

OPEN Tender Enquiry of LT PVC CONTROL CABLES as per Technical Specification No. PE-TS-412-507-E015A Rev00 for 2X660 MW ENNORE SEZ

ENQ. NO. PE/PG/EN1/E-5460/2016

DATE: 09/02/2017

DUE DATE
03/03/2017
2:00 PM (IST)

Subject: OPEN Tender Enquiry of LT PVC CONTROL CABLES as per Technical Specification No. PE-TS-412-507-E015A Rev00 for 2X660 MW ENNORE SEZ

BHEL invites offer from reputed Vendors (Refer pre-qualifying requirements enclosed in the Tender Documents uploaded on our websites www.bhelpem.com, www.bhel.com & CPP portal (www.eprocure.gov.in)) for LT PVC CONTROL CABLES of 2X660 MW ENNORE SEZ . Detailed scope of work & equipment details shall be as per technical specification. PE-TS-412-507-E015A Rev00 & other details hosted on above indicated BHEL-websites.

Your offer shall be submitted in two parts strictly as per Clause-2.0 of the "Instructions to Bidders" of GCC, Rev. 06 in quintuplicate (5 sets), in sealed covers for the below mentioned equipment/system.

Item Description – LT PVC CONTROL CABLES	
Project	Technical Specification no.
2X660 MW ENNORE SEZ	PE-TS-412-507-E015A Rev00

Your best quotation/offer for the above requirement, in line with our terms and conditions (hosted on our website, as indicated above), should either be delivered in person or sent by COURIER/REGISTERED or SPEED POST, to the following address only:

Tender Room
Bharat Heavy Electricals Ltd.
Project Engineering Management
PPEI Building, HRD & ESI Complex,
Plot No. 25, Sector – 16A,
NOIDA – 201 301 (U.P.)

Attention: 1) Mr. AMIT MEENA,(PG-II-2, SR. ENGINEER)
2) Mr. ANIL KUMAR PAL,(SR MGR/PG-II-2)

E-MAIL: amitmeena@bhelpem.co.in
Ph. No. 01204213613

It shall be the responsibility of the bidder to ensure that the tender is delivered on or before the due date by 2:00 PM (IST). The offer has to be deposited in tender box only. Part-I bids shall be opened at 3:00 PM (IST) on the due date in the presence of authorized representatives of the bidders, who may like to be present.

AMIT MEENA (PG-II-2, SR ENGINEER)
BHEL/PS-Project Engineering Management,
Power Project Engineering Institute,
Plot no. 25, Sector – 16A, Noida (UP) 201301, INDIA
(Ph. No.) 01204213613
(E-Mail.) amitmeena@bhelpem.co.in

Regd. Office
BHEL House Siri Fort
New Delhi-110049

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Important Note to be considered by All Bidders:

The offers of the bidders who are on the banned list as also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site http://www.bhel.com/vender_registration/vender.php.

TERMS AND CONDITIONS:

1. Bidders are advised to go through the GCC Rev-06 (<http://bhelpem.com/Documents/GCC/GCC-Rev.06.pdf>) while submitting the offers.
2. **Pre-Qualifying Requirements:**
Bidders have to provide the required details as per TECHNICAL PRE-QUALIFICATION REQUIREMENT CRITERIA (enclosed as NIT Tender Documents) in their Techno-Commercial offer. Bids of only those bidders shall be evaluated who meet the Technical Pre-Qualifying/General Pre-Qualifying requirements.
3. Bidders have to submit their offers in line with clause no. 2.0 of "Instructions to Bidders" of GCC Rev. 06.
4. Seller/ Contractor shall not dispatch any material before issue of MDCC by BHEL/ CUSTOMER. For details refer clause no. 15.0 of "General Commercial Terms & Conditions" of GCC Rev. 06.
5. Bidders have to note that TERMS AND CONDITIONS of the tender shall be as per Notice Inviting Tender (NIT) conditions, Special Conditions of Contract (SCC) of Project & General Conditions of Contracts (GCC, Rev. 06)

Order of precedence shall be as per clause NO. 35.0 of GCC Rev. 06 (GENERAL COMMERCIAL TERMS & CONDITIONS).
6. Bidders have to note that this is a conditional OPEN Tender enquiry. Price bid (Part-II) opening/RA participation is subject to following:

(i) Bidders, who are not approved by Customer, participation shall be subjected to approval of bidder by end customer (TANGEDCO). Same shall be taken up by BHEL with the customer based on the credentials/reference list being submitted by the bidder.
ii. Qualification of Technical/General PQR
iii. In line with clause no 2.2 of GCC Rev 06.
7. Bidders have to note that BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. For details refer clause no. 13.0 of "Instructions to Bidders" of GCC Rev. 06. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.
Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be

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considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. **The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.**

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com)."

8. Delivery Terms:

Supply: Delivery for LOT-1 quantity shall be within 4 months from the date of approval of technical and quality documents by BHEL/Customer. This is subject to submission of all drawing/documents by vendor within 2 weeks from the date of PO and re-submission within 10 days from Comments, if any.

Bidder to note that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. Any delay in submission/resubmission shall be reduced from delivery period. Subsequent Lot: A lead-time of three months shall be given for completion of supply of each lot from the date of clearance of the quantities.

Mandatory Spares: Mandatory Spares are to be delivered along with the last consignment of first LOT within the contractual delivery period.

9. CIF is not available for the subject package.

10. PVC shall be applicable for the subject package as per Annexure-I. All bidders shall be asked to quote as per the Price Variation Formulae for Cables uploaded on BHEL PEM website on the link given below.

<http://bhelpem.com/Documents/GCC/Price%20Variation%20Formulae%20for%20Cables.pdf>

11. Payment terms shall be as per GCC rev 06.

12. Indian bidders/Foreign bidders for Indigenous supplies have to quote freight charges in percentage of quoted Total Ex-works prices.

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13. Foreign bidders quoting along with their Authorised Indian associates to comply with BHEL corporate circular AA:MM: AGENCY dated 06th August 2010 for the guidelines regarding dealings with Indian agents of Foreign bidders (as enclosed).
14. Evaluation will be done on overall L1 (Total cost to BHEL) basis with necessary loadings as applicable. Bidders have to refer SCC Rev 01 & GCC Rev 06.
15. Bidders to note that following forms the part of Tender Documents:
 - General Conditions of Contract (GCC) Rev. 06
 - Technical Specification No. PE-TS-412-507-E015A Rev00
 - Price format
 - Special Conditions of Contract
 - Technical PQR, General PQR.
 - NIT CONDITIONS & other Enclosures

Bidders to note that offers shall be submitted strictly in accordance with the requirements of the above Tender Documents & all the above Tender Documents along with post-bid agreements/MoMs (during Techno-Commercial evaluation) shall automatically become the part of the Order/Contract after its finalisation.

16. Bidder has to note that Deviations from NIT are generally not acceptable. Deviations, if any, are to be listed out clearly, as per Annexure-II, of GCC Rev 06, in techno-commercial offer. Any deviation mentioned or shown separately or found hidden in offer, will not be taken cognizance of. In case of deviations from NIT, the bidder shall give the cost of withdrawal of such deviation in Sealed Cover as per Annexure-II, Deviation Sheet (Cost of Withdrawal), as per GCC Rev-06.
17. Foreign and indigenous bidders participating in subject tender will necessarily have to buy class III DSCs (Digital Signature Certificate) issued by the certifying authorities in India. Basic procedure /checklist is uploaded on "www.bhel.com" for participating in future tender enquires through e procurement.
18. The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.
19. Online Registration Portal is operational in BHEL. Non-registered Vendors, who wish to apply may apply through Online Registration Portal available at www.bhelpem.com → vendor section → Online Supplier Registration. All credentials and/or documents duly signed and stamped related to registration has to be uploaded on the website and submit the application for registration. One set of hard copy of the filled-up SRF downloaded from Online Registration Portal duly signed and stamped has to be submitted'.

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20. All corrigenda, addenda, amendments, time extensions, clarifications, etc. to the tender will be hosted on BHEL website (www.bhel.com) & BHEL-PEM website (www.bhelpem.com) only. Bidders should regularly visit websites to keep themselves updated.
21. All correspondence thereof, shall be addressed to the undersigned by name & designation and sent at the following address:

AMIT MEENA ,(PG-II-2,SR.ENGINEER)
M/s. Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex, Plot No 25,
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Ph. No. 0120-4368597

NOTE: In case you are not making an offer against this enquiry, you are requested to send a regret letter so as to reach us on or before the due date & time.

Thanking You.

Yours faithfully,
For and on behalf of BHEL

Amit
09/02/17

AMIT MEENA (PG-II-2, SR ENGINEER)

Enclosures:

1. Technical Specification No. . PE-TS-412-507-E015A Rev00
2. Price format/schedule (Prices should be quoted strictly in this format only)
3. PVC Factors/Formulae
<http://bhelpem.com/Documents/GCC/Price%20Variation%20Formulae%20for%20Cables.pdf>
4. Special Conditions of Contract
5. Technical PQR & General PQR.
6. BHEL corporate circular AA:MM: AGENCY dated 06th August 2010
7. GCC REV 06 Available on www.bhelpem.com
8. Technical & Commercial deviations(Annex-II) as per GCC Rev. 06

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ANNEXURE-A

BILL OF QUANTITIES (1.1kV LT PVC CONTROL CABLES)

(A MAIN SUPPLY

1.1 kV control cables with stranded, non-compacted plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto 5 cores)/number marking (more than 5 cores), distinct extruded inner sheath of PVC type ST1 material, GS Round Wire Armour as per IS : 3975 and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS :1554 (Part-1) and BHEL specification.

S.No.	Item code	Item name	UOM	Ordered Quantity	LOT-I QUANTITY	Unit Price (Ex-Works) Rs	Total Price (Ex Works) Rs	ED including cess @...% (for self manufactured items only) (INR)	CST @% Against C-form & E1/E2 (INR)	VAT @% (INR)	FREIGHT CHARGES INCLUDING SERVICE TAX) @% OF TOTAL EX-WORKS (INR)	TOTAL F.O.R. Site Price Supply (Rs)
A1	507-30015-A	3C - 1.5- ARMoured	MTR	18000	13000							
A2	507-30019-A	5C - 1.5- ARMoured	MTR	168000	118000							
A3	507-30021-A	5C - 2.5- ARMoured	MTR	36000	25000							
A4	507-30001-A	12C - 1.5- ARMoured	MTR	42000	30000							
A5	507-30003-A	12C - 2.5- ARMoured	MTR	38000	27000							

NOTES :

- Quantities indicated above for S. No. (A) & (B) shall be known as Order Quantities. The variation in quantities of all sizes for Main item (A) put together shall be limited to (-) 30% to (+) 30% of the total contract value derived on the basis of the Ordered quantities of main item (A).
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule. The unit prices shall apply for adjustment of variation in quantity as stipulated above.
- Lot-I quantities indicated above shall be cleared for manufacturing along with PO. However, manufacturing of the cables shall be taken up by the successful bidder only after approval of technical and quality documentation. Subsequent loss shall be cleared for manufacture based on progress of engineering & site requirements.
- Delivery schedule of LOT-1 and subsequent lots shall be as per NIT.
- The standard drum length shall be 1000 meters as indicated above. Tolerance on individual drum length shall be $\pm 5\%$.
- Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 1000m, in which case it shall be -5%/0%.
- For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
- In case of the quantities of any one lot cleared by BHEL for manufacturing are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches without any price implications.
- Bidder shall indicate unit price of cables inclusive of type test charges. No separate charges shall be payable for type tests.

ANNEXURE-B

BILL OF QUANTITIES (1.1KV LT PVC CONTROL CABLES)

(B) MANDATORY SPARES

1.1 KV control cables with stranded, non-compacted plain annealed copper conductor, PVC Type-A insulation, core identification by colour coding (upto 5 cores)/number marking (more than 5 cores), distinct extruded inner sheath of PVC type ST1 material, GS Round Wire Armour as per IS : 3975 and extruded PVC Type ST1 outer sheath with FRLS properties, generally conforming to IS :1554 (Part-1) and BHEL specification.

S.No.	Item code	Item name	UOM	Ordered Quantity	Unit Price (Ex-Works) Rs	Total Price (Ex-Works) Rs	ED including cess @ ...% (for self manufactured items only) (INR)	CST @% Against C-form & E1/E2 (INR)	VAT @% (INR)	FREIGHT CHARGES INCLUDING SERVICE TAX) @% OF TOTAL EX-WORKS (INR)	TOTAL F.O.R. Site Price Supply (Rs)
B1	507-30000-B	3C - 1.5- ARMoured	MTR	2000							
B2		SC - 1.5- ARMoured	MTR	17000							
B3		5C - 2.5- ARMoured	MTR	4000							
B4		12C - 1.5- ARMoured	MTR	4000							
B5		12C - 2.5- ARMoured	MTR	4000							

Notes: (Applicable for Mandatory Spares only)

- Quantities indicated above for SI. NO. (B) shall be known as Order Quantities. The quantities are firm & there is no variation in the ordered quantities.
- The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule enclosed with this specification.
- Standard drum length shall be 1000 metres.No negative tolerance on drum for mandatory spare (as indicated above) is allowed.
- Quantity of mandatory spares indicated above shall be released alongwith Lot-1 (indicated in Annexure-A) after approval of technical and quality documentation. The drums supplied against item B shall be clearly identified as "MANDATORY SPARE".
- Delivery schedule of quantities indicated above shall be as per NIT.

2 X 660 MW ENNORE SEZ SUPERCRITICAL TPP

**TAMIL NADU GENERATION & DISTRIBUTION
CORPORATION LIMITED**

TECHNICAL SPECIFICATION

FOR

LT PVC CONTROL CABLES

SPECIFICATION NO: *PE-TS-412-507-E015A*

REVISION: 0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301**



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

VOLUME II

REVISION 0

DATE: 25.01.2017

SHEET

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	b. DATA SHEET-A	04
	c. DATA SHEET-C (GUARANTEED TECHNICAL PARTICULARS)	02
4.	SECTION – II	
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	b. QUALITY PLAN (ALONGWITH ANNEXURE to QAP)	09
	c. ANNEXURE-B TO SECTION-II	02
	TOTAL NO. OF SHEETS=	24
	(INCLUDING COVER/ SEPARATOR SHEETS)	



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
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SPECIFICATION NO. PE-TS- 412-507-E015A

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SHEET 1 of 1

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'
3. 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.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

VOLUME II

SECTION I

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SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS



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**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

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SECTION I

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SHEET 1 OF 1

1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of LT PVC Control cables conforming to this specification.
- 1.2 General technical requirements of the LT PVC Control cables are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.3 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I, Data Sheet - A & Section-II.
- 1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

<u>S.No.</u>	<u>Reference Clause No. of Section- II</u>	<u>Specific Requirement/ Change</u>

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:-

Sl. No.	Drawings/Document Description	Drawings / Document Number
1.	Technical Data sheet - LT PVC Control cables	PE-V0-412-507-E401
2.	Cross-sectional Drgs.- LT PVC Control Cables	PE-V0-412-507-E402
3.	Quality Plan - LT PVC Control Cables	PE-V0-412-507-E403*
4.	Steel drum drawing - LT PVC Control Cables (if applicable)	PE-V0-412-507-E405

Note:

- * Standard Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing document number and description as stated above. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.



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**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

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SECTION I

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DATA SHEET A



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR LT
PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

VOLUME II

SECTION I

REVISION 0

DATE: 25.01.2017

SHEET 1 OF 3

DATA SHEET-A

1.0	Type of Cable	Flame Retardant Low Smoke (FR-LSH)
2.0	Standard applicable in general(Latest amendment to be referred if any)	IS:1554 (Part-1), IS:8130, IS:5831, IS:10810, IS:3975, ASTM D:2843, ASTM D:2863, ASTM D 3137:81, IEC-754-1, IEC:60332 Part-1, IEC:60332 Part-3-23
3.0	Voltage Grade	1.1kV
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ-Cum-Price Schedule
5.0	CONDUCTOR	
(a)	Material	Copper
	Grade and Class	Stranded, annealed high conductivity, Class 2
		<i>Non-Compacted</i>
		<i>Untinned</i>
(b)	Standard Applicable	IS: 8130
(c)	Shape	Circular
(d)	Min. number of strands	7
6.0	INSULATION	
(a)	Material	Extruded PVC Type-A
(b)	Standard Applicable	IS: 5831
(c)	Continuous withstand temperature	70°C
(d)	Short-circuit withstand temperature	160°C
(e)	Method of application	By extrusion; sleeve extrusion not permitted.
(f)	Nominal Thickness of insulation	As per Table-2 of IS: 1554 (Part-1)
7.0	CORE IDENTIFICATION	
(a)	Control Cables up to 5 core	Colour coding as per IS 1554 (Part-1)
(b)	Control Cables above 5 cores	By numbering as per IS 1554 (Part-1). Insulation to have black colour.
8.0	INNER SHEATH	
(a)	Material	Extruded PVC Type ST-1
(b)	Standard Applicable	IS: 5831
(c)	Colour	<i>Black</i>
(d)	Whether FR-LSH	<i>NO</i>
(e)	Thickness of inner sheath	As per Table-4 of IS: 1554 (Part-1)
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	<i>Pressure/Vacuum extruded</i>
(ii)	Without fillers	<i>Pressure extruded</i>
9.0	ARMOUR	



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR LT
PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

VOLUME II

SECTION I

REVISION 0

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SHEET 2 OF 3

(a)	<i>Applicable</i>	<i>YES</i>
(b)	Material:	
(i)	<i>Multi-core cables</i>	<i>Galvanised Steel Round Wire</i>
(ii)	Standard Applicable	IS: 1554 (Part-1) Table-5 and IS:3975
(c)	Minimum Coverage	90%
(d)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(e)	Breaking load of joint	95 % of normal armour
10.0	OUTERSHEATH	
(a)	Material	Extruded PVC Type ST1
	Standard Applicable	IS: 1554 (Part-1) & IS: 5831
(b)	Colour	<i>Black</i>
(c)	Whether FR-LSH	Yes
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per Table-7 of IS: 1554 (Part-1)
(f)	Marking	<i>Cable size (cross section area and no. of cores), voltage grade, PVC, Ref. IS, FRLS, Manufacturer's name and/ or trade name, and year of manufacture @ 5m (by embossing) 'BHEL-PEM' and 'TANGEDCO' Name @5m (by embossing) Progressive sequential marking @ 1m. (by printing/ embossing)</i>
11.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per IS 1554-I /ASTMD 2863)
(b)	Temperature index	Min. 250°C(As per IS 1554-I /ASTMD 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IS 1554-I /IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per IS 1554 /ASTM D 2843)
(e)	Flammability Test	
(i)	<i>Flammability test for single cable</i>	<i>YES</i> <i>As per:</i> <i>(a) IEC-60332 Part-1</i>
(ii)	<i>Flammability test for bunched cables</i>	<i>YES</i> <i>As per: (a) IEC-60332 Part-3-23,</i> <i>CAT-B</i>
(iii)	<i>Flammability test as per IEEE: 60383</i>	<i>YES</i>
(iv)	<i>Swedish Chimney test SEN-SS-424-1475-F3</i>	<i>YES</i>
12.0	<i>Anti-rodent and Termite repulsion Test</i>	<i>YES:</i> A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 60 degree C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). Place a drop of aqueous sodium sulphide solution on a thick filter paper and allow soaking. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound.
13.0	TOLERANCE ON OUTER DIAMETER	± 2mm



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR LT
PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS- 412-507-E015A

VOLUME II

SECTION I

REVISION 0

DATE: 25.01.2017

SHEET 3 OF 3

14.0	MINIMUM BENDING RADIUS	
(a)	Multi core cables	12 x O.D.
15.0	SAFE PULLING FORCE	
(a)	Copper conductor cable	50 N/ sq. mm.
16.0	CABLE DRUMS	
(a)	<i>Type of Drum</i>	Wooden as per IS 10418 OR Steel as per Annexure A to Section II
(b)	Standard drum length	<i>1000m (±) 5%. (as specified in BOQ-Cum-Priced Schedule)</i>
(c)	Painting	Entire surface to be painted
(d)	Wooden drum	The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS: 10418.

