BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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PLCC EQUIPMENTS		GROUP	TBEM	W.O. No	411
CUSTOMER	Indian Oil Corporation Limited (IOCL)				
CONSULTANT	TATA Consulting Engineers Limited (TCE)				
PROJECT	LSTK job for ISBL work of 220KV Grid Power Import at IOCL, Panipat Refinery				

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Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

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SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of PLCC Equipments complete with accessories as listed under this specification. No deviation from the requirements specified in various clauses of this specification shall be allowed. A certificate to this effect shall have to be furnished along with the offer.

The fitments offered shall be of IOCL/ HVPNL approved make or its subsequent approval from IOCL/ HVPNL shall be bidder's responsibility, with no commercial implications to BHEL. If any of the make offered by the bidder is not acceptable to M/s IOCL/ HVPNL, the bidder has to supply alternate IOCL/ HVPNL approved make, meeting the specification, with no commercial implications to BHEL.

Wherever bidder offers any item/spare in lieu of the same being "Built-in feature" of any fitment or the same being "Not applicable" is subject to approval by IOCL/ HVPNL. No price implication will be entertained by BHEL at contract stage if any separate equipment is insisted by IOCL/ HVPNL to meet the contract requirement.

This section covers the specific technical requirements of PLCC Equipments. This constitutes minimum technical parameters for the above item as specified by the customer (IOCL/ HVPNL). The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

The specification comprise of following sections:

Section-1: Scope, Specific Technical Requirements and Quantities
Section-2: Equipment Specification
Section-3: Project Details and General Technical Requirements
Section-4: Guaranteed Technical Particulars

In case of any conflict between various sections, **order of precedence** shall be in the same order as listed above, unless otherwise mentioned specifically.

Note: The term 'Owner/Purchaser/Employer' appearing in this specification shall refer to IOCL/ HVPNL and the term 'Contractor/ LSTK Contractor/ Sub-contractor/ Manufacturer' shall refer to the successful Bidder.

1.1 THE EQUIPMENT IS REQUIRED FOR THE FOLLOWING PROJECT

Name of customer: **Indian Oil Corporation Limited (IOCL)**

Name of consultant: **TATA Consulting Engineers Limited (TCE)**

Name of Project: **LSTK Job for ISBL work of 220kV Grid Power Import at IOCL, Panipat Refinery**

1.2 SPECIFIC TECHNICAL REQUIREMENTS

1.2.1 Equipment specification shall be as per Section-2.

1.2.2 Bidder to validate the wattage of its PLC terminals to ensure that the Power output (PEP) at HF terminal shall be as per the specification. Any input, if required, to validate the offered wattage of its PLC terminal shall be arranged by the bidder. No price implication will be entertained on account of increase in wattage of PLC terminal. The tentative line length for 220kV D/C IOCL Panipat-Mundh Line shall be 35 kM.

1.2.3 The link frequencies shall be arranged by the bidder during contract stage. No manufacturing hold-up is acceptable on account of non-availability of link frequencies from end customer. In absence of tuning frequencies, vendor shall have to program their PLC terminal with dummy set of frequencies during testing and then re-program them at site after availability of actual frequencies.

1.2.4 The successful bidder shall have to extend all possible supports like timely submission/re-submission of drawings, visit to end customer IOCL/ HVPNL to facilitate documents approval without any commercial implications to BHEL. Acceptance of bidder's documents shall be subject to end customer (IOCL/ HVPNL) approval. Testing of PLCC equipments as per HVPNL guidelines, at third party lab, if any, shall be carried out by successful bidder without any commercial implications to BHEL/ IOCL. Arranging and coordinating with HVPNL engineers for witnessing routine/ acceptance/ type tests at manufacturer's works or at third party lab is in the scope of bidder, without any commercial implications to BHEL/ IOCL.

1.3 QUANTITIES

As per Annexure-1, Section-1.

1.4 TYPE TESTS

The offered equipment should have been successfully type tested as per relevant IS/IEC and valid test reports shall be submitted for customer approval during contract stage. Bidder shall submit valid reports of type tests for PLCC Equipments carried out within last seven years from the date of bid opening. If these type test reports are more than seven years old (from the date mentioned above) or bidder do not have valid type test reports, the type tests shall be repeated with no extra cost to BHEL/IOCL/ HVPNL.

1.5 INSPECTION & TESTING

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, as per the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on each PLCC Equipment in accordance with the applicable IEC /IS and the material shall be offered for final inspection to BHEL and IOCL/ HVPNL in accordance with agreed quality plan with 3 weeks advance information.

Type test reports on identical equipment shall be submitted for approval. In the event of non-acceptability of submitted test reports on technical grounds at the contract stage, the type tests shall be conducted at no additional cost.

1.6 QUALITY PLAN

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval.

1.7 SPECIAL TOOLS AND TACKLES

The bidder shall include in his proposal the deployment of all special tools and tackles required for supervision of testing & commissioning of the equipment. The Special tools and tackles shall only cover items which are specifically required for the equipment offered and are proprietary in nature. A list of all such devices shall be furnished.

1.8 SERVICES

1.8.1 SUPERVISION OF COMMISSIONING & SITE TESTING

Supervision of commissioning & site testing of PLCC is in the scope of bidder (at both ends, viz. IOCL Panipat Refinery & HVPNL Mundh S/S).

1.8.2 FREQUENCY PLANNING

Frequency Planning is in the scope of bidder. The link frequencies shall be arranged by the bidder during contract stage.

1.9 TECHNICAL PRE QUALIFYING REQUIREMENTS

The manufacturer whose PLCC panels are offered, must have designed, manufactured, tested, supplied and commissioned PLCC panels for 220 kV System or above [applicable for 220 kV Substation] and the same must have been in satisfactory operation# for at least two (2) years as on the date of technical bid opening.

#: Satisfactory operation means certificate issued by the Employer/ Utility certifying the operation without any adverse remark.
Please note: Forms of undertaking if any (as per customer/BHEL format) shall be furnished to successful bidder during contract stage.

1.10 DRAWINGS/ DOCUMENTS REQUIRED FOR ENGINEERING MANUFACTURING CLEARANCE

The minimum drawings/ documents, as follows shall be required for providing engineering manufacturing clearance of the equipment (PLCC) and furthermore, it shall be used for delay analysis, if any, on account of the bidder. The schedule for submission and resubmission shall be in line with details provided in section-3.

