



**GUJARAT INDUSTRIES POWER COMPANY LIMITED
SURAT LIGNITE POWER PLANT (SLPP)**

VOLUME II — C&I (Instrumentation) — Technical Specification- Package-A

Design, Engineering, Supply, and Construction of Package A, B, C & D
**New Lignite Feeding System, Associated Works, Contingency Feeding
Arrangement & Dismantling**

Tender No.: GIPCL/SLPP/R&M/LHS/FB-RE/LOCATION/EPC/2026

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1. DETAILED SCOPE OF WORK: PACKAGE A

Package A covers Design, Engineering, Procurement, Supply, Fabrication, Erection, Testing, Pre-commissioning, Commissioning, and Handing Over of the New Lignite Feeding System at the Plant End (Feeder Breaker Relocation), on a complete Turnkey EPC basis.

- 1) The operation and control of entire new R&M lignite handling system (LHS) including conveyer shall be performed from existing LHS control room (control and electrical building).
- 2) Bidder shall provide new PLC RIO panel with identical I/O modules, rack, power supply modules and other hardware accessories of same make and model of existing LHS PLC (Siemens S7-400H) in new MCC / PLC room and connect with existing system with redundant multi mode FO cable communication for safe and reliable operation.
- 3) PLC RIO panels shall be installed in air-conditioned room in new MCC / Switchgear building.
- 4) Bidder shall provide control philosophy, instrument list, IO list, logic, HMI graphic, etc. for new R&M system and implement in existing 'Siemens' make LHS PLC and HMI system.
- 5) Redundant 110VAC Power supply to new RIO panel shall be provided from nearby existing 10KVA / 110 VAC UPS of new PCH PLC system. Required power cable shall be considered in bidder's scope.
- 6) Field instruments interrogation shall be 24VDC only.
- 7) If scoop control is used, Scoop oil pressure and Temperature to be taken from Pressure transmitter and RTD direct wired to PLC with analog value display on MMI. Alarm / Trip to be generated from LVM in PLC logic.
- 8) Separate dedicated pull cords in addition to other pullcords in conveyor to be installed for 'stone picker stand' in conveyors and hard wired to PLC for discrete display on MMI and tripping of conveyor.
- 9) Bidder shall provide all belt safety instruments for safe operation of system.
- 10) All drives running hour (shift wise and cumulative) to be configured with reset.
- 11) New dedicated electronic earthing for RIO panel.
- 12) Loop powered vibration sensors (X and Y direction) shall be provided for new LHS system HT drives and same shall be connected with PLC RIO.



- 13) Winding & Bearing temperature shall be provided with duplex temperature elements for HT drives and same shall be connected with RIO.
- 14) Zero speed switch (Non-contact type two wire inductive proximity switches) shall be provided for new lignite handling system conveyors.
- 15) Redundant communication / network cable (Multi mode FO cable) shall be provided between existing LHS PLC / RIO and new RIO panel.
- 16) Hard wire inputs shall be taken in new RIO panel from field instruments for interlocking of new lignite handling system.
- 17) Dust suppression system (DSS) operation shall be provided for new lignite handling system as per existing DSS operation philosophy.
- 18) All junction boxes, Tail End Emergency push button stations, all Interconnected cabling between sensors to JB/ Panel, PLC panel, Panel earthing cable, cable glands, Lugs, ferrules, cable trays, conduits, erection hardware, instrument fittings (double compression type) and other accessories are in the scope of vendor.
- 19) All field instruments/ sensors/ switches/ belt protection switches, as per finalized P&IDs, schemes, operation and control philosophy and logics approved during detailed engineering stage within the lignite handling plant package.
- 20) Any other item not covered herein but essential for successful installation and commissioning of the lignite handling plant and integrity of the system shall be included by the Bidder.
- 21) All necessary Vendor/Drawing/documents shall be subject to approval from Owner/Owner Representative.
- 22) All drives shall have individual start/stop facility from Local PB Station. In addition, drives can be started and stopped individually or in sequence from PLC based operator station through HMI work station.
- 23) Contractor shall furnish summary of control philosophy indicating permissive, trip and interlock conditions for each drive/equipment. It shall clearly list all permissive conditions (conditions required to start the drive), all the trip/protection conditions and each auto start/open and auto stop/close condition for each drive/equipment
- 24) The contractor shall furnish comprehensive logic diagram showing all interlock, protection, sequence and alarm requirements of complete system to the employer during detail engineering stage. In this logic diagram, tag number corresponding to I/O list and drive list shall be clearly indicated. The format of this logic diagram shall be informed by employer during detail engineering. The

recommended logic and write-up shall match fully. It's bidder responsibility to implement all new logic, hardware configuration in PLC, development of graphics and other required works in SCADA for interconnection conveyor package in existing Siemens S7-400H PLC.

- 25) The above summary conditions shall be comprehensive to include all process conditions and shall be elaborated in clear and unambiguous way and shall include tag numbers of devices and equipment.
- 26) Bidder shall provide redundant (power supply, communication module, fiber optic communication, FO to profibus / serial converter module etc.) for new RIO panel. Bidder shall supply fully internal wired, tag label, etc for RIO panel at site for connecting of field wiring.
- 27) Bidder shall provide complete logic, HMI graphic, IO list, alarm and set point list, power supply scheme, etc. for new Interconnection conveyor for phase I package and implement in existing LHS Siemens S7-400H PLC. All required software and hardware at existing LHS PLC end for successful implementation of new Interconnection conveyor package is under bidder scope.
- 28) Bidder shall provide 10% wired and 10% unwired 20% wired IO in each RIO panel as spare.
- 29) Existing LHS Siemens S7-400H system details shall be followed for implementation of new interconnection conveyor package:

1.	PS	407-0KR02-0AA0
2.	CPU	417-4HT14-0AB0
3.	CP443	443-1EX11-0XE0
4.	IM	153-2BA02-0XB0
5.	CP341	341-1CH02-0AB0
6.	DI	321-1BL00-0AA0
7.	DO	322-1BL00-0AA0
8.	AI	331-1KF01-0AB0
9.	AO	332-5HF00-0AB0
10.	AI	331-1KF02-0AB0

2. TECHNICAL SPECIFICATION

2.1. Pull Cord Switch

Sl. No.	Feature	Detail
1.	Type	Mechanical Manual Lever operated
2.	Contact Rating	Continuous 10 amp Breaking 2 Amp (240 V AC)

Sl. No.	Feature	Detail
3.	No. of Contact	1NO+1NC
4.	Reset Facility	Manual Reset
5.	Type of Enclosure	Die Cast Aluminium
6.	Degree of Protection	Flame proof/ Explosion proof for NEC Class 2, Division 1 area
7.	Accessories	Linking of switches through a single cable for each section