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES	SPECIFICATION NO. PE-TS- 412-507-E015A
		VOLUME II B
		SECTION I
		REV NO. DATE 24.11.2016
		SHEET 1 OF 2

DATA SHEET C
GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

- 1.1 Name of manufacturer :
- 1.2 Place of manufacture :
- 2.0 **INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE**
- 2.1 No. of cores x size :
- 2.2 Current rating of cable confirms to :
- 2.3 Short circuit rating of cable confirms to :
- 2.4 **CONDUCTOR**
- a) Material type & grade :
- b) No. & dia of wires in each core : no x mm
before stranding
- 2.5 **PVC INSULATION**
- a) Type :
- b) Minimum & Nominal thickness of insulation : mm
- 2.6 **PVC ST1 INNERSHEATH**
- a) Thickness (min.) : mm
- b) Method of application
- 1) Multi-core cables
- i) with fillers
- ii) without fillers :

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES	SPECIFICATION NO. PE-TS- 412-507-E015A
		VOLUME II B
		SECTION I
		REV NO. DATE 24.11.2016
		SHEET 2 OF 2

- c) Type of fillers (if used) :
Shape of fillers (if used) :

2.7 ARMOUR

- a) Material :
i) Multi-core cables
- b) Size / dimensions :
- c) Minimum no. of wires :
- d) Maximum resistivity of GS wire :
- e) Maximum resistivity of Aluminium round wire :

2.8 PVC ST1 FRLS OUTERSHEATH

- a) Minimum thickness of outer sheath : mm
- b) Colour :

2.9 Diameters

- a) Diameter of insulated conductor : mm
- b) Cable diameter under armour : mm
- c) Cable diameter over armour : mm
- d) Overall diameter of cable : mm

2.10 Weight of cable : kg./km

2.11 Dimension of drum : mm

2.12 Shipping weight : kg.

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS-412-507-E015A

VOLUME II

SECTION II

REVISION 0

DATE: 25.01.2017

SECTION - II

GENERAL TECHNICAL SPECIFICATION



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS-412-507-E015A

VOLUME II

SECTION II

REVISION 0

DATE: 25.01.2017

SHEET 1 OF 1

1.0 TECHNICAL REQUIREMENTS

- 1.1 Technical requirements for LT PVC CONTROL CABLES shall be as indicated in this section, in addition to those specified in Section I & Datasheet-A.
- 1.2 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.

2.0 CODES & STANDARDS

- 2.1 The design, material, construction, manufacture, inspection, testing and performance of LT PVC CONTROL CABLES shall conform to the latest revision of relevant standards and codes of practices mentioned in Data Sheet - A.
- 2.2 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 QUALITY ASSURANCE REQUIREMENTS

- 3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E003) as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in QP during contract stage.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.3 Type testing requirements, routine / acceptance testing and special testing requirements shall be as per Annexure –A to QAP. Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price (except UV Radiation & Hydraulic Stability test).
- 3.4 The charges of UV Radiation test & Hydrolytic Stability test (if applicable) shall be reimbursed extra at actual against original money receipt of Govt. Lab. (CPRI/ ERDA etc).
- 3.5 Cost of cables consumed for testing shall be to bidder's account.

4.0 Packing

- 4.1 Cables shall be supplied in non-returnable drums. Material of cable drums shall be as specified in Datasheet-A.
- 4.2 In case of wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401). Dimensions of wooden drums shall be as per IS 10418. All ferrous parts shall be treated with suitable rust protective finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.
- 4.3 In case of Steel drums, New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing. Over the cables polyethylene sheet shall be wrapped and then sealed properly. For Typical details of Steel drums, Annexure-B to Section-II, may be referred by the bidder. Bidder may modify, to choose appropriate dimensions of steel drums to suite various sizes/weight/ lengths of LT PVC CONTROL CABLES.



**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-TS-412-507-E015A

VOLUME II-B

SECTION II

REVISION 0

DATE: [25.01.2017](#)

QUALITY PLAN

		QUALITY PLAN SHEET 1 of 8		CUSTOMER : TANGEDCO		PROJECT : 2X660 MW ENnore SEZ STPP			SPECIFICATION : PE-TS-412-507-E015A			
				BIDDER/ VENDOR :		TITLE			NUMBER :			
				SYSTEM		QUALITY PLAN NUMBER PE-QP-999-507-E003, R-1			SPECIFICATION TECHNICAL SPECIFICATION TITLE FOR LT PVC CONTROL CABLE			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III AGENCY P W V			REMARKS
1	2	3	4	5	6	7	8	9	10			11
Instructions: 1. Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the final cable drum number or batch no. 2. Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.												
1.0	RAW MATERIAL											
1.1	Copper Rods/ Aluminium Rods / Wires (Al:- For Conductor & Armour) (Cu:- For Conductor)	GENERAL : 1. Physical properties 2. Elec.Properties SPECIFIC CHECKS : a) Make b) Grade c) Resistivity	MA	Physical Tests	Sample per Batch	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2	
			MA	Electrical Tests	Sample per Batch	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	IS 1554 Pt-1/ IS 613/ IS 5082 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2	
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC / Test Cert.	3/2	-	1	
			MA	-do-	-do-	Approved datasheet	Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1	
			MA	Electrical Tests	Manufacturer std.	IS 613/ IS 5082	IS 613/ IS 5082	Inspection Report/ Test Cert.	3/2	-	1	
1.2	PVC Compound (for insulation)	GENERAL : 1. Physical properties 2. Elec.Properties SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition	MA	Physical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2	
			MA	Electrical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2	
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC / Test Cert.	3/2	-	1	
			MA	Verify	100%	Approved datasheet	Approved datasheet	-do-	3/2	-	1	
			MA	Verify	100%	Compound Manufacturer std.	Compound Manufacturer std.	-do-	3/2	-	1	
1.3	Fillers (as applicable)	1. Make 2. Flame retardant & moisture resistant. (as applicable)	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC / Test Cert.	3/2	-	1	
			CR	Chemical/ Environ.	100%	Approved datasheet	Approved datasheet	COC / Test Cert.	3/2	-	2	(Fillers material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other component of cable)
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER : TANGEDCO			PROJECT : 2X660 MW ENNORE SEZ STPP			SPECIFICATION : PE-TS-412-507-E015A		
					TITLE			NUMBER :					
		SHEET 2 of 8		BIDDER/ VENDOR			QUALITY PLAN NUMBER PE-QP-999-507-E003, R-1			SPECIFICATION TITLE			TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLE
		SYSTEM			ITEM :HRPVC/ PVC POWER & CONTROL CABLE			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	P	W	V	REMARKS	
1	2	3	4	5	6	7	8	9	10			11	
1.4	Galvanised steel wire/strip for Armour (if applicable)	GENERAL : 1. Make 2. Dimension 3. Phy.and Elec. Properties 4.Galvanization Quality	MA	Verify	Manufacturer std.	Manufacturer approved source	Manufacturer approved source	Inspection Report/ Test Cert.	3/2	-	1	* Sample from each armoured size/ Batch/ Lot	
			MA	Measurement	Manufacturer std.	IS 1554 Pt-1/ IS 3975 & Approved datasheet	IS 1554 Pt-1/ IS 3975 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	2		
			MA	Physical & Electrical Tests	Sample*	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Inspection Report/ Test Cert.	3/2	-	2		
			MA	Galv. Tests	Sample*	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Inspection Report/ Test Cert.	3/2	-	2		
1.5	PVC compound for Sheath	GENERAL : 1. Physical properties 2. Elec.Properties 3. FRLS Properties (as applicable) SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition	MA	Physical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2	# (If applicable)	
			MA	Electrical Tests	Sample per batch	IS 1554 Pt-1/ IS 5831	IS 1554 Pt-1/ IS 5831	Inspection Report/ Test Cert.	3/2	-	1/2		
			CR	Chemical/ Environ.	Sample per batch	IS 1554 Pt-1/ IS 5831 & Approved datasheet	IS 1554 Pt-1/ IS 5831 & Approved datasheet	Inspection Report/ Test Cert.	3/2	-	1/2		
			MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	3/2	-	1		
			MA	Verify	100%	Approved datasheet	Approved datasheet	COC/ Test Cert.	3/2	-	1		
			MA	Verify	100%	Compound Manufacturer std.	Compound Manufacturer std.	COC/ Test Cert.	3/2	-	1		
1.6	Wooden drums	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	IS 10418	IS 10418	Inspection Report/ Test Cert.	3/2	-	1		
		2. Anti termite treatment	MA	Chem.	Mfr's Plant Std.	Mfr's Plant Std.	Mfr's Plant Std.	COC	3/2	-	1		
1.7	Steel drums #	1. Dimension	MA	Meas.	Mfr's Plant Std.	Approved drawing of steel drum / BHEL specification	Approved drawing of steel drum / BHEL specification	Inspection Report/ Test Cert	3/2	-	1		
		2. Surface finish	MA	Meas.	Mfr's Plant Std.	Surface shall be smooth	Mfr's Plant Std.	Inspection Report/ Test Cert.	3/2	-	1		
2.0 IN PROCESS													
2.1	Wire Drawing & Annealing.	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 1554 Pt-1/ IS 8130 & Approved Data Sheet	IS 1554 Pt-1/ IS 8130 & Approved Data Sheet	Inspection Report	2	-	1		
		2. Surface finish	MA	Visual	Plant Mfg. Std.	Surface shall be smooth	Surface shall be smooth	Inspection Report	2	-	1		
		3. % of Elongation	MA	Mechanical	Plant Mfg. Std.	IS 1554 Pt-1/ IS 8130 & Approved Data Sheet	IS 1554 Pt-1/ IS 8130 & Approved datasheet	Inspection Report	2	-	1		
2.2	Tinning (For Conductor)	1. Size	MA	Dimensional	Plant Mfg. Std.	Approved datasheet	Approved datasheet	Inspection Report	2	-	1	(Applicable only for tin-coated copper conductor)	
		2. Chemical test for Tinning (if applicable)	CR	Chemical Test	Sample	IS 1554 Pt-1/ IS:8130 & Mfrs Std	IS 1554 Pt-1/ IS:8130 & Mfrs Std	Inspection Report	2	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER : TANGEDCO		PROJECT : 2X660 MW ENNORE SEZ STPP			SPECIFICATION : PE-TS-412-507-E015A			
					BIDDER/ VENDOR :		TITLE			NUMBER :			
		SHEET 3 of 8		SYSTEM		REFERENCE DOCUMENT			ACCEPTANCE NORM			FORMAT OF RECORD	
SL. NO.		COMPONENT/OPERATION		CHARACTERISTICS CHECK		CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	ITEM :HRPVC/ PVC POWER & CONTROL CABLE	SECTION		VOLUME III	
										AGENCY		REMARKS	
1		2		3		4	5	6	7	8	9	10	
												P	W
												V	
2.3		Stranding of wires		1. No.of wires		MA	Counting	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	Inspection Report	2	-
				2. Resistance		CR	Electrical	Plant Mfg. Std.	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	IS 1554 Pt-1./ IS 8130 & Approved Data Sheet	Inspection Report	2	-
				3. Sequence, lay length & Direction		MA	Visual, Measurement	One Sample of each size/ lot	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	Inspection Report	2	-
				4. Surface Finish		MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inspection Report	2	-
				5.Dimension		MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1/ IS 8130/Appd. Data Sheet	IS 1554 Pt-1/ IS 8130/Appd. Data Sheet	Inspection Report	2	-
2.4		Core Insulation (No repair permitted)		1. Surface finish		MA	Visual	100%	Free from bulging	Free from bulging	Inspection Report	2	-
									burnt particles lumps, cuts & Scratches.	burnt particles lumps, cuts & Scratches.			1
				2 Insulation thickness		CR	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Appd.data sheet	IS 1554 Pt-1 & Appd.data sheet	Inspection Report	2	-
				3. Concentricity #		CR	Measurement	One Sample of each size/ lot	Mfrs Std/ IS 1554 Pt-1/ Approved Data Sheet	Mfrs Std/ IS 1554 Pt-1/ Approved Data Sheet	Inspection Report	2	-
				4 Dia over insulation		MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Inspection Report	2	-
				5. Core identification		MA	Visual	100%	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Inspection Report	2	-
				6. Tensile Strength & % Elongation		MA	Mechanical	100%	IS 1554 Pt-1/ IS 5831 & Approved Data Sheet	IS 1554 Pt-1/ IS 5831 & Approved Data Sheet	Inspection Report	2	-
				7 Spark Test or Water Immersion test		CR	Electrical	100%	Mfr's Std.	Mfr's Std.	Inspection Report	2	-
2.5		Core Laying		1. Dia over laidup core		MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Inspection Report	2	-
				2. Sequence of lay, Lay length & direction for laid up core		MA	Visual & Meas.	One Sample of each size/ lot	IS 1554 Pt-1 & Mfrs Std.	IS 1554 Pt-1 & Mfrs Std.	Inspection Report	2	-
				3. Core Identification		MA	Visual	One Sample of each size/ lot	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Inspection Report	2	-
						PARTICULARS		BIDDER/VENDOR					
BHEL						NAME							
						SIGNATURE							
						DATE				BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER : TANGEDCO		PROJECT : 2X660 MW ENNORE SEZ STPP		SPECIFICATION : PE-TS-412-507-E015A					
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PE-QP-999-507-E003, R-1		SPECIFICATION TITLE TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLE					
				SHEET 4 of 8		SYSTEM		ITEM :HRPVC/ PVC POWER & CONTROL CABLE		SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6	7	8	9	10	P	W	V	11
2.6	InnerSheath Extrusion (If applicable)	1. Surface finish	MA	Visual	100%	Surface shall be Smooth	Surface shall be Smooth	Inspection	2	-	-	(Pimple, fish eye, porosity & burnt particles not permitted)	
		2. Sheath thickness	CR	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Inspection Report	2	-	-		
		3.Dia over inner sheath	MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Approved Data Sheet	IS 1554 Pt-1 & Approved Data Sheet	Inspection Report	2	-	-		
		2.7 Armouring (If applicable)	1. No.of wires/Strips	MA	Counting	At the start of the process	IS 1554 Pt-1/ IS 3975 & Approved Data Sheet	IS 1554 Pt-1/ IS 3975 & Approved Data Sheet	Inspection Report	2	-		-
			2. Lay Direction	MA	Visual	At the start of the process	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Inspection Report	2	-		-
	3. Lay Length		MA	Visual, Meas.	At the start of the process	IS 1554 Pt-1/ IS 3975	IS 1554 Pt-1/ IS 3975	Inspection Report	2	-	-		
	2.7 Outer Sheath Extrusion	4. Coverage	MA	Measurement	At the start of the process	IS 1554 Pt-1/ IS 3975 & approved data sheet	IS 1554 Pt-1/ IS 3975 & approved data sheet	Inspection Report	2	-	-		
		5. Dia over armouring	MA	Measurement	At the start of the process	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Inspection Report	2	-	-		
		1. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inspection Report	2	-	-		(Pimple, fish eye, porosity & burnt particles not permitted)
		2.Sheath thickness	CR	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Inspection Report	2	-	-		
3. Dia over outer sheath		MA	Measurement	One Sample of each size/ lot	IS 1554 Pt-1 & Appd. Data Sheet	IS 1554 Pt-1 & Appd. Data Sheet	Inspection Report	2	-	-			
4. Marking/ Color/ Embossing	MA	Visual	One Sample of each size/ lot	Appd. Data Sheet	Appd. Data Sheet	Inspection Report	2	-	-				
2.8	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-H)	CR	Electrical Tests & Measurement	100%	IS 1554-I & Appd. Datasheet	IS 1554-I & Appd. Datasheet	Test Report	2	-	1		
			PARTICULARS		BIDDER/VENDOR								
BHEL			NAME										
			SIGNATURE										
			DATE					BIDDER'S/VENDORS COMPANY SEAL					

		QUALITY PLAN SHEET 5 of 8		CUSTOMER : TANGEDCO		PROJECT : 2X660 MW ENNORE SEZ STPP			SPECIFICATION : PE-TS-412-507-E015A			
				BIDDER/ VENDOR :		QUALITY PLAN NUMBER PE-QP-999-507-E003, R-1			SPECIFICATION TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLE			
				SYSTEM		ITEM :HRPVC/ PVC POWER & CONTROL CABLE			SECTION VOLUME III		REMARKS	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			
1	2	3	4	5	6	7	8	9	P	W	V	11
3.0	Final Inspection	1. Finish	MA	Visual	(See remark)	IS 1554 Pt-1/ Appd. Data Sheet	Free from Porosity, Bulging, Burnt particles, lumps, cuts & scratches	Test Report	2	1	-	One drum each for Power & Control cables in Lot.
		2. Length	MA	Measurement	(See remark)	IS 1554 Pt-1/ Appd. Data Sheet	BHEL Spec./ Data Sheet	Test Report	2	1		Length of each drum shall be as per tolerance given in the data sheet.
		3. Dimension	MA	Measurement	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Approved Data Sheet	Test Report	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Appd.Data Sheet	Test Report	2	1	-	
		4. Marking/Colour Coding	MA	Visual	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	2	1	-	
		5. Acceptance Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS tests	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	2	1		
		6. Type & FRLS Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS Tests	Sample#	BHEL Specn. Apprd.Data Sheet	BHEL Specn. Apprd.Data Sheet	Test Report	2	1	-	Refer Annexure to QAP for Type & Acceptance Tests
4.0	Packing	Sealing Identification	MA	Visual	100%	As per IS	As per IS	Test Report	2	1	-	
NOTES:- (A) JOINTS IN WIRE SHALL BE AS PERMITTED BY MFRS STANDARD. VENDOR TO CERTIFY THE SAME. (B) NO REPAIR OF CORE INSULATION PERMITTED (C) CABLE ENDS SHALL BE SEALED AS PER VENDOR'S SPECIFICATION. (D) RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER. (E) FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET (F) WHEREVER EXTENT OF CHECK FOR STAGE IS MENTIONED AS 'SAMPLE' & NOT DEFINED IN QP, THE SAME SHALL BE AS PER VENDORS SAMPLING PLAN. (G) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER IS/ BHEL SPECIFICATION. (H) FOR LISTS OF ROUTINE TESTS , ACCEPTANCE TESTS & TYPE TESTS REFER ANNEXURE TO QAP. LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL 2-VENDOR 3- SUB VENDOR CHP: CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE.												
BHEL			PARTICULARS		BIDDER/VENDOR		BIDDER'S/VENDORS COMPANY SEAL					
			NAME									
			SIGNATURE									
			DATE									

	ANNEXURE TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-TS-412-507-E015A
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
	SHEET 6 OF 8	SYSTEM	ITEM: PVC CONTROL CABLE	DOC. NO.