1a	PLCC Link Network Diagram & BOM
1b	GA Drawings & Guaranteed Technical Particulars of PLC Terminals & Protection Couplers
1c	GA Drawings & Guaranteed Technical Particulars of Coupling Device
1d	GA Drawings & Guaranteed Technical Particulars of EPAX
1e	Guaranteed Technical Particulars of HF Cable

2	Type Test Reports
3a	Quality Assurance Plan
3b	Inspection Test Schedule (if applicable)

1.11 PACKING AND DISPATCH

The equipment shall be divided into suitable number of shipping sections for protection and ease of handling during transportation. The equipment shall be properly packed for selected mode of transportation i.e. sea, rail and road in such a manner that it is protected against the climatic conditions and for any damage during transportation, transit and storage. The equipments shall be wrapped in polyethylene sheets before being placed in wooden crates/cases to prevent damage to the finish. Crates/cases shall have skid bottoms for handling. Special notations such as 'Fragile', 'This side up', 'Weight', 'Owner's particulars\ 'PO nos.' etc., shall be clearly marked on the package together with other details as per purchase order.

The equipment may be stored outdoors for long periods before installation. The packing should also be suitable for outdoor storage areas with heavy rains/ high ambient temperature unless otherwise agreed and hence, packing shall be suitable for long duration storage (minimum 1 year).

1.12 DEVIATIONS

The bidder shall list out all the deviations from the specification separately. Offers without specific deviations will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

1.13 LIST OF DOCUMENTS TO BE SUBMITTED

i) PLCC Link Network Diagram; BOM, General Arrangement Drawings of Coupling Device, PLC Terminals, EPAX, Protection Coupler.
ii) Guaranteed Technical Particulars for each type of item offered.
iii) Type Test Reports as per relevant IEC standards.
iv) Quality Assurance Plan.
v) Documents in support of qualifying requirement.
vi) Performance certificates.
vii) List of Past Supplies.

PLCC EQUIPMENT BOQ

Sl. No.	Item Description as per Tender BOQ	Detailed Description	Unit	Quantity		
				220kV GIS S/S AT IOCL PANIPAT (LOCAL END)	220kV HVPNL MUNDH S/S (REMOTE END)	TOTAL
A)		**Main Items**				
1	SUPPLY- PLCC : DIGITAL PLCC: CARRIER EQUIPMENT (SPEECH+DATA+PROTECTION)	Digital PLCC: Carrier Equipment (Speech+data+protection)	Nos.	4	4	8
2	SUPPLY- PLCC : DIGITAL PLCC: CARRIER EQUIPMENT (SPEECH+DATA)	Digital PLCC: Carrier Equipment (Speech+data)	Nos.	1	1	2
3	SUPPLY- PLCC : DIGITAL PLCC: PROTECTION COUPLER (4 COMMAND)	Digital PLCC: Protection Coupler (4 Command)	Nos.	4	4	8
4	SUPPLY- PLCC : DIGITAL PLCC: COUPLING DEVICE (PH-PH)	Digital PLCC: Coupling Device *(1 Set = (2 LMU + 1 BT))*	Set	2	2	4
5	SUPPLY- PLCC : DIGITAL PLCC: EPAX (24/8) WITH 24 NOS TELEPHONES, CABLE ETC	Digital PLCC: EPAX (24/8) with 24 nos telephones, cable etc	Set	1	0	1
6	SUPPLY- PLCC : DIGITAL PLCC: 4 WIRE TELEPHONE INSTRUMENT (ALONG WITH TELEPHONE CABLES)	Digital PLCC: 4 wire telephone instrument (along with telephone cables)	Nos.	2	2	4
7	SUPPLY- PLCC : HF CABLE (150 OHMS BALANCED)	HF cable (150 Ohms Balanced)	kM	1	1	2
8	SUPPLY- PLCC : TESTING & MAINTENANCE EQUIPMENT (PRINT TEST KIT ONLY)	Testing & maintenance equipment (Print Test Kit only)	Set	1	1	2
9	SUPPLY- PLCC : 5 PAIR TELEPHONE CABLES, ARMOURED, 0.5 MM ANNEALED COPPER CONDUCTOR AND PETROLEUM JELLY FILLED WITH POLYETHENE OUTER JACKETS	5 Pair Telephone Cables, armoured, 0.5 mm annealed copper conductor and petroleum jelly filled with polyethene outer jackets	kM	2	0.5	2.5
10	SUPPLY- PLCC : SINGLE PAIR TELEPHONE CABLE (ARMOURED)	Single Pair Telephone Cable (Armoured)	kM	2	0	2
B)		**Services**				
11	SERVICES- PLCC : SYSTEM ENGINEERING AS PER SPECIFICATION (INCLUDING FREQUENCY PLANNING)	Services: System Engineering as per specification (Including Frequency Planning)	Lot	1		1
12	SERVICES- PLCC : SUPERVISION OF PRE-COMMISSIONING (PANEL-WISE)	Services: Supervision of Pre-Commissioning (Panel-wise)	Lot	5	5	10
13	SERVICES- PLCC : SUPERVISION OF TESTING AND COMMISSIONING (LINK WISE)	Services: Supervision of Testing and Commissioning (Link-wise)	Lot	2		2

Note:

1) Cut-lengths of HF cable shall be informed to the successful bidder.

2) The above BOQ also includes remote end equipments.

3) The above quantities are subject to change by ±20% of total contract value at contract stage. Some of the items may not be ordered at all.

4) Supervision of Testing and Commissioning is required for all the above items and 1 Lot (Link-wise) will include Supervision of Testing and Commissioning for all the above items at both ends of each link/ direction.

5) Training on the offered system shall be included in the price quoted against item no. 11 above.

6) Single Pair Telephone Cables shall be armoured.

SECTION-2

EQUIPMENT SPECIFICATION

[redacted]

POWER LINE CARRIER COMMUNICATION (PLCC) EQUIPMENTS & PROTECTION COUPLER

1. GENERAL:

The PLCC panels as offered should have been designed, manufactured, tested, supplied and commissioned for the specified voltage and fault level and as per IOCL PR specification. **The design and planning of the offered system shall be in line with HVPNL specifications and systems. Below information is for reference and overall design, selection of equipments [redacted] is in [redacted] contractor scope.**

2. STANDARD:

2.1 All the PLCC equipment covered under the package shall conform to the requirements of the latest addition of the relevant IEC/IS Specification or equivalent National Standards, except to the extent mentioned by this specification.

2.2 The works covered by the specification shall be designed, engineered, manufactured, built tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

2.3 The equipment to be furnished under this specification shall conform to latest issue with all amendments of standard specified above.

2.4 In addition to meeting this specific requirement called for in the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards and shall form an integral part of specification.

2.5 The [redacted] contractor shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves but intended to complement each other.

2.6 The contractor shall note that list of standards presented in this specification is not complete. Whenever necessary the list of standards shall be considered in conjunction with specific IS/IEC/ IOCL PR specifications.

2.7 When the specific requirements stipulated in the specification exceed or differ than required by applicable standards, the stipulation of the specification shall take precedence.

2.8 Other internationally accepted standards which ensure equivalent or better performance than that specified in the standard referred shall also be accepted.