2.2. Belt Sway Switch

Sl. No.	Feature	Detail
1.	Type	Mechanical Roller operated type
2.	Contact Rating	Continuous 10 amp Breaking 2 Amp (240 V AC)
3.	No. of Contact	1NO+1NC
4.	Reset Facility	Auto Reset
5.	Type of Enclosure	Die Cast Aluminium
6.	Degree of Protection	Flame proof/ Explosion proof for NEC Class 2, Division 1 area
7.	Spacing	One pair at 30m interval

2.3. Zero Speed Switch

Sl. No.	Feature	Detail
1.	Type	2 Wire, 24V DC Proximity switch
2.	Connection	Direct wired to PLC
3.	Alarm / Trip	Logic to be prepared in PLC as per existing LHS PLC

2.4. VIBRATION MONITORING SYSTEM for HT Drive

Sl. No.	Feature	Detail
1.	Type	24VDC loop powered 4-20 mA signal
2.	Connection	Direct wired to PLC
3.	Alarm / Trip	Logic to be prepared in PLC as per existing LHS PLC

2.5. Technical Specification for Vibration Pick-Ups

Sl. No.	Item	Description
1.	Type	Loop powered 2 wire type
2.	Measurement Range	0-25 mm/sec, zero to peak value
3.	Output	Loop powered 4-20mADC
4.	Power Supply	15-30 VDC loop powered
5.	Accuracy (Repeatability)	2%
6.	Sensitivity	100 mv/g
7.	Case Material	Stainless steel
8.	Sensing element	PZT ceramic
9.	Sensing structure	Shear Mode
10.	Connector	2 pin, MIL- C-5015 (pin dia 1.3MM)
11.	Sealing	Welded, hermetic
12.	Protection class	IP 67
13.	Sensor cable	Cable with Stainless Steel Protection Conduit
14.	Cable Length	7 mtrs
15.	Frequency response	+/-3 DB, 3-14000Hz
16.	Operating temperature	-40 to 85 Deg C
17.	Minimum loop resistance	600 Ohms
18.	Case Isolation	100 M Ohm Minimum
19.	Overvoltage Protection	Required
20.	Reverse Polarity protection	Required
21.	Calibration Certificate	Required
22.	Detailed Manual	Required
23.	Mounting	Stud Mounting, Size-M6
24.	Accessories for mounting	Mounting Pad with stud (In vendor scope)
25.	Guarantee	36 months from date of supply

2.6. Brake Limit Switch

Sl. No.	Feature	Detail
1.	Type	2 Wire, 24V DC Proximity switch
2.	Connection	Direct wired to PLC
3.	Alarm / Trip	Logic to be prepared in PLC as per existing LHS PLC

2.7. Belt Weigher

Sr. No.	DATA	DETAILS BY CUSTOMER
A	MATERIAL DATA	
1.	Material to be weighed	Lignite
2.	Lump size	(-) 250 mm – 98% passing
3.	Temperature of Material	5 Deg C to 50 Deg C
4.	Bulk Density	800 - 1000 kg/m ³
5.	Moisture content	52% (monsoon season)
B	CONVEYOR DATA	
1.	Belt width (mm)	1800 mm (Minimum)
2.	Belt speed (m/sec)	Max 1.5 M/s
3.	Capacity (TPH)	1200 TPH
4.	Troughing Angle	35° (3-roll troughing idlers for carry side)
5.	Inclination	As per mech Design requirement
6.	Weight of Belt/meter (Kg.)	As per mech Design requirement
7.	Weight of Idler set (Kg.)	As per mech Design requirement
8.	Tail Pulley Dia. (mm)	As per mech Design requirement
9.	Tail Pulley (RPM)	As per mech Design requirement
10.	Idler Spacing (mm)	As per mech Design requirement
C	ACCURACY / CALIBRATION	
1.	Accuracy required	1% +/-
2.	Output	4 to 20 mA

2.8. Terminal Block

Sl. No.	Feature	Detail
1.	Type	Screw terminal- type

Sl. No.	Feature	Detail
2.	Connection	Direct wired to PLC
3.	Alarm / Trip	Logic to be prepared in PLC as per existing LHS PLC

The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Owner's approval.

The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.

The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.

For ensuring proper connections, Bidder shall provide suitable accessories along with insulation sleeves. The exact connecting accessory shall be finalized as per application during detail engineering stage subject to Purchaser's / Consultant's approval without any cost repercussions.

Internal wiring in factory pre-wired electronic equipment cabinets may be installed according to the bidder's standards as to wire size and method of termination or internal equipment. Terminal blocks for connection of external circuits into factory pre-wired electronic equipment cabinets shall meet all the requirements as specified above.

TBs with fuse should be provided for all input signals to control system panels.

2.9. Cables

- 1) All instrument Cables shall be FRLS type XLPE insulated.
- 2) copper conductor PVC insulated, armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable to IS: 1554 (Part-I).
- 3) For Embedded Temperature Detectors two sets of six (6) Twisted triad 0.5 mm² ATC copper conductor armoured, shielded cable, 650/1100 V Grade IS: 1554 (Part-I). For bearing temperature, RTDS, two (2) sets of four (4) twisted triad 0.5 mm², ATC copper conductor armoured shielded 650/1100 V Grade, IS: 1554 (Part-I).
- 4) Bearing Temperature Indicators - For each indicator, 0.5 mm² six (6) tarnished triad ATC copper conductor, PVC insulated, shielded armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable as per IS: 1554 Part-I. Two (2) cables one (1) for each bearing temperature indicator.



