11.3 Earthing Electrode will be GI pipe for electrical system & Copper plate for instrument/ SCADA& Telecom system.

11.4 Minimum 10 Nos. GI Pipe electrodes for each station will be provided as per IS-3043 and asper site requirement. (6 Nos. for equipment , 2 Nos transformer body earthing, 2 Nos. Transformer neutral earthing).

11.5 Minimum 2 Nos. Copper Plate Electrodes will be provided for RTU / Control Panel at eachstation.

11.6 Minimum 2 Nos. Copper Plate Electrodes will be provided for Telecommunication System ateach station.

11.7 Minimum 2 Nos. Copper Plate Electrodes will be provided for UPS system at each station.

11.8 Lightning protection system shall be provided as per IEC 62305 and with class II lightingprotection system (LPS) and LPL –II.

11.9 Advanced maintenance free earthing with carbon backfill for process area and non-maintenance free for other than process area.

12.0 CABLES

Power & Control cables will have the following specification:

12.1 HT Power Cable (11 KV- UE)

- XLPE insulation
- Inner sheath will be ST2
- Inner and outer sheath will be extruded.
- Steel strip / wire armoured.
- Outer sheath of cable will be FRLS PVC, ST2 type.
- Voltage grade – 11000 V (UE)
- Applicable standard: IS-7098 Part I & II.

12.2 LT Power Cable (1.1 KV)

- XLPE insulation
- Inner sheath will be ST2
- Inner and outer sheath will be extruded.

- Steel strip / wire armoured.
- Outer sheath of cable will be FRLS PVC, ST2 type.
- Voltage grade – 1100 V
- Applicable standard: IS-7098 Part I & II.

12.3 Control Cable (1.1kV grade)

- Stranded Annealed Copper Conductor 2.5 sq mm.
- XLPE insulation.
- Inner sheath will be ST2
- Steel strip/wire armored
- Outer sheath of cable will be FRLS PVC, ST2 type.
- Voltage grade – 1100 V
- Applicable Standard: IS-7098 Part I.

12.4 Lighting Cable / Wire in conduit

- 1.5 mm^2 stranded Copper PVC insulated wire in concealed PVC conduit will be used in lighting fixtures.
- 3 core 2.5 mm^2 stranded copper cable (YWY) will be used for flameproof fixtures.
- 3 core 2.5 mm^2 stranded copper cable (YWY) will be used from outdoor lighting DB to junction box on the lighting poles.
- 3 core 2.5 mm^2 stranded copper cable (YWY) will be used from junction box on the lighting poles to lighting fixture.
- 4 core 2.5 mm2 stranded copper cable (YWY) will be used for lighting in shed area.
- 4mm2 stranded Copper PVC insulated wire in concealed PVC conduit for 5/15 amp switch socket, 20A Industrial switch socket.

CABLING SYSTEM

Cable laying philosophy:

A. Paved area: Cable tray/RCC trench

B. Unpaved area: Directly buried with sand cushioning, brick covered and warning tape and cable marker.
C. Type of cable trays: Galvanized prefabricated

13.0 SOLAR SYSTEM

Rating - Hybrid Solar system (800W continuous load)

Battery Bank - Ni-Cd (2x50%)

Redundancy - Parallel redundant

Back – up Time of Ni-Cd Battery - 72 Hrs. for Solar PV system

Solar Photo Voltaic System - Photovoltaic System (System capacity Min 10kWp)

11.0 SPLIT A.C. SYSTEM

11.1 All A/C will be supplied power 230V, 50 Hz, 1 Ph. & N and control room temperature will bemaintained 25°C ±2°C with 12 hrs. timer.

14.0 415V SWITCH BOARD

Switch board shall be equipped with energy saving device, APFCR and Meters with mod buscommunication.

15.0 POWER SUPPLY DETAILS

For SV stations of pipeline, a hybrid solar power system with battery back-up of 72 hours (3 days) considered for power supply to Critical loads (i.e. PCP system, Instrument, SCADA, Telecom).

A servo stabilizer (Automatic Voltage regulator) is also considered to improve the voltagelevel of rural feeder of SEB.

For R/T, D/T & IP stations UPS system (20/10 KVA) with 12 hrs. battery backup has been considered for power supply to Critical loads (i.e. PCP system, Instrument, SCADA, Telecom).

TRANSFORMER AND ITS MOUNTING ON DOUBLE POLE STRUCTURE WITHINDT/RT/IP / SV TERMINAL

Power connectivity from nearest available power source through Overhead Conductor/Cables(O/H or U/G) alongwith all requisite materials upto Double Pole structure of IGGL terminal shall be executed by SEB on depositary basis or by the Contractor (If SEB permits to executethis work by the Contractor). All the payments towards works executed on depositary basis shall be paid by the Owner.

Supply, Installation, Testing & Commissioning works of Distribution Transformer & Double Pole structure at IGGL terminal shall be executed by SEB on depositary basis or by the Contractor (If SEB permits to execute this work by the Contractor). All the payments towards works executed on depositary basis shall be paid by the Owner.

Contractor shall carry out all the required liasioning with concerned authorities for the above mentioned works including all works related to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State electricity Authority/Board etc.

16.0 STATUTORY APPROVAL

The submission of application on behalf of the Owner to Govt. Authority/ Central Electricity Authority, if required along with copies of required certificates complete in all respects, shall be done by the contractor well ahead of time so that the actual commissioning of are not delayed for want of approval from authority. The actual inspection of work by the Govt. inspector shall be arranged by the Contractor and necessary coordination and liaison work in this respect shall be the responsibility of the contractor. However any fee paid to the Govt. Authority in this regard shall be reimbursed by the Owner on submission of bills with documentary evidence.

The Inspection and acceptance of the work as above shall not absolve the Contractor from any of responsibilities under this contract.

17.0 DRAWINGS AND DESIGN DOCUMENTS

17.1 The following documents shall be submitted by the contractor before procurement/execution of the electrical items/works.

a) Filled up data sheet/Checklist.
b) HSE Policy
c) Bar Charts & Project completion schedule
d) QAP
e) Design documents/calculations
f) List of two years operation and maintenance spare.
g) Approx. dimensions of the system.

17.2 The following drawings (in three sets) & documents shall be submitted for approval within 3 weeks of award of contract.

a) Soil survey report with marked location vulnerable area.
b) Various Installation & Commissioning Procedures- Earthing, Lighting, PDB Panels, LDB Panels, Outdoor & Indoor lighting, UPS, Solar PV System, Battery Bank, Cable laying & termination etc.

c) QA & QC Procedures.
d) Various Data Sheets & Design for Approval- Lighting, PDB Panels, LDB Panels, Outdoor & Indoor lighting, UPS, Solar PV System, Battery Bank, Cable's, wiring, earthing & lightning etc along with basis of system design and design calculations, equipment selection criteria and sizing calculations, formulae used
e) Equipment layout, Cable layout & schedule.
f) Colour code identification for the various cables/ wires used in the system.
g) G.A. of various electrical equipments.
h) Schematic diagrams of various equipments.
i) Wiring diagram for reference.
j) Tentative Bill of Material

17.3 After the job completion, contractor shall prepare AS-BUILT drawings/data sheets and documents, submit catalogues/manuals (O&M) of major brought out items. Final certified as built drawings, documents and manuals etc shall be submitted by the contractor to owner in bound volume with one set in soft copy (CD) plus five sets of prints to owner & one set to VCS.

Other drawings and documents shall be submitted by contractor/VCS along with AS-BUILTDrawings/Datasheets-

a) Test documents & drawings for bought out items.
b) Detailed commissioning report of each station.
c) As-built Earthing & lightning layout with commissioning report.
d) As-built lighting layout with lux level at each point.
e) Installation, Testing & commissioning documents.
f) Displaying of Hazardous area classification, Earthing layout drawings atSV/IP/DT & RT.

Energising Quality	**PROJECT NUMBER: C221052**	IGGL

11KV HT SYSTEM SCOPE OF WORK			TOTAL SHEETS		19
DOCUMENT NO.	C221052	00	EL	SOW	4002

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

C1	13.05.2022	ISSUED FOR IDC	VV	RD	AA
B1	02.05.2022	ISSUED FOR IDC	VV	RD	AA
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHKD**	**APPR**

ABBREVIATION

CEA	Central Electricity Authority
SEA	State Electricity Authority
BS	British Standards
IGGL	Indra Dhanush Gas Grid Limited (IGGL),
PNGRB	Petroleum and Natural Gas Regulatory Board
OISD	Oil Industry Safety Directorate
MEDB	Main 11KV HT system Distribution Board
XLPE	Cross-Linked Polyethylene.
PVC	Poly Vinyl Chloride
NEC	National 11KV HT system Code
UPS	Uninterruptible power systems
CMS	11KV HT System
MOV	Motor Operated Valve
ACB	Air circuit breakers
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MPCB	Motor Protection Circuit Breaker
CT/PT	Current Transformer/Potential Transformer
ELCB	Earth Leakage Circuit Breaker
PDB	Power Distribution Board
O/ILDB	Outdoor/Indoor Lighting Distribution Board
FRLS	Flame Retardant Low Smoke

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1.0 DEFINITION

Where used in this document, the following terms shall have the meanings indicated below, unless clearly indicated by the context to this order:

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
OWNER	Indradhanush Gas Grid Limited
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of the OWNER for the Engineering Services
VENDOR / MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR.

2.0 INTRODUCTION

VCS Quality Services Pvt. Ltd. (VCS) has been appointed as a PMC (Project Management Consultant) by IGGL for **"PMC Services for North East Gas Grid Phase-III of IGGL."**

Indradhanush Gas Grid Limited (IGGL), a joint venture (JV) of IOCL, ONGC, GAIL, OIL and NRL has been entrusted with the responsibility to execute cross country natural gas pipeline connecting all states of the North East and Sikkim. The natural gas Pipeline grid in North East would connect Guwahati to capital cities / major cities of North East states like Itanagar, Dimapur, Kohima, Imphal, Aizawl, Agartala, Shillong, Silchar, Gangtok and Numaligarh. The grid would be connected with upcoming Barauni-Guwahati natural gas pipeline as a part of Urja- Ganga scheme. The grid would also connect to sustainable and viable indigenous gas sources in North-East.

The pipeline grid has been designed with flexibility for gas injection in either direction.

3.0 PROJECT BRIEF

Salient details of the tentative pipeline sections under VCS's scope of work are as under:

A) Siliguri – Gangtok Pipeline (dia. 12") – tentative length is 186 Kms.

The pipeline in this section originates from a tap off point on Barauni-Guwahati pipeline at Siliguri and traverses through plain agricultural land and forest land for initial 50 odd kilometers which includes the crossing of Teesta River. Thereafter, the pipeline traverses through hilly terrain along the new highway under construction up to Lava, which is approximately at Ch.108.000 km of this pipeline section and thereafter follows the route of NH-717A up to near Ranipool area. The total area traversed by this pipeline section thus comes out to be approximately 186 km.