2.9 In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out alongwith English language version of standard or relevant extract of the same. The equipment

PLCC EQUIPMENTS OFFERED SHALL BE OF DIGITAL TYPE, MEETING THE EQUIPMENT SPECIFICATION MENTIONED IN SECTION-2, AS APPLICABLE.

conforming to standards other than IS/IEC shall be subject to IOCL PANIPAT's approval.

2.10 The [redacted] contractor shall clearly indicate in his bid the specific standards in accordance with which the works will be confirmed.

3.1 **LOCATION OF EQUIPMENT:**

The PLCC equipments as specified shall be installed at the receiving end of the transmission lines (at IOCL Panipat end) as well as sending end.

4. FREQUENCY PLANNING:

4.1 For planning frequency and output power of carrier terminals, [redacted] contractors may plan for a minimum receive signal to noise ratio of 25dB for the speech channels without compander and 15dB for protection signalling & 29dB for data transmission. The details of line, tower, conductor shall be furnished to the Contractor to carry out the assessment of signal attenuation. IEC/CIGRE specifications/guidelines shall be adhered to.

4.2 Frequency and output power of PLC terminals for protection shall be planned such that the protection signal is received with full reliability even when one of the phase is earthed or is on open circuit on the line side causing an additional minimum loss of 6dB.

4.3 Successful [redacted] contractor shall be fully responsible for the co-ordination required with concerned State Electricity Board for finalising the frequency plan.

4.4 The frequency plan will be referred to wireless Advisor/DOT Department for clearance and in case any change in the contractor's recommended carrier frequency and power output is proposed by these authorities, the contractor shall have to modify his proposal accordingly. Change of power output shall however not involve repeater station.

5. PROPOSED ARRANGEMENT:

5.1 The power line carrier communication equipment required by the IOCL PANIPAT is to provide primarily efficient, secure and reliable information link for carrier aided distance protection and direct tripping of remote end breaker and also for speech communication between sub-station. It shall include separate carrier terminals of multipurpose type for speech and protection purposes. Provision for super-imposing telex and data signals shall be made on speech terminals. All carrier terminals including those for protection shall be suitable for point to point speech communication also.

5.2 For security reasons each transmission line shall be protected by Main-I and Main-ii protections or Main & Backup protections. The features of Direct Trip Send and Direct Trip Receive shall also be provided in the protection coupler.

5.3 The requirement of carrier information on each link covered under this specification is for speech communication and protection signaling.

5.4 The equipment for protection signals shall have high degree of reliability and speed. It shall be guaranteed to function reliably in the presence of noise impulse caused by

isolator or breaker operation. It shall also be possible to effect direct tripping of breaker at one end when the other end breaker opens out either manually or by relays such as Bus fault relay etc.

5.5 The time intervals between receipt of a trip command on the transmit side, its transmission over the carrier link, reception at the far end and giving command to the trip relays at the distant end shall not exceed 20 m.sec. for permissive inter-tripping and 30m.sec. fordirect inter-tripping even for the longest line section. The above timings are Inclusive of operating time for auxiliary relays and interposing relays, if any, included in the PLCC equipment.

5.6 The requirement of protection signaling channel is such that security against incorrect signals being received shall be atleast two to three orders higher than reliability against a signal not being received.

5.7 The planning of frequencies for the PLCC terminals shall be done confederating the existing PLCC network as well as full communication channel requirement detailed above so that there is no problem of frequency allocation at a later date when the subsequent section communication requirements come up.

5.8 For reasons of security and reliability, phase to phase coupling for S/C lines and inter-circuit coupling for D/C lines shall be employed.

5.9 The parameters of the equipment quoted shall be such that the mode of wave propagation on transmission line shall not impose any limitation on the efficient and reliable performance of information link from protection or communication point of view.

5.10 The [redacted] contractor shall submit curves illustrating 'incorrect tripping' and 'Failure to trip' probability plotted against corona noise level in the presence of impulse noise due to switching of isolator and circuit breaker etc. Detail of Field tests and laboratory tests for successful operation of his equipment, under such adverse conditions shall be furnished by the [redacted] contractor in event of order during drawing approval stage. These are to be related to end-to-end signaling and shall take into account the type of communication link.

5.11 [redacted] contractor to note that all the activities related to supervision of installation, testing and commissioning of the supplied equipments shall be in their scope along with liasoning with the HVPNL sub-station at the sending end for establishing the communication system through PLCC.

6. POWER LINE CARRIER TERMINAL:

6.1 The offered PLCC equipment should be suitable for carrier transmission in high frequency of Speech, Facsimile, Telegraphy, RTU data, Teleprotection signals in frequency range of 40KHz to 500KHz over high voltage overhead power transmission lines.

The system should have one/two speech channels each of which can be set for full bandwidth speech cum fax conversations or shared speech cum superimposed data channels or suitable for high speed 4 wire RTU data channel of 1200/2400 bits per second. The superimposed data channel can support upto 600 baud (2760-3720 Hz, 960 Hz BW or 2280-3360 Hz, 1080 Hz BW) channel as a backup for RTU/SCADA. The system should be fully field programmable and flexible easy to use and compact leading to simplified network design, installation and maintenance work. The system can provide up to 12/6Nos. ~~of 50 baud, 8/4 Nos. of 100 baud or 1 Nos. of 600 baud voice band data~~ for of 50 baud, 8/4 Nos. of 100 baud or 1 Nos. of 600 baud voice band data for

superimposed channels and speech up to 2 KHz/2.4KHz in VF circuits simply by changing plugin filters provided in channels modem. Optionally system can be provided to give speech and data only channels (upto 28/13/9 Nos. of 50/100/200 baud or 1 Nos. of 1200/2400 bps) or Interface for protection coupler signal.

As already indicated the information link shall be provided for speech, protection, telex and data services. PLC terminals shall be fully co-ordinated to match with the specific requirements. Because of strict requirement of high speed of operation, security, reliability and efficient operation of protection channel along with the carrier terminals, [redacted] contractor shall ensure the complete and fool-proof co-ordination of the PLC and protection equipments. It shall therefore be necessity to have these combinations as one unit without any mismatch or necessary of any intermediate co-ordination unit.

6.2 PLC terminal shall use Amplitude Modulation and shall have single side band transmission mode. These shall be equipped for fixed frequency duplex working and shall be fully transistorised, however, this fixed frequency shall be programmable at site. Characteristic input and output parameters of the SSB PLC terminals shall be as per IEC-495, unless otherwise specified.