- 5) 1100 Volt grade, control cables with stranded copper conductors, HRPVC Insulation Type C, extruded FRLS HRPVC, of type ST2 Inner sheath, round wire/strip armour as specified elsewhere in the specification and extruded FRLS HRPVC of type ST2 overall sheath. The cables shall be suitable for use in 1100V non-effectively earthed system. Control cable shall generally conform to IS 1554 latest and have ISI mark. Armour shall be GS.
- 6) Power cables shall be sized to satisfy the following Criteria:
 - To withstand specified system short circuit current for the specified fault clearing time.
 - To carry full load current under applicable installation conditions considering Site ambient temperature & site installation (Grouping) conditions based on Manufacturer's recommendation.
 - To limit the voltage drop under steady state/transient state conditions to permissible values.
- 7) The Bidder shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/ devices/ systems included under Bidder's scope ensuring completeness of the control system.
- 8) Other type of cables like fiber optic/co-axial cables for system bus, cables for connection of peripherals etc. (under Bidder's scope) are also to be furnished by the Bidder.
- 9) Bidder shall supply all cable erection and laying hardware from the main trunk routes like main trays, branch cable trays/sub-trays, supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems.
- 10) Power cable and signal cable should be routed in separate cable tray
- 11) The Cables shall be provided in non-returnable drums
- 12) The drum length shall be 1000m (+/-5%) up to & including 8 pairs and 500 m (+/-5%) above 8 pairs. Both end of cable shall be capped by means of non hygroscopic sealing material.
- 13) After commissioning 20% of the conductors / pairs cables shall be available as Spare. All instrument cables shall be laid on cable trays. Cable trays shall be sized to have 20% spare space as a minimum.
- 14) All prefabricated cables shall have 20% spare cores, which will not be connected to pin connectors.
- 15) Colour coding for the identification of pairs shall be as per BS-5308 Part-2 or VDE 0815.
- 16) All cables shall have PVC primary insulation as per IS 5831 Type C / IEC 502 suitable for FRLS. Inner and outer jacket shall be made of extruded flame retardant 90 deg.C PVC to IS 5831 Type ST2 / IEC 502. Oxygen Index of PVC shall be over 29% and temperature index shall be over 250oC.
- 17) The cables shall be armoured. Armour over inner jacket shall be of galvanised steel wire / flat as per IS 3975.
- 18) All the cores of single pair or multipair shall be twisted and twists shall not be less than 20 per metre. The outer sheath for analog and digital cables the colour shall be light blue and black respectively. Every pair shall be twisted with a lay of 40 to 50 mm and to be wrapped with polyester tape. Individual pair screening with edges frees poly aluminium tape with continuous drain wire of minimum overlap of 30%.

- 19) Required number of pairs to be laid up to form the cable and overall shielded with edge free Poly-aluminium tape with continuous drain wire of minimum overlap of 30%.
- 20) The cable shall be provided with marking including manufacturer's name, insulation material, and conductor sizes, no of pairs, voltage ratings, type of cable etc. Progressive sequential marking of the length of the cable at every one meter & progressive markings to read 'FRLS' at every 5 meters shall be provided on the outer sheath of all instrumentation cables. Colour coding & colour banding shall identify pairs of Cables. The colour of outer sheath shall be sky blue so that C&I cable is easily distinguished from other cables.

2.9.1. Instrumentation and Multipair Signal Cable

a)	Conductor type	Stranded (7) annealed tinned copper.
b)	Conductor size	0.5/1.0/1.5 Sq.mm. (as required)
c)	Conductor resistance	39 Ω/Km/18 Ω/Km/12 Ω/Km.
d)	Conductor Insulation	HR PVC Type-C (IS-5831,1984) 0.6 mm thick.
e)	Operating Voltage	300/500V RMS. (Core to earth/core to core)
f)	Twisting	Twin twisted with lay of 60 mm.
g)	Twisting Direction	All pairs in the same direction. Lapped to form bunch with mylar tape.
h)	Screen (Pair & Overall)	Aluminium mylar tape with a thickness of 28 μm (min.) for individual pair screen and 60 μm (min.) for overall screen with 100% coverage and 25% overlapped edges. Over the individual pair screening tape two laps of 0.05 mm thick (min.) polyester tape shall be applied with minimum overlap of 25%. Metallic side of the screen shall be in contact with drain wire.
		(i) Analog signals- Individual pair & overall shield to be considered.
		(ii) Binary signals- overall shield to be considered.
i)	Drain wire	Annealed tinned copper wire, stranded. Size 0.5 Sq. mm. (No. of strands / size:- 7 / 0.3mm)
j)	Inner Sheath	Extruded FRLS PVC (anti rodent, anti termite & moisture resistant properties)

		HR PVC Type ST2 of IS-5831,1984 Thickness as per IS-1554, Part-I 1976
k)	Rip Cord	Non-metallic under sheath
l)	Armouring	GI wire/strip as per IS 3975
m)	Outer Sheath	Extruded FRLS PVC (anti rodent, anti termite & moisture resistant properties). HR PVC Type ST2 of IS-5831,1984. Thickness as per IS-1554, Part-I 1976.
n)	Filler	Non hygroscopic with FRLS property
o)	Temperature Range	85 °C
p)	Insulation at 20 Deg.C	100 MOhms/Km [Min]
q)	Capacitance at 800 Hz	120 nf/km
r)	Cross talk	60 dB.
s)	Attenuation	1.2 dB/Km.
t)	Codes & Standards	(i) IPCEA-S-61-402.
		(ii)BS 5308.
		(iii) IEC 332-1.
		(iv) ASTM-B-33.
		(v)IS-8130-1984.
		(vi) IS 1554 Part-1.
		(vii) IS 10810.
u)	Sheath color	Inner- Black and Outer- Gray.
v)	Tests	(i) Oxygen Index: Min.29 at room temp. (ASTM-D-2863).
		(ii) Acid Gas Gen.: Max.20% by weight as per IEC 754 Part-I.
		(iii) Temp Index: Min 250 ° C at 21Oxy. Ind. (ASTM-D-2863).
		(iv) Smoke Density Rating: Max.60% (ASTM-D-2843).

		(v) Flammability Test: as per IEC 332 Part-I.
		(vi) Swedish Chimney Test-SS-424-1475 F3.
		(vii) Insulation Resistance 100 M Ohm / Km Min.
		(viii) High voltage test Core to core- 1.5 kV for 1 min. Core to screen- 1.0 kV for 1 min.
		(ix) Rodent & Termite repulsion test (Presence of lead shall be confirmed).

1. Colour of core for Instrumentation Cable (As per IS-9938)

PAIR	CORE	COLOR
1 st	1 st	Blue
1 st	2 nd	Red
2 nd	1 st	Gray
2 nd	2 nd	Yellow
3 rd	1 st	Green
3 rd	2 nd	Brown
4 th	1 st	White

- Above 4 Pairs, 4 Pairs making a unit shall have indelible printed colour coded bands like Pink for 1st unit, Orange for 2nd unit and Violet for 3rd unit and so on. In addition band marking, for example single band for 1st. unit, double band for 2nd. unit and so on, shall be provided on each conductor for identification of unit. Band marking on individual core shall be provided at regular intervals not exceeding 50 mm.
- Cables near high temperature zone shall be capable of withstanding high temperature and terminated in junction box / panel in normal temperature zone. Teflon insulated and sheathed thermocouple extension cables and copper conductor cables shall be used in high temperature zone. Conductor and sheath shall be extruded FEP (Teflon) as per VDE 0207 Part 6 and ASTM D 2116. These cables shall be pair, multipair, triad, multitriad and twisted & shielded.

2.9.2. Optical Fibre Cables

- This specification defines the minimum general requirements for the Design, manufacture, supply, inspection, installation, testing & commissioning of optical fiber cables and accessories, such as fiber distribution (patch) panels, adapters, connectors, joint boxes, pigtails and other components, as required to complete



the system. Bidder shall consider all related activities, such as cable stripping, cable entry in boxes and panels, cable fiber splicing/fusion, cable performance testing and other services, to achieve a properly documented and operational cable network.

2. Fiber Optic Cables shall be installed on cable tray, duct bank, cable trench, as necessary. For outdoor applications the cable shall be armoured with Poly Ethylene sheathing. Cable shall be routed through suitable grade permanently lubricated HDPE protection pipe as per IS 4984, IS 12235 & TEC.G/CDS-08/01 of suitable size @ 53% fill factor.
3. The Optical Fiber core shall be of ultra pure fused silica glass coated with UV-cured acrylate suitable to withstand temperature of about 800C (continuous).
4. Fiber optic cable shall be of loose tube design. Typically, fibers shall be housed in-groups of 6 (minimum) within gel-filled buffer tubes to protect against ingress of moisture and vibration. The tubes shall be manufactured with industry standard material like Poly-Butelene Terathylate (PBT). They shall be colour for easy identification. Buffer tubes shall be approachable with industry standard tools and practices. The buffer tubes shall be stranded around the Central Strength Member utilizing Reverse Oscillating Lay (ROL). Blank fillers shall be used as necessary to maintain circular cable structure. Cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end.
5. The central strength member of the cable shall be Fiberglass Reinforced Plastic (FRP) or other material with equivalent mechanical strength to provide both tensile and anti buckling strength to the cable.
6. In addition to central strength member, additional strengthening substance like aramid yarns shall be helically applied over the cable core to provide additional tensile strength to the cable.
7. The cable shall be of dual jacket & armoured. Inner sheath consists of a medium density polyethylene (MDPE) jacket extruded over the cable core. Two highly visible ripcords are placed under the jacket to aid in sheath removal. A co-polymer coated steel tape is corrugated and wrapped around the inner jacket to provide additional cable compression strength and rodent protection. The armour is covered with an outer black FRLS MDPE jacket. A ripcord is also placed underneath the armour for easy outer jacket removal.
8. Minimum bending radius shall be equal or more to 15 D. A continuous strength member shall be provided for the entire length of the cables. Every tube and fiber shall be colour coded to provide easy identification. The outer sheath shall be marked to show fiber type and cable classification at suitable intervals.
9. Entire length of the cable shall be marked with the following at regular intervals:
 - a) Manufacturer's Name
 - b) Month and year of manufacturer
 - c) Coded description of the cable based on Telcordia's (Bellcore) SR-2014 Suggested Optical Cable Code (SOCC).

- d) Sheath Identification Number
 - e) Sequential Length Marking in meter
 - f) A Telephone Handset symbol to distinguish communication from power cable as per NESC section –35 G.
10. Fiber optic cable shall provide a long life expectancy of minimum 25 years and shall meet the industrial standard of continuous operation at temperature of 55 °C and humidity to 100% without degradation to optical or mechanical performance.
11. Optical fiber used in the plant shall generally conform to the following specification.

	ATTRIBUTES	VALUE
(a)	Cladding Diameter	125 m 1.0 m
(b)	Cladding non-circularity	≤1.0%
(c)	Attenuation Coefficient at	
	1290 nm to 1340 nm	<0.36 dB/km
	1525 nm to 1575 nm	<0.25 dB/km
(d)	Chromatic Dispersion Coefficient at	
	1310 nm	<3.5 ps/nm.km
	1550 nm	<18 ps/nm
(e)	Polarization Mode Dispersion (PMD)	<0.5 ps/ km
(f)	Mode Field Diameter at	
	1310 nm	9.2 0.4 m
	1550 nm	10.50 1.0 m
(g)	Mode Field Concentricity Error	≤0.5 m
(h)	Proof Test	≥1%
(i)	Fiber Curl (ROC)	≥4.0 m
(j)	Macro-bend Test on Fiber at 1550 nm	≤0.1 dB



2.9.3. CABLE ASSEMBLY

1. **Optical Fiber Environmental Splice Enclosure**
Optical fiber environmental splice joint enclosures shall be re-enterable and rack/wall mountable. The interior splice case shall be equipped to mechanically accommodate single-mode optical fibers connected by the fusion method. Splice case shall be equipped to organize the splice trays and the required service loops of buffered incoming optical fibers and outgoing 'pigtailed' in such a way that allows each completed splice and associated optical fiber to be maintained in an unstrained configuration. Splice enclosure shall be dust and weather proof.
2. **Fiber Optic Distribution Patch Panel**
Fiber optic distribution panels shall be provided as required. Fiber optic distribution panels shall be of a standard wall mounted sheet metal enclosure type. Fiber optic distribution panels shall be equipped to secure optical fiber patch cables and pigtails to prevent damage during all operation and maintenance functions. In general splice enclosure are envisaged. However, if no optical fiber splice enclosures are implemented, then the fiber optic distribution panels shall be equipped with splice trays for storage and protection of fusion splice connections of single-mode fiber optic cable and pigtails. Each fiber optic distribution panel shall be fully equipped with 'S' type bulkhead connector sleeves or equivalent. Unused sleeve ports shall be equipped with reusable caps to prevent the intrusion of dust.
3. **Pigtail and Patch Cord**
All pigtails shall be factory SC-connectorized, and satisfy specified performance for optical links. All unused pigtails (including spares) shall be terminated with the connector to a bulkhead connector sleeve, protected by a reusable cap on the opposite sleeve port, to prevent the intrusion of foreign material or dust. All necessary connector pigtails shall be provided in the lengths required.

2.9.4. Fiber Optic Tool Kit

Optical Time Domain Reflectometer

- 1) A recording optical time domain reflectometer (OTDR) will be utilized to test for end-to-end continuity and attenuation of each optical fiber. The OTDR shall be equipped with data storage, printer, help feature, compare trace features and OTDR software. The data storage unit must include a built-in drive capable of storing a minimum of 10000 test traces.
- 2) The printer shall preferably be internal. The printer shall be able to print data traces within 30 seconds or less. The machine settings used to repeat tests at a later time shall include: index, range, wavelength, average time, pulse width and scale settings. The test results (on printout) shall provide information including: loss, distance, reflectance, date and time.



- 3) The requirements for the compare trace feature include the ability to recall two historical traces from a diskette and display them simultaneously for analysis and printing. The compare trace must compute and display a single graph representing any differences between two traces. The compare trace must be able to recall historical traces from a diskette and perform the same tests on connected live fibers. The compare trace shall perform a two-point loss measurement test for any two particular fibers in a comparison analysis. The losses between the two points on each fiber shall be displayed, and the differences between the two readings clearly shown.
- 4) The OTDR must be equipped with software to support all of the required functions. The software shall provide for printing of whole set of traces (batch print) with minimal commands eliminating the time spent for printing traces individually.
- 5) Contractor shall provide all mounting accessories, cables and connectors required to establish data communication.

2.9.5. Prefabricated Cable

Used for interconnection between systems /marshalling cabinets. Used for panel external wiring, tinned copper. Conductor of 0.5 sq mm cross-section with seven strands twisted pair with 20 twists/ meter. Insulation material shall be PVC, heat resistant with FRLS properties.

2.10. Panels/Cabinets Internal Wiring

1. All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferrules at both ends. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.
2. Maximum of 2 wires shall be terminated per terminal. Wiring raceways, straps shall be flame retardant. All wiring shall be ferruled. Wires carrying power and signal wires shall be routed in separate raceways. Accessories like MCB, cable support, fuses etc shall be supplied. Cable entries shall be cemented with fireproof compound.
3. All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.
4. All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables. All the special tools as may be required for solder less connections shall be provided by Bidder.
5. Wire sizes to be utilized for internal wiring:
 - a) Current (4-20 mA), low voltage signals (48V) - 0.5 Sq.mm.
 - b) Ammeter/voltmeter circuit, - 1.5 Sq.mm.control switches etc. for electrical system.



- c) Power supply and internal illumination - 2.5Sq.mm.

2.11. Cable Installation and Routing

1. All field cables shall be armored FRLS cables as per specifications_____
2. All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Owner.
3. All Instrument cable trays shall be perforated type mounted in vertical position.
4. Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:
 - a) From 415V tray system - 610 mm
 - b) From control cable tray system - 305 mm
5. Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed in the gland plates. Fireproof sealing to prevent dust entry and propagation of fire shall be provided for all gland plates used for cable entry.
6. The cables emanating from redundant equipment/devices shall be laid through different routes.

2.12. Cable Laying and Accessories

1. Cables shall be laid strictly in line with cable schedule.
2. Identification tags for cables: Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/ duct/ pipe entry/ exit, and at every 20 m in cable trench/tray.
3. Cable tray numbering and marking shall be provided at every 10m and at each end of cableway & branch connection.
4. Joints for less than 250 Meters run of cable shall not be permitted.
5. Buried cable protection: With concrete slabs; Route markers at every 20 Meters along the route & at every bend.
6. Road Crossings: Cables to pass through buried high density PE pipes encased in PCC. At least 300 mm clearance shall be provided between LT power & LT control/ instrumentation cables.
7. Segregation: In order to ensure physical isolation to prevent fire jumping, interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire.



8. All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.
9. The cable sub-trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the bidder. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).
10. The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded.
11. Cables / cable trays crossing above conveyors shall be avoided

2.13. Junction Box (JB)

1. Junction boxes to be supplied by bidder's as on required basis.
2. Junction Boxes shall have following features:
 - a) Single door type, explosion proof type and front open with cable entry from bottom.
 - b) 12/24/36/48/64 way with 20% spares terminals.
 - c) Screw type terminals shall be used.
 - d) 6mm thick SS.
 - e) JB shall have Hinged Door with steel handle and IP lock. Door gasket shall be of synthetic rubber.
 - f) Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.
 - g) Terminals shall be rail mounted screw type suitable for conductor size upto 2.5 mm². Terminals shall have screwed connection. An M6 earthing stud shall be provided.
 - h) Enclosure shall be IP: 65 or better.
 - i) 3mm (min) Gland plate shall be provided for cable entry.

2.14. Cable Sub-Tray & Support

1. The cable sub-trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the Bidder. It is the assembly of section and associated fitting forming a rigid structural system used to support the cable from the equipment or instruction enclosure up to the main cable trays (trunk route).



2. The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables.
3. The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables.

The Bidder shall furnish and install the estimated quantities and size of sub trays / troughs including all required fittings and adaptors on as required basis.

3. C & I ITEMS -VENDOR LIST

SL. No.	DESCRIPTION	VENDOR NAME
3.1	PLC SYSTEM	SIEMENS
3.2	SOLENOID VALVES(SOV)	ASCO SCHRADER ROTEX HERION
3.3	PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER / DP BASED FLOW / LEVEL TRANSMITER	YOKOGAWA HONEYWELL EMERSON PROCESS MANAGEMENT FOXBORO SIEMENS ABB
3.4	PRESSURE GAUGE	WIKI SWITZER PRECISION INDUSTRIES WAREE H. GURU INSTRUMENTS LTD GENERAL INSTRUMENTS A N INSTRUMENTS GAUGES BOURDON ASHCROFT WIKI GLUCK PYROELECTRIC FORBES MARSHALL
3.5	PRESSURE SWITCHES	SWITZER INSTRUMENTS ASHCROFT MENNSMAN REXROTH DRESSER
3.6	DIFFERENTIAL PRESSURE INDICATORS	SWITZER INSTRUMENTS WIKI INDFOS WAAREE GENERAL INSTRUMENT CONSORTIUM
3.7	DIFFERENTIAL PRESSURE SWITCHES	SWITZER INSTRUMENTS MENNSMAN REXROTH

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SL. No.	DESCRIPTION	VENDOR NAME
		ASHCROFT DRESSER WAAREE GENERAL INSTRUMENT CONSORTIUM
3.8	BYPASS / INLINE ROTAMETER	EUREKA TRAC ABB PLACKA
3.9	RTD	DETRIEV INSTRUMENTATION GENERAL INSTRUMENTS PYROELECTRIC INSTRUMENTS GOA PVT. LIMITED TOSHNIWAL INDUSTRIES PVT. LTD TEMPSSENS INSTRUMENTS (I) PVT. LTD.
3.10	THERMOCOUPLE ASSEMBLY	DETRIEV INSTRUMENTATION GENERAL INSTRUMENTS PYROELECTRIC INSTRUMENTS GOA PVT. LIMITED TEMPSSENS INSTRUMENTS (I) PVT. LTD
3.11	THERMOWELL	DETRIV INSTRUMENTS TECHNO INSTRUMENTS, AHMEDABAD ALTOP INDUSTRIES TEMPSSENS PYROELECTRIC GENERAL INSTRUMENTS
3.12	TEMPERATURE GAUGES	WIKI SWITZER PRECISION INDUSTRIES ASHCROFT PYROELECTRIC WAREE AN INSTRUMENTS H. GURU INSTRUMENTS LTD GENERAL INSTRUMENTS DRESSER-USA
3.13	TEMPERATURE SCANNER	MASIBUS
3.14	LEVEL TRANSMITTER FOR SOLID MATERIAL (RADAR)	ENDRESS & HAUSER EMERSON FOXBORO

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SL. No.	DESCRIPTION	VENDOR NAME
		SIEMENS HONEYWELL
3.15	LEVEL SWITCHES (FLOAT TYPE)	LEVCON MAGNETROL V AUTOMAT ENDRESS & HAUSER
3.16	LEVEL SWITCHES FOR SOLID MATERIAL (PADDLE TYPE)	ENDRESS & HAUSER LEVELSTAT
3.17	RF LEVEL SWITCH., VIBRATING FORK TYPE LEVEL SWITCH	ENDRESS & HAUSER LEVELSTAT EIP ENVIROEIP ENVIRO MAGNETROL
3.18	LEVEL SWITCHES (MAGNETIC TYPE)	MAGNETROL LEVCON ENDRESS & HAUSER
3.19	VIBRATION TRANSMITTER (LOOP POWERED – (24V DC) (ONLY FOR BOP/ UTILITY AREAS)	BENTLEY NEVADA MASIBUS PREDICTIVE & PROACTIVE TECHNOLOGIES PVT LTD HANSFORD EMERSON
3.20	WORK STATION HMI SCREEN / MONITOR	HP NEC
3.21	NETWORK HARDWARE- SWITCHES FOR DCS	CISCO
3.22	ETHERNET SWITCHES / ETHERNET TO FIBER OPTIC CONVERTERS	MOXA RUGGEDCOM HIRSCHMANN CISCO ARISTA
3.23	UNIT CONTROL DESK / PLC HMI CONTROL DESK	PYROTECH, UDAIPUR RITTAL
3.24	CHAIRS	GODREJ HOF
3.25	ACDB/DCDB/ MARSHALLING	PYROTECH, UDAIPUR RITTAL

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SL. No.	DESCRIPTION	VENDOR NAME
	PANELS / IPR PANELS	
3.26	LOCAL CONTROL PANELS / PANELS(PLC)	PYROTECH, UDAIPUR RITTAL PROCON POSITRONICS
3.27	CONTACTORS	EMERSON ABB L&T SIEMENS JYOTI
3.28	RELAYS / INTERPOSING RELAYS	JYOTI OMRON SIEMENS ABB L&T ALLEN BRADLEY OEN
3.29	DIGITAL DISPLAY UNIT (DDU)	MASIBUS EUROTHERM PYROTECH, UDAIPUR RADIX ENDRESS & HAUSER
3.30	BULK POWER SUPPLIES	PHOENIX SIEMENS PEPPERL + FUCHS WEIDMULLER
3.31	TIMERS	SIEMENS ENDRESS & HAUSER L & T RADIX
3.32	ANNUNCIATION SYSTEM/WINDOW for LOCAL CONTROL PANELS	MINILEC PROCON APLAB MASIBUS
3.33	CONTROL SWITCHES	KAYCEE ABB GEC ALSTHOM SIEMENS TEKNIK

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SL. No.	DESCRIPTION	VENDOR NAME
3.34	MINIATURE CIRCUIT BREAKERS	SIEMENS ABB L & T ENDRESS & HAUSER
3.35	ISOLATORS / SIGNAL MULTIPLIER/ SIGNAL CONVERTERS	MTL P & F PHOENIX
3.36	PUSH BUTTON	HONEYWELL SIEMENS TEKNIK KAYCEE TELE MECHANIC L&T
3.37	INDICATING LEDS/ILLUMINATED PUSHBUTTONS	L & T SIEMENS JAINSON COMEX HONEYWELL TEKNIC H&B
3.38	JUNCTION BOXES, FIELD TERMINATION CABINETS, MARSHALLING CABINETS	PYROTECH, UDAIPUR CEAG FLAME PROOF CONTROL GEARS FLEXPRO ELECTRICALS PVT LTD ELECTRO MECH RITTAL BALIGA LIGHTING EQUIPMENTS LTD.
3.39	WIRING TERMINATION ACCESSORIES, TERMINAL BLOCKS	WAGO ELEMEX WEIDMULLER PHOENIX
3.40	LOCAL INSTRUMENT ENCLOSURE (LIE) / LOCAL INSTRUMENT RACK (LIR)	PYROTECH INSTRUMENTATION LIMITED RITTAL CHEMIN
3.41	LABORATORY INSTRUMENTS,	YOKOGAWA NAGMAN GE DRUCK

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SL. No.	DESCRIPTION	VENDOR NAME
	MEASURING INSTRUMENTS	SCANDURA TINSLEY FLUKE
3.42	ERECTION HARDWARE (COMPRESSION TYPE FITTINGS)	SWAGELOK
3.43	CONDENSATE POTS / GLYCERINE SEAL POTS (MOC-SS)	EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI METPRESS ENGINEERING WORKS, KOLKOTTA MICROPRECISION, FARIDABAD PRECISION ENGG INDUSTRIES, MUMBAI
3.44	IMPULSE TUBES	RATNAMANI METALS & TUBES LTD HEAVY METAL & TUBES INDORE SUMITOMO CORPORATION SWAGELOK PARKER EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI BHEL MAHARASTRA SEAMLESS INDIAN SEAMLESS METAL TUBES LTD
3.45	VALVE MANIFOLDS (SS), ISOLATION VALVES (SS) FOR PRESSURE, FLOW, DP, LEVEL INSTRUMENTS	EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI WIKA SWAGELOK PRECISION ENGG INDUSTRIES, MUMBAI ILP BALDOTA BHARAT HEAVY ELECTRICALS LIMITED
3.46	INSTRUMENTATION CABLES	CORDS CABLE DELTON CABLE POLYCAB KEC KEI FINOLEX
3.47	COMPENSATING CABLE	FINOLEX DELTON CORDS CABLE

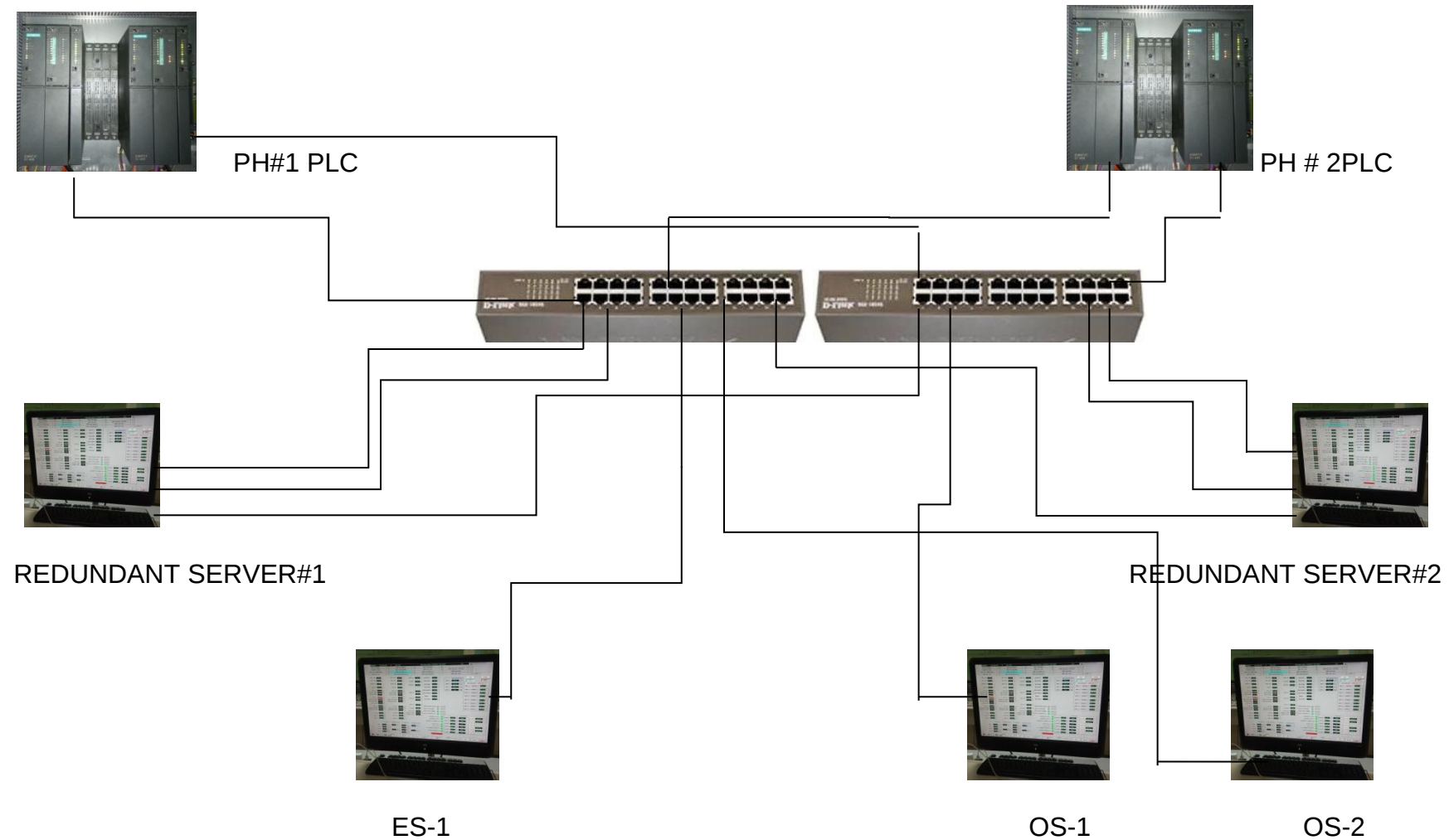
Gujarat Industries Power Company Limited (GIPCL)

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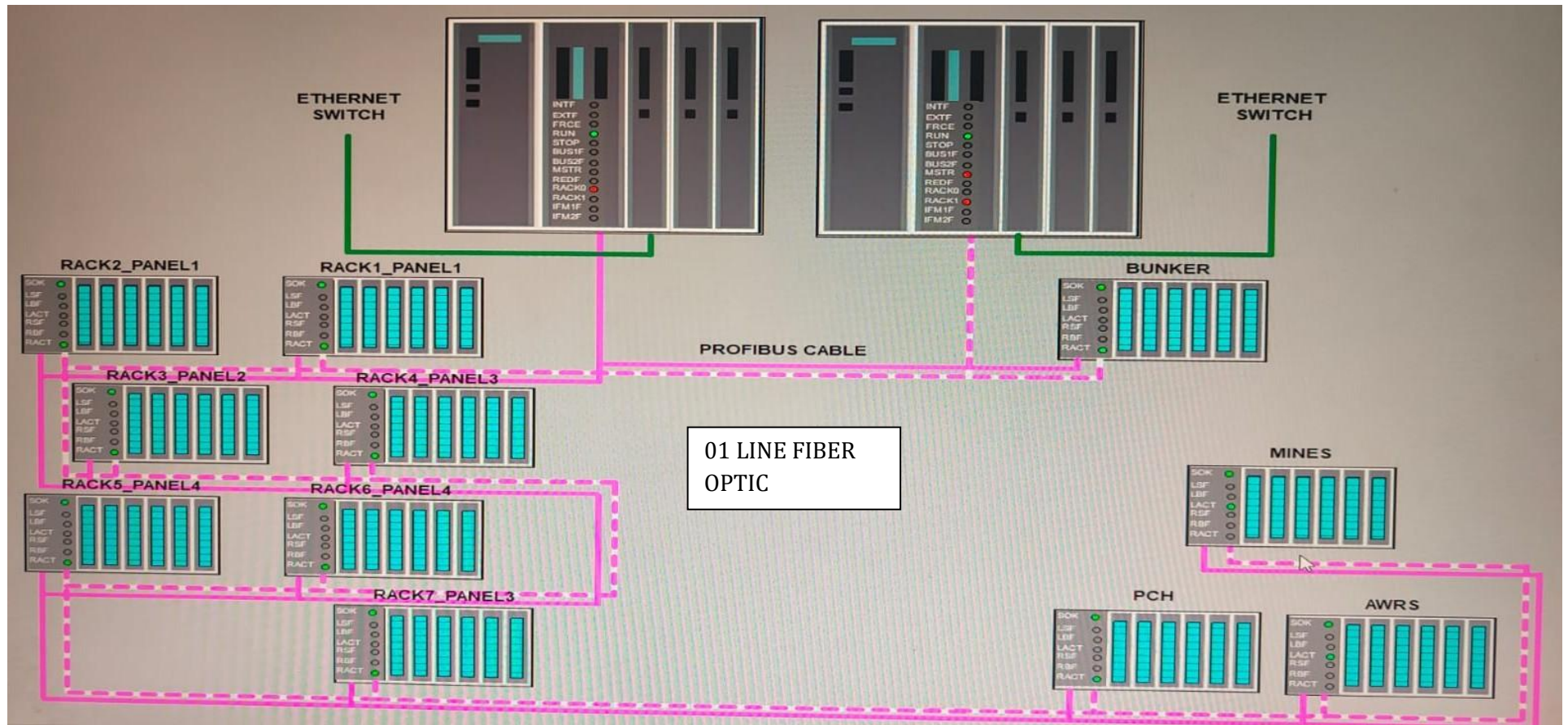
SL. No.	DESCRIPTION	VENDOR NAME
3.48	HIGH TEMPERATURE CABLE (PTFE)	TEMPSSENS THERMOCABLES LAPP CABLES DELTON KERPEN CABLES
3.49	ETHERNET CABLE (CAT-6 OR BETTER)	D-LINK FINOLEX DELTON STERLITE
3.50	FIBER OPTIC CABLE	FINOLEX HFCL STERLITE TECHNOLOGIES
3.51	SPEED SWITCH CONTROLLERS PROXIMITY SW AMPLIFIER RELAY MODULE	TURCK P & F
3.52	SPEED TRANSMITTERS	TURCK P & F
3.53	PROXIMITY SWITCHES	P & F TURCK
3.54	PULL CORD / BELT SWAY SWITCHES	JAYASHREE SIEMENS
3.55	PULL CORD INDICATOR	PARAMETRICS JAYASHREE
3.56	BELT WEIGHER FOR CONVEYORS	POWER BUILD LIMITED. SCHENK
3.57	METAL DETECTOR SYSTEM	RAMSAY POWER BUILD LIMITED. ELECTROMAG THERMO FISHER SCIENTIFIC

4. EXISTING LIGNITE HANDLING SIEMENS PLC AND HMI CONFIGURATION





PH#1 PLC SYSTEM



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SIEMENS PLC MODULES:

1	PS	407-0KR02-0AA0	4	IM	153-2BA02-0XB0	7	DO	322-1BL00-0AA0
2	CPU	417-4HT14-0AB0	5	CP341	341-1CH02-0AB0	8	AI	331-1KF01-0AB0 / 331-1KF02-0AB0
3	CP443	443-1EX11-0XE0	6	DI	321-1BL00-0AA0	9	AO	332-5HF00-0AB0



5. SCOPE OF SUPPLY

Tentative Scope of supply for C&I System is as under.

Any other instrument / item / hardware/ consumable required to complete the project shall be in the scope of bidder

Sr. No.	Item Description	Qty
1	PLC RIO PANEL complete with SIEMENS PLC modules, redundant power supply, I/O rack, I/O modules, FO and profibus communication modules and all required hardware and internal wiring	As per system requirement
2	Field Instruments Pull cord Switch Belt sway Switch Zero Speed Switch Brake Limit Switch	
3	Drive Tail End Push button station	
4	Vibration System	
5	Power Cable	
6	Instrument Cable	
7	FO cable (Multimode)	
8	Profibus cable	
9	Pressure Gauge / Pressure Transmitter / RTD / Thermocouple / Any other Transmitter / Pressure / Level switch, etc	
10	Junction Box	
11	All types of Hardware / Consumables	
12	Complete Belt Weigher system	

6. DATA SHEET TO BE FILLED BY BIDDER

Sr.	Document / Drawing	Category
1	PLC GA Drawing	Approval
2	Field Instruments	Approval
3	Belt Weigher	Approval
4	Cable Schedule (Power, Control, instrument)	Approval
5	Cable Tray Layout Drawings	Approval



6	Earthing Layout Drawing	Approval
7	Electronic Earthing	Approval
8	Control Philosophy / PLC Control Narrative	Approval
9	PLC I/O List (complete – all packages)	Approval
10	Instrument List / Instrument Index	Approval
11	Interlock List and Logic Diagrams (CLDs)	Approval
12	SCADA / HMI Screen Designs (preliminary)	Approval
13	As-Built Drawings – All	For Records
14	O&M Manuals – All equipment	For Records

7. FACTORY ACCEPTANCE TEST (FAT) REQUIREMENTS

FAT shall be carried out at the manufacturer's works before dispatch. GIPCL/PMC shall be given a minimum of 15 days advance notice for witnessing. FAT reports shall be submitted and approved before dispatch clearance is given.

7.1. FAT — PLC/RIO Panel

Sr.	Test Activity	Acceptance Criterion	Witness
1	I/O Loop Check (all DI, DO, AI, AO)	All I/O signals verified against I/O list; 100% check	
2	Control Logic Verification (sequence start/stop)	Start/stop sequences, interlocks per approved CLD; all verified	



Sr.	Test Activity	Acceptance Criterion	Witness
3	SCADA Interface and Mimic Screen Test	All process values displayed; alarms annunciated; trends logged	
4	Communication Network Redundancy Test	Primary path disconnect; automatic switchover to redundant path within 1 sec	
6	Cybersecurity Baseline Check	No unnecessary open ports; firewall configured; password protection	

8. QUALITY ASSURANCE PLAN (QAP) AND FIELD QUALITY PLAN

The Contractor shall prepare and submit a comprehensive QAP within 30 days of LoI/LoA/WO. The QAP shall cover: design, procurement, manufacturing, fabrication, supply, erection, and commissioning stages.

8.1. QAP Framework

- C&I Equipment ITP: PLC/RIO Factory Acceptance Test (FAT); instrument calibration certificates; loop check reports, Belt weigher, etc.

9. MANDATORY AND COMMISSIONING SPARE PARTS

The Contractor shall supply the following mandatory spare parts as part of the Contract, to be handed over to GIPCL at the time of Taking Over Certificate (TOC). Commissioning spares shall be available at site before commencement of commissioning.

9.1. Mandatory Spare Parts — C&I

Sr.	Item Description	Min. Qty.	Remarks
1	Spare field instruments — each type (zero speed, belt sway, pull-cord, chute block)	2 nos. of each type	



Sr.	Item Description	Min. Qty.	Remarks
2	PLC I/O modules — DI, DO, AI, AO	2 nos. of each type/density	
3	RIO Communication Module	1 no.	
7	Signal Isolator / Barrier — each type used	2 nos. per type	
8	Belt Weigher Controller	1 no.	

9.2. Commissioning Spares

The following items shall be available at site before commencement of commissioning. These are in addition to (and separate from) mandatory spares and shall be consumed/used during commissioning activities. Any unused commissioning spares at TOC shall be handed over to GIPCL.

Sr.	Item Description	Min. Qty.	Remarks
1	Cable glands and ferrules — all sizes and other spares as per OEM recommendation	5% extra of installed quantity	



10. PRE-COMMISSIONING AND COMMISSIONING REQUIREMENTS

10.1. Pre-Commissioning Checks — Package A

- Verify calibration of all field instruments against calibration certificates.
- Perform 100% I/O loop check between field instruments/devices and PLC I/O list.
- Test all interlocks per approved Interlock List: simulate each condition; verify correct response.
- Test SCADA/HMI: all process values displayed correctly; all alarms functioning; trends recording.
- Test communication network redundancy: disconnect primary; verify automatic switchover.

10.2. Commissioning — Hot Run (with Lignite)

- GIPCL to provide lignite for hot commissioning. Contractor to ensure all systems are pre-commissioned and cold-run approved before requesting lignite.
- Hot commissioning: Feeder Breaker and conveyor loaded with lignite; all process parameters monitored (vibration, temperature, flow rates).
- Stone removal demonstration: operators assigned at all 6 stone picking posts; demonstrated to GIPCL/PMC.
- VFD speed control range: demonstrated from minimum to maximum (5% to 100%) without hunting.
- Belt weigher accuracy: verified against weigh bridge during hot run.
- All dust suppression systems: operational during hot run; no excessive dust emission.
- 72-hour Trial Operation: monitored continuously; any downtime exceeding 1 hour to be noted; trial to be restarted if cumulative downtime exceeds 4 hours in any 24-hour period.