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS FOR LT PVC CONTROL CABLES

A. Type Test Conduction:

- Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
- Sampling:
 - Type test shall be conducted & witnessed on one size (sample) of every lot of control cable.
 - Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

- Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.
- Sampling:
Acceptance tests shall be carried out on each type & size of the cables on the cable drums selected at random as per following sampling plan:

S. NO.	NO. OF DRUMS IN THE LOT	NO. OF DRUMS TO BE TAKEN AS SAMPLE
1.	Up to 100	10% (Subject to minimum of 1 drum)
2.	101 to 300	13
3.	301 to 500	20
4.	Above 500	32

- Flammability Test to be conducted only on one sample/ lot.
- Tests listed in S.No-7.0 shall be conducted only on one sample / lot.**

C. Routine Test Conduction:

- Tests for which "R" is indicated in the 'Test Conduction Required As' column below shall be conducted as Routine tests.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor	T, A	IS 10810 Pt 1	<i>In process records shall be furnished to inspector at the time of inspection.</i>
II.	Tensile Test	For aluminium conductor	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor	T, A	IS 10810 Pt 3	
IV.	Resistance test	For copper/ aluminium conductor	T, A, R	IS 10810 Pt 5	

BHEL	PARTICULARS	BIDDER/ VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S / VENDORS COMPANY SEAL

	ANNEXURE TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-TS-412-507-E015A
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
	SHEET 7 OF 8	SYSTEM	ITEM: PVC CONTROL CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
2.0	Tests for Round Steel Wires/Strips				
I.	Measurement of dimensions	For GS Round wire/Strip	T, A	IS 10810 Pt 36	
II.	Tensile test	For GS Round wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation test	For GS Round wire/Strip	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS Round wire	T, A	IS 10810 Pt 38	
V.	Winding test	For GS Formed wire	T, A	IS 10810 Pt 39	
VI.	Resistivity test	For GS wire/Strip	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip	T, A	IS 10810 Pt 41	
3.0	Physical Tests for PVC Insulation & PVC sheath				
I.	Test for thickness	Applicable for PVC insulation, PVC inner sheath & PVC outer sheath	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 10	
V.	Hot deformation test	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 15	
VI.	Heat shock test	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 14	
VII.	Shrinkage test	For PVC insulation & PVC outer sheath only	T, A	IS 10810 Pt 12	
VIII.	Thermal stability test	Applicable for PVC insulation & PVC outer sheath	T, A	IS 10810 Pt 60	
4.0	Improved Fire performance (FR-LSH) Tests				
I.	Oxygen index test	For PVC outer sheath only	T, A	ASTMD 2863	Min. 29
II.	Smoke density test	For PVC outer sheath only	T, A	ASTM D2843	Max. 60%
III.	Acid gas generation test	For PVC outer sheath only	T, A	IEC-754-1	Max. 20% by weight
IV.	Temperature Index Test	For PVC outer sheath only	T, A	ASTMD 2863	Min. 250 °C
5.0	Flammability Tests				
I.	Flammability test for single cable	For complete cable	T, A	IS: 1554 Part-I (As per category C2)/ IEC-60332 (Part-1)	

BHEL	PARTICULARS	BIDDER/ VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S / VENDORS COMPANY SEAL

	ANNEXURE TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-TS-412-507-E015A
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
	SHEET 8 OF 8	SYSTEM	ITEM: PVC CONTROL CABLE	DOC. NO.

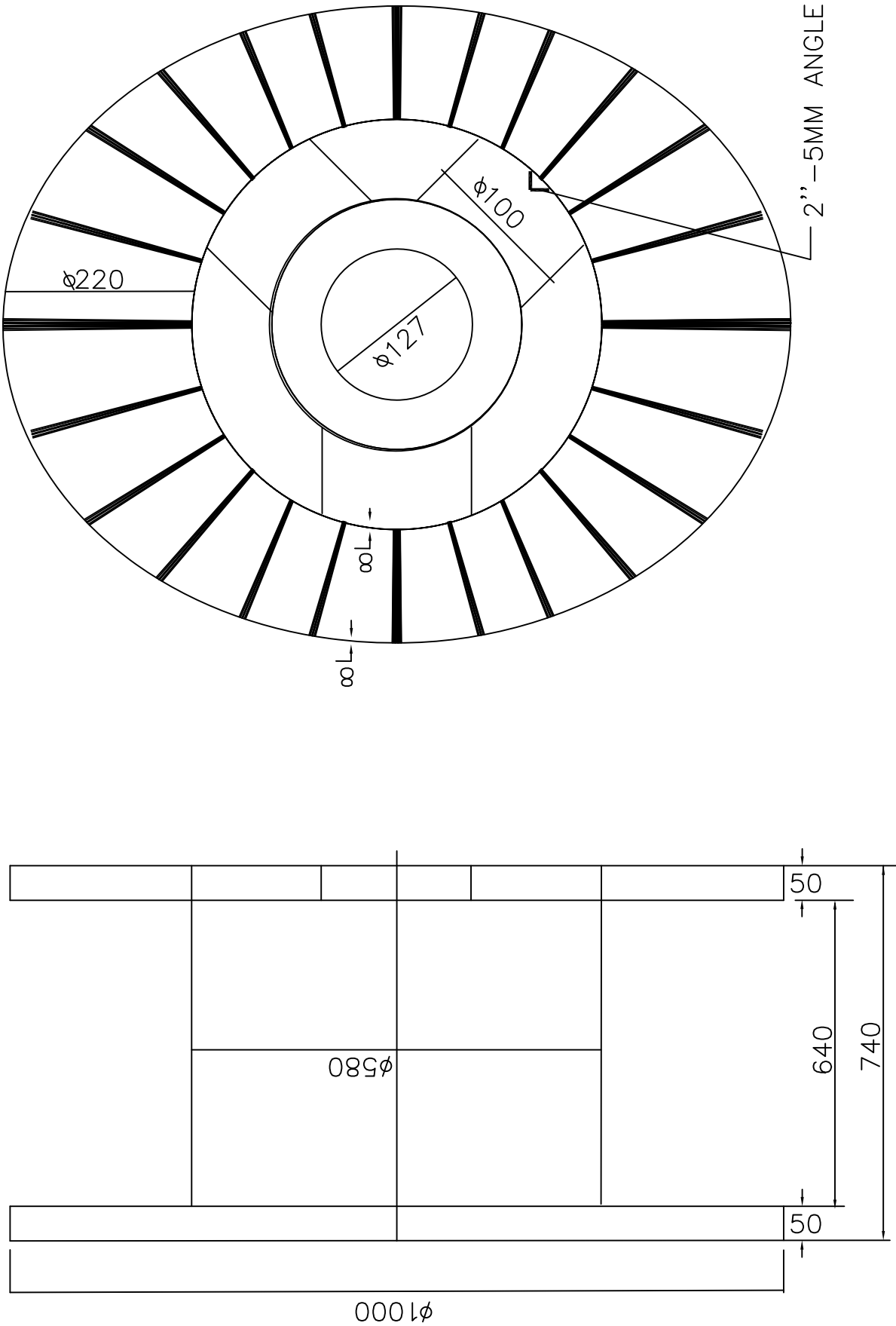
<u>S. No.</u>	<u>TEST</u>	<u>APPLICABLE FOR</u>	<u>TEST CONDUCTION REQUIRED AS</u>	<u>REFERENCE STANDARD</u>	<u>REMARKS</u>
II.	Flammability test for bunched cables	For complete cable	T	IS: 1554 Part-1 (As per category C2)/ IEC-60332 Part-3-23, Category-B	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	T, A	IEEE:383	
6.0	<u>Electrical Tests</u>				
I.	High Voltage Test (Water Immersion test)	On Cores	T	IS 10810 Pt 45	
II.	High Voltage Test at Room Temperature	For complete cable	T, A, R	IS 10810 Pt 45	
III.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
7.0	<u>Anti-rodent & Termite Repulsion Test</u>	For PVC outer sheath only	A	--	

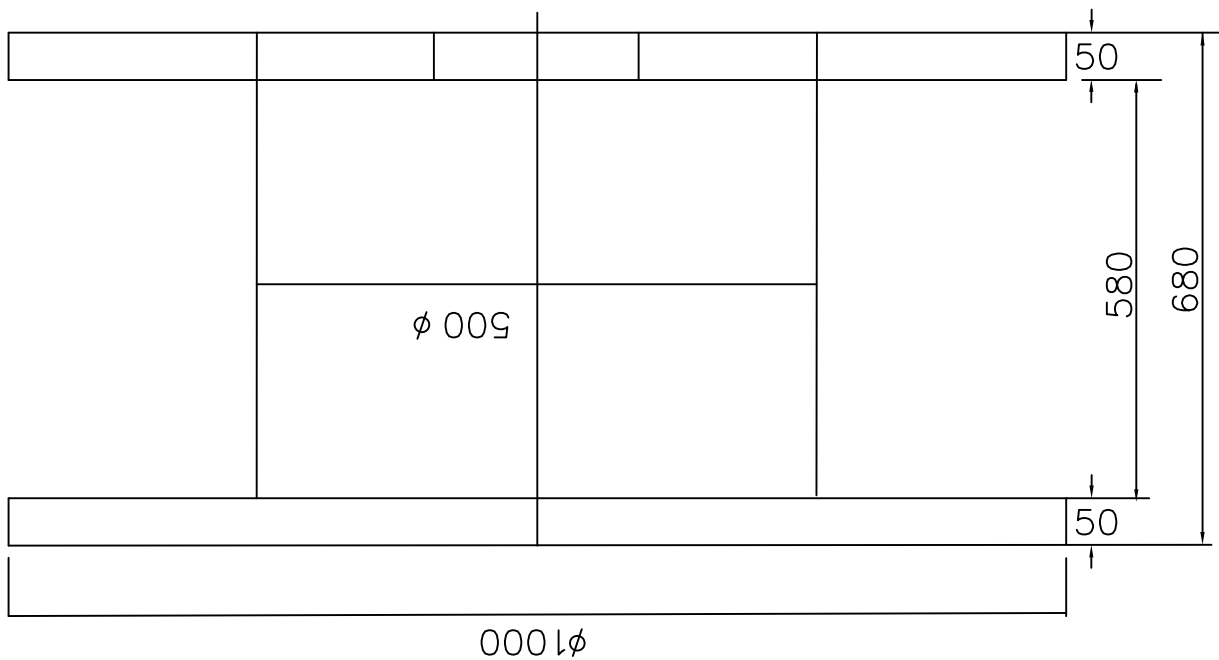
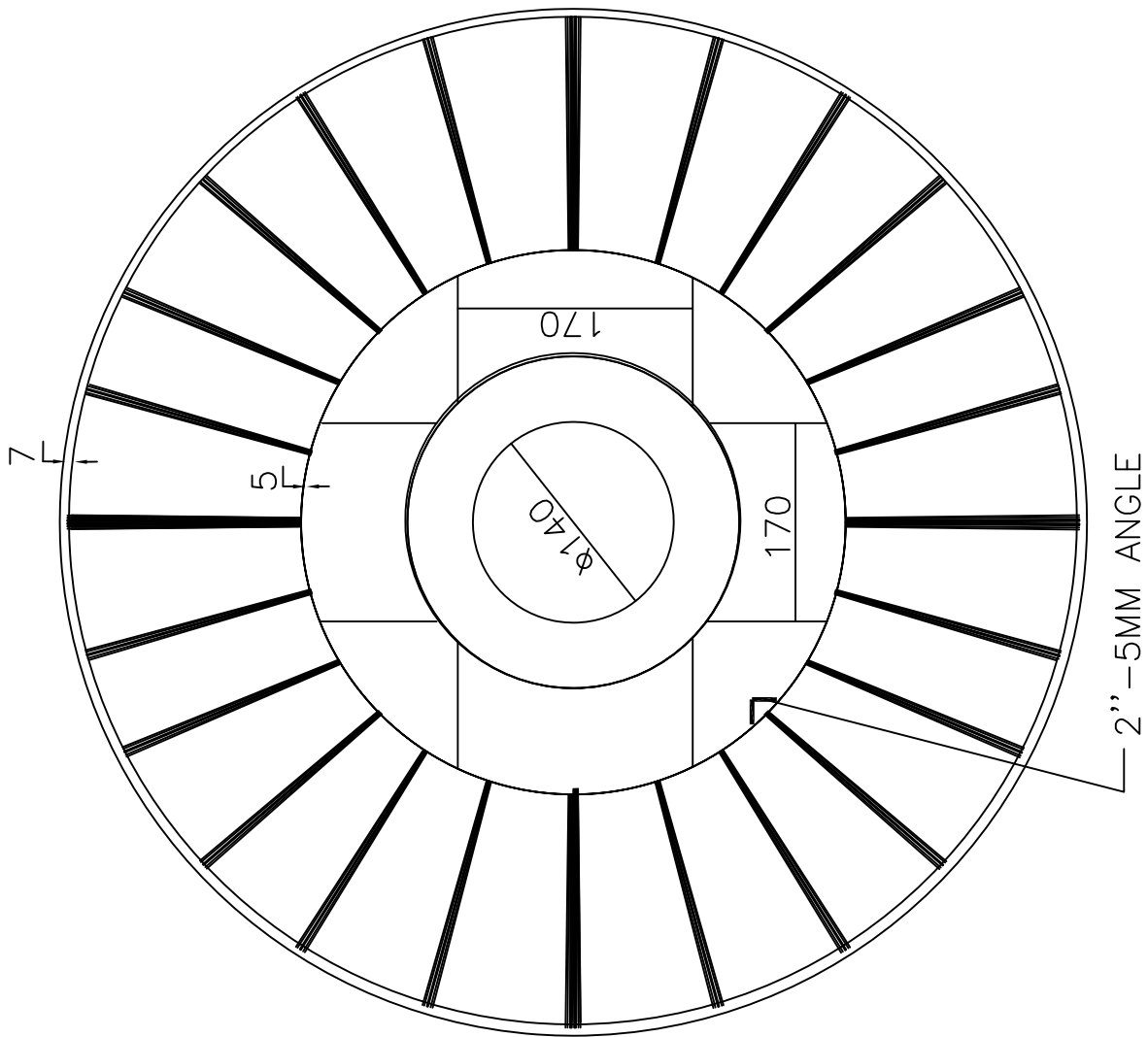
BHEL	PARTICULARS	BIDDER/ VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S / VENDORS COMPANY SEAL

STEEL DRUM DRAWING (TYPICAL)

ANNEXURE-B TO SECTION-II

(Sheet 1 of 2)





DIMENSION in mm



SPECIAL CONDITIONS OF CONTRACT (REV 01)

**FOR 2 X 660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF
NCTPS, CHENNAI, Job No. 412**

These Conditions shall be read in conjunction with General Condition of Contract (GCC) enclosed along with the tender enquiry. In case of any conflict or inconsistency, the requirement of SCC shall prevail over the GCC.

1.0	Project Name	2 X 660 MW ENNORE SEZ COAL BASED STPP
2.0	Ultimate Customer (TANGEDCO)	Tamilnadu Generation and Distribution Corporation (TANGEDCO)
3.0	Location of Plant	Site for main plant is located near ennore port (approx. 5 km) and approx. 5 km from Athipattu Pudunagar, State : Tamil Nadu, Nearest Airport: Chennai (60 km), Nearest Seaport: Ennore Port (Approx. 5 km), Nearest Railway Station: Athipattu Pudunagar (Approx. 5 kms), Site is adjacent to the Chennai-Howrah broad gauge line. Access to site: Distance from Chennai city is 35 km. All weather roads from Pattamandri on the Thiruvottiyar district highway.
4.0	Consignee Address / BHEL Site Office Address	Construction Manager BHEL Site-Office 2 x 660 MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS Vayalur Village, Ambathur Taluk, Thiruvallur District, Tamil Nadu.
	Notes:	1. Consignee address in LR should be strictly as per Sl. No. 04. 2. Vendor to note that to effect "Sale in Transit", BHEL shall issue "Delivery Note" to the Transporter for transferring the ownership from BHEL to customer (TANGEDCO). 3. It is Vendor's responsibility to ensure availability of trucks well in advance for dispatch of material to meet contractual delivery requirement. Delivery note shall be carried by transporter along with other dispatch documents
5.0	Buyer and Paying Authority	A) <u>For Inter-State sales (where CST is applicable):</u> 1. For those packages, for which PO is placed by BHEL-PEM - PEM, Noida . 2. For those packages for which PO is placed by BHEL-PSSR & LOA is issued by BHEL-PEM - BHEL-PSSR, Chennai .

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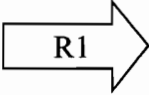
		B) FOR Intra-State sales (where VAT is applicable): 1. For those packages, for which PO is placed by BHEL-PEM- <u>Paying Authority shall be BHEL-PEM, Noida. However Buyer will be BHEL HPBP, TIRUCHIRAPALLI.</u> Detailed requirements are enclosed as Annexure I which are to be followed strictly. 2. For those packages for which PO is placed by BHEL-PSSR & LOA is issued by BHEL-PEM - <u>Paying Authority shall be BHEL-PSSR, Chennai. However Buyer will be BHEL HPBP, TIRUCHIRAPALLI.</u> Detailed requirements are enclosed as Annexure I which are to be followed strictly.
6.0	Mode of Dispatch	By Road/Rail/Sea on Door Delivery and freight Pre-Paid Basis.
7.0	Road Permit Required	Not applicable
8.0	Transit Insurance	In BHEL Scope. Vendor shall inform the following details of dispatches to the Underwriter (refer details below) under intimation to BHEL-PEM and BHEL Site office: (1) Policy No. (2) Consignee Name. (3) Consignment Details (items with their weights and value (in INR)). (4) Project Name and P.O. No. (5) LR No. and date, Despatch origin and destination details, Inv. No..
	Policy No. R1 →	SCE - 500300/44/15/04/40000004 MARINE - 500300/21/15/02/00000005 Policy period : 15/04/2015 - 14/04/2018
	Underwriters R1 →	M/s. United India Insurance Company – New Delhi D-24 & E-25, 2nd Floor Himalaya House 23 KG Marg, Connaught Place, New Delhi
9.0	BHEL-PEM TIN No.	09765702874
10.0	Customer CST & VAT Nos.	TANGEDCO CST No. - 1248670 TANGEDCO TIN / VAT No. - 33181706465 TANGEDCO TAN No. - CHET 11 952 D TANGEDCO PAN No. - AADCT4784E
11.0	Unloading at site	- By BHEL site office for Supply packages. (The Vendor shall furnish LR wise Gross Wt. and net weight of the consignment for the purpose of handling the consignment by BHEL site loading/unloading contractor). - By Vendor for Turnkey i.e. Supply and Erection & Commissioning Packages.