6.3 The features of carrier terminal are detailed out below:

a)	Mode of transmission single side bandwith suppressed carrier or reduced carrier.	Amplitude Modulation / Suitable for Digital PLCC, as applicable.
b)	Carrier frequency range	40 to 500KHz
c)	Nominal carrier frequency band in either direction of transmission	4.0KHz
d)	Power output (PEP) of HF terminals	~~30 Watt~~ 40 Watt
e)	Frequency difference between a pair of PLC terminals	Frequency difference between VF signal at the transmitting and receiving ends not exceed 2 Hz with suppressed carrier. With Reduced carrier frequency difference shall be zero. This shall include permissible ambient temperature variation and supply frequency and voltage variation of (+) 15 % and (-)10%
f)	Automatic gain control	For 40dB change in carrier frequency signal level within the regulation range, change in VF receive levels of both speech and other signals shall be less than 1dB.
g)	Supply voltage	48V DC+15%-10% (Positive pole earthed)
h)	Nominal impedance -Carrier freq. Sides -VF sides	 150ohm balanced 600ohm

i)	Return loss within nominal freq. Band:	-Not less than 10dB on Carrier freq. Transmit side. -Not less than 14dB on VF side.
j)	Spurious emission at edge of nominal carrier	-10dBm(Max)
k)	Speech level across 600ohms. -Four wire transmit -Four wire receive -2 wire transmit -2 wire receive	 0dBr to –17dBr 8 dBr to -3.5 dBr 0dBr -7dBr
l)	Permissible limits for variation of overall loss(attenuation) of the speech channel in relation to 800Hz for back to back operation of a pair of terminals without compander.	As per IEC 495/IS 9482
m)	Voltage withstand requirement D/C Power terminal. When isolated from earth	Capable of withstanding 500V DC for 1 minute between both terminals connected together and earth.
n)	When not isolated from earth.	An impulse voltage of 1000v 1.2/50 applied between.
o)	VF signalling and alarm circuit when free from earth.	500V DC applied for 1 minute between both terminals of circuit connected together and earth.

6.4 Following facilities to be provided in the PLC terminals:

1) Loop test facility for local transmitted and receiver.
2) Changeover provision of termination of PLC terminals on dummy load.
3) Position of each module may be marked at the back side of chassis also.
4) Terminal blocks for power supply, telephone cable and two HF cable sockets.
5) Channel testing from terminal to terminal.

6.5 All the PLC terminals shall be of multipurpose type. The [redacted] contractor shall confirm that the total transmission time for tele-protection shall not exceed 20ms for permissive and 30ms for direct tripping signals.

6.6 In the input circuit of PLC terminal protective devices shall be provided in the form of zener diodes or surge suppressors in order to eliminate an surge transfer through the coupling device or the surge induced in the connecting path of HF cable.

6.7 To improve voice transmission characteristics for the system, companders and expanders shall be provided. The companders shall have atleast 2:1 compression ratio with a corresponding expansion ratio of 1:2. The operating range of compander shall be compel with the audio power levels specified for 4 wire operation. The improvement gained by companders shall however, not be taken into account for power allocation and shall be in-hand reserve.

6.8 Sudden changes in input level to the receiver shall not cause false tripping. The [redacted] contractor shall clearly indicate during the detailed engineering stage the methods adopted to ensure above phenomenon. The receiver design shall also provide protection against false tripping from random noise.

~~6.9 Fail-safe devices shall be provided, so that a malfunction in one unit or sub-~~

6.9 Fail-safe devices shall be provided, so that a malfunction in one unit or sub-

assembly cannot cause damage elsewhere in the system. All plug-in equipment shall be fitted with features to prevent improper insertion. The electrical cables shall not be routed across sharp edges or near sources of high temperature. The adjustments, which are susceptible to mis-adjustment for accidental contact/vibration, shall be equipped with suitable locking devices.

6.10 The PLC set shall be designed to give guaranteed performance from 0 deg. C to 50deg. C ambient temperature. The thermal capability of the equipment shall be so designed that the equipment remains operational successful upto 60deg. C ambient temperature. Any ventilation fans provided for circulation of air inside the cabinets shall conform to relevant Indian Standards.

6.11 The terminals shall be provided with built-in indicating Instrument to facilitate checking of important voltages and current values and signal levels in different parts of the PLC terminals. Protection fuses shall be provided in all important circuits and fuses shall be so mounted as allow their easy inspection and replacement. All test points shall be easily accessible.

The carrier set shall be provided with suitable supervision and alarm facilities Individual parts of the carrier set should be accessible from front, making it possible to place the carrier cabinets side-by-side. All components and parts of the carrier sets shall be suitably tropicalised.

6.12 PLC terminals shall be housed in floor mounting sheet metal cabinets, suitable for mounting on concrete plinth as well as channel frame by means of nuts and bolts or welding. The cabinets shall be properly cleaned and spray painted with two coats or synthetic enamel paint. Exterior of the cabinets shall be painted with smoke-glossy finish. Interior of the cabinets shall be painted with white enamel paint with glossy finish. All the panels shall be provided with suitable point for earthing with the earth of the Grid/S/Stn. Detailed drawings for earthing connections shall be submitted during detailed engineering and drawing approval stage.

6.13 All cabinets having PLC terminals shall be provided with LED lamps of sufficient wattage for interior illumination with switch.

6.14 A name plate shall be provided on the front door of each cabinet indicating channel function, transmitter frequency and direction etc.

6.15 [redacted] contractor shall submit type test & routine test certificate from internationally reputed test authorities for the quoted PLC terminals in respect of characteristic input and output parameters of the PLC terminals in accordance with IEC-495 along with the Bid.

6.15.1 INSPECTION & TESTS:

Following type test reports, as specified in IEC standard (amended up to date) shall be submitted during inspection to TPI for the offered type, rating/design of equipment invariably d. The type test reports shall not be older than Seven years and shall be valid up to expiry of validity of offer. The type test must have been carried out at any ISO/IEC accredited laboratories.

TYPE TESTS:

I **Frequency Test**

a) Carrier frequency side

i) Nominal impedance, return loss and tapping loss

ii) Balance of ground

~~iii) Spurious omissions~~

iii) Spurious omissions

iv) carrier frequency levels
v) frequency accuracy

b) Voice Frequency Side

i) Automatic gain control
ii) Transmit/receive frequency difference Noise generated, within the terminals
iii) Harmonic distortion Selectivity
iv) Nominal impedance and return loss
v) Balance of ground
vi) Telephone signalling channel
vii) Voltage withstand requirements
viii) Electromagnetic compatibility

II Standard Equipment

i) Attenuation distortion Group delay distortion Signals above 3400 Hz

III Speech Plus Equipment

i) Attenuation distortion
ii) Group delay distortion

V Multichannel Terminals

i) Carrier frequency output power
ii) Nominal impedance, return loss
iii) Spurious omissions
iv) Inter channel cross talk attenuation

ROUTINE TEST:

As per quality assurance program (QAP).