B) Dimapur – Kohima-Imphal Pipeline (dia. 12") – tentative length is 199 Kms

The proposed pipeline route traverses through plain agricultural land and forest land for initial 5 odd kilometers and then enters the ghats/hilly terrain and traverses through it till Senapati town which is approximately at Ch.155.000 km of this pipeline section (en route taking the under-construction Kohima Bypass Road) and then runs through more or less plain area till Sekmai. The total area traversed by this pipeline section thus comes out to be approximately 199 km.

Summary of various stations envisaged in the proposed North East Gas Grid Phase-III of IGGL are as under:

A) <u>SILIGURI – GANGTOK PIPELINE (SGPL)</u>

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	1	Siliguri
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava
3	Receipt Terminal (RT/SGPL) with/ without Tap off	1	Gangtok
4	Sectionalizing Valves Stations with/without Tap off	3	Along the Siliguri-Gangtok route

4.0 PIPELINE SIZE, LENGTH AND DESIGN CONDITIONS

Detail of the pipeline is given below:

SL. No	Process Fluid	From	To	Size (Inch)	Length (km)	Design Pressure	Design Temp.
1	Natural gas	Siliguri	Gangtok	12”	186	92	-29 to +65

4.1 Multi Products Pipeline Details

A) Design Pressure: 92kg/Cm2g

B) Design Temperature; -29° TO +65°C

C) Pipeline Size: - 12" (90.5 km),

D) Pipeline Material: - API 5L Gr. X 70 PSL 2

E) Pipeline Wall Thickness; -7.14mm / 8.38 mm

F) Pipeline Total Length (APPROX.): - 385 Km (Approx.)

G) Pipeline Corrosion Coating; - 3LPE (EXTERNAL

4.2 SITE CONDITIONS

Parameters	
Max / Min. Temperature	50/-5 °C
Design Temperature	50°C
Relative Humidity	95%
Altitude above Sea level	Up to 1000 Meters
Atmospheric pollution	Designed to withstand the site conditions, dust, vapour, Industrial Gases
Hazardous Area classification	Zone-2, Gas group IIA, IIB,
Control Room/ 11KV HT system / D.G. Room/Guard	Safe area

5.0 GENERAL REQUIREMENTS

This document is to describe the scope of 11KV HT system work which will be used for “NORTH EAST GAS GRID PHASE-III OF IGGL”.

In case of conflicting requirement of tender documents, following priority shall govern in general. However, in case of conflict, it shall be referred to Client for clarifications and decision of Client shall be final and binding with or without any cost implications

- The requirements of any statutory body shall govern.
- SOR/Data Sheets
- This specification / Basis of design
- Scope of Works
- Latest Code & Engineering Standards

This document establishes minimum requirements of 11KV HT system Design Parameters and Basis for Design and Detailed Engineering of the North East Gas Grid Phase-III of IGGL Pipeline network & associated facilities covered under this project as defined briefly herein below.

The scope of specification shall provide the minimum requirements & form the basis for carrying detailed design engineering for 11KV HT system power system, sizing of various 11KV HT system equipment's, & their supply, installation, testing & commissioning of the 11KV HT system for North East Gas Grid Phase-III of IGGL Pipeline network & associated facility. This document also provides the general guidelines for preparation of 11KV HT system specification, datasheets and other relevant documents.

This section covers the details of work tendered and scope of work pertaining to 11KV HT system work including supplying, fabrication, erection, inspection and testing, supplying material and consumable providing pre-commissioning and commissioning assistance to owner, clean up and restoration of site for North East Gas Grid Phase-III of IGGL DT, RT IP & SV Stations.

Work to be carried out by the Contractor shall include as a minimum, but not limited to, the following:

a) Supply, installation, testing & commissioning of the all-complete 11KV HT system shall be performed as per enclosed specifications, data sheet and construction drawings.

b) Transportation of all supplied materials to workshop(s) / worksite(s) including handling, loading, unloading, stacking, storage including arranging all necessary storage area(s) thereof, as required.

c) Providing all labour, consumable materials, tools, tackles, test equipment, site transportation, supervision and services to perform all necessary works

d) Obtaining all necessary statutory approvals and permissions including safety permits from the concerned authorities/station in-charge having jurisdiction, for performing the work including shifting of any obstruction etc. as may be required and restoring any such facility disturbed during construction at its location.

e) "Receiving and Taking-over" of all materials from the OWNER designated place(s) of issue; transportation, unloading, from place(s) of issue to Contractor's own stock yard(s) / work site(s) / workshop(s) including arranging all necessary storage area(s) thereof till the materials are installed in permanent installation. Handling, storage and safekeeping of all materials until they are used in the system or the same are handover to OWNER including making own arrangement for warehousing and security of such materials.

f) All associated civil work such as excavation, backfilling and removal of excess soil from site for directly buried cables, earth strip, cable protection pipes, earth pits, lighting pole foundation, making of earth pit chamber, grouting of base plate supports and foundation bolts, chipping of concrete or brick work and making good the same after installation of equipment, sealing of cable entries and other similar jobs; supply and spreading of sand, bricks, concrete foundation for street light poles, earth pit chamber.

g) Collection of all as-built details in appropriate formats required for generation of as-built drawings and documents and submission of an as-built dossier including drawings, project records, video records, photographs, inspection and test records and other quality records as per specifications and instructions of Engineer-in-Charge.

h) All coordination with and providing required assistance to other agencies / contractors, engaged by OWNER for, Civil, Mechanical, Piping, SCADA & Telecom works, and commissioning operations.

i) Horizontal and vertical cable laying in trenches/cable-trays/racks, pulling thru pipes on walls/columns, steel structures including supply and fixing of necessary GI saddles, saddle bars, cable tags, GI/Al clamps for cables laid on vertical walls/columns/structures.

j) Cable termination and connection of leads, both indoor/outdoor type including drilling, taping of cable insulation, crimping of lugs, supply and fixing of GI nuts, screws, bolts, washers and other necessary hardware.

Any other works not specifically listed herein but are required to complete the Works covered in the Contract.

6.0 TECHNICAL REQUIREMENTS

The work shall be performed in conformity with, standard specifications and installation standards enclosed and code of practices of the Bureau of India Standards. In case of any conflict, the stipulations under this specification shall govern.

In addition, the work shall also conform to the requirements of the following:

i. The Indian Electricity Act and the rules framed there under

ii. The fire Insurance Regulations

iii. The regulations lay down by the Chief Electrical Inspector of the state government / Central Electricity Authority (CEA).

iv. The regulations lay down by the Factory Inspector.

v. The regulations lay down by the PESO/Chief Inspector of Explosives.

vi. IS-9920 Part-I to V

vii. IS-2544/1973- Porcelain post insulators

viii. IS-2633- Galvanization of ferrous parts

ix. IS-9921 Part I to IV

x. IS-5340 Part-III

xi. M.B.Lal committee recommendations for electrical installations.

xii. PNGRB guidelines (as applicable)

xiii. OISD standard (as applicable)

xiv. Any other regulations lay down by the Central, State or Local Authorities from time to time during the pendency of this contract.

xv. The contractor shall guarantee the installation against any defects of workmanship and materials (supplied by the contractor) for a period of 12 months from the date of issue of the completion certificate. Any damage or defects connected with the erection of materials, equipments or fittings supplied by the contractor that may be undiscovered at the time of issue of the completion certificate, or may arise or come to light thereafter, shall be rectified or replaced by the contractor at his own expense as deemed necessary and as per the instruction of the Engineer-in-charge within the time limit specified by the Engineer-in-charge. The above guarantee shall be applicable for the quality of work executed as well as for the equipment / cable / fittings/ other material supplied by the contractor.

xvi. (Dry during summer, Humid & Heavy Rainfall during Monsoon)

xvii. 11kV Power supply is considered available at IP terminal, SV terminal & Receiving terminals.

xviii. NORMAL POWER 11kV, 3Ph VARIATION As per SEB FREQUENCY 50 Hz ± 5% FAULT LEVEL HT SIDE OF TRANSFORMER 26.3 kA for 3 sec or As per SEB (Whichever is higher) FAULT LEVEL LT SIDE OF TRANSFORMER 10kA for 1 sec for Single Phase 30kA for 1 sec for Three Phase

7.0 SCOPE OF DESIGN & ENGINEERING

i. Submission of electrical equipments selection criteria & respective design calculations, inspection & test plan, installation & commissioning procedures, drawings for

Review/Approval, preparation of site engineering drawings and details for installation works wherever applicable or required by the Engineer-in-charge & final commissioning reports, submit to the Engineer-In-charge for Review/Approval.

ii. Selection & design of all HT electrical equipment shall be as per relevant Indian & International standards & contractor shall submit installation & commissioning drawings for 2-Pole structure & associated equipments approval.

iii. Correction, updating and submission of all Owner's/Tender's drawings for as-built status.

iv. Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation and drawings from the Chief Electrical Inspector of the State

v. Government/Central Electricity Authority and other statutory authority as required. This includes

vi. equipments installed or commissioned by others within the battery limit. This is for the purpose of obtaining a comprehensive approval from competent authority.

vii. 11kV GANG OPERATED AIR BREAK SWITCH

This section covers Design, manufacturing, testing at manufacturer works and supply of 11 KV, 200 Amps, 50HZ triple pole gang operated, outdoor type, single throw, single break tilting type manually operated AB Switches suitable for vertical mounting. The A. B. Switches offered shall be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components shall be deemed to be within the scope of supplier's supply, irrespective of whether those are specifically brought out in the specification and/or in order or not. Also similar parts particularly removable ones shall be interchangeable.

viii. Description of the materials

The 11KV A.B. Switch (3 Pin Type) sets shall confirm to the following parameters

a) Number of poles 3

b) Number of Post insulator per pole 3 nos. 12KV post insulator.

c) Nominal system voltage 11KV

d) Highest system voltage 12KV

e) Rated frequency 50Hz

f) System earthing effectively Unearthed.

g)Rated nominal current 200 amps

h)Altitude of installation Not exceeding1000M

The post insulators used in the A.B. Switches shall have the following ratings:-

a) One minute power frequency withstand voltage between

b)Earth & poles 28 KV (rms)

c) Across terminal of open switch 32 KV (rms)

Rated lightning impulse withstand voltage between

a) Poles & Earth 75 KV (Peak)

b) Across terminal of open switch 85 KV (Peak)

c) Short time current 26.2 KA for 1 second

ix. General

The 11 KV A.B. Switch Set shall be the gang operated rotating single air break type having 3 post insulators per phase. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over travel or staining that might adversely affect any of its parts. The required base M.S. Channel (hot dip galvanized) phase coupling rod, operation rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and medium gage of 32mm diameter nominal bore G.I. pipe single length 6 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia nominal bore G.I. pipe. The Rating post insulators shall be provide with suitable bearing mounted on a base channel with 8mm dia thrust collar and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia – 32mm) for gang operation through another suitable bearing by two numbers 10mm dia stainless steel bolts with double nuts. All the bearings shall be provided with grease nipple. All metal (ferrous) parts shall be galvanized an polished. The pipe shall be galvanized in accordance with IS-4736/1968.The post insulators should be fixed with the base channel using Galvanized Nuts and Bolts.

x. **Mounting :-** The A.B. Switches shall be suitable for Vertical mounting in double pole sub-station structures.

xi. **Switching Blades ;-**It shall be made out of electrolytic copper with silver plated. Contractor shall submit its size for approval. The Switch shall have such a spring

mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.

xii. **Fixed Contracts :-** The Fixed Jaw type female contacts shall be made of electrolytic copper (minimum 99% copper composition) duly silver coated controlled by stainless steel high pressure spring housed in robust G.I. Cover. It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of move contract blade without the same being transmitted to the post insulator. The male and female contacts assemblies shall be of sturdy construction and design to ensure Electro dynamic withstand ability during short circuits.Thermal withstand-ability during short circuits.

a)Constant contact pressure even when the live parts of the insulator stacks are subject to tensile stresses due to linear expansion of connected bus bar of flexible conductors either because of temperature variation or strong winds.

b)Self-wiping action during closing and opening.

c) Self-alignment assuring closing of the switch without calling for any adjustment.

xiii. Arcing Horn

A set of adjustable arcing horns made from 2 SWG G. I. Wire shall be mounted on each insulator stack of G.O. Switch. The supplier shall supply a graph showing impulse and power frequency spark over voltage for various gap settings of arcing horns.

xiv. Terminal Connectors

Terminal connectors shall be robust in design. The fixed connector & movable connector shall be shall be of copper casting with uniform machine finishing duly silver plated made out of minimum 95% copper composition with 2 nos. 12mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2 nos. bimetallic solder less sockets suitable upto 80 mm2 conductor. Contractor shall submit size of fixed connector & movable connector for Approval.

xv. Spacing

The minimum clearance between phases to the switch shall be 760mm. The operation down rod shall be at a transverse distance of 300mm from the outer limb of the switch. The centre spacing between two post insulator of the same phase shall be

380mm. In the open position of the A.B. switches the moving blade shall rotate through 90o. This shall be exhibited in the drawing.

xvi. Name Plates

The switches shall be provided with a nameplate, which contains the information in accordance with IS-9921 (part I to V). The name plates will be weather & rust proof.

xvii. Completeness of Equipment

All fittings, accessories or apparatus which may not have been specially mentioned in this specification but which are otherwise necessary for satisfactory working of G.O. switches shall be deemed to have been included in the scope of supply.

xviii. Packing & Transportation

The supplier shall be responsible for suitable packing of all the material and marking on the consignment to ensure correct dispatch to the destination. All G.O. Switches shall be packed suitably capable of withstanding rough handling for transportation to the various consignees so as to avoid any shortage and damage occurring during transit. Separators shall be fixed between the post insulators and other breakable parts of GO Switch and also between individual GO Switches so as to prevent relative movement to avoid damage. All the labels used on each packing shall be of tin securely bounded with wire and shall have the descriptive marking stamped thereon. All GO Switches damaged during transportation shall be to the suppliers account.

xix. Type Test

a) Certificate for the following type tests conducted on a prototype set of A.B. Switch in a NABL approved test house/CPRI shall have to be submitted along with offer. Dielectric Test (impulse and one minute were power frequency withstand voltage test.)

b) Temperature rise test (for contracts and terminals)

c) Shorts Time current and peak withstand current test.

d) Mainly active load breaking capacity test.

e) Transformer off-load breaking capacity test.

f) Line charging breaking capacity test.

g) Cable charging breaking test.

h)Operation and mechanical endurance test.

i) Mechanical strength test for post insulator, as per IS-2444/1937 shall be furnished.

j) Test for galvanization of metal (ferrous) parts.

xx. Routine /Acceptance Test

The following routine tests shall have to be conducted on each set by Owner/Third Party agency of the materials at the works of the manufacturer as per relevant IS/IEC. The supplier shall give fifteen days advance intimation to the Purchaser to enable him to depute his representative for witnessing the tests.

a) Power frequency voltage dry test.
b) Measurement of resistance of main circuit.
c) Tests to prove satisfactory operation.
d) Dimension Check
e) Galvanization test.
f) Operational test.

xxi. DROP OUT FUSES

The D.O. Fuses are intended for use on Distribution transformers for protection/isolation of the same during overload or fault conditions of lines. The drop out fuse shall conform to IS: 9385 (Part-I to III) as amended from time to time. The drop-out fuses shall be expulsion type. The equipment offered by the tenderer shall be suitable for 11KV, 3 Ph 50 Hz solidly grounded earthed neutral systems. It shall be designed for a normal current rating of 200 Amps. The drops out fuses are required with Post Insulators. These shall be suitable for mounting on the structure. The bracket/channel hardware's for D.O. Fuses shall be provided with adequate sizes of nuts, bolts and washer for mounting on the structures of the purchaser.

xxii. POST INSULATORS

Each 11 KV D.O. Fuse shall have two nos. 11 KV Post Insulators. The insulators shall conform to IS: 2544 of 1973 with latest amendments. The porcelain used for manufacture of D.O. Fuse shall be homogeneous, free from flaws or imperfections that might effect the mechanical or dielectric strength adversely. They shall be thoroughly vitrified tough and impervious to moisture. The glazing of the porcelain shall be of uniform brown colour free from blisters, burns and other similar defects. Insulators of the same rating and type shall be interchangeable. The porcelains and metal parts shall be assembled in such a manner that any thermal expansion differential between the metal and porcelain parts through range of temperature variation shall not loosen parts or create undue internal stresses which may affect the electrical or mechanical strength and rigidity. Each cap and base pin shall be made of high grade cast steel or

malleable steel casting and they shall be machine faced and smoothly galvanized. The cap and base shall be properly cemented with insulators to give perfect grip. Excess use of cement shall be avoided. Each 11KV Post Insulators should have technical particulars as detailed below:-

a) Nominal system voltage KV (rms) 11
b) Highest system voltage KV (rms) 12
c) Dry Power Frequency one KV (rms) minute 35
d)Withstand voltage
e) Power Frequency puncture KV (rms) Voltage 1.3 times the actual dry
f) Flashover voltage
g) Impulse withstand voltage KV (rms) 75
h) Visible discharge voltage KV (rms) 9
i) Creepage distance in mm (minimum) 320
j) Cantilever strength (KN) 6.60

xxiii. As **stated** above unless otherwise modified in this specification the drop out fuse shall conform to IS: 9385 (Part-I to III) and as amended from time to time. The rated lightning impulse withstand voltage for positive and negative polarities shall be as given below:-

a) To earth and between pole 75 KV Peak
b)Across the isolating distance of fuse base 85 KV Peak

Rated one minute power frequency withstand voltage (dry and wet) values for the fuse base-

a) To earth and between pole 28 KV Peak
b)Across the isolating distance of fuse base 32 KV Peak

xxiv. RATED BREAKING CAPACITY

The rated breaking capacity shall be 8KA (symmetrical). Bidder shall submit type test reports/certificates of DO fuses along with offer.

xxv. MAIN CONTACTS

The main contacts of the D.O. Fuse shall be suitable for heavy duty, properly aligned, made from Brass material. These shall have good finish and smooth surface and shall be silver plated. All the sharp edges shall be rounded off. These contacts shall be so designed to withstand highest short circuit breaking current that may be encountered during service. In nut-shell the contact assembly shall ensure:-

i. Electrodynamic withstand ability during short circuit without any risk of repulsion of contact.

ii. Thermal withstand ability during short circuits.

iii. Constant contact pressure even when the lower parts of the insulator stacks are subjected to tensile stresses due to linear expansion of connected bus bar or flexible conductors either because of temperature variation or strong winds.

iv. Proper alignment to ensure smooth operation of D.O. Fuse without adjustment.

xxvi. CONNECTORS

The connectors shall be made from Brass suitable for ACSR/AAAC Squirrel/Weasel & Rabbit, Raccoon & Dog. The connectors should be bolted type having 4 bolts & groove to hold the conductor. All brass parts should be silver plated for corrosion resistance and efficient current flow. All ferrous parts should be hot dip galvanized as per the latest version of IS: 2633. Nuts and bolts shall conform to IS: 1364 and should be hot dip galvanized. Spring washer should be electro galvanized.

xxvii. FLY NUTS

These shall be provided at both the ends of Epoxy Resin Fiber Glass (ERFG) tube for tightening the fuse element. The nut shall be provided with one flat washer of 1 mm thickness. The arrangement shall be made to ensure that the fuse wire runs centrally inside the ERFG tube after tightening. The fly nuts should have at least 4 threads with adequate wall thickness.

xxviii. SPRING STRIPS

The spring strips shall be of phosphor bronze multi line brush type having a high pressure contacts and should retain its tension under minimum continuous service current of 200 Amps at 90 ○˚C.

xxix. Completeness of Equipment

All fittings, accessories or apparatus which may not have been specially mentioned in this specification but which are otherwise necessary for satisfactory working of DO fuses shall be deemed to have been included in the scope of supply.

xxx. D.O. BARRELS (CARRIER TUBES):-

The carrier tube made of Epoxy Resin Fibre Glass (ERFG) and conforming to the following specification shall be used for 11KV D.O Sets:-

8.0 EQUIPMENTS DETAILS REQUIREMENTS

a) This specification governs the requirement for an electrical grade tube with good mechanical and high heat resistance properties, made from fine woven glass fibre

cloth, impregnated with epoxy resin. Tube shall be well consolidated of circular cross section and uniform wall thickness with ends trimmed smoothly at right angles to the axis of the tube. The external surfaces shall be brown in colour and shall be uniformly finished with polyuret and varnish or epoxy resin. The tube has a temperature index of at least 155°C.

b) **APPLICATION-** Used as fuse carrier in 11KV Drop out Fuses.

c) **COMPLIANCE WITH-** Indian Standard Specification no.10192

d) LIGHTNING ARRESTOR

e) The section covers the design, manufacture, shop testing before dispatch, supply, delivery, erection, testing & commissioning of 9 KV, static class heavy rating, gapless, metal (zinc) oxide lighting arrestors complete along with clamps, complete fitting and accessories for installation on outdoor type 11 kV Double pole structure.

f) System parameters

(i) Nominal system voltage 11Kv
(ii) Highest system voltage 12Kv
(iii) System earthing Effectively earthed system
(iv) Frequency (Hz) 50
(v) Lightning Impulse withstand Voltage (kVP) 75
(vi) Power frequency withstand Voltage (kv rms) 28
(vii) Arrestors duty
-Connection to system Phase to earth
-Type of equipment to be protected 11 KV transformers & Switchgear

g) Lighting Arrestors

(i) Type Gapless Metal oxide – outdoor
(ii) Arrestor rating (KV rms) 9
(iii) Continuous Operating voltage (kV rms) 7.65
(iv) Nominal discharge Current: 5 Rating (KA)
(v) Long Duration discharge class Distribution Class
(vi) Degree of protection IP 55
(vii) Maximum residual voltage at 5 KA (KV peak) 32
(viii) Maximum switching lighting residual 24 Voltage (kVp) at 1Ka
(ix) Partial discharge at 1.05 COV not greater than (PC) 50

(x) High current impulse withstand voltage 100 at 65 kA (kVp)

h) Insulator Housing

(i) Power frequency withstand test voltage (Wet) (kV rms) 28
(ii) Lighting impulse withstand / tests voltage (kVP) 75
(iii) Creep age distance not less than 320
(iv) Pressure relief class B

i) General Requirement

The equipment along with all accessories shall be capable of performing intended duties under specified conditions. The Contractor shall guarantee the reliability and performance of the individual equipment as well as of the complete system as specified in the bid documents. The lighting arrestor shall be provided with line and earth terminals of suitable size & lightning counter. The line side terminal shall be suitable for AAA conductor or ACSR weasel / rabbit conductor.

i) The metal oxide gap less Lighting Arrestor without any series or shunt gap shall be suitable for protection for 11KV side of Distribution Transformers, associated equipment from voltage lightings resulting from natural disturbance like lightning as well as system disturbances.

ii) The lighting arrestor shall draw negligible current as operating voltage and at the same time offer least resistance during the flow or lighting current.

iii) The lighting arrestor shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing / silicon polymeric of specified creep age distance.

iv) The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.

v) The lighting arrestor shall be provided with line and earth terminal of suitable size. The ground side terminal of lighting arrestor shall be connected with 25x6 mm galvanized strip.

vi) The lighting arrestor shall not operate under power frequency and temporary over voltage conditions but under lighting conditions, the lighting arrestor shall change over to the conducting mode.

vii) Lighting arrestors shall have a suitable pressure relief system to avoid damage to the porcelain / silicon polymeric housing and providing path for flow of rated fault currents in the event of arrestor failure.

viii) The reference current of the arrestor shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.

ix) The Lighting Arrestor shall be thermally stable and the supplier shall furnish a copy of thermal stability test along with the bid.

j) Arrestor Mounting

The arrestors shall be suitable for mounting on 4 pole/2 pole structure used for plinth mounted transformer and for incoming and outgoing lines.

k) Fittings & Accessories

The lighting arrestor shall be complete with insulating bases, fasteners for stacking units along with clamp & terminal connectors and inbuilt disconnector. The terminals shall be non-magnetic, corrosion proof, robust and of adequate size and shall be so located that incoming and outgoing connections are made with minimum possible bends. The top metal cap and base of lighting arrestor shall be galvanized. The line terminal shall have built in clamping device, which can be adjusted for both horizontal and vertical take off.

l) Drawings, Documents and Design Calculations

Bidder to submit followings along with the bid:

i) Sectional drawings

ii) Mounting arrangement

m) Completeness of Equipment

All fittings, accessories or apparatus which may not have been specially mentioned in this specification but which are otherwise necessary for satisfactory working of Lightning Arrestor shall be deemed to have been included in the scope of supply.

n) Name **Plate**

The nameplate attached to the arrestor shall carry the following information:

i) - Rated Voltage

ii) - Continuous Operation Voltage

iii) - Normal discharge current

iv) - Pressure relief rated current Manufacturer Trade Mark

v) - Year of Manufacture

vi) - Name of Scheme

o) **DANGER** CAUTION **BOARDS**: The danger of caution boards shall have to be displayed on pole and transformer

p) Test on **Lighting Arrestors**

The lighting Arrestors offered shall be type tested from NABL accredited laboratory. Copies of test certificates shall be furnished by the bidder for scrutiny. Routine and Acceptance tests shall be carried out in accordance with IS: 3070 (Part-3)-1993. The purchaser representative will witness the acceptance test at the works of manufacturer. The suitability of the Lighting Arrestors shall also be established from the following:

i) - Residual voltage test

ii) - Reference voltage test

iii) - P.D. test

iv) - Sealing test

v) - Thermal stability

vi) Metal oxide block shall be tested for guaranteed specific energy capability in addition to routine / acceptance test as per IEC / IS.

vii) The maximum residual voltages corresponding to nominal discharge current of 5 kA for steep current, impulse residual voltage test, lightning impulse protection level and switching impulse level shall generally conform to relevant IS.

viii) The suppliers shall furnish the copies of the type tests and the characteristics curves between the residual voltage and nominal discharge current of the offered lighting arrestor and power frequency voltage v/s time characteristic of the lighting arrestor subsequent to impulse energy consumption as per clause 6.6 of IS ; 3070 (Para-3) offered along with the bid. The lighting arrestor housing shall also be type tested and shall be subjected to routine and acceptance tests in accordance with IS: 2071.

9.0 AREA CLASSIFICATION

Hydrocarbon handling areas have been generally classified as zone 1&2, gas group IIA/IIB as per IS: 5572, API RP-500, OISD - 113 and IP Rules. All equipments to be installed in these areas shall be suitable for the area classification with temperature

class T3 (200^{0}C), CMRI testing and approved by PESO/CCOE, DGFAS and having BIS license.

10.0 JOB SPECIFICAITONS

Various electrical works covered under this contract like equipment erection, cabling and grounding works, etc. shall be performed in accordance with specifications attached with this tender. (Certain clauses of specifications, which are applicable to equipments or system not covered under this contract, shall not be applicable). Erection and commissioning of certain special HT equipments shall be performed in accordance with supplier's instructions and directions of the Engineer-in-charges under supervision by equipment supplier/s. The equipments/materials to be supplied by the contractor shall conform to the requirements of the applicable specifications enclosed in the tender document.

11.0 STATUTORY APPROVAL OF WORKS

All works relating to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State Electricity Authority/Board etc, shall be in the scope of contractor. The application on behalf of the owner for submission to Electrical Inspector /PESO/ DGMS etc. along with copies of required certificates and drawings, complete in all respects, shall be prepared by the contractor and submitted to the Engineer-in-charge for onward transmission well ahead of time so that the actual commissioning of equipment are not delayed for want of inspection by the Electrical Inspector / DGMS. The actual Liaison work shall be arranged by the Contractor and necessary coordination and liaisons work in this respect shall be responsibility of the contractors. However, the Owner on submission of bills along with documentary evidence shall reimburse any fee paid to the statutory Authority in this regards.

12.0 MAKES OF EQUIPMENTS AND MATERIALS

All equipments / materials supplied by the contractor shall be as per the list of approved makes enclosed with this document subject to submission of Certification and approvals.

13.0 QUALITY ASSURANCE, INSPECTION AND TESTING

The equipment shall be inspected by the Owner and/or their inspection agency at the manufacturer's works prior to despatch. The equipment will be inspected as per the tests preidentified in the approved QAP to ensure conformity of the same with

relevant approved drawings, data sheets, specifications, National/International standards.

Performance tests of any equipments which cannot be conducted/demonstrated either partially of wholly at the manufacturer's work, shall be conducted after erection at site in the presence of Owner & their inspection agency. In all the cases, prior approval of the approval shall be obtained.

In case of waiver category of items, the same shall be pre identified. For such items, the contractor shall furnish necessary certificates, test reports etc for Review/Approval to Owner/Inspection agency. The issue of Inspection Certificate/Waiver Certificate for any equipment or component there of does absolve the contractor from his contractual obligations towards subsequent satisfactory performance of the equipment at site. Should any equipment be found defective, In whole or part thereof after receipt at site or during erection/commissioning and testing shall be Rectified/Changed by contractor free of cost.

Contractor shall submit test plan for the equipment with four-week advance notice.

14.0 TESTING & COMMISSIONING

The successful tenderer shall submit detailed site testing & commission procedure with time schedules for Review/Approval to Owner.

The successful tenderer shall provide adequate supervisory/ skilled personnel and all tools and tackles, testing equipment and instruments required for complete checking of installations and testing and commissioning of all equipment and accessories.

All the tests shall be conducted in the presence of Owner/ Engineer-in/charge or his authorized representative unless he waives this requirement in writing.

The testing and commissioning of all equipment under the scope of the tenderer shall be carried out in accordance with the latest edition of relevant Indian Standards and IE Rules.

Test reports shall be submitted in required number of copies duly signed by the ***TENDERER*** to ***OWNER***.

All equipment after testing shall be energized only after certification by the qualified testing engineer that the equipment is ready for energisation and with \ the concurrence of **OWNER .**

After the completion of all tests and rectification of all defects pointed out during final inspection, plant start-up trials would be commenced. During the start-up trials contractor shall provide skilled / unskilled personnel and supervision round the clock

at his cost. The number and category of orkmen and duration up to which required, will be decided by the Engineer-incharge.

Any defects noticed during the start-up trial relating to the equipment supplied and work carried out by the Contractor, will be rectified by the contractor at his own cost.

On successful completion of erection of each item /equipment, a final inspection will be carried out at site by **Owner** for correctness and completeness of erection.

Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectification at his own cost.

After the operating conditions are fully achieved in the plant and the other requirements as stated in the General Conditions of Contract are fulfilled, the contractor would be eligible for applying for a completion certificate.

15.0 DRAWINGS, STANDARD SPECIFICATIONS AND INSTALLATION STANDARDS

Following minimum information shall be furnished with bid:

a) Type test reports of GO-AB, DO Fuse, Lightning arrestors, Insulators etc.

Following Drawings & Documents shall be submitted after award of contract for approval:

a) Filled-Up Data sheet

b) GA of Double pole structure with equipment mounting arrangement with dimensions.

c) Earthing schedule of DP structure.

The equipments / materials to be supplied by the contractor shall conform to the requirements of the applicable specifications. Also the installation of various material / equipment shall conform to the installation standards /norms.

The drawings accompanying the tender documents when read with specification shall depict the electrical system of the Terminal. These are indicative of the nature of work and issued for tendering purposes only. Purpose of these drawings is to enable the tendered to make an offer in line with the requirements of the Owner. Construction shall be as per drawings / specifications issued / approved by the Engineer-in-charge during the course of execution of work.

After the job completion, contractor shall prepare AS-BUILT drawings and documents, submit catalogues/manuals (O&M) of major brought out items like HT Substation, Transformers, LA, AB switch etc. Final certified As-Built drawings, documents and manuals etc shall be submitted by the contractor to owner in bound volume with one set in soft copy (CD) plus five sets of prints.

Contractor shall train the work force of Owner with his technical and supervisory personnel for safe, efficient operation and maintenance of the equipment and system installed by the contractor. The Number of personnel to be trained and the duration and structure of the training shall be mutually discussed

16.0 SCOPE OF SUPPLY

Contractor shall procure and supply all materials other than Company supplied materials, required for permanent installation of 11KV HT system in sequence and at appropriate time. All equipment, materials, components etc. shall be 11KV HT system for the intended service. Approved vendor list has been enclosed with the bid package for various items. For items which are not covered in the vendor list, Contractor shall obtain Company's prior approval for the vendor. Necessary details i.e., data sheets & specifications for the items in the Contractor's scope of supply, as required, shall be enclosed with the bid package.

i) Preparation of Material requisition, request for quotation, bid evaluation and recommend vendors for Company's approval. Only single offer shall be provided by the bidder fully complying to specification requirements for Company's review and approval.

ii) Stores management including receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling / handing over surplus material to Company for Company supplied items at Company's storage yard.

iii) Carryout proper documentation of inspection and quality assurance programmers for bulk materials duly approved by Company. Contractor shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.

iv) Contractor shall immediately report to the Company of all changes which will affect material quality, and recommend any necessary corrective actions to be taken.

v) All purchase requisitions including purchase orders shall be approved by Company.

vi) Compliance with vendors and supplier's instructions and recommendations for transportation, handling, installation and commissioning

vii) The Contractor shall also provide the following:

viii) **Major Items**- Electrical Poles, metering Panel, MCCB/ACB, HV& LV Cables, Lighting Fixtures, Earthing CT , PT, OHL Conductors.

a) All temporary materials required for installation/ testing/ commissioning. All consumables required for the works.
b) All construction equipment/machineries, tools and tackles, devices, apparatus, equipment, safety devices, etc. including ladders and scaffolding etc complete as required.
c) CT, PT, Isolators, switchgears (MCB, MCCB etc.)
d) Cable jointing Kit., Termination kit, Cable glands & lugs.
e) Isolators,switches box plates, Junction boxes.
f) Consumables for erection such as lugs, ferrules, glands, etc; electrodes;
g) Cement, aggregates, sand, bricks, structural steel
h) Fencing for pole, fixture mounting brackets
i) Power sockets, convenience outlets etc
j) Structural and support steel & paint
k) Earthing materials (earth strip, Earth conductor, treated & non-treated earthing electrodes, earthing bus bars etc)
l) Lightning Protection materials including finials, horizontal & down conductors, earth Electrodes
m) Cable trays & coupler plates with fittings, nut bolt & washers (ladder & perforated).
n) other consumables such as cable ties, cable tags, cable tiles, sand, cable markers, ferrules/shrink sleeves etc
o) PVC pipes, rubber mats.
p) GI Conduits, bends, inspection cover etc. GI pipes for cable sleeving
q) Safety equipment as per statutory requirements i.e. framed first aid chart, first aid box, firefighting equipment etc
r) Expendable materials (e.g., clothes, grease, cleaning materials, welding rods, solder, etc.)
s) All materials namely hardware like GI bolts, nuts, washers etc, anchor fasteners, small civil work, fixing cleats for surface run cables & conduit clamps etc
t) Equipment and materials, as per applicable specification, required for successful completion of the job except those specified as supplied by OWNER.
u) Any other material not specifically mentioned above but required for successful completion of the job.

17.0 CONSTRUCTION

Contractor scope of work for 11KV HT system items construction shall include, but not limited to the following:

All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall need prior approval from the Company followed by subsequent revision of relevant drawings upon approval; Contractor shall do the follow up with the concerned authorities to get the permissions to execute the job in time. However, all statutory payments required for such permissions shall be reimbursed by Company at actuals. Contractor shall obtain permits / clearance from concerned authorities before actual commencement of the job at site including preparation and establishment of safety procedures.

i) Contractor shall also inform all local authorities in advance and obtain all necessary approvals for works wherever encountered along the system. Contractor shall be required to carry out all the works as mentioned in the work permit;

ii) In some areas where mechanized excavation is not possible, Contractor shall have to do manual excavation also. Contractor shall consider all these eventualities while bidding;

iii) Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements of the bid package;

iv) Providing all equipment, manpower, machinery, consumables, apparatus, tools and tackles for fabrication, installation, inspection, testing, pre-commissioning and commissioning complete as required including facilities for inspection and interpretation of testing results by Company's Representative;

v) Obtaining all necessary approvals and work permits from Company / Concerned local authorities having jurisdiction including all work permit as applicable for performing the work in existing terminal facilities.

vi) Coordination and supervising the work of sub-Contractors.

vii) Transportation of appropriate materials to worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.

viii) Fabrication of all, structural components as per approved drawings.

ix) Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.

x) Receiving and taking-over Company supplied free issue items from designated warehouse, loading, transportation, unloading, handling, and stacking of items at Contractor's worksite(s)/ workshop till the materials are installed in permanent installation.

xi) Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables and other resources etc. as required for the execution of complete work.

xii) Installation of 11KV HT system cable trays (perforated type) along with cover and suitable accessories as per approved cable routing drawings and Project requirements.

xiii) Cable laying, dressing and termination of 11KV HT system cables between instruments, JBs and cabinets are required.

xiv) Preparation of as built drawings, documents, photographs, project records as per specification and instructions of the Company including furnishing of all Test Certificates/Inspection Reports for all materials used for permanent installation.

xv) All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work and the associated facilities and making the entire system ready for operation.

xvi) Other miscellaneous works (civil works, co-ordination, etc.): All related civil works shall be included in the scope of the Contractor.

xvii) Preparation of buried cable trenches including excavation, back filling, compacting, providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies. The job includes repairing of all civil works damaged during installation of 11KV HT system equipment.

xviii) The scope of work under this contract shall be inclusive of breaking of walls and floors, and chipping of concrete foundations necessary for the installation of equipment, materials, and making good of the same.

xix) Minor modifications wherever required to be done in the Company free supplied equipment's or devices to enable cable entry, termination, etc.

xx) Sealing of openings made in the walls / floors for cable trays, cables, bus ducts, etc. suitably using acceptable practice and standards.

xxi) Supply and installation of all other accessories not specifically mentioned herein, but nevertheless necessary for completion of the job

xxii) As-built drawing & document shall be provided for all work done including old systems where any integration has been done. All documentation to be provided as printed documents and computer files compatible with MS Office and AutoCAD.

Energising Quality	**PROJECT NUMBER: C221052**	IGGL

ELECTRICAL SCOPE OF WORK			TOTAL SHEETS		19
DOCUMENT NO.	C221052	00	EL	SOW	4002

INDRADHANUSH GAS GRID LIMITED

NORTH EAST GAS GRID PHASE-III OF IGGL

REV	DATE	DESCRIPTION	PREP	CHKD	APPR
C1	21.10.2022	ISSUED FOR REVIEW	VV	RD	AA

ABBREVIATION

CEA	Central Electricity Authority
SEA	State Electricity Authority
BS	British Standards
IGGL	Indra Dhanush Gas Grid Limited (IGGL),
PNGRB	Petroleum and Natural Gas Regulatory Board
OISD	Oil Industry Safety Directorate
MEDB	Main Electrical Distribution Board
XLPE	Cross-Linked Polyethylene.
PVC	Poly Vinyl Chloride
NEC	National Electrical Code
UPS	Uninterruptible power systems
P/MCC	Power/Motor Control Centre
MOV	Motor Operated Valve
ACB	Air circuit breakers
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MPCB	Motor Protection Circuit Breaker
CT/PT	Current Transformer/Potential Transformer
ELCB	Earth Leakage Circuit Breaker
PDB	Power Distribution Board
O/ILDB	Outdoor/Indoor Lighting Distribution Board
FRLS	Flame Retardant Low Smoke

TABLE OF CONTENTS

1.0 DEFINITION

Where used in this document, the following terms shall have the meanings indicated below, unless clearly indicated by the context to this order:

PROJECT	PMC Services for North East Gas Grid Phase-III OF IGGL.
OWNER	Indradhanush Gas Grid Limited
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of the OWNER for the Engineering Services
VENDOR / MANUFACTURER	Party, which manufactures and supplies equipment and services to the OWNER or to CONTRACTOR .

2.0 INTRODUCTION

The Hydrocarbon vision 2030 for North East India (vision document), released by MoP&NG proposes detailed plan for Natural gas infrastructure development in North-East. The states covered in the vision document include Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura.

M/s Indradhanush Gas Grid Limited (IGGL), a Joint Venture of IOCL, ONGC, GAIL, OIL and NRL, is in the process of implementing the North East Gas Grid (NEGG) with a vision to connect all the eight (08) northeastern state capitals and major consumption centers in the region. The NEGG will be connected to National gas grid at Guwahati through Barauni-Guwahati pipeline (already under execution by M/s GAIL).

M/s IGGL intends to lay pipeline along with terminal works for section-10 & 11 which consist of 12" NB x 199.007 Km (approx.) in section-10 and 12" NB x 186 Km (approx.) in section-11 mainline. Main line taken from Siliguri DT to Gangtok RT in Section-11. Similarly in section-10 12" Main line taken from T point Jorhat to Dimapur DT to Sekmai gas Bottling plant RT Via IP station at Tadubi (Manipur).

The brief scope of work includes supply of materials (other than free issue), pipeline laying work including but not limited to Construction Management, HSE & Quality Management, Survey, ROU management, clearing of ROU, grading, stringing, bending, welding (Manual), trenching, joint coating, lowering, crossings, crossings by HDD (wherever specified), Tie-ins, NDT and destructive testing, backfilling, laying of pipeline along-with OFC & HDPE ducts, TCP works, site restoration, hydro-testing, dewatering, swabbing, drying, nitrogen purging (as applicable), pre-commissioning, commissioning and Gas-in of pipeline including construction / installation of related facilities like scraper launching / receiving facilities and all piping works at dispatch / receiving terminals, I.P. Stations and piping works at Sectionalizing valve stations, Tap-off station & Injection points, etc. including associated Mechanical, Cathodic protection, Corrosion monitoring works, Electrical works, Telecom works, Firefighting works,

Instrumentation, Civil works (including boundary wall and building works), Architectural and Structural works at all stations, and Pipeline Information Management system. The scope of work has been divided into the following parts:

PROJECT TITLE: -SILIGURI-GANGTOK PIPELINE SECTION (SECTION-11)		
REF. SCHEMATIC DRAWING NO: -C221052-SGPL-PP-SCM-2001		
PART NO	**SPREAD NO.**	**SCOPE OF WORK**
PART-D1 (Length 44.2 km)	SPREAD-2B (Length 44.2 km)	Pipeline laying from **Ch. 59+800** Km to **Ch. 104+000** Km including associated works (Mechanical, Piping & Including Terminal works as per scope matrix) & One (01) SV stations.
PART-D2 (Length 46.3 km)	SPREAD-2C (Length 46.3 km)	Pipeline laying from **Ch. 104+000** km to **Ch. 150+300** Km. Intermediate Pigging Station (IP station) Lava, West Bengal at **Ch. 128+000** Km including associated works (Mechanical, Piping & Terminal works) at Two (02) SV stations.

Note: Chainage shown above are tentative and for reference purpose only, there may be change in Chainage shown as per site condition during execution.

3.0 PROJECT BRIEF

Summary of various stations envisaged in the proposed North East Gas Grid Phase-III of IGGL are as under:

A) SILIGURI – GANGTOK PIPELINE (SGPL)

Sr. No	Type of Station	Nos.	Location
1	Dispatch Terminal (DT / SGPL)	0	----------
2	Intermediate Pigging Station (IP/SGPL/01)	1	Tentatively at Lava
3	Receipt Terminal (RT/SGPL) with/ without Tap off	0	----------
4	Sectionalizing Valves Station with/without Tap off	3	Along the Siliguri-Gangtok route

3.1 Multi Products Pipeline Details

A) Design Pressure: 92kg/Cm2g

B) Design Temperature; -29° TO +65°C

C) Pipeline Size: - 12" (254km), 12" (186km),

D) Pipeline Material: - API 5L Gr. X 70 PSL 2

E) Pipeline Wall Thickness; -7.14mm / 8.38 mm

F) Pipeline Total Length (APPROX.): - 90.5 Km (Approx.)

G) Pipeline Corrosion Coating; - 3LPE (EXTERNAL

3.2 SITE CONDITIONS

Parameters	
Max / Min. Temperature	50/-5 °C
Design Temperature	50°C
Relative Humidity	95%
Altitude above Sea level	Up to 1000 Meters
Atmospheric pollution	Designed to withstand the site conditions, dust, vapour, Industrial Gases
Hazardous Area classification	Zone-2, Gas group IIA, IIB, for Temp. Class T3
Control Room/ Electrical room/ D.G. Room/Guard	Safe area

4.0 SCOPE

The Bidder's scope of work includes following:

4.1 SCOPE OF DESIGN & ENGINEERING

4.1.1 Submission of electrical equipment design calculations (Lighting, Earthing & Lightning, PDB, LDB etc.), Complete SLD with control scheme, HVAC Calculations, detail engineering, various drawings/layouts for review and approval, preparation of cable schedules, BOM, preparation of site engineering drawings and details for installation works wherever applicable or required bythe Engineer-in-charge, and submits to the Engineer-in-charge for review.

4.1.2 Correction, updating and submission of all Owner's drawings for as-built status shall be in the contractor's scope.

4.1.3 Obtaining clearance for energizing the complete electrical facilities covered under this tender and approval of installation and drawings from the Chief Electrical Inspector of the State Government/Central Electricity Authority and other statutory authority as required. This includes equipment installed or commissioned by others within the battery limit. This is for obtaining a comprehensive approval in one go.

4.2 SCOPE OF SUPPLY

Following electrical equipment and material are in the Bidder's scope of supply in this tender:

4.2.1 415V, 25 KA Single Front Indoor LT Panel to receive and distribute power for all stations, LDBs etc. as per SLD Nos. C221052-00-EL-SLD-4002/ C221052-00-EL-SLD-4004/C221052-00-EL-SLD-4005.

Bidders to note that:

A supply, installation, testing & commissioning of 10/20 KVA UPS system, Rectifier, Battery Bank, ACDB / DCDB & interconnecting cables are not in scope of this contract. Same shall be supplied, installed, tested & commissioned by other contractor through separate tender. **However, Contractor scope of work includes incoming cables for UPS & all outgoing cables&cabling work from various ACDB & DCDBs**.

B supply, installation, testing & commissioning of Hybrid Solar system, grid Charger & associated Solar Array/Panels, Anodised Al/Hot dip galvanized MS mounting structure, Junction boxes, Charge controller, DCDB, Battery bank, DC- DC converter, interconnecting cables among - arrays, charge controller, DC-DC Converter,DCDB, Battery bank, 3Ph charger etc. are not in scope of this contract. Same shall be supplied, installed, tested & commissioned by other contractor through separate tender. **However, Contractor scope of work includes all outgoing cables& cabling work from various DBs**.

4.2.2 MV power and control cable (XLPE – insulated armoured Al/Cu conductor 1/2/3/3.5/4 core cables).

4.2.3 GI pipes, GI Cable-trays and accessories, cable markers, identifier tags, GI saddles and all other associated accessories for cable-laying.

4.2.4 FLP (CMIFR tested, PESO approved) type double-compression nickel-plated brass cable glands, tinned- copper lugs, clamping material etc. for cable termination.

4.2.5 1.8T, 5 star Split Air Conditioners with stabilizer and AC Control Panel.

4.2.6 Electric illuminated station detail board along with mounting structure.

4.2.7 63 Amp Flameproof type welding receptacles etc.

4.2.8 Inverter for emergency critical lighting as per SOR.

4.2.9 Outdoor type pole mounted 11/0.433 kV copper wound distribution Transformer substation 63/25kVA.

4.2.10 Complete Double Pole structure with, Gang switch, overhead Conductor of suitable rating and all necessary accessories for completion of work including tapping from existing HT line etc. complete as per specification, SOR and requirement of approval from respective electricity/statutory authority. All electrical work i.e. charging of transformer, pole mounted substation, tapping from battery limit of electricity board shall be carried out in supervision of respective authority including necessary approval, if required.

4.2.11 Double pole structure with AB Switch, Lightning arrestors, horn gap fuse, copper wire jumpers upto transformer HT terminals.

4.2.12 ACSR conductor, 11m MS joint/pole, Pin insulator and GI hardware etc. as required from respective state electricity board battery limit upto double pole structure inside IGGL Terminal.

4.2.13 Cables between transformer LT terminals of transformer & load break fuse switch unit, cable supports, double compression cable glands, lugs etc. as required.

4.2.14 Supply of 160A TPN, AC-23 duty MCCB in outdoor type dust & weather proof steel enclosure.

4.2.15 Supply of High Mast Lighting system on 20m high pole consisting for 8 nos. of lighting fixtures (200W LED Lamp).

4.2.16 Supply of 63 & 25 kVA AVR (Automatic Voltage Regulator), TPN, continuous duty with I/O MCCB in indoor type dust proof, Floor mounted, steel enclosure, Input voltage range shall be from 320 Volt to 480 Volt and Output shall be 433 Volt $\pm$3% etc. complete in all respect.

4.2.17 Fabrication and supply of MS frames, supports, canopies and brackets for miscellaneous electrical equipment, including welding, supply of bolts, nuts etc. for mounting and other necessary supplies, all inclusive of painting as specified.

4.2.18 Cable gland plate of suitable size & of min 3mm thickness shall be provided for cable termination, wherever required, for all the electrical panels (PDB/LDB/OLDB/UPSDB etc.)

4.2.19 For Telecom/LAN works listed in Electrical SOR the supply and installation is in the scope of the bidder.

4.2.20 Certain items as per SOR (telecom system) for telephone/LAN are to be supplied to IGGL in loose form. These items are for installation at locations lying outside the scope of work of this tender. These loose supplied items will be installed by other vendor/contractor.

4.2.21 CO-ORDINATION WITH OTHER CONTRACTORS:

Contractor shall be entirely responsible for Co-ordination with other contractors of UPS/Solar/Battery & it should be ensured that the terminal work should be timely executed.

If the contractor fails to timely execution of the terminal work, necessary penalty clause shall be applied as per the direction of the Engineer-in-Charge.

4.2.22 All works relating to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State electricity authority/Board etc., shall be in the scope of contractor.

Note: SLDs attached with tender documents having SLD Nos. C221052-00-EL-SLD-4002/ C221052-00-EL-SLD-4004/C221052-00-EL-SLD-4005 are for tender purpose only. Detailed SLD shall be furnished by the Bidder as per the requirements of the system. Any change, Modifications, Addition/deletion occurs later due to system requirements shall deem to be inclusive in the price quoted by the Bidder, No extra cost shall be paid for the same.

4.3 SCOPE OF INSTALLATION, TESTING & COMMISSIONING

4.3.1 Laying & termination of all MV/HV power and control cables laid in concrete-lined trenches, buried cable trenches, pipes, road crossings, pipe-racks etc.

4.3.2 Installation testing & commissioning of 415 V switch boards/PDBs/MLDBs/LDBs.

4.3.3 Installation, testing & commissioning of Outdoor type pole mounted 11/0.433 kV Transformer substation.

4.3.4 Installation, testing & commissioning of Distribution Transformer with Double Pole, Gang switch, over head Conductor of suitable rating and all necessary accessories for completion of work including tapping from existing HT line etc. complete as per specification & SOR.

4.3.5 Installation, testing & commissioning of 11/0.433 kV, 63/25 KVA copper wound Distribution Transformer.

4.3.6 Installation, testing & commissioning of Double pole structure with AB Switch, Lightning arrestors, horn gap fuse, copper wire jumpers upto transformer HT terminals.

4.3.7 Installation, testing & commissioning of ACSR conductor, 7m MS joint/pole, Pin insulator and GI hardware etc. as required from respective state electricity board battery limit upto double pole structure inside IGGL Terminal.

4.3.8 Installation, testing & commissioning of Cables between transformer, LT terminals of transformer & load break fuse switch unit, cable supports, double compression cable glands, lugs etc. as required.

4.3.9 Installation, testing & commissioning of 125A/63A TPN, AC-23 duty MCCB in outdoor type dust& weather proof steel enclosure.

4.3.10 Installation, testing & commissioning of High Mast Lighting system on 20m high pole consisting for 8 nos. of lighting fixtures (200W LED Lamp).

4.3.11 Installation, testing & commissioning of 63kVA & 25kVA AVR (Automatic Voltage Regulator), TPN, continuous duty with I/O MCCB in indoor type dust proof steel enclosure etc. complete in all respect.

4.3.12 Installation, testing and commissioning of lighting system in buildings.

4.3.13 Installation, testing and commissioning of outdoor street lighting system & lighting system for process area.

4.3.14 Installation, testing & commissioning of earthing system & complete lightning protection system.

4.3.15 Installation, testing and commissioning of the Bidder supplied materials.

4.3.16 Installation testing & commissioning of Oil filled transformer and pole mounted HT substation.

4.3.17 Installation testing & commissioning of Inverter for critical lighting as per directions of engineer-in-charge.

4.3.18 Installation testing & commissioning of Electric illuminated station detail board.

4.3.19 All works relating to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State electricity authority/Board etc., shall be in the scope of Bidder.

5.0 OTHER MISCELLANEOUS WORKS

5.1 Preparation of buried cable trenches, including, back filling, compacting providing of brick protection by second-class bricks, spreading of fine river sand, including all supplies.

5.2 The job includes repairing of all civil works damaged during installation of electrical facilities.

5.3 The scope of work under this contract shall be inclusive of breaking of walls, floors and chipping of concrete foundations necessary for the installation of equipment, materials, and making good of the same.

5.4 Minor modifications wherever required to be done in the owner free supplied equipment / devices to enable cable entry, termination, etc.

5.5 Sealing of opening made in the walls / floors for cables trays, cables, bus ducts, etc. using acceptable practice and standards.

5.6 Supply and installation of all other accessories not specifically mentioned herein, but never the less necessary for completion of the job.

6.0 AREA CLASSIFICATION

Hydrocarbon handling areas have been generally classified as zone 1 & 2, gas group IIA/IIB as per IS: 5572, API RP-500, OISD - 113 and IP Rules. All equipment to be installed in these areas shall be suitable for the area classification with temperature class T3 (200°C), CMIFR testing and approved by CCOE, PESO, DGFAS and having BIS license.

7.0 JOB SPECIFICAITONS

Various electrical works covered under this contract like equipment erection, cabling, lighting and grounding works, etc. shall be performed in accordance with specifications attached with this tender. (Certain clauses of specifications, which are applicable to equipment or system not covered under this contract, shall not be applicable).

Erection and commissioning of certain special equipment shall be performed in accordance with supplier's instructions and directions of the Engineer-in-charges under supervision by equipment supplier/s.

The equipment/materials to be supplied by the Bidder shall conform to the requirements of the applicable specifications enclosed in the tender document.

8.0 TRANSFORMER AND ITS MOUNTING ON DOUBLE POLE STRUCTURE WITHIN DT/RT/IP /SV TERMINAL

8.1 Power connectivity from nearest available power source through Overhead Conductor/Cables (O/H or U/G) along with all requisite materials up to Double Pole structure of IGGL terminal shall be executed by SEB on depositary basis or by the Bidder (If SEB permits to execute this work by the Bidder). All the payments towards works executed on depositary basis shall be paid by the Owner on submission of bills along with documentary evidence.

8.2 Supply, Installation, Testing & Commissioning works of Distribution Transformer & Double Pole structure at IGGL terminal shall be executed by SEB on depositary basis or by the Bidder (If SEB permits to execute this work by the Bidder). All the payments towards works executed on depositary basis shall be paid by the Owner on submission of bills along with documentary evidence.

8.3 Bidder shall carry out all the required liaising with concerned authorities for the above-mentioned works (Sr. no. 8.1 & 8.2) including all works related to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State electricity Authority/Board etc. Power connection shall be in the name of Owner**.**

9.0 STATUTORY APPROVAL OF WORKS

All works relating to statutory approvals of the complete installation, from competent authority like CEA, DGMS, State electricity Authority/Board etc., shall be in the scope of Bidder.

The application on behalf of the owner for submission to Electrical Inspector / DGMS etc. along with copies of required certificates and drawings, complete in all

respects, shall be prepared by the Bidder and submitted to the Engineer-in-charge for onward transmission well ahead of time so that the actual commissioning of equipment are not delayed for want of inspection by the Electrical Inspector / DGMS. The actual Liaison work shall be arranged by the Bidder and necessary coordination and liaisons work in this respect shall be responsibility of the Bidder. However, the Owner on submission of bills along with documentary evidence shall reimburse any fee paid to the statutory Authority in this regards.

10.0 MAKES OF EQUIPMENT AND MATERIALS

All equipment / materials supplied by the Bidder shall be as per the list of approved makes enclosed with this document subject to submission of Certification and approvals.

11.0 INSPECTION, TESTING & COMMISSIONING

11.1 All the equipment supplied and installed by the Bidder shall be tested and commissioned, as required and no separate payments shall be made for the same. Any damage or defect noticed shall be brought to the notice of the engineer- in-charge and shall be rectified without any delay and no payments shall be made for rectification**.**

11.2 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the Bidder shall carry out the rectification at his own cost.

11.3 The Bidder shall carry out all the tests as enumerated in the technical specifications and as per applicable codes and standards.

11.4 Before the electrical system is made live, the electrical Bidder shall carry out suitable tests to establish to the satisfaction of engineer-in-charge that the installation of equipment, wiring and connections have been correctly done and are in good working condition and that it will operate as intended.

11.5 All the tests shall be conducted in the presence of Owner/ Engineer-in-charge or his authorized representative unless he waives this requirement in writing. The Bidder shall arrange all testing equipment necessary to carry out the test. The tests shall be recorded on approved Performa and certified records of the tests shall be submitted to Owner/ Engineer-in-charge.

11.6 After the completion of all tests and rectification of all defects pointed out during final inspection, plant start-up trials would be commenced. During the start-up trials Bidder shall provide skilled / unskilled personnel and supervision round the clock at his cost. The number and category of workmen and duration up to which required, will be decided by the Engineer-in-charge. Any defects noticed during the start-up trial relating to the equipment supplied and work carried out by the Bidder, will be rectified by the Bidder at his own cost.

11.7 Engineer-in- charge shall have the right to get these defects rectified at the risk and cost of the Bidder if he fails to attend to these defects immediately as desired.

11.8 After the operating conditions are fully achieved in the plant and the other requirements as stated in the General Conditions of Contract are fulfilled, the Bidder would be eligible for applying for a completion certificate.

12.0 DRAWINGS, STANDARD SPECIFICATIONS AND INSTALLATION STANDARDS

12.1 The equipment / materials to be supplied by the Bidder shall conform to the requirements of the applicable specifications. Also the installation of various material / equipment shall conform to the installation standards /norms.

12.2 The drawings accompanying the tender documents when read with specification shall depict the electrical system of the Terminal. These are indicative of the nature of work and issued for tendering purposes only. Purpose of these drawings is to enable the tendered to make an offer in line with the requirements of the Owner. Construction shall be as per drawings / specifications issued / approved by the Engineer-in-charge during the course of execution of work.

12.3 Conduit layout drawing in ceiling, wherever required, to be prepared by the Bidder and shall be submitted for approval.

12.4 After the job completion, Bidder shall prepare AS-BUILT drawings and documents, submit catalogues/manuals (O&M) of major brought out items like Inverter, HT Substation, Lighting fixture etc. Final certified as built drawings, documents and manuals etc. shall be submitted by the Bidder to owner in bound volume with one set in soft copy (CD) plus five sets of prints.

13.0 TECHNICAL CRITERIA FOR ACCEPTANCE (ELECTRICAL) OF ELECTRICAL SUB- CONTRACTOR

13.1 Copy of Electrical Contractor's license – Grade A from Electrical Licensing Board for 11kV or above enclosed.

13.2 Credential of Electrical Contractor which shows completion of HT Panel, 11KV, Transformer, DG set, LT panels lighting, earthing etc.

13.3 The Main/Electrical Contractor shall be the single point responsible vendor for all electrical equipment like LT panel, Transformer, DG Set etc.

TO BE FILLED-UP BY TENDERER

Sl. No.	Description	Remarks
1.	No deviation from the Electrical Specification/ SOR	
2.	Unpriced schedule of rate (SOR) enclosed.	
3.	List of similar electrical job undertaken during last three years has been enclosed with theoffer.	
4.	List of electrical personnel employed, with their qualification & experience, has been enclosed with the offer.	
5.	Credential of electrical sub-contractor, enclosed with the offer.	
6.	Photocopy of Electrical Contractor's license – grade A has been enclosed with the offer.	

ELECTRICAL
INSPECTION CATEGORIZATION PLAN FOR ELECTRICAL ITEMS

Inspection of various Electrical items shall be carried out as per following categorizationplan:

S.No.	Item description	Site Acceptance based on Manufacturer Test Certificate review at site (In line with Approved documents)	Inspection at Manufacturer'sworks by Contractor appointed TPIA Despatch Clearance Note to be issued by VCS after review of TPI inspection reports
1	Power Distribution Boards/Panels	X	✓
2	FLP Feeder Pillar (Structure mounted) for outdoor lighting	X	✓
3	Inverter with tubular battery	✓	X
4	Earthing material (Earth pit with GI Electrode/Cu plate Electrode, GI/Copper Strips, GIwire, GI Lightning rod, Advance Maintenance free earthing system)	✓	X
5	Power & Control Cables (HT & LT)	X	✓
6	Lighting fixtures (FLP & Non-FLP type)	✓	X
7	Street Light Pole	✓	X
8	High Mast & FLP Feeder pillar panel for High Mast	X	✓
9	Distribution Transformers (11/0.433kV)	X	✓
10	MCCB Enclosure – WP Outdoor type	X	✓
11	ACSR weasel conductor	✓	X
12	Ceiling/Wall mounted Fans, Exhaust Fans, Air conditioners,	✓	X
13	Welding socket	✓	X
14	Cable Tray	✓	X
15	First Aid box	✓	X
16	Carbon-di- oxide(CO2) type fire extinguisher	✓	X
17	Insulating Mast	✓	X
18	Telephone/LAN socket, LAN Swithes	✓	X
19	Telephone/LAN/UTP cable	✓	X
20	AVR	X	X

NOTE: Contractor appointed TPI shall be from the list of approved TPIs placed elsewhere in the tender documents

ANNEXURE-I

LIST OF TWO YEAR OPERATION AND MAINTANANCE SPARES

The Spare parts as listed below shall be quoted with the offer with item wise unit prices:

1.	Contactor	1 No. of each rating
2.	Fuses	10% of each rating
3.	Fuse Fittings	1 No. of each types
4.	Overload Relay With single phase Preventer	1 No. of each rating
5.	Indication Lamps	10% of total installed quantity (Min Qty 2 nos. for each type)
6.	MCB & MCCB	One no. of each rating
7.	Control Switches	Two no. of each rating
8.	Meters	One no. of each type

Note: All spare parts shall be identical to the parts used in distribution boards.

ANNEXURE-II

LIST OF TOOLS KITS AND INSTRUMENTS-LOT (DETAILS OF LOT TO BE SUPPLIED BY BIDDER)

S. No.	ELECTRICAL INSTRUMENTS	Qty.
1	500 V Hand Driven Insulation Resistance tester (Make-Fluke, Megger, Motwane)	01 No.
2	Earth Tester Kit, complete with electrodes and connector (Make-Fluke, Megger, Motwane)	01 No.
3	Digital Tong Tester for A.C. & D.C. current measurement (Make-Rishabh, Fluke, Matwane)	01 Nos.
4	Digital Multimeter (Make-Rishabh, Fluke, Motwane)	01Nos.
4	Hand Drill Machine (Make-Bosch)	01 No.
5	Fuse Puller	01Nos.
6	Manual Crimping Tool with accessories for cable size up to 240 mm ^{2}	01 No.

One no. of tool box to be provided at each control room building. Tool box should contain at least the following tools.

A) Slides wrench -2 Nos. (12" & 8")

B) Ring Spanner-1Set

C) DE Spanner-1Set

D) Pipe wrench-1Set (14")

E) Screw Driver-1Set

F) Electrician screw driver-1 Set

G) Millimeter -1No

H) Allen Key - 1Set

I) Drilling machine (1000 Watt) with multipurpose toolkit-1Set

J) Industrial Electric Extension Board. (Make-Anchor or equivalent) -1 No.

Energising Quality	CONTRACTOR		**QUALITY ASSURANCE PLAN FOR ELECTRICAL EQUIPMENT**	CLIENT:	**M/s IGGL**
				PROJECT:	**NORTH EAST GAS GRID PIPELINE PROJECT (Section-11)**
	ORDER NO. & DATE			PACKAGE NO.	**Part-D**
	SUB-CONTRACTOR			PACKAGE NAME	**Electrical System**
	ORDER NO. & DATE				

INSTRUCTIONS FOR FILLING UP :

1. QAP shall be submitted for each of the equipment separately with break up of assembly/sub-assembly & part/component or for group of equipment having same specification.
2. Use numerical codes as indicated for extent of inspection & tests and submission of test certificates & documents. Additional codes & description for extent of inspection & tests may be added as applicable for the plant and equipment
3. Separate identification number with quantity for equipment shall be indicated wherever equipment having same specifications belonging to different facilities are grouped together.
4. Weight in tonnes (T) must be indicated under column 5 for each item. Estimated weights may be indicated wherever actual weights are not available.

ABBREVIATIONS USED :

CONTR : CONTRACTOR

MFR : MANUFACTURER

CODES FOR EXTENT OF INSPECTION, TESTS, TEST CERTIFICATES & DOCUMENTS:

Code	Description	Code	Description	Code	Description	DOCUMENTS:
1.	Visual	12.	Routine test as per relevant IS other standard	23.	Short time rating	D1. Approved GA drawings
2.	Dimensional	13.	Type test as per relevant IS/ other standard	24.	Operational & functional check	D2. Approved single line/ schematic diagram
3.	Fitment & Alignment	14.	Impulse Test	25.	Over Speed Test	D3. Approved data sheet
4.	Physical Test (Sample)	15.	Partial Discharge Test	26.	Flame Proof Test	D4. Approved bill of materials
5.	Chemical Test (Sample)	16.	Heat run test\temp. rise	27.	Clearance and creepage Distance	D5. Unpriced P.O. copy
6.	Ultrasonic Test	17.	Enclosure Protection Test	28.	Acceptance Test	D6. Calibration Certificate of all measuring instruments and gauges
7.	Magnetic Particle Test (MPT)	18.	Calibration	29.	Harmonics measurement .	
8.	Radiography Test	19.	Noise & Vibration			
9.	Dye Penetration Test	20.	Test certificates for bought out components			
10.	Measurement of IR Value a) Before HV Test b) After HV Test	21.	Tank Pressure Test			
11.	High Voltage test/Dielectric test	22.	Paint shade verification			

EQUIPMENT DETAILS							INSPECTION AND TESTS						Test Certificates & documents to be submitted to VCS	Acceptance Criteria Standards /IS/ BS/ASME/ Norms and Documents	REMARKS / SAMPLING PLAN
Sl. No.	Description (With equipment heading, place of use, and Brief Specifications)	Identification No.	Quantity		Manufacturer's Name and Address	Expected schedule of Final Inspection	Raw Material and in process stage inspection			Final Inspection/Test by					
			No/M	T			MFR	CONTR	VCS	MFR	CONTR/ TPI	VCS/ Owner			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	**Power & Lighting Distribution Board/MCCB Enclosure**		**Set**				**1,2,3,4, 24, 27**	-	-	**1,2,3,12, 22, 24,27**	**1,2,3,12, 22, 24,27**	**HOLD-**	**D1, D2, D3, D4, D5, D6, 20, 12,13*,16**	**I.S, Data Sheet, Specification, Approved Drawings**	**13* for similar rating**
2	**LT Power and Control Cable**		**Mt.**				-	-	-	**1,10,11, 12,13, 28**	**1,2,10,11, 12, 28**	**HOLD**	**12,13,28 D3, D5, D6,**	**I.S., Data Sheet, Specifications & Test Certificate**	**13* for similar rating, Inspection to be done by TPI**
3	**Distribution Transformer upto 250 KVA.**		**No.**				**1,2,3,4, 21,27**	-	-	**1,2,10,11, 12**	**1,2,10,11, 12,22,27**	**HOLD**	**12,13,20 D3, D5, D6**	**I.S., Data Sheet, Specifications & Test Certificate**	**13* for similar rating, Inspection to be done by TPI**
4.	**AVR (AUTOMATIC VOLTAGE REGULATOR)**		**Set**				**1,2,3,4, 21,27**	-	-	**1,2,10,11, 12**	**1,2,10,11, 12,22,27**	**HOLD**	**12,13,20 D3, D5, D6**	**I.S., Data Sheet, Specifications & Test Certificate**	**13* for similar rating, Inspection to be done by TPI**

For Manufacturer (Stamp & Signature)

For CONTR (Stamp & Signature)

For VCS (Stamp & Signature)

VCS/QAP/ELEC/001

SHEET 1 OF 1 R-0

***Refer inspection categorization plan for - Category inspections.**

ANNEXURE-VIII

PIPELINE INFORMATION MANAGEMENT SYSYTEM (PIMS)

ANNEXURE – VIII TO PARTICULAR

JOB SPECIFICATION

PIPELINE INFORMATION MANAGEMENT SYSTEM (PIMS)

PARTICULAR JOB SPECIFICATION (PJS)

PIPELINE INFORMATION MANAGEMENT SYSTEM (PIMS)

CONTENTS

PIPELINE INFORMATION MANAGEMENT SYSTEM (PIMS)

1.0 INTRODUCTION

The Hydrocarbon vision 2030 for North East India (vision document), released by MoP&NG proposes detailed plan for Natural gas infrastructure development in North-East. The states covered in the vision document include Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura.

M/s Indradhanush Gas Grid Limited (IGGL), a Joint Venture of IOCL, ONGC, GAIL, OIL and NRL, is in the process of implementing the North East Gas Grid (NEGG) with a vision to connect all the eight (08) north eastern state capitals and major consumption centers in the region.

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2.0 WORK TENDERED

2.1 For The brief scope of work refer Scope of work attached with Volume-I

Contractor shall be required to deploy separate teams and hardware for each part.

The work includes providing solution and services for implementation of web based and GIS based Pipeline information management system for pipeline projects of CLIENT including setting up of office in each part and support offices at Delhi/ NCR along with all requisite equipment/ tools/ consumables, trained manpower, GIS survey/ mapping, transferring/ conversion of data collected from owner for pre-construction, construction and post construction activities, as-built drawings of stations and mainline integration of different activities/ functions in electronic form including training of applications to owner's personnel, handing over software/ solution Application developed with requisite license and use for owner personnel's complete in all respect as per scope of work/ SCC and as per direction of Engineer-in-charge.

The scope of work also includes supply of GPS instruments and computer hardware with complete accessories and peripherals for PIMS application display as per tender including training to owner's personnel and final hand over to owner's personnel.

The Web & GIS based pipeline information management system shall be capable of archiving various data related to pre-construction, supply, inspection, delivery, construction, hydro testing, commissioning, as-built drawing for mainline & stations, RoU related data, material management data in electronic format which can be used in future for the development of maintenance and operation modules and to respond emergency situation during operation and maintenance.

2.2 Contractor shall deploy separate teams with all equipment/ hardware/ software for each part. Work on all the parts shall proceed simultaneously. There may be separate laying contractors for each pipeline as well as their terminals. Though VCS/ CLIENT shall endeavor to facilitate PIMS contractor to get all the documents from the concerned parties. However it shall be the sole responsibility of PIMS contractor to obtain all the documents from the concerned parties. The PIMS contractor has to interact/ liaison with the laying contractors of pipeline, terminals as well as CLIENT & VCS to get the documents. The complete scope of work tendered has been divided into parts / sections as given elsewhere in the tender:

2.3 Owner intends to have a Web based and Licensed Arc GIS based management system which can archive various data related to pre-construction, supply, inspection, delivery, construction, hydro- testing, and commissioning, as built drawings for mainline and stations in electronic format which can be used in future for the development of maintenance and operation modules and to respond emergency situations during operation and maintenance stage.

2.4 The detailed route survey for the pipeline project has already been completed. The scope of work shall cover development of GIS based management system for above surveyed pipeline route. The contractor shall carry out development and customization of GIS based management system for planning, execution, operation and maintenance controls, on a specified format using standard and approved quality control parameters.

2.5 The scope of work consists of the requirements mentioned in this document, enclosed standard specifications, Schedule of Rates and as mentioned elsewhere.

2.6 The design of the software & data formats will be done in consultation CLIENT/ VCS N at Delhi office during the process of supply of software. Data input by successful bidder will start only after finalization of software design & data formats. The Complete package along with data & Licenses will be handed over to CLIENT after Integration of data into the system.

2.7 Successful bidder will hand over all data to CLIENT after integrating and giving an undertaking about authenticity of data certifying that all logged in data are as per requirement of the tender and are 100% true.

2.8 Owner has the right to crosscheck the authenticity of data being uploaded in PIMS & also check the integration & final presentation of the composite data to his satisfaction, as and when desired.

2.9 The development of GIS based management system shall be customized to suit owner's requirement on technical, organizational, training, operational, information management system area and integration with existing/proposed organizational systems for planning, control and information management, using suitable software.

2.10 Carryout interpretation and integration of all physical features. Symbolization/ legend structure, layering, edge matching, topological integrity, database linking, incorporation of processing techniques for attribute allocation etc.

2.11 The PIMS agency shall provide the details of the required hardware & software specifications including but not limited to server, storage, backup infrastructure, licenses, required bandwidth, monitor, scanner, printer and any other hardware etc. as required for storing the centralized data for effective functioning of the software application at owner's place at Noida/ Delhi. Above information shall be provided keeping in view future scalability of users, data etc. for a minimum of next 5 years.

2.12 PIMS application shall support virtualization platform (Vmware, Hyper V, Citrix etc.)

2.13 Bidder shall provide dedicated application support team, certified database administrator(DBA) during project implementation, warranty and support phase for any application related issues/

changes, configurations, database level troubleshoot and day-to-day operation like online data backup/ restoration, Database changes, database migration, database monitoring etc.

2.14 Role base access for the application and database shall be configured to avoid unauthorized access and which can be used for monitoring and analysis of logs.

2.15 PIMS application shall have multi browser support (ex. Internet Explorer, Google Chrome, Mozilla Firefox, Opera etc.). PIMS application shall be compatible with SAP system of CLIENT and it shall be able to integrate with SAP at a later date, if required.

2.16 Application shall support online as well as offline data entry. Wherever connectivity is available user can enter the data by logging in to the system. In case there is no connectivity, user must be able to enter data in offline mode and upload the same in the application at later stage when connectivity is available.

2.17 The Successful bidder should have proper auditable PIMS & IT security system in place. The bidder shall also provide PIMS system with appropriate IT security in order to protect it against data breach/ pilferage of data through hacking, etc.

3.0 SCOPE OF WORK

The Contractor's Scope of Work for the PIMS shall consist of, but not limited to providing services for implementation of Web & GIS based Pipeline Information Management System (PIMS). All such works that are not indicated here below but are otherwise required to complete the work in all respects shall also form part of Contractor's Scope of Work.

The scope indicated below shall be read in conjunction with Schedule of Rates as applicable, drawings, standards, specifications and other documents forming part of the Contract document.

All works listed below shall be applicable for all Parts / Sections for Laying of Pipeline and their associated stations / terminals, unless specifically mentioned otherwise.

The detailed scope of work pertaining to Web & GIS based PIMS shall be in general but not limited to the following:

3.1 Overview

This document provides the minimum requirement for providing services for implementation of Web & GIS based Pipeline Information Management System (PIMS).

PIMS is a latest state of art system for electronic documentation and retrieval of Projects as built

information. PIMS provides user-friendly and easy navigation web-based interface for quick retrieval of pipeline information at anytime from anywhere. This system shall include near real time uploading of progress and executed data of pipeline & associated works for construction and material supply.

PIMS solution shall be designed to satisfy the needs across different stages of project life cycle:

- Project Planning
- Project Execution/ Construction
- Operation & Maintenance

Broadly, the PIMS system shall provide facility for:

- Online generation of pipe-book & application for generation of alignment sheets,
- