.5 (G TYPE) SCREEN CABLE	13500		
13.	1.1 KV 16P X 0.5 (G TYPE) SCREEN CABLE	14000		
14.	1.1 KV 6P X 1.5 (G TYPE) SCREEN CABLE	4000		
15.	1.1 KV 8P X 1.5 (G TYPE) SCREEN CABLE	16500		
16.	1.1 KV 12P X 1.5 (G TYPE) SCREEN CABLE	23500		
17.	1.1 KV 16P X 1.5 (G TYPE) SCREEN CABLE	18000		
18.	1.1 KV 10T X 0.5 (F TYPE) SCREEN CABLE	13500		
19.	1.1 KV 10T X 1.5 (F TYPE) SCREEN CABLE	11000		
	GRAND TOTAL			
NOTE : GST and applicable Taxes shall be considered extra at actuals on Total ex-works Price.				