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12.0	Storage at site	- By BHEL site for Supply packages. - By Vendor for Turnkey i.e. Supply and Erection & Commissioning Packages.
13.0	Movement of Material within Site	- By BHEL site for Supply packages. - By Vendor for Turnkey i.e. Supply and Erection & Commissioning Packages.
14.0	Provision of facilities at Site (Applicable for Turnkey Packages) 	Construction Power: HT power supply (33KV/433 V or 11KV/433 V) shall be made available for erection work at the rates prevailing at the time of usage on chargeable basis as per HT tariff V (Temporary construction supply) rates applicable as per TNERC tariff order. Fuel and start-up power required during testing, commissioning, PG testing, re-testing etc. shall be provided at free of cost. Construction Water: Construction water shall be available at one point within the plant boundary on chargeable basis subject to availability.
15.0	Inspection Agency (Domestic supplies)	Later
	Inspection Agency (Imported supplies)	Later

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16.0	Dispatch Documents required (to be furnished by Vendor for payment)	<u>For Despatch Payment</u> For materials originating from Indian Territory (a). One (1) original and Six (6) copies of the clean rail/lorry receipt. For payment Receipted LR (signed & stamped)/ confirmation from site regarding receipt of packages/ Boxes original / copy. (b). One (1) original and Six (6) copies of signed Invoices (Paying Authority along with TIN No. should be mentioned, for VAT cases Annexure-I to be followed). (c). One (1) original and Seven (7) copies of Challan and Packing List (clearly showing number of packages, gross weight and net weight). (d). Six (6) copies of inspection certificate, if any issued by the customer. (e). Eight (8) copies of Customer/BHEL MDCC. (f). Six (6) copies of Approved Test Certificates if any. (g). Delivery order- Two (2) copies. (h). Guarantee Certificate – One (1) Original + One (1) copy. (i). Insurance Intimation - Two (2) copies. (j). CQIR / Inspection Reports – One (1) Original + One (1) copy. (k). PVC Calculation and copy of all applicable indices, if PVC applicable. – Two (2) copies. For materials originating from non-Indian Territory (a). Three (3) original and Seven (7) copies of clean bill of lading or One (1) clean original Airway Bill & Four (4) copies, in case of air freight. (b). One (1) original and Six (6) copies of signed Invoices (Paying Authority along with TIN No. should be Mentioned). (c). One (1) original and Seven (7) copies of Packing List (clearly showing number of packages, gross weight and net weight).
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		(d). Six (6) copies of certificate of country of origin. (e). Eight (8) copies of Customer/BHEL MDCC. (f). Six (6) copies of inspection certificate, if any, issued by the customer/his authorised representative. (g). Six (6) copies of certificate from the vendor to the effect that drawings and catalogues for customs clearance purpose have been kept with the packages for shipment. (h). Six (6) copies of certificate from the vendor to the effect that the contents in each case are not less than that entered in the invoices and guaranteed as new and as per the relevant technical specifications. (i) Shipping Specification – One (1) copy. (j). Quality Certificate – One (1) copy. (k). Approved Test Certificates if any. - Six (6) copies. (l). Guarantee Certificate – One (1) Original + One (1) copy. (m). Inspection Reports – One (1) Original + One (1) copy. (n). PVC Calculation and copy of all applicable indices, if PVC applicable. – Two (2) copies. For Claiming Freight, MRC & Services Payments refer GCC.
17.0	Material Receipt Certificate (MRC).	FOR Packages wherever E&C is in the scope of Vendor, The vendor shall arrange Material Receipt Certificate from the project site, duly signed by Customer and BHEL-Site after receipt & physical verification of the material at site. FOR Supply Packages, Material Receipt Certificate shall be arranged by BHEL-PEM. Vendor to provide copy of receipted LR's to enable BHEL-PEM to obtain MRC from site.




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18.A	Taxes & Duties (For Domestic Bidder) (Concessional Custom Duty against EC except for packages mentioned at sr. no. 18 C)	All bidders/vendors to note that this project is a Non-Mega (ICB) power Project. However Essentiality certificate shall be issued by TANGEDCO (Ultimate customer) for availing concessional custom duty under Project Import Regulations. Essentiality certificate shall be issued by TANGEDCO (Ultimate customer) for the specified items to be imported by the vendor, limited to CIF content mentioned in the NIT, for availing concessional custom duty. The bidder has to indicate in their offer, the import contents (if any) for the package i.e. list of items along with qty., currency of import, country of import & CIF value. The benefits availed in concessional custom duty must be passed onto BHEL in their offer. Availability of CIF for the packages, if any, shall be intimated in NIT.
		Concessional Sales Tax against issuance and exchange of form 'C' & 'E1/E2' / VAT, as applicable, are to be quoted by the bidder in their offer. Bidders has to note that in order to derive the total Landed Cost to BHEL following pricing elements shall also be considered in evaluation: i. ED (as applicable on self-manufactured items)- Except for packages mentioned at Sr. no. 18C. ii. CST/VAT (as applicable), iii. Service Tax (For Supply Packages). iv. Freight (including service Tax), However R1 i. Service tax quoted in case of Turnkey packages shall not be considered for evaluation purpose. However same shall be considered for ordering purpose. VAT for Intra-state dispatch shall be paid subject to conditions specified in Annexure I. "Wherever cenvat credit, if applicable could not be availed by BHEL within statutory time limit of six months(as per cenvat credit rule,2014) due to delay in submission of invoices or for any other reason attributable to bidder/contractor, liability towards loss of such cenvat credit(Excise duty/service tax etc) should be passed on to bidders/contractors." Entry Tax/ Octroi: Not Applicable.

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18.B	Taxes & Duties (For Order Directly to Foreign Bidders)	In case of Order on foreign supplier, the dispatches shall be FOB (Port of Dispatch) basis and the Taxes Duties in the country of dispatch shall be borne by Foreign Bidder & to be accounted in the prices quoted to BHEL/PEM/NOIDA. Evaluation shall be done as per provisions of GCC.
18.C	Custom duty (CD) & Excise duty ED for water treatment plant. R1 →	Custom duty (CD) & Excise duty (ED) are exempted against exemption certificate for following packages as per GOI notification 14/2004-Custom dated 08/01/2004 and 3/2004-Central Excise dated 08/01/2014 respectively :- 1. Oxygen dosing system 2. Chemical Dosing system 3. Condensate polishing unit 4. Pre-Treatment plant 5. Effluent treatment plant 6. Electrolytic Chlorination plant 7. Sewage Treatment plant Necessary documents shall be facilitated by TANGEDCO from concerned Government authorities for availing relevant exemption by BHEL. Exemption certificate shall be arranged by BHEL and provided to vendor for their self-manufactured as well as sub-vendor items directly dispatchable to site. Vendor should quote their price considering benefits of NIL Custom duty and NIL Excise duty. However vendor shall indicate the list of imported items, quantity and value of imported items in Indian Rupee and Foreign currency, amount of CD, rate of CD alongwith the country of import in their bid.
19.0	Packing, Identification & marking	• The supplier shall include and provide for securely protecting and packing the materials so as to avoid loss or damage during handling & transport by air, sea, rail and road. • All packing shall allow for easy removal and checking at site. Special precaution shall be taken to prevent rusting of steel and iron parts during transit by sea. Gas seals or other materials shall be adopted by the Contractor for protection against moisture during transit. • The number of each package in a shipment shall be shown in fraction, numerator showing number of the package and the denominator showing total number of packages in a lot / consignment. The packages number shall be generally prepared in the sequence in which they will be required for erection. • Each package delivered under the Contract shall be marked by and at the expense of the supplier and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and

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address of consignee, the gross weight and net weight of the package, the name of the Contractor with a distinctive number of mark sufficient for purposes of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and indelibility. Each equipment or parts of equipment shall, when shipped or railed or otherwise dispatched be tagged with reference to the assembly drawings and corresponding part numbers. Each bale or package shall contain a packing note quoting specifically the name of the Contractor, the number and date of contract and the name of the office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the part numbers with reference to the assembly drawing and the quantity of each part, drawings nos. and tag numbers.

- Rotor bearings should not be used as a support while packing.
- Besides wherever necessary, packing shall bear a special marking "TOP", "BOTTOM", "DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc.
- All packing cases, containers (excluding marine container), packing and other similar materials shall be new.
- Notwithstanding anything stated in this clause, the Contractor shall be entirely responsible for loss, damage or depreciation or deterioration to the materials & supplies due to faulty and/or insecure packing.
- One copy of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package/container for immediate reference.
- Each and every package box shall be marked with the following, as a minimum:

(i). Name and address of Consignee :

(ii). Project reference :

(iii). Contract No.:

(iv). Packing No.: (1/10, 2/10, 3/10 when there are 10 packages For one consignment)

(v). Net Weight/Gross Weight :

(vi). Port of Loading :

(vii). Destination Port : Ennore Port

(viii). Packing Mark : [symbols indicating "TOP" and other special markings as per

clause 10.10.(4) & 10.10.(6) above]

(ix). Type of Equipment :

"E" (for Equipment supply)

"T" (for Tools & Tackles)

"S" (for Mandatory Spares)

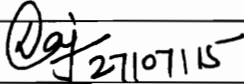
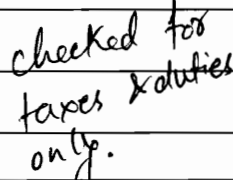
- Two copies of packing list should be kept in case/package No. 1 of each consignment of the goods and four copies in each case (three inside the box and one copy in a special packet at the outer side of the box).

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20.0	Commissioning spares	The commissioning spares shall be properly packed separately in separate box and each spare shall be properly tagged giving details (to match the description given in the packing slip) to facilitate their proper identification. Three copies of packing list is to be kept inside the box and one copy in a special packet at the outer side of the Box.		
21.0	Mandatory Spares	The Mandatory spares shall be properly packed separately in separate box indicating Mandatory Spares in bold letters and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the Ultimate Customer Contract & Number per item (to match the description given in the packing slip) to facilitate their proper identification by ultimate customer M/s TANGEDCO. Three copies of packing list along with Manufacturing drawing no. Reference, Catalogue reference etc. is to be kept inside the box and one copy in a special packet at the outer side of the Box.		
22.0	Submission of Final Drawing / Documents along with O&M Manual, Type Test Certificates (if any)	As per GCC/ Technical specification/ Kickoff meeting.		
		Prepared By	Checked & Reviewed By	Vetted By Finance
Name:		RAJEEV KUMAR	ANUJ KUMAR	SWATI NAIR
Designation:		SR.ENGINEER	DGM	checked for taxes & duties only.
Signature:				
Date:		27/07/15	27/7/15	28/7/15

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Annexure-I

SPECIAL CONDITIONS OF CONTRACT (REV 01)

2 X 660 MW ENNORE SEZ COAL BASED STPP, Job No. 412

In order to avail the benefit of input tax credit available to BHEL in case of VAT leviable on intra-state transaction between BHEL and vendor, & to fulfill the compliances as per requirements of applicable State's VAT law, the following modality shall be applicable:

BHEL has identified a nodal agency in each State to take care of VAT compliances in the State in which project is located. For the subject project nodal agency shall be:

BHEL HPBP, TIRUCHIRAPALLI – 620014, Tamil Nadu
VAT TIN No. 33243560005

Nodal agency is defined as Buyer in such cases, where VAT is applicable.

Vendors' original tax invoice for intra State transactions is one of important documents for availing Input Tax credit. In this regard the following may be noted by all vendors for strict compliance:

- As a general rule, a tax invoice must be original, must contain vendor's TIN No with full address, invoice no & date, product description with unit rate, quantity, value, VAT rate, VAT amount, gross value of bill, **buyer i.e. BHEL's address with TIN No.** (as given above) special marking like "Original" and/or "valid for input credit"/ Buyer can take credit against this" etc as per applicable State VAT law.
- Please note that BHEL's address and TIN to be mentioned in vendors tax invoice shall be **principal place of business & applicable TIN No. of nodal agency of BHEL, as given above.** In no case the vendors, invoices shall be addressed to BHEL PEM nor shall they contain our TIN as buyer.
- As original tax invoice of vendors are to be furnished to nodal unit for assessment/VAT audit purposes, extra copy of Original invoice is required to be submitted by vendors for retaining with bank payment voucher.
- Original tax invoice along with extra copy of Original Tax invoice in line with respective state VAT law shall be essential document to be submitted by vendor for claiming payment.
- Vendor shall also furnish a certificate/statement/document as prescribed under applicable State VAT law. Please note that some of the States requires additional certificate/documents e.g. Haryana requires certificate in form C-4 in addition to original tax invoice.
- Please note that reimbursement/payment of VAT shall be subject to furnishing of Vat complaint tax invoice and other certificate/document as per applicable State VAT law.
- Tax invoice must show Vat rate & VAT amount separately and in no case all inclusive prices is to be shown in the tax invoice since input credit is not admissible in case VAT is not indicated separately.
- In case vendor is unable to furnish Vat compliant tax invoice & other certificate/document, VAT shall not be reimbursed by BHEL.

R1

Where the supplies are made from within the same state where the project is located, the vendor has to provide VAT tax invoice for such supplies even if the price quoted is all inclusive.

Raj

Swati

General Points of PQR

1. Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/ Indian subsidiaries shall be evaluated as follows:
 - a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
 - b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
 - c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/ warranty.
 - d. If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. etc. and warranty/ guarantee shall be submitted along with the offer.

2. Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.
3. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
4. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
5. Any other project specific requirement shall be as per Annexure-I and bidder shall submit relevant supporting documents.
6. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
7. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

	PRE-QUALIFICATION REQUIREMENTS FOR LT PVC CONTROL CABLE	PE-PQ-999-507-E015
		REVISION NO. 03 DATE 29/04/2016
		SHEET NO. 1 OF 1

ITEMS : LT PVC Control Cable	
SCOPE : Supply : YES; Erection & Commissioning : NO;	
1.0	Vendor should be a manufacturer of LT control cables.
2.0	Availability of test reports of tests of LT PVC/HRPVC FRLS control cables to establish in- house capability to carry out all routine, type & acceptance tests as per relevant IS/ International Standards (except UV radiation & hydrolytic stability test which can be conducted at Govt. Lab/ Govt. approved Independent lab).
3.0	Capacity of manufacturing 200 km of LT control cables per month.
4.0	Manufactured and supplied at least one (1) km of FRLS cables.
5.0	Manufactured and supplied LT control cables upto 12 cores.
6.0	Manufactured & supplied at least 500 km of LT control cables in one or more orders and at least 100 km in one single order.
7.0	Minimum two (2) nos. purchase orders for LT PVC / HRPVC control cables shall be submitted which should not be more than five (5) years old from the date of application for registration or date of techno- commercial bid opening (as applicable) for establishing continuity in business

NOTE:

Supplier to comply to "general points of PQR" available at <http://bhelpem.com/vensection/PMD/PMD.aspx>
In case supplier is not OEM, the offer shall be evaluated as per point no 1 of "general points of PQR".

PREPARED BY NAME: MANISH SHUKLA 29/04/16 DESIGNATION: SR. MGR	REVIEWED BY NAME: RAJNISH GOYAL DESIGNATION: AGM	APPROVED BY NAME: MEENA KESRI 29.4.16 DESIGNATION: AGM & DH (E)
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Price Variation Formulae for cables –Annexure-I

1. Prices shall be variable as per price variation formulae given below (basis-IEEMA). The price variation shall be limited to + 10% of total ex-works price actually supplied (cable size wise) and –ve price variation shall be unlimited. Rates for working out price variation shall be as per rates published by IEEMA for the factors given below:-

Sl no.	FORMULAE	Table Ref	Remarks
1.	$P = P_o + AIF(AL - A_{lo}) + CCFAI(CC - CCo) + FeF(Fe - Fe_o)$	As per Annexure-II	Steel strip armouring
2.	$P = P_o + AIF(AL - A_{lo}) + CCFAI(CC - CCo) + FeW(Fe - Fe_o)$		Round wire steel armouring
3.	$P = P_o + CuF(Cu - C_{uo}) + CCFCu(CC - CCo) + FeF(Fe - Fe_o) + ALF(Al - A_{lo})$		Steel strip armouring
4.	$P = P_o + CuF(Cu - C_{uo}) + CCFCu(CC - CCo) + FeW(Fe - Fe_o) + ALF(Al - A_{lo})$		Round wire steel armouring

Note:

- Formula at sl. no. 1 & 3 are as per circular no. IEEMA (PVC)/CABLE/2007 dtd 01/01/2007
- Formula at sl. no. 2 & 4 are as per circular no. IEEMA (PVC)/CABLE/2007 dtd 01/01/2007 & table P3 (revised) of circular no. 50/PVC/CLAR/02 dtd 07/03/2012.
- For formulae at sl. no. 1 & 2: for unarmoured cable FeF & $FeW = 0$
- For formulae at sl. no. 3 & 4: $FeF=0$; if Al armouring is there, $ALF = 0$; if steel armouring is there. For unarmoured cable ALF & $FeF=0$.

2. Base date for prices :

Initial Price (As per IEEMA) for- A_{lo} , C_{uo} , CCo & Fe_o :

Base Date shall be- 1st working day of the previous month to the date of issue of tender enquiry.

Final Price (as per IEEMA) for- Al, Cu, Cc & Fe:

The first working day of month, one month prior to the date on which cable is notified as being ready for inspection i.e TPIA inspection call raise date on web portal.

- Variation factor value for ALF , CuF , $CCFAL$, $CCFCu$, FeF & FeW , as applicable shall be as per Technical Specification.
- PVC shall be payable within contractual delivery period (including any extension thereto).

Aluminium conductor cables

S. No.	Cable Type	AIF		CCFAI	FeF	FeW	IEEMA Formula
		Single core unarmoured & Multi core	Single Core armoured				
1	HT XLPE Power cable	ALP	H1	H2	H3	H5	Sl. No. 1 or 2 of Annexure-I
2	LT XLPE Power Cable	ALP	L1	L2	L3	L3 (Additional)	Sl. No. 1 or 2 of Annexure-I
3	LT PVC Power Cable	ALP	P1	P2	P3	P3 (Revised_07 March 2012)	Sl. No. 1 or 2 of Annexure-I
4	LT HRPVC Power Cable	ALP	P1	P2	P3	P3 (Revised_07 March 2012)	Sl. No. 1 or 2 of Annexure-I

Copper conductor cables

S. No.	Cable Type	CuF	AIF		CCFCu	FeF	FeW	IEEMA Formula
			Single Core unarmoured & Multi core	Single Core armoured				
1	HT XLPE Power cable	CUP		H4	H2	H3	H5	Sl. No. 3 or 4 of Annexure-I
2	LT XLPE Power Cable	CUP		L4	L2	L3	L3 (Additional)	Sl. No. 3 or 4 of Annexure-I
3	LT PVC Power Cable	CUP		P4	P2	P3	P3 (Revised_07 March 2012)	Sl. No. 3 or 4 of Annexure-I
4	LT HRPVC Power Cable	CUP		P4	P2	P3	P3 (Revised_07 March 2012)	Sl. No. 3 or 4 of Annexure-I
5	LT XLPE Control Cable	CUC		--	L5	L6	L6 (Additional)	Sl. No. 3 or 4 of Annexure-I
6	LT PVC Control Cable	CUC		--	P5	P6	P6 (Revised_07 March 2012)	Sl. No. 3 or 4 of Annexure-I
7	LT HRPVC Control Cable	CUC		--	P5	P6	P6 (Revised_07 March 2012)	Sl. No. 3 or 4 of Annexure-I
8	LT XLPE Fire Survival Power Cable	CUP		L4	L2	L3	L3 (Additional)	Sl. No. 3 or 4 of Annexure-I
9	LT XLPE Fire Survival Control Cable	CUC		--	L5	L6	L6 (Additional)	Sl. No. 3 or 4 of Annexure-I
10	LT EPR Fire Survival Power Cable	CUP		L4	L2	L3	L3 (Additional)	Sl. No. 3 or 4 of Annexure-I
11	LT EPR Fire Survival Control Cable	CUC		--	L5	L6	L6 (Additional)	Sl. No. 3 or 4 of Annexure-I
12	Screened control Cable (Overall screen)	Cu POS		--	--	Fe POS	Fe POS	Sl. No. 3 or 4 of Annexure-I
13	Screened control Cable (Individual & Overall screen)	Cu PIS		--	--	Fe PIS	Fe PIS	Sl. No. 3 or 4 of Annexure-I

Notes

- (i) L3 (Additional) & L6 (Additional) tables shall be as per IEEMA circular No. 119/DIV/CAB/05 dated 01.07.2010.
- (ii) P3 (Revised_07 March 2012) & P6 (Revised_07 March 2012) tables shall be as per IEEMA circular No. 50/PVC/CLAR/02 dated 07.03.2012.
- (iii) Cu POS, Cu PIS, Fe POS & Fe PIS tables shall be as per IEEMA circular No. 89/DIV/Cable/05 dated 11.07.2014.
- (iv) All other tables shall be as per IEEMA circular No. 36/DIV/CAB/05 dated 06.01.2007.

Terms used in PVC formulae:

P = Price payable as adjusted in accordance with above appropriate formula (In Rs./Km).

Po= Price quoted/confirmed (in Rs./km).

1	ALUMINIUM	2	COPPER
	ALF = Variation factor for aluminum.		CuF = Variation factor for copper.
	Al = Price of EC grade aluminium rods (Properzi rods).		Cu = Price of CC copper rods.
	Alo = Price of EC grade aluminium rods (Properzi rods).		Cuo = Price of CC copper rods.
3	PVC COMPOUND /POLYMER	4	STEEL
	Cc = Price of PVC compound.		FeF = Variation factor for steel strip armouring.
	Cco= Price of PVC compound.		FeW=Variation factor for round wire steel armouring.
	CCFAL= Variation factor for PVC compound/Polymer for aluminum conductor cable.		Fe= Price of steel strips/steel wire.
	CCFCu =Variation factor for PVC compound/Polymer for copper conductor cable.		Feo= Price of steel strips/steel wire.

IEEMA (PVC)/CABLE/2007

Effective from: 1st January 2007

Material Price Variation Clause For PVC And XLPE Insulated Cables

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula (in Rs/Km)

Po Price quoted/confirmed (in Rs/Km)

ALUMINIUM

AIF Variation factor for aluminium

Al Price of EC grade aluminium rods (Properzi rods). This price is as applicable of first working day of the month, one month prior to the date of delivery.

Alo Price of EC grade aluminium rods (properzi rods). This price is as applicable on first working day of the month, one month prior to the date of tendering.

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of tendering.

PVC COMPOUND/POLYMER

Cc price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cco Price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

CCFAI Variation factor for PVC compound/Polymer for aluminum conductor cable.

CCFCu Variation factor for PVC compound/Polymer for copper conductor cable.

IEEMA(PVC)/CABLE/2007/ 1 of 24

IEEMA (PVC)/CABLE/2007Effective from: 1st January 2007**STEEL**

FeF	Variation factor for steel
FeW	Variation factor for round wire steel armouring
Fe	Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, one month prior to the date of delivery.
Feo	Price of steel strips/steel wire. This price is as applicable on first working day of the month, one month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA(PVC)/CABLE/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Notes

- (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi, etc.
- (b) All Prices are as on first working day of the month.
- (c) The details of prices are as under:
 - 1 The price of aluminum (in Rs/MT) is the average ex-works price of EC grade aluminium rods quoted by the primary producers confirming to specification IS: 5484
 2. Price of PVC Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer.
 3. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
 4. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable).

Price variation formulae for 'Power Cables'

A. Aluminum conductor PVC insulated 1.1 kV power cables

$$P = P_o + AIF (AL - ALo) + CCFAI (CC - Cco) + FeF (Fe - Feo)$$

For unarmoured multicore cables (without steel armour); $FeF = 0$

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
P1	Aluminium conductor aluminium armour in single core armoured cables
P2	PVC compound
P3	Steel armour

B. Copper conductor PVC insulated 1.1 kV power cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - Cco) + Fef (Fe - Feo) + AIF (Al - Alo)$$

For steel armoured cables; $AIF = 0$ For aluminium armoured cables; $FeF = 0$
For unarmoured cables; $FeF, AIF = 0$

Tables References:

CUP	Copper conductor
P2	PVC compound
P3	Steel armour
P4	Aluminium armour

C. Copper conductor PVC insulated 1.1 kV control cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - Cco) + FeF (Fe - Feo)$$

For unarmoured cables; $FeF = 0$

Tables References:

CUC	Copper conductor
P5	PVC compound
P6	Steel armour

D. Aluminium Conductor XLPE insulated 1.1 kV power cables

$$P = P_o + AIF (AL - ALo) + CCFAI (CC - Cco) + FeF (Fe - Feo)$$

For unarmoured multicore cables (without steel armour); $FeF = 0$

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
L1	Aluminium conductor + aluminium armour in single core armoured cables
L2	Polymer
L3	Steel armour

IEEMA (PVC)/CABLE/2007

Effective from: 1st January 2007

E. Copper conductor XLPE insulated 1.1 kV power cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - Cco) + FeF (Fe - Feo) + AIF (AI - Alo)$$

For steel armoured cables; AIF = 0 For aluminium armoured cables; FeF = 0
For unarmoured cables; FeF, AIF = 0

Table References:

CUP	Copper conductor
L2	Polymer
L3	Steel armour
L4	Aluminium armour

F. Copper Conductor XLPE insulated 1.1 kV control cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - CCo) + FeF (Fe - Feo)$$

For unarmoured cables; FeF = 0

Table References:

CUC	Copper conductor
L5	Polymer
L6	Steel armour

G. For Aluminium conductor XLPE insulated 3.3 to 33 kV power cables

$$P = P_o + AIF (AI - Alo) + CCFAI (Cc - Cco) + FeF (Fe - Feo)$$

For unarmoured multicore cables (without steel armour); FeF = 0

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
H1	Aluminium conductor + aluminium armour in single core armoured cables
H2	Polymer
H3/H5	Steel armour (Flat/Round)

H. Copper conductor XLPE Insulated 3.3 to 33 kV power cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (CC - Cco) + FeF (Fe - Feo) + AIF (AI - Alo)$$

For steel armoured cables; AIF = 0 For aluminium armoured cables; FeF = 0
For unarmoured cables; FeF, AIF = 0

Table References:

CUP	Copper conductor
H2	Polymer
H3/H5	Steel armour (Flat/Round)
H4	Aluminium armour

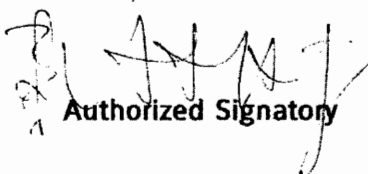

Authorized Signatory

TABLE ALP

VARIATION FACTOR FOR ALUMINIUM (AIF)
POWER CABLES WITH ALUMINIUM CONDUCTOR
(EXCLUDING SINGLE CORE ARMoured CABLES)

Nominal Cross Sectional Area (in Sq. mm.)	1 core	2 core	3 core	3.5 core	4 core
2.5	0.007	0.014	0.021	-	0.028
4	0.011	0.023	0.034	-	0.046
6	0.017	0.034	0.052	-	0.069
10	0.029	0.053	0.087	-	0.116
16	0.046	0.091	0.137	-	0.183
25/16	0.073	0.146	0.219	0.262	0.292
35/16	0.101	0.202	0.302	0.345	0.404
50/25	0.137	0.273	0.410	0.478	0.547
70/35	0.197	0.395	0.593	0.687	0.791
95/50	0.274	0.548	0.821	0.949	1.095
120/70	0.346	0.691	1.036	1.221	1.382
150/70	0.425	0.853	1.279	1.464	1.706
185/95	0.533	1.070	1.605	1.861	2.140
225/120	0.655	1.310	1.965	2.287	2.620
240/120	0.703	1.400	2.099	2.421	2.799
300/150	0.879	1.757	2.635	3.033	3.514
400/185	1.126	2.249	3.374	3.873	4.498
500	1.418	2.838	4.256	-	5.675
630	1.828	3.663	5.494	-	7.326
800	2.340	4.679	7.018	-	9.357
1000	2.951	5.890	8.834	-	11.779

TABLE CUP
VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	1 core	2 core	3 core	3.5 core	4 core
2.5	0.023	0.046	0.069	-	0.092
4	0.036	0.076	0.112	-	0.151
6	0.056	0.112	0.171	-	0.227
10	0.095	0.174	0.286	-	0.382
16	0.151	0.299	0.451	-	0.602
25/16	0.240	0.480	0.720	0.862	0.960
35/16	0.332	0.664	0.993	1.135	1.329
50/25	0.451	0.898	1.348	1.572	1.799
70/35	0.648	1.299	1.950	2.260	2.602
95/50	0.901	1.802	2.700	3.121	3.601
120/70	1.138	2.273	3.407	4.016	4.545
150/70	1.398	2.806	4.207	4.815	5.611
185/95	1.753	3.519	5.279	6.121	7.038
225/120	2.154	4.309	6.463	7.522	8.617
240/120	2.312	4.605	6.904	7.963	9.206
300/150	2.891	5.779	8.667	9.976	11.558
400/185	3.703	7.397	11.097	12.738	14.794
500	4.664	9.334	13.998	-	18.665
630	6.012	12.048	18.070	-	24.095
800	7.696	15.389	23.082	-	30.775
1000	9.706	19.372	29.055	-	38.741

TABLE CUC
VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
CONTROL CABLES WITH COPPER CONDUCTOR

No of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.026	0.047
3	0.039	0.070
4	0.052	0.094
5	0.065	0.117
6	0.078	0.141
7	0.091	0.164
8	0.110	0.182
9	0.117	0.205
10	0.130	0.235
12	0.157	0.282
14	0.183	0.329
16	0.209	0.376
18	0.246	0.410
19	0.248	0.446
20	0.260	0.456
24	0.313	0.563
27	0.352	0.634
30	0.391	0.704
37	0.483	0.869
44	0.573	1.033
52	0.678	1.221
61	0.796	1.432

TABLE P1
VARIATION FACTOR FOR ALUMINIUM (AIF)
ALUMINIUM ARMoured SINGLE CORE PVC INSULATED 1.1 KV CABLES

Nominal cross sectional area (in Sq.mm)	Aluminium factor for Aluminium armoured cable with aluminium conductor
4	0.0685
6	0.0795
10	0.1017
16	0.1303
25	0.1693
35	0.2090
50	0.2597
70	0.3360
95	0.4567
120	0.5443
150	0.6427
185	0.7743
240	0.9737
300	1.2582
400	1.5502
500	1.8958
630	2.3650
800	2.9306
1000	3.7666

TABLE P2
VARIATION FACTOR FOR PVC COMPOUND (CCFAI/CCFCu)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal cross Sectional Area (in Sq. mm)	1 core	2 core		3 core		3.5 core		4 core	
	Unarm	Unarm	arm	Unarm	arm	Unarm	arm	Unarm	arm
2.5	0.079	0.125	0.139	0.141	0.157	-	-	0.161	0.179
4	0.094	0.140	0.156	0.164	0.182	-	-	0.188	0.209
6	0.101	0.154	0.171	0.179	0.199	-	-	0.198	0.220
10	0.114	0.194	0.216	0.214	0.238	-	-	0.249	0.277
16	0.142	0.234	0.246	0.279	0.290	-	-	0.328	0.345
25	0.171	0.288	0.303	0.364	0.383	0.422	0.444	0.443	0.466
35	0.189	0.321	0.338	0.408	0.429	0.489	0.515	0.498	0.524
50	0.211	0.411	0.433	0.508	0.535	0.613	0.645	0.647	0.681
70	0.241	-	-	0.613	0.645	0.707	0.744	-	-
95	0.284	-	-	0.795	0.811	0.908	0.927	-	-
120	0.339	-	-	0.866	0.884	1.024	1.045	-	-
150	0.388	-	-	1.070	1.092	1.289	1.315	-	-
185	0.450	-	-	1.310	1.337	1.499	1.530	-	-
225	0.521	-	-	1.586	1.618	1.840	1.878	-	-
240	0.534	-	-	1.649	1.683	1.990	2.031	-	-
300	0.653	-	-	2.007	2.048	2.361	2.409	-	-
400	0.770	-	-	2.437	2.487	2.616	2.669	-	-
500	0.936	-	-	3.117	3.181	3.687	3.762	-	-
630	1.175	-	-	-	-	-	-	-	-
800	1.433	-	-	-	-	-	-	-	-
1000	1.642	-	-	-	-	-	-	-	-

TABLE P3
VARIATION FACTOR FOR STEEL (FeF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal Cross sectional Area (in Sq. mm)	2 core	Shape	3 core	Shape	3 ½ core	Shape	4 core	Shape
4	0.305	W	0.335	W	-	-	0.363	W
6	0.348	W	0.363	W	-	-	0.407	W
10	0.392	W	0.407	W	-	-	0.293	F
16	0.235	F	0.293	F	-	-	0.323	F
25	0.293	F	0.352	F	0.382	F	0.382	F
35	0.323	F	0.382	F	0.411	F	0.440	F
50	0.382	F	0.440	F	0.469	F	0.499	F
70	0.411	F	0.499	F	-	F	0.587	F
95	0.499	F	0.587	F	0.616	F	0.645	F
120	0.528	F	0.616	F	0.675	F	0.731	F
150	0.587	F	0.675	F	0.731	F	0.790	F
185	0.645	F	0.761	F	0.820	F	0.879	F
240	0.731	F	0.879	F	0.937	F	0.996	F
300	0.820	F	0.966	F	1.055	F	1.113	F
400	0.937	F	1.083	F	1.172	F	1.231	F
500	1.055	F	1.231	F	1.348	F	1.406	F
630	1.172	F	-	-	-	-	-	-

TABLE P4
VARIATION FACTOR FOR ALUMINIUM (AIF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	Aluminium Factor for Aluminium armoured cable with copper conductor
4	0.058
6	0.063
10	0.073
16	0.084
25	0.096
35	0.108
50	0.123
70	0.139
95	0.183
120	0.198
150	0.218
185	0.241
240	0.271
300	0.379
400	0.424
500	0.478
630	0.537
800	0.591
1000	0.816

TABLE P5

**VARIATION FACTOR FOR PVC COMPOUND (CCFCu)
PVC INSULAYTED CONTROL CABLES WITH COPPER CONDUCTOR**

No of cores	Core size 1.5 sq mm		Core size 2.5 sq mm	
	Unarm	Arm	Unarm	Arm
2	0.118	0.121	0.125	0.139
3	0.121	0.131	0.141	0.157
4	0.137	0.152	0.161	0.179
5	0.157	0.174	0.187	0.206
6	0.179	0.199	0.234	0.260
7	0.179	0.199	0.234	0.260
8	0.193	0.215	0.292	0.325
9	0.216	0.241	0.300	0.335
10	0.236	0.262	0.303	0.337
12	0.249	0.277	0.334	0.371
14	0.311	0.327	0.389	0.409
16	0.344	0.362	0.435	0.458
18	0.352	0.371	0.474	0.500
19	0.375	0.395	0.476	0.501
20	0.391	0.412	0.519	0.546
24	0.457	0.481	0.584	0.615
27	0.491	0.517	0.631	0.664
30	0.529	0.557	0.706	0.743
37	0.615	0.647	0.835	0.879
44	0.739	0.778	1.019	1.026
52	0.845	0.889	1.100	1.158
61	0.952	1.002	1.246	1.312

TABLE P6
VARIATION FACTOR FOR STEEL (FeF)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm	Shape of armour	Core size 2.5 sq mm	Shape of armour
2	0.243	W	0.277	W
3	0.257	W	0.289	W
4	0.277	W	0.314	W
5	0.303	W	0.342	W
6	0.329	W	0.379	W
7	0.329	W	0.379	W
8	0.341	W	0.456	W
9	0.383	W	0.275	F
10	0.408	W	0.325	F
12	0.289	F	0.342	F
14	0.306	F	0.360	F
16	0.317	F	0.372	F
18	0.332	F	0.350	F
19	0.343	F	0.397	F
20	0.368	F	0.400	F
24	0.398	F	0.475	F
27	0.414	F	0.478	F
30	0.425	F	0.503	F
37	0.461	F	0.548	F
44	0.507	F	0.601	F
52	0.556	F	0.641	F
61	0.585	F	0.685	F

TABLE L1
VARIATION FACTOR FOR ALUMINIUM (AIF)
ALULMINIUM ARMoured SINGLE CORE XLPE INSULATED 1.1 KV CABLES

Nominal cross sectional area (in Sq. mm)	Aluminium factor for Aluminium armoured cable with aluminium conductor
4	0.0685
6	0.0795
10	0.1017
16	0.1303
25	0.1693
35	0.2090
50	0.2597
70	0.3360
95	0.4567
120	0.5443
150	0.6427
185	0.7743
240	0.9737
300	1.2582
400	1.5502
500	1.8958
630	2.3650
800	2.9306
1000	3.7666

TABLE L2

VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	1 core	2 core		3 core		3.5 core		4 core	
	Unarm	Unarm	Arm	Unarm	Arm	Unarm	Arm	Unarm	Arm
2.5	0.055	0.163	0.175	0.166	0.177	-	-	0.177	0.188
4	0.075	0.201	0.204	0.205	0.213	-	-	0.218	0.213
6	0.085	0.213	0.234	0.205	0.230	-	-	0.242	0.232
10	0.082	0.252	0.280	0.217	0.251	-	-	0.285	0.298
16	0.089	0.278	0.341	0.289	0.246	-	-	0.300	0.279
25	0.101	0.307	0.278	0.276	0.247	0.295	0.264	0.331	0.290
35	0.109	0.330	0.319	0.305	0.270	0.328	0.292	0.368	0.319
50	0.124	0.482	0.685	0.348	0.311	0.372	0.335	0.422	0.394
70	0.146	0.354	0.335	0.469	0.397	0.489	0.420	0.528	0.464
95	0.163	0.436	0.389	0.504	0.441	0.544	0.471	0.591	0.523
120	0.176	0.475	0.421	0.556	0.498	0.599	0.538	0.722	0.656
150	0.217	0.510	0.490	0.690	0.611	0.717	0.633	0.840	0.762
185	0.236	0.631	0.608	0.836	0.738	0.854	0.756	1.007	0.899
240	0.273	0.750	0.726	1.002	0.842	1.079	0.952	1.238	1.119
300	0.303	0.919	0.887	1.161	1.012	1.170	1.031	1.457	1.414
400	0.372	1.093	1.040	1.376	1.283	1.545	1.379	1.778	1.626
500	0.413	1.342	-	1.568	1.400	1.806	1.456	-	-
630	0.469	1.546	-	-	-	-	-	-	-
800	0.569	-	-	-	-	-	-	-	-
1000	0.667	-	-	-	-	-	-	-	-

TABLE L3
VARIATION FACTOR FOR STEEL (FeF)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	2 core	Shape	3 core	Shape	3 ½ core	Shape	4 core	Shape
4	0.305	W	0.335	W	-	-	0.363	W
6	0.348	W	0.363	W	-	-	0.407	W
10	0.392	W	0.407	W	-	-	0.293	F
16	0.235	F	0.293	F	-	-	0.323	F
25	0.293	F	0.352	F	0.382	F	0.382	F
35	0.323	F	0.382	F	0.411	F	0.440	F
50	0.382	F	0.440	F	0.469	F	0.499	F
70	0.411	F	0.499	F	-	F	0.587	F
95	0.499	F	0.587	F	0.616	F	0.645	F
120	0.528	F	0.616	F	0.675	F	0.731	F
150	0.587	F	0.675	F	0.731	F	0.790	F
185	0.645	F	0.761	F	0.820	F	0.879	F
240	0.731	F	0.879	F	0.937	F	0.996	F
300	0.820	F	0.966	F	1.055	F	1.113	F
400	0.937	F	1.083	F	1.172	F	1.231	F
500	1.055	F	1.231	F	1.348	F	1.406	F
630	1.172	F	-	-	-	-	-	-

TABLE L4
VARIATION FACTOR FOR ALUMINIUM (AIF)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor
4	0.058
6	0.063
10	0.073
16	0.084
25	0.096
35	0.108
50	0.123
70	0.139
95	0.183
120	0.198
150	0.218
185	0.241
240	0.271
300	0.379
400	0.424
500	0.478
630	0.537
800	0.591
1000	0.816

TABLE L5
VARIATION FACTOR FOR POLYMER (CCFCu)
XLPE INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm		Core size 2.5 sq mm	
	Unarm	Arm	Unarm	Arm
2	0.118	0.121	0.125	0.139
3	0.121	0.131	0.141	0.157
4	0.137	0.152	0.161	0.179
5	0.157	0.174	0.187	0.206
6	0.179	0.199	0.234	0.260
7	0.179	0.199	0.234	0.260
10	0.236	0.262	0.303	0.337
12	0.249	0.277	0.334	0.371
14	0.311	0.327	0.389	0.409
16	0.344	0.362	0.435	0.458
19	0.375	0.395	0.476	0.501
24	0.457	0.481	0.584	0.615
27	0.491	0.517	0.631	0.664
30	0.529	0.557	0.706	0.743
37	0.615	0.647	0.835	0.879
44	0.739	0.778	1.019	1.026
52	0.845	0.889	1.100	1.158
61	0.952	1.002	1.246	1.312

TABLE L6
VARIATION FACTOR FOR STEEL (FeF)
XLPE INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm	Shape of amour	Core size 2.5 sq mm	Shape of amour
2	0.243	W	0.277	W
3	0.257	W	0.289	W
4	0.277	W	0.314	W
5	0.303	W	0.342	W
6	0.329	W	0.379	W
7	0.329	W	0.379	W
10	0.408	W	0.325	F
12	0.289	F	0.342	F
14	0.306	F	0.360	F
16	0.317	F	0.372	F
19	0.343	F	0.397	F
24	0.398	F	0.475	F
27	0.414	F	0.478	F
30	0.425	F	0.503	F
37	0.461	F	0.548	F
44	0.507	F	0.601	F
52	0.556	F	0.641	F
61	0.585	F	0.685	F

TABLE H1
VARIATION FACTOR FOR ALUMINIUM (AIF)
ALUMINIUM ARMoured SINGLE CORE XLPE INSULATED 3.3 TO 33 KV CABLES

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Aluminium Conductor					
	3.3 KV	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
35	0.251	0.284	0.301	0.344	0.358	0.473
50	0.312	0.336	0.352	0.397	0.408	0.672
70	0.385	0.409	0.423	0.469	0.501	0.723
95	0.476	0.500	0.518	0.637	0.656	0.856
120	0.561	0.586	0.601	0.726	0.744	0.949
150	0.653	0.678	0.696	0.823	0.842	1.050
185	0.773	0.797	0.893	0.949	0.965	1.183
240	0.997	1.063	1.083	1.139	1.154	1.387
300	1.209	1.271	1.283	1.333	1.307	1.753
400	1.438	1.556	1.565	1.620	1.636	2.046
500	1.873	1.901	1.910	2.110	2.128	2.484
630	2.337	2.361	2.369	2.580	2.595	2.978
800	3.007	3.071	3.080	3.145	3.163	3.588
1000	3.737	3.741	3.749	3.804	3.822	4.565

TABLE H2

**VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)
3 CORE XLPE INSULATED 3.3 to 33 KV POWER CABLES
WITH COPPER / ALUMINIUM CONDUCTOR**

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM
35	0.374	0.990	1.142	1.604	1.782	-
50	0.445	1.119	1.260	1.834	2.046	2.864
70	0.547	1.290	1.396	2.011	2.284	3.219
95	0.594	1.440	1.647	2.269	2.428	3.367
120	0.732	1.692	1.877	2.498	2.715	3.646
150	0.812	1.906	2.061	2.767	2.931	3.927
185	0.960	2.086	2.406	3.028	3.180	4.166
240	1.130	2.484	2.744	3.398	3.580	4.589
300	1.219	2.912	3.161	3.840	4.016	5.029
400	1.313	3.530	3.664	4.353	4.666	5.736

Fillers added in PVC consumption

TABLE H3

VARIATION FACTOR FOR STEEL (FeF)
XLPE INSULATED 3.3 TO 33 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area Sq. mm.	3.3 KV	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
35	0.645	0.645	0.731	0.879	0.937	-
50	0.675	0.703	0.761	0.937	0.966	-
70	0.761	0.761	0.849	0.996	1.055	1.289
95	0.820	0.849	0.907	1.083	1.113	1.348
120	0.879	0.907	0.966	1.142	1.172	1.406
150	0.966	0.966	1.055	1.201	1.259	1.494
185	1.025	1.055	1.113	1.259	1.318	1.553
240	1.142	1.142	1.231	1.377	1.406	1.641
300	1.231	1.259	1.318	1.465	1.524	1.758
400	1.348	1.406	1.435	1.582	1.641	1.876

TABLE H4

VARIATION FACTOR FOR ALUMINIUM (AIF)
XLPE INSULATED SINGLE CORE 3.3 TO 33 KV POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor					
	3.3 KV	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
35	0.153	0.187	0.204	0.247	0.258	0.372
50	0.179	0.203	0.220	0.262	0.275	0.425
70	0.196	0.219	0.233	0.278	0.311	0.444
95	0.213	0.237	0.254	0.373	0.392	0.470
120	0.228	0.253	0.268	0.393	0.410	0.488
150	0.243	0.269	0.287	0.414	0.432	0.504
185	0.261	0.285	0.381	0.437	0.455	0.526
240	0.324	0.389	0.410	0.465	0.480	0.556
300	0.365	0.428	0.440	0.490	0.510	0.737
400	0.432	0.471	0.480	0.536	0.552	0.783
500	0.489	0.517	0.526	0.726	0.744	0.844
630	0.544	0.568	0.572	0.787	0.801	0.902
800	0.706	0.787	0.797	0.862	0.880	0.982
1000	0.824	0.865	0.867	0.923	0.940	1.324

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1st July 2010

To Members of IEEMA Cable Division, All SEBs, Utilities & Listed purchasing organizations

Sub: Round Wire 'W' Steel Factors for various types of Cables

IEEMA Cable division members have decided to evolve new Round Wire steel factors for LT & HT cables which are missing in the existing tables of factors since some of the users were procuring such types of cables and demanding these factors.

After collecting and compiling inputs from leading manufacturers and receiving approval from IEEMA Cable division; we are publishing the following Round Wire 'W' steel factors (FeF) and accordingly enclosing following Additional tables of factors for your perusal and records.

- ® P3 - PVC insulated 1.1 KV Power Cables with Copper/ Aluminium Conductor
- ® L3 - XLPE insulated 1.1 KV Power Cables with Copper/ Aluminium Conductor
- ® P6 - PVC Insulated Control Cables with Copper Conductor
- ® L6 - XLPE Insulated Control Cables with Copper Conductor

We have also added factors for XLPE insulated 3.3 to 33 KV Power Cables with Copper/ Aluminium Conductor of 25 sq. mm. cross sectional area and only for 33KV (E) power cable of 50 sq. mm. cross sectional area. Accordingly, the updated Table H3 is also enclosed for your perusal and records.


Executive Officer

End: as above

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TABLE P3 (Additional)

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in sq. mm)	2 Core	3 Core	3.5 Core	4 Core
1.5	0.247	0.259		0.288
2.5	0.273	0.301		0.329
4	0.305	0.335		0.363
6	0.348	0.363		0.407
10	0.392	0.407		0.533
16	0.439	0.523	0.014	0.573
25	0.526	0.625	0.664	0.685
35	0.591	0.685	0.729	0.761
50	0.661	0.790	0.864	1.108
70	0.745	1.122	1.200	1.256
95	1.085	1.286	1.376	1.443
120	1.147	1.386	1.479	1.562
150	1.267	1.526	1.684	2.173
185	1.403	2.090	2.315	2.421
240	1.994	2.397	2.641	2.722
300	2.180	2.642	3.670	3.842
400	2.987	3.728	4.126	4.292
500	3.517	4.226	5.958	6.301
630	4.774	6.018	6.737	7.141

TABLE L3 (Additional)

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in sq. mm)	2 Core	3 Core	3.5 Core	4 Core
4	0.305	0.335		0.363
6	0.348	0.363		0.407
10	0.392	0.407		0.434
16	0.405	0.503	0.014	0.536
25	0.492	0.582	0.618	0.644
35	0.541	0.649	0.684	0.717
50	0.616	0.740	0.782	0.818
70	0.708	1.069	1.161	1.212
95	1.011	1.202	1.299	1.348
120	1.091	1.306	1.407	1.483
150	1.206	1.470	1.649	2.084
185	1.341	2.017	2.194	2.328
240	1.882	2.280	2.483	2.619
300	2.059	2.542	2.958	3.713
400	2.352	3.559	3.926	4.120
500	3.347	4.058	5.278	6.132
630	3.735	5.744	6.672	6.876

TABLE P6 (Additional)

**VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR**

No. of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.243	0.277
3	0.257	0.289
4	0.277	0.314
5	0.303	0.342
6	0.329	0.379
7	0.329	0.379
8	0.341	0.456
9	0.383	0.508
10	0.408	0.535
12	0.510	0.572
14	0.546	0.625
16	0.581	0.660
19	0.608	0.696
24	0.714	0.819
25	0.679	0.798
27	0.732	0.837
28	0.696	0.815
30	0.758	0.881
33	0.747	0.883
37	0.820	1.217
44	0.926	1.355
48	1.122	1.308
50	1.122	1.308
52	1.149	1.361
56	1.202	1.388
61	1.299	1.520

TABLE L6 (Additional)

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
XLPE INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No. of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.243	0.277
3	0.257	0.289
4	0.277	0.314
5	0.303	0.342
6	0.329	0.379
7	0.329	0.379
8	0.408	0.404
9	0.411	0.430
10	0.423	0.557
12	0.434	0.563
14	0.458	0.595
16	0.557	0.621
19	0.581	0.659
24	0.682	0.779
27	0.697	0.779
30	0.715	0.812
33	0.758	0.856
37	0.812	1.016
44	0.864	1.238
48	0.849	1.222
52	0.904	1.298
56	0.900	1.275
61	1.206	1.374



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Cir. No. 50/PVC/CLAR/02

March 07, 2012

To members of Cable division, Utilities, SEBs, listed purchasing organizations

Sub: Revision in Table P3 and P6 providing Round Wire 'W' Steel Factors for various types of Cables.

We have issued Cir. No. 119/DIV/CAB/05 dated 1st July, 2010 providing Round Wire 'W' Steel Factors for various types of Cables.

It is observed that IEEMA factors for round wire steel (FeF) for 2 core and 3 core of 2.5 sq. mm. cross sectional area for Copper conductor PVC power cables (table P3) & Copper conductor PVC Control cables (table P6) are indicated different.

After discussion with IEEMA Cable division members during the meeting held on 21st February 2012, it has been decided to have identical/same factors for both these types of Cables. Accordingly revised and updated tables are enclosed herewith. We request members to use these tables henceforth. Revised table references are as under

P3 – PVC insulated 1.1 kV Power Cables with Copper/Aluminium Conductor

P6 – PVC insulated Control Cables with Copper Conductor


Assistant Director
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Encl: Revised tables P3 and P6

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TABLE P3 (Revised_07 March 2012)

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in sq. mm)	2 Core	3 Core	3.5 Core	4 Core
1.5	0.247	0.259		0.288
2.5	0.273	0.289		0.329
4	0.305	0.335		0.363
6	0.348	0.363		0.407
10	0.392	0.407		0.533
16	0.439	0.523	0.014	0.573
25	0.526	0.625	0.664	0.685
35	0.591	0.685	0.729	0.761
50	0.661	0.790	0.864	1.108
70	0.745	1.122	1.200	1.256
95	1.085	1.286	1.376	1.443
120	1.147	1.386	1.479	1.562
150	1.267	1.526	1.684	2.173
185	1.403	2.090	2.315	2.421
240	1.994	2.397	2.641	2.722
300	2.180	2.642	3.670	3.842
400	2.987	3.728	4.126	4.292
500	3.517	4.226	5.958	6.301
630	4.774	6.018	6.737	7.141

TABLE P6 (Revised_07 March 2012)

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No. of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.243	0.273
3	0.257	0.289
4	0.277	0.314
5	0.303	0.342
6	0.329	0.379
7	0.329	0.379
8	0.341	0.456
9	0.383	0.508
10	0.408	0.535
12	0.510	0.572
14	0.546	0.625
16	0.581	0.660
19	0.608	0.696
24	0.714	0.819
25	0.679	0.798
27	0.732	0.837
28	0.696	0.815
30	0.758	0.881
33	0.747	0.883
37	0.820	1.217
44	0.926	1.355
48	1.122	1.308
50	1.122	1.308
52	1.149	1.361
56	1.202	1.388
61	1.299	1.520

Cir. No: 89/DIV/Cable/05

11 July 2014

To all members of Cable division of IEEMA
SEBs, Utilities and other listed purchasing organizations

Sub: Price Variation Clause for 'Instrumentation Cables'

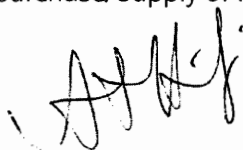
Members of IEEMA Cable division especially Instrumentation Cable manufacturers have decided to evolve a new PV clause for 'Instrumentation Cables'. Members may recall IEEMA has circulated draft PV clause for 'Instrumentation Cables' after collection & compilation of all the necessary data from manufactures vide circular no. 40/DIV/Cable/05 dated 21st March 2014.

These PV formulae are derived on weight basis, the weight of raw materials like Copper and Steel is considered for following different type of Instrumentation Cables:

1. **Pair Instrumentation Over all Screen Cables**
2. **Pair Instrumentation Individual and Over all Screen Cables**
3. **Triad Instrumentation Over all Screen Cables**
4. **Triad Instrumentation Individual and Over all Screen Cables**

The weight factors of Copper & Steel for all the above four types of Cables are also enclosed along with draft PV clause.

We are making this PV clause operational with effect from 1st July 2014. We request and recommend to incorporate this new PV clause in all your tenders/contracts of purchase/supply of Instrumentation Cables.



Deputy Director General

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IEEMA (PVC)/Instrumentation Cable/2014

Effective from: 1st July 2014

Material Price Variation Clause For Instrumentation Cables

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula (in Rs/Km)

Po Price quoted/confirmed (in Rs/Km)

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cu_o Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of tendering.

STEEL

FeF Variation factor for steel

Fe Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Fe_o Price of steel strips/steel wire. This price is as applicable on first working day of the month, one month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA(PVC)/CABLE/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

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IEEMA (PVC)/Instrumentation Cable/2014
Effective from: 1st July 2014
Notes

- (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi, etc.
- (b) All Prices are as on first working day of the month.
- (c) The details of prices are as under:
 1. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
 2. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable).

Price variation formula for 'Instrumentaion Cables'

$$P = P_o + CuF (Cu - Cuo) + FeF (Fe - Feo)$$

1. For Pair Instrumentation Over all Screen Cables
Tables References:

Cu POS	Copper Factor
Fe POS	Steel Factor

2. For Pair Instrumentation Individual and Over all Screen Cables
Tables References:

Cu PIS	Copper Factor
Fe PIS	Steel Factor

3. For Triad Instrumentation Over all Screen Cables
Tables References:

Cu TOS	Copper Factor
Fe TOS	Steel Factor

4. For Triad Instrumentation Individual & Overall Screen Cables
Tables References:

Cu TIS	Copper Factor
Fe TIS	Steel Factor



Deputy Director General

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Copper Factors for Instrumentation Cables - CuF

Cu POS

Pair Instrumentation Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0142	0.0185	0.0233	0.0326	0.0500
2	0.0258	0.0345	0.0440	0.0625	0.0978
3	0.0353	0.0484	0.0626	0.0904	0.1433
4	0.0448	0.0623	0.0811	0.1183	0.1888
5	0.0578	0.0800	0.1022	0.1467	0.2356
6	0.0662	0.0926	0.1210	0.1768	0.2829
7	0.0756	0.1067	0.1378	0.2000	0.3245
8	0.0852	0.1204	0.1582	0.2327	0.3741
9	0.0933	0.1334	0.1734	0.2534	0.4134
10	0.1046	0.1485	0.1959	0.2893	0.4665
11	0.1111	0.1600	0.2089	0.3067	0.5023
12	0.1236	0.1764	0.2333	0.3452	0.5580
13	0.1289	0.1867	0.2445	0.3600	0.5912
14	0.1378	0.2000	0.2623	0.3867	0.6356
15	0.1467	0.2134	0.2800	0.4134	0.6801
16	0.1618	0.2322	0.3080	0.4573	0.7409
17	0.1645	0.2400	0.3156	0.4667	0.7690
18	0.1734	0.2534	0.3334	0.4934	0.8134
19	0.1822	0.2667	0.3512	0.5201	0.8579
20	0.1911	0.2800	0.3689	0.5467	0.9023
21	0.2000	0.2934	0.3867	0.5734	0.9468
22	0.2089	0.3067	0.4045	0.6001	0.9912
23	0.2178	0.3200	0.4223	0.6267	1.0357
24	0.2381	0.3437	0.4575	0.6813	1.1068
25	0.2356	0.3467	0.4578	0.6801	1.1246
26	0.2445	0.3600	0.4756	0.7068	1.1690
27	0.2534	0.3734	0.4934	0.7334	1.2135
28	0.2623	0.3867	0.5112	0.7601	1.2579
29	0.2711	0.4001	0.5290	0.7868	1.3024
30	0.2800	0.4134	0.5467	0.8134	1.3468
31	0.2889	0.4267	0.5645	0.8401	1.3913
32	0.2978	0.4401	0.5823	0.8668	1.4357
33	0.3067	0.4534	0.6001	0.8934	1.4802
34	0.3156	0.4667	0.6179	0.9201	1.5246
35	0.3245	0.4801	0.6356	0.9468	1.5691
36	0.3334	0.4934	0.6534	0.9735	1.6135
37	0.3423	0.5067	0.6712	1.0001	1.6580
38	0.3512	0.5201	0.6890	1.0268	1.7024
39	0.3600	0.5334	0.7068	1.0535	1.7469
40	0.3689	0.5467	0.7245	1.0801	1.7913
41	0.3778	0.5601	0.7423	1.1068	1.8358
42	0.3867	0.5734	0.7601	1.1335	1.8802
43	0.3956	0.5867	0.7779	1.1601	1.9247
44	0.4045	0.6001	0.7957	1.1868	1.9691
45	0.4134	0.6134	0.8134	1.2135	2.0136
46	0.4223	0.6267	0.8312	1.2402	2.0580
47	0.4312	0.6401	0.8490	1.2668	2.1025
48	0.4710	0.6759	0.9010	1.3410	2.2009

Copper Factors for Instrumentation Cables - CuF

Cu PIS

Pair Instrumentation Individual and Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0133	0.0178	0.0222	0.0311	0.0489
2	0.0349	0.0437	0.0531	0.0717	0.1069
3	0.0490	0.0621	0.0763	0.1041	0.1570
4	0.0630	0.0806	0.0994	0.1389	0.2071
5	0.0800	0.1022	0.1245	0.1689	0.2578
6	0.0937	0.1200	0.1484	0.2042	0.3103
7	0.1067	0.1378	0.1689	0.2311	0.3556
8	0.1218	0.1569	0.1948	0.2692	0.4107
9	0.1334	0.1734	0.2134	0.2934	0.4534
10	0.1503	0.1943	0.2417	0.3349	0.5122
11	0.1600	0.2089	0.2578	0.3556	0.5512
12	0.1785	0.2313	0.2882	0.4001	0.6128
13	0.1867	0.2445	0.3023	0.4178	0.6490
14	0.2000	0.2623	0.3245	0.4489	0.6979
15	0.2134	0.2800	0.3467	0.4801	0.7468
16	0.2350	0.3053	0.3812	0.5305	0.8141
17	0.2400	0.3156	0.3912	0.5423	0.8446
18	0.2534	0.3334	0.4134	0.5734	0.8934
19	0.2667	0.3512	0.4356	0.6045	0.9423
20	0.2800	0.3689	0.4578	0.6356	0.9912
21	0.2934	0.3867	0.4801	0.6668	1.0401
22	0.3067	0.4045	0.5023	0.6979	1.0890
23	0.3200	0.4223	0.5245	0.7290	1.1379
24	0.3479	0.4535	0.5673	0.7911	1.2165
25	0.3467	0.4578	0.5690	0.7912	1.2357
26	0.3600	0.4756	0.5912	0.8223	1.2846
27	0.3734	0.4934	0.6134	0.8534	1.3335
28	0.3867	0.5112	0.6356	0.8846	1.3824
29	0.4001	0.5290	0.6579	0.9157	1.4313
30	0.4134	0.5467	0.6801	0.9468	1.4802
31	0.4267	0.5645	0.7023	0.9779	1.5291
32	0.4401	0.5823	0.7245	1.0090	1.5780
33	0.4534	0.6001	0.7468	1.0401	1.6269
34	0.4667	0.6179	0.7690	1.0712	1.6758
35	0.4801	0.6356	0.7912	1.1024	1.7247
36	0.4934	0.6534	0.8134	1.1335	1.7736
37	0.5067	0.6712	0.8357	1.1646	1.8225
38	0.5201	0.6890	0.8579	1.1957	1.8713
39	0.5334	0.7068	0.8801	1.2268	1.9202
40	0.5467	0.7245	0.9023	1.2579	1.9691
41	0.5601	0.7423	0.9246	1.2891	2.0180
42	0.5734	0.7601	0.9468	1.3202	2.0669
43	0.5867	0.7779	0.9690	1.3513	2.1158
44	0.6001	0.7957	0.9912	1.3824	2.1647
45	0.6134	0.8134	1.0135	1.4135	2.2136
46	0.6267	0.8312	1.0357	1.4446	2.2625
47	0.6401	0.8490	1.0579	1.4757	2.3114
48	0.6887	0.8936	1.1186	1.5587	2.4186

Copper Factors for Instrumentation Cables - CuF

Cu TOS

Triad Instrumentation Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0190	0.0255	0.0326	0.0466	0.0728
2	0.0400	0.0533	0.0667	0.0933	0.1467
3	0.0533	0.0733	0.0933	0.1334	0.2134
4	0.0662	0.0926	0.1209	0.1768	0.2806
5	0.0800	0.1133	0.1467	0.2134	0.3467
6	0.0948	0.1343	0.1769	0.2606	0.4197
7	0.1067	0.1534	0.2000	0.2934	0.4801
8	0.1236	0.1764	0.2333	0.3452	0.5579
9	0.1334	0.1934	0.2534	0.3734	0.6134
10	0.1522	0.2182	0.2894	0.4293	0.6952
11	0.1600	0.2334	0.3067	0.4534	0.7468
12	0.1808	0.2601	0.3454	0.5133	0.8324
13	0.1867	0.2734	0.3600	0.5334	0.8801
14	0.2000	0.2934	0.3867	0.5734	0.9468
15	0.2134	0.3134	0.4134	0.6134	1.0135
16	0.2267	0.3334	0.4401	0.6534	1.0801
17	0.2400	0.3534	0.4667	0.6934	1.1468
18	0.2534	0.3734	0.4934	0.7334	1.2135
19	0.2667	0.3934	0.5201	0.7734	1.2802
20	0.2800	0.4134	0.5467	0.8134	1.3468
21	0.2934	0.4334	0.5734	0.8534	1.4135
22	0.3067	0.4534	0.6001	0.8934	1.4802
23	0.3200	0.4734	0.6267	0.9335	1.5469
24	0.3334	0.4934	0.6534	0.9735	1.6135
25	0.3467	0.5134	0.6801	1.0135	1.6802
26	0.3600	0.5334	0.7068	1.0535	1.7469
27	0.3734	0.5534	0.7334	1.0935	1.8136
28	0.3867	0.5734	0.7601	1.1335	1.8802
29	0.4001	0.5934	0.7868	1.1735	1.9469
30	0.4134	0.6134	0.8134	1.2135	2.0136
31	0.4267	0.6334	0.8401	1.2535	2.0803
32	0.4401	0.6534	0.8668	1.2935	2.1469
33	0.4534	0.6734	0.8934	1.3335	2.2136
34	0.4667	0.6934	0.9201	1.3735	2.2803
35	0.4801	0.7134	0.9468	1.4135	2.3470
36	0.4934	0.7334	0.9735	1.4535	2.4136
37	0.5067	0.7534	1.0001	1.4935	2.4803
38	0.5201	0.7734	1.0268	1.5335	2.5470
39	0.5334	0.7934	1.0535	1.5735	2.6137
40	0.5467	0.8134	1.0801	1.6135	2.6803
41	0.5601	0.8334	1.1068	1.6535	2.7470
42	0.5734	0.8534	1.1335	1.6935	2.8137
43	0.5867	0.8734	1.1601	1.7336	2.8804
44	0.6001	0.8934	1.1868	1.7736	2.9470
45	0.6134	0.9134	1.2135	1.8136	3.0137
46	0.6267	0.9335	1.2402	1.8536	3.0804
47	0.6401	0.9535	1.2668	1.8936	3.1471
48	0.6534	0.9735	1.2935	1.9336	3.2137

Copper Factors for Instrumentation Cables - CuF

Cu TIS

Triad Instrumentation Individual & Overall Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0178	0.0245	0.0312	0.0446	0.0715
2	0.0489	0.0622	0.0756	0.1022	0.1556
3	0.0667	0.0867	0.1067	0.1467	0.2267
4	0.0845	0.1108	0.1393	0.1951	0.3012
5	0.1022	0.1356	0.1689	0.2356	0.3689
6	0.1222	0.1617	0.2043	0.2880	0.4423
7	0.1378	0.1845	0.2311	0.3245	0.5112
8	0.1602	0.2130	0.2699	0.3818	0.5881
9	0.1734	0.2334	0.2934	0.4134	0.6534
10	0.1980	0.2640	0.3351	0.4750	0.7328
11	0.2089	0.2823	0.3556	0.5023	0.7957
12	0.2357	0.3149	0.4003	0.5682	0.8776
13	0.2445	0.3312	0.4178	0.5912	0.9379
14	0.2623	0.3556	0.4489	0.6356	1.0090
15	0.2800	0.3800	0.4801	0.6801	1.0801
16	0.2978	0.4045	0.5112	0.7245	1.1513
17	0.3156	0.4289	0.5423	0.7690	1.2224
18	0.3334	0.4534	0.5734	0.8134	1.2935
19	0.3512	0.4778	0.6045	0.8579	1.3646
20	0.3689	0.5023	0.6356	0.9023	1.4357
21	0.3867	0.5267	0.6668	0.9468	1.5069
22	0.4045	0.5512	0.6979	0.9912	1.5780
23	0.4223	0.5756	0.7290	1.0357	1.6491
24	0.4401	0.6001	0.7601	1.0801	1.7202
25	0.4578	0.6245	0.7912	1.1246	1.7913
26	0.4756	0.6490	0.8223	1.1690	1.8625
27	0.4934	0.6734	0.8534	1.2135	1.9336
28	0.5112	0.6979	0.8846	1.2579	2.0047
29	0.5290	0.7223	0.9157	1.3024	2.0758
30	0.5467	0.7468	0.9468	1.3468	2.1469
31	0.5645	0.7712	0.9779	1.3913	2.2181
32	0.5823	0.7957	1.0090	1.4357	2.2892
33	0.6001	0.8201	1.0401	1.4802	2.3603
34	0.6179	0.8446	1.0712	1.5246	2.4314
35	0.6356	0.8690	1.1024	1.5691	2.5025
36	0.6534	0.8934	1.1335	1.6135	2.5737
37	0.6712	0.9179	1.1646	1.6580	2.6448
38	0.6890	0.9423	1.1957	1.7024	2.7159
39	0.7068	0.9668	1.2268	1.7469	2.7870
40	0.7245	0.9912	1.2579	1.7913	2.8581
41	0.7423	1.0157	1.2891	1.8358	2.9293
42	0.7601	1.0401	1.3202	1.8802	3.0004
43	0.7779	1.0646	1.3513	1.9247	3.0715
44	0.7957	1.0890	1.3824	1.9691	3.1426
45	0.8134	1.1135	1.4135	2.0136	3.2137
46	0.8312	1.1379	1.4446	2.0580	3.2849
47	0.8490	1.1624	1.4757	2.1025	3.3560
48	0.8668	1.1868	1.5069	2.1469	3.4271

Steel Factors for Instrumentation Cables - FeF					
Fe POS					
Pair Instrumentation Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.1490	0.1565	0.1635	0.1735	0.1930
2	0.2190	0.2335	0.2470	0.2665	0.2595
3	0.2360	0.2545	0.2690	0.2900	0.2680
4	0.2390	0.2580	0.2715	0.2945	0.2830
5	0.2630	0.2820	0.2420	0.2805	0.3155
6	0.2840	0.3160	0.2805	0.2995	0.3430
7	0.2840	0.2595	0.2805	0.2995	0.3430
8	0.3235	0.2930	0.3030	0.3315	0.3780
9	0.2805	0.3180	0.3290	0.3590	0.4205
10	0.2970	0.3215	0.3455	0.3755	0.4385
11	0.3005	0.3255	0.3490	0.3805	0.4435
12	0.3055	0.3440	0.3680	0.3880	0.4520
13	0.3265	0.3530	0.3780	0.4105	0.4785
14	0.3265	0.3530	0.3780	0.4105	0.4785
15	0.3490	0.3765	0.4015	0.4365	0.5195
16	0.3490	0.3765	0.4015	0.4365	0.5195
17	0.3590	0.4005	0.4140	0.4635	0.5470
18	0.3590	0.4005	0.4265	0.4635	0.5470
19	0.3590	0.4005	0.4265	0.4635	0.5470
20	0.3830	0.4240	0.4535	0.4920	0.5760
21	0.3830	0.4240	0.4535	0.4920	0.5760
22	0.4065	0.4520	0.4785	0.5310	0.6190
23	0.4065	0.4520	0.4810	0.5310	0.6190
24	0.4305	0.4770	0.5070	0.5595	0.6475
25	0.4305	0.4770	0.5070	0.5595	0.6475
26	0.4305	0.4770	0.5070	0.5595	0.6475
27	0.4355	0.4820	0.5245	0.5660	0.6700
28	0.4570	0.5045	0.5345	0.5895	0.6950
29	0.4570	0.5045	0.5345	0.5895	0.6950
30	0.4570	0.5045	0.5345	0.5895	0.6950
31	0.4795	0.5285	0.5595	0.6150	0.7225
32	0.4820	0.5285	0.5595	0.6150	0.7225
33	0.4820	0.5285	0.5595	0.6150	0.7225
34	0.4920	0.5520	0.5835	0.6410	0.7500
35	0.4920	0.5520	0.5835	0.6410	0.7500
36	0.4920	0.5520	0.5835	0.6410	0.7500
37	0.4920	0.5520	0.5835	0.6410	0.7500
38	0.5145	0.5760	0.6225	0.6550	0.7805
39	0.5145	0.5760	0.6225	0.6550	0.7805
40	0.5145	0.5760	0.6225	0.6550	0.7805
41	0.5395	0.6025	0.6475	0.6975	0.8230
42	0.5395	0.6025	0.6475	0.6975	0.8230
43	0.5395	0.6025	0.6475	0.6975	0.8230
44	0.5635	0.6265	0.6735	0.7250	0.8540
45	0.5635	0.6265	0.6760	0.7250	0.8540
46	0.5635	0.6265	0.6760	0.7250	0.8540
47	0.5635	0.6265	0.6760	0.7250	0.8540
48	0.5635	0.6265	0.6760	0.7375	0.8665

Steel Factors for Instrumentation Cables - FeF

Fe PIS

Pair Instrumentation Individual and Over all Screen Cables

No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.1880	0.1980	0.2070	0.2220	0.2410
2	0.2315	0.2460	0.2595	0.2815	0.2755
3	0.2505	0.2690	0.2820	0.2495	0.2830
4	0.2645	0.2830	0.2420	0.2805	0.3155
5	0.2895	0.2730	0.2805	0.3005	0.3430
6	0.2755	0.2980	0.3005	0.3280	0.3730
7	0.2755	0.2980	0.3005	0.3280	0.3730
8	0.2980	0.3215	0.3455	0.3740	0.4230
9	0.3230	0.3490	0.3730	0.4040	0.4685
10	0.3405	0.3655	0.3765	0.4215	0.4885
11	0.3430	0.3690	0.3815	0.4265	0.4945
12	0.3490	0.3765	0.4015	0.4470	0.5160
13	0.3715	0.3990	0.4255	0.4720	0.5420
14	0.3715	0.3990	0.4255	0.4720	0.5420
15	0.3955	0.4240	0.4510	0.5020	0.5720
16	0.3955	0.4240	0.4510	0.5020	0.5720
17	0.4190	0.4495	0.4795	0.5295	0.6150
18	0.4190	0.4495	0.4795	0.5295	0.6150
19	0.4190	0.4495	0.4795	0.5295	0.6150
20	0.4445	0.4770	0.5060	0.5570	0.6450
21	0.4445	0.4895	0.5060	0.5695	0.6450
22	0.4695	0.5045	0.5345	0.5870	0.6885
23	0.4695	0.5045	0.5345	0.5870	0.6885
24	0.4970	0.5310	0.5620	0.6285	0.7210
25	0.4970	0.5310	0.5620	0.6285	0.7210
26	0.4970	0.5310	0.5620	0.6285	0.7210
27	0.5035	0.5495	0.5810	0.6360	0.7410
28	0.5135	0.5610	0.6050	0.6610	0.7690
29	0.5135	0.5610	0.6050	0.6610	0.7690
30	0.5260	0.5610	0.6050	0.6610	0.7690
31	0.5495	0.5845	0.6300	0.6885	0.7990
32	0.5495	0.5845	0.6300	0.6885	0.7990
33	0.5495	0.5845	0.6300	0.6885	0.7990
34	0.5735	0.6225	0.6585	0.7285	0.8405
35	0.5735	0.6225	0.6585	0.7285	0.8405
36	0.5735	0.6225	0.6585	0.7285	0.8405
37	0.5735	0.6225	0.6585	0.7285	0.8405
38	0.5990	0.6485	0.6850	0.7575	0.8740
39	0.5990	0.6485	0.6850	0.7575	0.8740
40	0.5990	0.6485	0.6850	0.7575	0.8740
41	0.6250	0.6775	0.7135	0.7880	0.9180
42	0.6250	0.6775	0.7135	0.7880	0.9180
43	0.6250	0.6775	0.7135	0.7880	0.9180
44	0.6485	0.7050	0.7410	0.8165	0.9495
45	0.6485	0.7050	0.7410	0.8165	0.9495
46	0.6485	0.7050	0.7410	0.8165	0.9495
47	0.6485	0.7050	0.7410	0.8165	0.9495
48	0.6485	0.7050	0.7535	0.8290	0.9620

Steel Factors for Instrumentation Cables - FeF

Fe TOS

Triad Instrumentation Overall Screen Cables

No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.1550	0.1635	0.1735	0.1855	0.2065
2	0.2400	0.2555	0.2715	0.2965	0.2945
3	0.2595	0.2790	0.2955	0.2805	0.3145
4	0.2730	0.2925	0.3260	0.2955	0.3305
5	0.3060	0.2730	0.2955	0.3145	0.3590
6	0.2755	0.2920	0.3145	0.3415	0.4005
7	0.2755	0.2920	0.3145	0.3415	0.4005
8	0.3105	0.3355	0.3590	0.3890	0.4535
9	0.3365	0.3630	0.3880	0.4320	0.4995
10	0.3530	0.3790	0.4040	0.4495	0.5185
11	0.3565	0.3830	0.4090	0.4545	0.5235
12	0.3630	0.3905	0.4165	0.4635	0.5445
13	0.3855	0.4140	0.4410	0.4895	0.5725
14	0.3855	0.4140	0.4410	0.4895	0.5725
15	0.4080	0.4385	0.4660	0.5295	0.6150
16	0.4080	0.4385	0.4660	0.5295	0.6150
17	0.4335	0.4635	0.5060	0.5570	0.6450
18	0.4335	0.4635	0.5060	0.5570	0.6450
19	0.4335	0.4635	0.5060	0.5570	0.6450
20	0.4585	0.4920	0.5335	0.5875	0.6885
21	0.4585	0.4920	0.5335	0.6040	0.6885
22	0.4835	0.5310	0.5610	0.6290	0.7355
23	0.4835	0.5310	0.5610	0.6460	0.7355
24	0.5085	0.5585	0.6025	0.6585	0.7665
25	0.5085	0.5585	0.6025	0.6585	0.7665
26	0.5085	0.5585	0.6025	0.6660	0.7665
27	0.5145	0.5635	0.6090	0.6935	0.7880
28	0.5395	0.5875	0.6325	0.7060	0.8165
29	0.5395	0.5875	0.6325	0.7060	0.8165
30	0.5395	0.5875	0.6325	0.7060	0.8165
31	0.5635	0.6125	0.6560	0.7335	0.8565
32	0.5635	0.6125	0.6560	0.7335	0.8565
33	0.5635	0.6125	0.6560	0.7335	0.8565
34	0.5875	0.6375	0.6850	0.7730	0.8890
35	0.5875	0.6375	0.6850	0.7730	0.8890
36	0.5875	0.6375	0.6850	0.7730	0.8890
37	0.5875	0.6375	0.6850	0.7730	0.8890
38	0.6125	0.6760	0.7150	0.8030	0.9345
39	0.6125	0.6760	0.7150	0.8030	0.9345
40	0.6125	0.6760	0.7150	0.8030	0.9345
41	0.6500	0.7050	0.7555	0.8315	0.9785
42	0.6500	0.7050	0.7555	0.8315	0.9785
43	0.6500	0.7050	0.7555	0.8315	0.9785
44	0.6760	0.7310	0.7815	0.8765	1.0230
45	0.6760	0.7310	0.7815	0.8765	1.0230
46	0.6760	0.7310	0.7815	0.8765	1.0230
47	0.6760	0.7310	0.7815	0.8765	1.0230
48	0.6760	0.7310	0.7940	0.8765	1.0230

(1)

Steel Factors for Instrumentation Cables - FeF

Fe TIS

Triad Instrumentation Individual and Overall Screen Cables

No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.195	0.207	0.217	0.231	0.253
2	0.252	0.270	0.284	0.270	0.309
3	0.276	0.293	0.272	0.297	0.332
4	0.309	0.276	0.296	0.315	0.359
5	0.278	0.293	0.315	0.343	0.389
6	0.296	0.321	0.343	0.372	0.433
7	0.296	0.321	0.343	0.372	0.433
8	0.341	0.366	0.391	0.436	0.504
9	0.368	0.396	0.434	0.469	0.537
10	0.354	0.413	0.439	0.489	0.570
11	0.389	0.417	0.445	0.494	0.576
12	0.408	0.439	0.465	0.515	0.599
13	0.432	0.462	0.492	0.542	0.627
14	0.432	0.462	0.492	0.542	0.627
15	0.457	0.491	0.519	0.571	0.671
16	0.457	0.491	0.519	0.571	0.671
17	0.484	0.517	0.547	0.613	0.705
18	0.484	0.517	0.547	0.613	0.705
19	0.484	0.517	0.547	0.613	0.705
20	0.512	0.545	0.589	0.645	0.751
21	0.512	0.545	0.589	0.645	0.751
22	0.540	0.588	0.619	0.691	0.798
23	0.540	0.588	0.619	0.691	0.798
24	0.566	0.615	0.661	0.721	0.844
25	0.566	0.615	0.661	0.721	0.844
26	0.566	0.615	0.661	0.721	0.844
27	0.585	0.648	0.670	0.743	0.854
28	0.610	0.648	0.696	0.771	0.873
29	0.610	0.660	0.696	0.771	0.873
30	0.610	0.660	0.696	0.771	0.898
31	0.634	0.689	0.736	0.812	0.929
32	0.634	0.689	0.736	0.812	0.929
33	0.634	0.689	0.736	0.812	0.929
34	0.660	0.715	0.764	0.841	0.974
35	0.660	0.715	0.764	0.841	0.974
36	0.660	0.715	0.764	0.841	0.974
37	0.660	0.715	0.764	0.841	0.974
38	0.689	0.743	0.793	0.887	1.020
39	0.689	0.743	0.793	0.887	1.020
40	0.689	0.743	0.793	0.887	1.020
41	0.716	0.784	0.836	0.919	1.070
42	0.716	0.784	0.836	0.919	1.070
43	0.716	0.784	0.836	0.919	1.070
44	0.756	0.813	0.867	0.962	1.103
45	0.756	0.813	0.867	0.962	1.103
46	0.756	0.813	0.867	0.962	1.103
47	0.756	0.813	0.867	0.962	1.103
48	0.756	0.826	0.879	0.962	1.116

ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWAL)



PROJECT:-

PACKAGE:-

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE

NOTES:

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to “REVERSE AUCTION PROCEDURE” i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at “Total Cost to BHEL” like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

BHEL FRAUD PREVENTION POLICY

1.0 Introduction

BHEL, a public sector enterprise, is an integrated power plant equipment manufacturer and one of largest engineering and manufacturing company in India engaged in design, engineering, manufacturing, construction, testing, commissioning and servicing of a wide range of products and services for core sectors of the economy viz. Power, Transmission, Industry, Transportation, Renewable energy, Oil & Gas and Defense.

All organizations are subject to risks of fraud. Frauds negatively impact the reputation and brand value of organization. Vigilant handling of fraud cases within organisation sends clear signals to the public, stakeholders and regulators about the management attitude towards fraud risks and organisation's fraud risk tolerance.

All levels of management, staff, internal and external auditors have responsibility for dealing with fraud risk.

Section 143(3) (i) of the Company Act, 2013 requires auditors to report about the adequacy of internal Financial controls in the Company and the operating effectiveness of such controls. Further, as per General Direction issued by C&AG vide circular No. 294/CA-II/Cord/A/cs instructions/30-2008 dated 22.04.2010, auditors are required to comment on Risk of Frauds in their reports.

BHEL has already put in place various policies, systems and procedures to guide employees for undertaking various transactions within and outside organisation to conduct the same in a transparent & uniform manner e.g. Purchase Policy, Works Policy along with Delegation of Powers (DOP), HR Policy, Conduct, Discipline and Appeal Rules for employees, Standing Orders etc. Keeping in view the BHEL approach in following Corporate Governance principles proactively, it is appropriate that a Fraud Prevention Policy is formulated and implemented

2.0 Policy Objectives

2.1 Objective of the Policy is to provide a system for detection, prevention and reporting of a fraud detected or suspected; and handling of such matters pertaining to fraud.

2.2 The Policy is expected to ensure and provide for the following:

2.2.1 To ensure that management is aware of its responsibilities for detection and prevention of fraud and for establishing procedures for preventing fraud and/or detecting fraud when it occurs.

BHEL FRAUD PREVENTION POLICY

2.2.2 To provide a clear guidance to employees and others dealing with BHEL forbidding them from involvement in any fraudulent activity and the action to be taken by them where they suspect any fraudulent activity;

2.2.3 To conduct investigations into fraudulent or suspected fraudulent activities; and

2.2.4 To provide assurance that any and all suspected fraudulent activity/ activities will be fully investigated.

2.2.5 To provide training on fraud prevention and identification.

3.0 Scope of Policy

The policy applies to fraud or suspected fraud in connection with business transactions with BHEL committed by employees, ex-employees working as advisors/ consultants, persons engaged on adhoc / temporary/ contract basis, vendors, suppliers, contractors, customers, lenders, consultants, service providers, any outside agencies or their employees/ representatives, or any other parties.

4.0 What is Fraud?

4.1 Fraud is any intentional act or omission designed to deceive others, resulting in the victim suffering a loss and/or perpetrator achieving a gain.

4.2 As per Section.447(1) of The Companies Act, 2013 Fraud is defined as follows:

- **"fraud"** in relation to affairs of a company or anybody corporate, includes (a) any act, (b) omission, (c) concealment of any fact or (d) abuse of position committed by any person or any other person with the connivance in any manner -
 - with intent to deceive,
 - to gain undue advantage from, or
 - to injure the interests of the company or its shareholders or its creditors or any other person, whether or not there is any wrongful gain or wrongful loss
- **"Wrongful gain"** means the gain by unlawful means of property to which the person gaining is not legally entitled.
- **"Wrongful loss"** means the loss by unlawful means of property to which the person losing is legally entitled.

BHEL FRAUD PREVENTION POLICY

5.0 Actions Constituting Fraud

5.1 While fraudulent or suspected fraudulent activity could have a very wide range of coverage, the following are some of the act(s) which constitute fraud.

5.2 The list given below is only illustrative and not exhaustive:-

5.2.1 Forgery or unauthorised alteration of any document or account belonging to the Company

5.2.2 Forgery or unauthorised alteration of cheque, bank draft, E-banking transaction(s) or any other financial instrument etc.

5.2.3 Misappropriation of funds, securities, supplies or others assets by fraudulent means etc.

5.2.4 Falsification of records, submitting fake claims or claims with altered documents / supporting, removing the documents from the files and / or replacing it by a fraudulent one etc.

5.2.5 Wilful suppression of facts/deception in matters of appointment, placements, submission of reports, tender committee recommendations etc. as a result of which a wrongful gain(s) is/are made to one and wrongful loss(s) to the others.

5.2.6 Utilizing Company funds / assets for personal or other than official purposes.

5.2.7 Verification and authorization / certification of bills for payment (goods / services) without completion of supply / completion of works as per Purchase Order / Work Order.

5.2.8 Destruction, disposition, removal of records or any other assets of the Company with an ulterior motive to manipulate and misrepresent the facts so as to create suspicion/suppression/cheating as a result of which objective assessment/decision would not be arrived at.

5.2.9 Wilful delay in reporting recoveries / adjustments from suppliers / vendors bills.

5.2.10 Allowing / unauthorized use of Company assets by outsiders like vendors / suppliers / sub-contractors.

5.2.11 Any other act that falls under the gamut of fraudulent activity.

BHEL FRAUD PREVENTION POLICY

6.0 Responsibility for Fraud Prevention

6.1 Following personnel's are responsible to ensure that there is no fraudulent act committed by them while performing any business transaction(s) with BHEL:

- Every employee
- Ex-employee working as advisor / consultant
- Person engaged on adhoc/temporary/contract basis
- Vendor / supplier / contractor / bidder / service provider
- Customer / Consultant
- Lender
- Any outside agency / their representative / employee who have a business relationship with BHEL

6.2 As soon as it is learnt that a fraud or suspected fraud has taken or is likely to take place, same should immediately be reported to Nodal officer

7.0 Nodal Officers and their Responsibility

7.1 Nodal Officer

Nodal officers shall be notified by management. All Direct Reporting Officers (DROs) to Unit Head / Construction Managers to be designated as Nodal Officers. List of Nodal Officer(s) would be displayed at BHEL web site / Intranet.

7.2 Fraud Prevention and Detection

All Nodal Officers shall be responsible for implementing the Fraud Prevention Policy of the Company and prevention and detection of fraud as per this Policy. It is the responsibility of all Nodal Officers to ensure that complete mechanism in respect of Fraud Prevention Policy is in place within his administrative / functional area of control.

7.2.1 Fraud Prevention

7.2.1.1 Create an ethical and transparent environment by training and implementing policies, guidelines and procedures.

7.2.1.2 Familiarise each employee with the types of improprieties that might occur in their area.

7.2.1.3 Educate employees regarding the measures to be taken for prevention and detection of fraud.

BHEL FRAUD PREVENTION POLICY

7.2.1.4 Create a culture whereby employees are encouraged to report any fraud or suspected fraud which comes to their knowledge, without any fear of victimization.

7.2.1.5 Promote awareness among the employees of ethical principles subscribed to by the Company through CDA Rules/Standing orders.

7.2.1.6 Maintain record of complaints/cases received and submit annual report to Nodal Officer in Corporate Finance.

7.2.2 Fraud Detection

Ensure that along with preventive controls, Detective mechanism are also in place. Some examples of detective mechanism are segregation of duties, reconciliation, audits, independent reviews, physical inspection, periodic inventory check, surprise checks etc.

8.0 Reporting of Fraud

8.1 All employees of BHEL, representative of vendors, suppliers, contractors, consultants, service providers or any other agencies doing any type of business with BHEL as soon as he / she comes to know of any fraud or suspected fraud or any other fraudulent activity must report such incident. Such reporting shall be made to the designated Nodal Officers.

The reporting of the fraud normally should be in writing. In case the reporter is not willing to furnish a written statement of fraud but is in position to give sequential and specific transaction of fraud / suspected fraud, then the officer receiving the information/Nodal Officer should record such details in writing as narrated by the reporter and also maintain the details about the identity of the official/ employee / other person reporting such incident.

In case the reporter ask for protection, the protection available under Clause 5.0 of Whistle Blower Policy of Company notified vide Corporate HR Circular no. 024/LLX/2014 dated 16.09.2014 shall be extended to the reporter.

8.2 All reports of fraud or suspected fraud shall be handled with utmost speed and shall be coordinated by Nodal Officers

8.3 Officer receiving input about any suspected fraud / Nodal officers shall ensure that all relevant records, documents and other evidence are immediately taken into custody and protected from being tampered with, destroyed or removed by suspected perpetrators of fraud or by any other official under his influence.

BHEL FRAUD PREVENTION POLICY

9.0 Investigating Procedure

9.1 The "Nodal Officer" shall act as co-ordinator and refer the details of the fraud/suspected fraud to Unit head for intimating the same to the concerned Director. The Director after considering report of Nodal Office / Unit head may refer the case to Internal Auditor (IA) or Corporate Vigilance for further investigation.

9.2 This input would be in addition to the intelligence, information and investigation of cases of fraud being investigated by the Vigilance Deptt. on their own as part of their day to day functioning.

9.3 After completion of the investigation, appropriate action which could include administrative action, disciplinary action, civil or criminal action or closure of the matter if it is proved that fraud is not committed etc. depending upon the outcome of the investigation shall be undertaken.

9.4 Vigilance Department or IA shall report to concerned Director the result of the investigation undertaken by them to seek orders for further action.

10.0 Incorporation of Fraud Prevention Policy in Tenders /MOUs etc.

10.1 A clause may be added in all the NITs that

"The Bidder along with its associate/collaborators/sub-contractors/sub-vendors/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice."

10.2 Fraud Prevention policy and List of Nodal Officers shall be hosted on BHEL web site, vendor portals of Units/ Regions intranet.

11.0 Administration and Review of the Policy

The Chairman and Managing Director, BHEL shall be the Appropriate Authority for administration and revision of this Policy.

**Corporate Materials Management
BHEL New Delhi**

AA:MM:Agency
Dt. 06.08.2010

Guidelines regarding dealings with Indian Agents of Foreign Suppliers

1. BHEL shall deal directly with the foreign original equipment manufacturers (OEM)/ Foreign Principal, for all its purchases which are imported.
2. Wherever the foreign OEM/ principal desires to avail the services of an Indian Agent, the dealings with Indian Agents are to be regulated. The guidelines of BHEL in this regard have been drafted as per CVC circular no. 007/VGL/033 dated 04.12.2007.

Definition of Indian Agent

3. An Indian Agent of foreign principal is an individual, a partnership, an association of persons, a private or public Company, that carries out specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

Recommendations

4. All NITs shall have the following terms regarding Indian agents of foreign principals:
 - i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.
 - ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.
 - iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.
 - iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.
 - v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.
 - vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.
 - vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure -'A' shall apply in all such cases.

- viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

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Guidelines for Indian Agents of Foreign Suppliers

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BHEL shall apply for registration in the registration form in line with SEARP.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.
- 2.0 Disclosure of particulars of agents/ representatives in India, if any.**
- 2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:
 - 2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.
 - 2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.
 - 2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.
- 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
 - 2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.
 - 2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.
 - 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, reserved for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

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Annexure-B

This format is applicable only to Indian Suppliers/ Agents supplying indigenous portion of Foreign Purchases.

* In all other cases, extant guidelines of SEARP, 2010 are to be followed.

SEARP (SRF) Clause No	Detail
	Name & address of the firm
1.0	Products/ Systems / Services being considered for
2.0	General Information
2.2	Name of Chief Executive
2.3	Details of authorized signatory
3.0	Ownership Information
3.1	Type of firm
3.2	Nature of Business • Attach authorization letter and agency agreement from Principal (from whom capital equipment is procured) • Attach copy of declaration from Foreign Principal for total guarantee/ warranty of indigenous supplies
3.3	Year of establishment
3.4	Year of commencement of business
4.0	Registration particulars
4.1	Permanent Account No.
4.2 / 4.3	Sales Tax / TIN no
4.6	Service tax no. (in case of E&C)
5.0	Organisational strength
6.0	Other particulars
6.1	If the company is already registered with other units
6.2	Directors/ Partners, if related to any BHEL Employee
6.9	If any Ex BHEL Personnel employed by the Company
6.12	Details of pending legal issues with BHEL
6.13	Bank Account information
9.0	Financial information
9.6	Sales/ Turnover details of last 3 years (or from the date of incorporation whichever is less)

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