ACCEPTANCE TESTS:

The following acceptance tests shall be carried out by the [redacted] contractor in presence of authorized third party agency (TPI) and/ or of customer representative..

i) Carrier frequency levels
ii) Frequency accuracy
ii) Automatic gain control
iv) Transmit/receive frequency difference
v) Voltage withstand requirements
vi) Attenuation distortion
vii) Attenuation distortion
viii) Carrier frequency output power

7. SPEECH COMMUNICATION:

~~PLC equipments offered shall provide telephone communication~~
PLC equipments offered shall provide telephone communication

between the stations where the transmission line equipment shall be suitable for providing the following:

(a) The equipment shall contain all normal facilities like ring back tone, dial tone, engage tone & priority tone and suitable pluses to established and disconnect communication between subscribers.

(c) The equipment shall be provided with necessary alarm circuits and fuses etc.

(d) The equipment shall be of 4 kHz bandwidth on either direction for providing super imposed data and be suitable for tele-printer facilities at a later date without major modifications and high cost. The [illegible] contractor shall clearly indicate in his bid the provision made in his proposal for future development and the extent to which such additional facilities can be asked at a later date.

(e) Arrangement for over-riding facilities shall be provided by means of priority keys wherever specified. The over-riding facility shall enable cutting in ongoing calls with the priority key and ask the concerned parties to finish their conversation. The wanted number should then get automatically connected without having to redial the number.

(f) All the carrier telephone conversations shall be secret and it should not be possible for anybody to overhear the conversation going on between any two parties except those provided with over-riding facilities.

(g) All the relays etc, used in the equipment shall be of roubust design to cope with the duty imposed on them. Electronic components used in the equipment shall be of long life type and as far as possible a few types only shall be used.

(h) The telephone facility of new building shall be integrated with the existing exchange. The required wiring upto the nearest telephone junction box shall be in the scope of [illegible] contractor. The termination at both ends including supply of all kinds of materials shall be in the scope of supply of [illegible] contractor. Any extension of IO cards in existing exchange if required shall also be in the [illegible] contractor's scope.

(i) All the terminals for speech shall be supplied fully wired for addition of VFTs in future. However, the terminal supplied shall be equipped with programmable transit band pass filters.

(j) Equipment for speech communication must be fully compatible with IOCL PANIPAT's existing equipment. Any Interfaces required for proper matching and connection with the IOCL PANIPAT's existing equipment shall be provided by the Contractor.

(k) Terminals for protection shall be suitable between two ends of each transmission line or on tandem operation basis with back to back connection at the intermediates stations.

(l) Each PLC terminal for speech as well as protection purposes shall be provided with a plug-in type service telephone and buzzer. Further, 4 wire remote telephone instruments (parallel to service telephone) shall also be provided on one PLC terminals for protection for each link. These instruments shall be ~~located in respective switchyard control room to enable the operator to make~~ located in respective switchyard control room to enable the operator to make

emergency calls on point-to-point basis. Each such instrument shall be equipped, with a buzzer and 'press-to-call' key and shall not require any additional power supply units.

8. NETWORK PROTECTION EQUIPMENT (PROTECTION COUPLER):

8.1 The [redacted] contractor shall offer voice frequency transmission equipment which shall work on frequency shift or coded signal principle for transmission/reception of protection signals as single purpose channel. The equipment shall be suitable for connection to the power line carrier terminal mentioned above.

8.2 The voice frequency transmission equipment shall not only be insensitive to corona noise but shall also remain unaffected by impulse type noise which are generated by electrical discharge and by the opening and closing of circuit breakers, isolators, earthing switches etc. The equipment shall be made immune to a field strength of 10V/m expected to be caused by portable radio transmitters in the range of 20-1000 MHz. During detailed engineering stage, the [redacted] contractor shall clearly explain as to what measures have been taken to make the equipment insensitive to corona noise, white noise and to impulse noise of an amplitude larger than the wanted signal and submit full field test and laboratory test reports in event of order during detailed engineering stage. The guarantee on design data shall not be acceptable.

8.3 The equipment shall be unaffected by spurious tripping signals. The [redacted] contractor shall submit proof as to how this is achieved satisfactorily.

8.4 The equipment shall be suitable for transmission of direct and permissive trip signal as well as blocking signals for protective gear of power system. The equipment shall be operated in the audio frequency range in speech band or above speech band as superimposed channel in 4KHz band of SSR carrier. The equipment shall operate with full duplex frequency shift mode of operation. The protection signaling equipment shall be solid state design, modular in construction and have a proven operating record in similar application ever EHV systems. Details regarding application of the equipment over 220kV systems shall be submitted along with the bid

Each protection signaling equipment shall provide:

(i) Transmission facilities for minimum two protection signals.
(ii) Reception facilities for minimum two protection signals.
(iii) Direct trip Send and Direct Trip Receive facility in addition to above two protection signals.

8.5 The equipment shall be designed for remote tripping/blocking on permissive basis and direct tripping for reactor fault and others. The overall time of PLC VFT and transmission path for permissive trip/blocking shall be 20 msec. or less and for direct tripping 30 msec. or less even for the longest line section. Operating time lower than specified above may be preferred provided they fulfill the requirements of security and reliability as mentioned below:

False-trip probability $>10^{-5}$ (Noise burst of nay amplitude)

~~Fail to trip probability $>10^{-5}$~~

Fail to trip probability $>10^{-5}$

For S/N dB In 3.1 KHz Band (while Noise Measurement)

8.6 It may be emphasised that specified time, as mentioned above is composed of the following:

a) Back-to-Back signal delay in frequency shift or coded signals protection equipment.

b) Back-to-Back delay in PLC terminal.
c) Delay in transmission line.
d) Operation time of interposing relay, if any in frequency shift or coding equipment Reference is invited in this regard to the guide lines expressed in CIGRE Publication "Teleprotection" report by Committee 34-35.

8.7 The following transfer criteria shall be provided by the equipments:

a) Transmit side: One number potential free NO (normally open) contact of protective relays (at HVPNL source sub-station end) of under noted rating or suitable as per project requirements of each of the following functions:

i. Permissive trip command
ii. Direct trip command

Contact rating.

Maximum voltage: 360 volts (DC).
Maximum current rating : 5amps.
Maximum power rating : 1200 w/va.

b) Receive side: Voice frequency transmission equipment for network protection shall be provided with one potential free No (normally open) contact of the under noted rating or suitable as per project requirements of each of the following functions:

i. Permissive trip command
ii. Direct trip command

Contact rating.
Rated voltage :250 volts DC
DC Rated current :0.1ADC.
Other Parameters :as per IEC-255-0-20

c) Alarm: In addition, the voice frequency protection terminal shall provide at least one number potential free change over contact of the following rating or suitable as per project requirements for alarm purposes.
Rated voltage :250 volts DC
Rated current :0.1 ADC.
Other Parameters :as per IEC-255-0-20

8.8 Frequency shift of coded signal protection equipment shall have at-least two channels. In order to ensure full availability of PLC protections channel, arrangement of parallel circuiting of these two channels as main and stand by channels shall be made. This arrangement is generally shown in relevant specification drawing. Each arrangement shall be developed by the successful [redacted] contractor in co-ordination with protective relay Contractor. The parallel wiring should however retain the concept of two

protection channels of each type of protection with each backing up the other 100% during normal operation and also permit testing without affecting the other. The contractor shall submit drawings showing Inter-connection between PLCC and protection panels for approval by the IOCL PANIPAT in event of order.

8.9 It has to be ensured that under no circumstances protection channel should share the power. Each protection channel shall be able to transmit power for which system is designed. For example, a 20 W PLC terminal shall transmit

20 Watt (Max.) for protection channel alone in the event of fault. Speech and superimposed data channels, in the same protection terminal must get disconnected momentarily during the operation of protection channels.

8.10 The equipment shall be constructed such that in permissive line protection system, operational reliability of the protection channel may be checked over the carrier link by means of a loop test. It shall be possible to carry out the above test from either end of the carrier link. During healthy condition of the transmission line, the loop test shall not initiate a tripping command. In the event of a system fault, while loop test is in progress, protection signal shall over-ride the test signal.

8.11 The equipment shall be complete with built in counters for counting the number of trip commands sent and number of trip commands received.

8.12 Contractor shall develop drawings showing inter-connection between protection panels and PLCC panels and submit the drawings for IOCL PANIPAT's approval.

8.13 The voice frequency transmission equipment shall be suitable for 48V (+) 15% and (-)10% DC power supply- ~~Suitable hardware shall be included in the project by BBTK contractor for development of 48 V dc supply form 220 V DC or 110 V UPS system~~.

9.0 TELEPHONE SET:

The instrument should be sturdy & compact in form. It should have Tone/Pulse facility, flash and pause facility, last number redialing, visual ringing indication, ring volume control and fast dialing facility. It should be compatible with different types of switching units used in conjunction with PLCC system in IOCL PANIPAT and also with the DOT line. It should be able to be feed from exchange with F48 V, 2x200 ohm feed bridge or 56 V 2x400 ohms feed bridge.

10.0 DOCUMENTATION: The document schedule for this section shall follow the following vendor data requirement schedule.

Sr No	Description with bids	With Bids	Post order	Final documents with equipments

			For review	For records	soft copy	Prints
1	Technical Catalogue	x	x		x	x
2	Dimensional / Assembly Drawings		x	x	x	x
	a.GA drawings (Elevation and Plan)		x	x	x	x
	b. Installation Plan including foundation, cut out and mounting details		x	x	x	x
	c. Cross Sectional View		x	x		
	d. Outline general arrangement		x		x	x
	e. Face Plan		x			x
	f. Cubicle Arrangement Drawing		x	x		x
	g. Component Drawing		x	x		x
	h. Name plate Drawing		x	x		x
	I. Arrangement of cable termination		x			x
3	Electrical Wiring Drawings		x			
	a. Single Line diagram (if any)		x	x	x	x
	b. Control Schematic			x	x	x
	c. Wiring Diagram and Terminal Details			x	x	x
	d. Interpanel Wiring Diagram			x	x	x
4	Bill Of Material			x		x
5	Sizing Calculations		x	x		x
6	Auxiliary Power Requirement data(AC&DC)		x	x		x
7	QA plan of Vendor		x			x
8	Inspection Plan and testing procedure (For review by inspection)		x			x
9	Test Records			x		x
10	Type Test Certificate		x	x		x
11	List of Commissioning spares		x		x	x
12	List of Maintenance Spares		x		x	x

13	List Of special Tools & Tackles		x		x	x
14	Data Book/ Manual					
	a. Intallation manual			x		x
	b. Operating/Maintenance manual					
	c. Catalogues/ Brochures			x		x
15	Equipment storage procedure at site					x
16	Any other drawing required to complete the equipment like bird barrier etc.		x		x	x

[redacted]

COUPLING DEVICE

The specification provided below are for reference purpose. The complete design, engineering and supply of the equipments shall be in line with HVPNL guidelines, applicable standards and as per tender requirements and shall be responsibility of [redacted] contractors including all liasoning requirements with HVPNL authorities.

1. General

1.1 The coupling devices shall be interposed between the capacitor voltage transformer/coupling capacitor and coaxial line to the PLC transmitter/receiver and in conjunction with the capacitor voltage transformer/coupling capacitor shall ensure:

a) Efficient transmission of carrier frequency signals between the carrier frequency connection and the power line.

b) Safety of personnel and protection of the low voltage parts and installation, against the effects of power frequency voltage and transient over voltage.

c) The coupling device, in conjunction with the CVT shall form an electric filter of band pass type.

d) It shall match characteristic impedance of HT line to impedance of the carrier frequency connection. Impedance matching between power line and the carrier frequency connection may be done by a transformer or an auto-transformer.

e) Galvanic isolation between primary and secondary terminals of the coupling device shall be performed by the above mentioned transformer.

f) Power frequency currents derived by the CVT may be drained to the earth by a separate inductance termed drain coil of suitable rating or through primary of the above transformer.

g) Voltage surges coming from the power line at the terminals of the coupling device shall be limited by a non-linear surge arrester of suitable rating in the primary side. Requirement of a gas type voltage arrester in secondary side of the coupling device shall have to be fully justified.

h) The surges Arrester shall have power frequency spark over voltage co-ordinated with the equipment ahead of it.

i) For direct and efficient earthing of its primary terminals, the coupling device shall be equipped with an earthing switch. The coupling device shall be designed such that it shall not be possible to remove the cover before the earthing switch is operated to the 'earthed' position. Further the Earth Switch shall be available for earthing of CVT-HT terminals, when the coupling filter units are removed from circuit for maintenance/replacement. The design shall take due regard of requirements for safety in accordance with the Indian Electricity Rules.

1.2 Two numbers 'phase to earth' type coupling filters shall be used to achieve in secure 'phase to phase' / 'Inter-circuit coupling'. Connection between secondaries of the

'phase to phase' / 'Inter-circuit coupling'. Connection between secondaries of the

two phases to earth type coupling device shall be through a balancing transformer/hybrid such that reliable communication shall be ensured even when one of the couple is phase to earthed or open circuited on the line side.

1.3 The coupling device shall be suitable for outdoor mounting. Temperature of metallic equipment mounted out door is expected to rise upto 65°C during the maximum ambient temperature of 50° C specified. The equipment offered by the [redacted] contractor shall operate satisfactorily under these conditions.

1.4 The elements of coupling device shall be fitted on a base plate and enclosed in a metal box. The HT Terminal of coupling device shall be connected to HF terminal of the CVT by means of 6mm Sq. copper wire with suitable lugs & taped with 11kV insulation by the contractor. The same shall be quoted by the bidder and included in the price quoted against Coupling Device.

1.5 Coupling device shall have at least two terminals for carrier equipment connection. [redacted] contractor shall confirm that such a parallel connection to coupling device directly will not result in any additional attenuation.

1.6 The coupling device including the drainage coil, surge arrestor and earthing switch shall conform to type tests and shall be subjected to routine tests as per IEC- 481/IS:8998.

1.7 Coupling device shall conform to IEC-481/IS-8997 and IS-8998 shall have the following carrier frequency characteristics as applicable to a phase to earth type coupling device.

a)	Nominal line side impedance	400 ohms for 220kV line Ph-E & 600 ohms for Ph-Ph
b)	Nominal line side impedance	150 ohms (balanced)
c)	Composite loss	Not more than 2 dB
d)	Return loss	Not less than 12 dB
e)	Band width	shall suit the frequency plan between 40 KHz and 500 KHz
f)	Nominal peak envelope	Not less than 650 Watt Power (for inter-modulation product 80 dB down)

1.8 INSPECTION & TESTS:

1.8.1 Type Tests:

Following type test reports, as specified in IEC standard (amended up to date) shall be submitted for the offered type, rating of equipments invariably at the time of inspection for verification by TPI with/without owner's representatives. The type test reports shall not be older than Seven years and shall be valid up to expiry of validity of offer. The type test must have been carried out at any ISO/IEC/NABL accredited laboratories.

Following type tests certificates to be furnished:

a) Composite loss
b) Return loss
c) Distortion and inter-modulation test
d) Impulse-voltage test
e) Tests on arresters
f) Power frequency voltage test
g) Tests on drain coil and matching transformer winding

1.8.2 Routine Tests

As per quality assurance program (QAP).

1.8.3 Acceptance Tests

All acceptance tests as stipulated in the relevant IS: 8998 shall be carried out by the [redacted] contractor in presence of authorised Third Party Agency (TPI).

a) Composite loss
b) Return loss
c) Power frequency voltage test

1.9 DOCUMENTATION: The document schedule for this section shall follow following vendor data requirement module:

Sr No	Description with bids	With Bids	Post order		Final documents with equipments	
			For review	For records	soft copy	Prints
1	Dimensional / Assembly Drawings		x	x	x	x
	b. Outline GA drawings		x	x	x	x
	b. Coupling Device Mounting arrangement		x	x	x	x
	c. Cross Sectional View		x	x		
	e. Name plate Drawing		x	x		x
2	QA plan of Vendor		x			x

3	Type Test Certificate		x	x		x
4	List of Commissioning spares		x		x	x
5	List Of special Tools & Tackles		x		x	x
6	Data Book/ Manual					
	a. Installation manual			x		x
	b. Operating/Maintenance manual					
	c. Catalogues/ Brochures			x		x
7	Equipment storage procedure at site					x

[redacted]

HIGH FREQUENCY CABLE FOR POWER LINE CARRIER COMMUNICATION:

The specification provided below are for reference purpose. The complete design, engineering and supply of the equipments shall be in line with HVPNL guidelines, applicable standards and as per tender requirements and shall be responsibility of [redacted] contractors including all liasoning requirements with HVPNL authorities.

1. GENERAL:

This chapter deals with Technical specification of H.F. cable (150 ohms balanced) for connecting power line carrier communication terminal with the associated equipment for IOCL PANIPAT carrier network

High frequency cable shall connect the coupling device installed in the switchyard to the PLC terminal installed indoor. The high frequency cable to be offered by the [redacted] contractor shall be suitable for being laid directly in trenches or in ducts.
The cable shall be tinned copper braided and steel armoured and its outer covering shall be protected against attack by termites. [redacted] contractor shall offer his comments on method employed by him for earthing of screen and submit full justification for the same with due regard to safety requirements.

1.1 SCOPE:-

1.1.1 This specification covers details of H.F. Cable (150 Ohms BALANCED) required for connecting Power Line carrier Communication terminals with the associated equipment for IOCL PANIPAT carrier Network.

1.1.2 The scope of supply shall Include design, manufacture, testing at [redacted] contractor's works before dispatch, delivery, installation and commissioning of the H.F. Cable for use on Power Line carrier Communication equipment in IOCL PANIPAT.

1.2 CLIMATIC CONDITIONS:-

For the climatic conditions, please refer the [redacted] SECTION - 3.

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2.3 The atmosphere is to be considered as laden with industrial and town gas and dust in suspension during dry-months. Fog smoke and mild acid are also present. Heavy lighting is also present during the months from June to October. The H.F. Cable is exposed to sunshine, rain, Fog, Hail, Snow etc.

1.3 MATERIALS AND WORKMANSHIP:-

1.3.1 All materials used in the construction/manufacture of the H.F.Cable shall be brand new and of the best quality obtainable of their respective kind and shall confirm to their respective Indian Standards or other equivalent International recognized standards whenever applicable. The successful [redacted] contractor shall assume full reasonability for coordinated and adequate design.

1.3.2 The workmanship for HF Cable shall be of the highest grade and the entire construction in accordance with the best modern engineering practice. The HF Cable shall be designed to ensure satisfactory operation under the atmospheric conditions prevailing at site.

1.4 STANDARDS:

1.4.1 The HF Cable and all its materials covered by this specification shall unless otherwise stated complete in all respects with the requirements of the latest edition of IS-5026 and IS-11967 Part-II/Sec-3.

1.5 DEPARTURE FROM SPECIFICATION:-

Should the [redacted] contractor wish to depart from the provisions of this specifications either on account of manufacturing practice for any other reasons he shall draw special attention to the proposed points of departure a separate sheet(s) in his tender under deviation statement clause of the tender specification and shall submit such full information, drawings and specification so that the merits of his proposal may be fully understood. This specification shall be held binding unless the departures have been fully recorded as required above.

1.7 TROPICAL TREATMENT:-

1.7.1 The H.F. Cable can be subjected during the service to extremely severe climatic conditions detailed under Sr. No. 1.2 of this specification. All corrodible parts and surfaces shall be provided with such protective finishes so that no part of the installed H.F.Cable shall be injuriously affected by the atmospheric conditions. The H.F.Cable, if required, may be given special treatments for tropical conditions.

1.7.2 All part of the H.F. Cable that are likely to develop corrosion under normal working conditions shall be effectively protected against corrosion by standard methods to achieve durable results.

1.8 EQUIPMENTDESIGN:-

The successful bidder/ contractor shall assume full responsibility for adequate design for the duty in view to ensure trouble free long service and tropical conditions and shall use such arrangement and material as to confim to the best engineering practice for the operating conditions specified.

Impedance of the cable shall be such as to match the impedance of the PLC terminal on one side and to that of the coupling device on the other side over the entire carrier frequency range of 40-500 kHz. The H.F. Cable (150 ohms balanced) shall meet the following parameters:-

1. Overall diameter of H.F.Cable shall be between 20-25 mm.
2. The mutual capacitance at 1 kHz of the H.F.Cable be 34 pf (Nominal)/meter.
3. Conductor resistance of cable shall not exceed 12.8 ohm per km at 20 deg C and dia to be 1.4 mm
4. The H.F.Cable shall have bending radius of 20 times the overall diameter of the cable.
5. Loop resistance of H.F cable will not exceed 30 ohms per KM at 20 deg C.
6. Withstand test Voltage between conductor and outer sheath for one minute to be 4kV.
7. The attenuation per km of the cable at various frequencies in the range of 10 to 500 kHz shall remain in the range of 1 to 5.1 dB/km.
8. H.F.Cable will be with semi spaced dielectric, polythene string and tube and annealed tinned braided copper wire with 90% coverage, polythene inner sheath, GI wire braided armouring and overall PVC sheathed, preferably grey. The protective armouring provided in the HF cable shall consist of 0.3 mm (approx) dia of standard GI wire braiding with 70% coverage.

1.10 INSPECTION & TESTS

1.10.1 Type Tests:

Following type test reports, as specified in IEC standard (amended up to date) shall be submitted for the offered type, rating of equipments invariably at the time of inspection for verification by TPI with/without owner's representatives. The type test reports shall not be older than Seven years and shall be valid up to expiry of validity of offer. The type test must have been carried out at any ISO/IEC/NABL accredited laboratories

- Corona extinction voltage
- Characteristic impedance Attenuation (insertion loss)
- Structural return loss

- Capacitance Stability
- Capacitance unbalance
- Transmission unbalance
- Mechanically induced noise Voltage
- Time delay
- Ageing stability
- Stress-crack resistance
- Outer conductor integrity
- Screening efficiency
- Cold bend
- Flow
- Dimensional stability
- Contamination
- Bendability
- Flammability
- Resistance to fluids
- Solderability Weight

1.10.2 ROUTINE TESTS:

As per quality assurance program (QAP).

1.10.3 ACCEPTANCE TESTS:

The following acceptance tests as stipulated in the relevant IS:11967 (Part- 2/Sec-3), shall be carried out by the [redacted] contractor in presence of authorised Third Party Agency (TPI) with/without IOCL's representatives.

i) Visual and mechanical inspection
ii) Physical dimensions
Iii Marking
iv) Workmanship
v) Characteristic impedance Attenuation (insertion loss)
vi) Structural return loss
vii) Corona extinction voltage
viii) Capacitance
x) Transmission unbalance
xi) Mechanically induced noise voltage
xii) Time delay
xiii) Cold dend
xiv) Contamination
xv) Resistance of fluids
xvi) Solderability Weight

1.6 DOCUMENTATION: The document schedule for this section shall follow the vendor data requirement module:

Sr No	Description with bids	With Bids	Post order		Final documents with equipments	
			For review	For records	soft copy	Prints
1	Interior and outer sheath cross sectional details		x	x	x	x
2	QA plan of Vendor		x			x
3	Type Test Certificate		x	x		x
4	Equipment storage procedure at site					x

Chapter-8B

PUBLIC ADDRESS , TELECOMMUNICATION SYSTEM AND LAN SYSTEM:

1. PUBLIC ADDRESS SYSTEM

a. Scope: Design, supply, installation, cabling, site testing, commissioning, integration with existing system for provision of PA system in the proposed ISBL project area shall be in the scope of LSTK contractor.
b. The offered PA system shall be digital type only comprising of base station at CPP control room and field call points distributed in switchyard and switchgear complete with all accessories, hardware and software components.
c. All field call points shall be two way communication type.
d. The field call points shall be suitable for outdoor installation with minimum protection class of IP65.
e. The enclosure housing of the field call points shall be suitable for humid and corrosive atmosphere and made up of cast Aluminium/ hot dip galvanised materials.
f. All kinds of associated cabling, structural, cable tray works as per project requirements shall be in the scope of LSTK contractor including supply of materials.
g. The new system shall also be integrated with the existing system of the PR. Design, engineering and co-ordinations required for integration including all kinds of additional integration components shall be in the scope of LSTK contractor.
h. The location and number of field call points shall be in compliance with the OISD and all other statutory requirements.

2. **TELECOMMUNICATION:**
    a. The supply of telephone sets in new switchgear building (near GIS system), control room extension, office room in GIS building, cabinet room in GIS building.
    b. Telephone cabling upto the nearest JB of the IOCL exchange including supply, laying, termination, cable tray works, structural works and all inclusive.
    c. Hotline connectivity with the source sub-station of OSBL through PLCC system is also in the scope of LSTK contractor including supply of all required materials.

3. LAN NETWORK:

a. [redacted] contractor shall develop a LAN network for complete 220 KV switchgear building including cabinet rooms and all office rooms. The supply of all required materials including its installation wiring is in the scope of LSTK contractor.
b. Suitable number of LAN connection points shall be provided near GIS switchgears, cabinet rooms and office rooms.
c. Nearest LAN network of new building shall be integrated with the IOCL LAN network at nearby place. Supply of all required hardware like FO cable, network switches, LAN cables etc required for integration is in the scope of [redacted] contractor including its installation and commissioning.
d. All the materials associated with the LAN network shall be as per applicable IS standards and of latest technology.

AMENDMENTS BY IOCL

53	Section-C, Page 553 of 1047 Chapter-5	The separate relay shall be provided for LBB protection in every bay. The DC supply of this relay shall be separate from DC supply of the primary relay.	The separate relay shall be provided for LBB protection in every bay. The DC supply of this relay shall be separate from DC supply of the primary relay. Common differential relay based scheme shall not be used
54	Annexure- S-2/C-4/2 clause 3.1	The PLCC equipments as specified shall be installed at the r e c e i v i n g end of the transmission lines (at IOCL Panipat end)	The PLCC equipments along with HF cables, protection coupler , phase to phase coupling devices as specified shall be installed at the both r e c e i v i n g end of the transmission lines (at IOCL Panipat end) and at sending end of the transmission line (at HVPNL SS) The PLCC equipment shall be digital and in line with requirement of HVPNL & relevant technical specification is given in ~~annexure S-3/C-4/2~~ section-2. All hardware required for developing the PLCC communication link at both ends shall be in the scope of [redacted] contractor except CVT. For each incoming line PLCC system shall be separate & shall be suitable for voice, protection , control and other signal transfer as per detail specifications.
55	Annexure S-3/C-4/6 clause 5.1.16	A pressure relief device capable of releasing abnormal internal pressure shall be provided.	A pressure relief device capable of releasing abnormal internal pressure shall be provided. Pressure relief system is separate of system of volumetric changes. It is required to release any sudden rise of pressure in case of internal faults/ short.
56	Annexure S-3/C-4/6 chapter 03G	CVT technical Parameters	CVT shall have minimum 2 secondary windings or more as per project requirement. The VA and capacity of each winding shall be selected based on project design requirement.

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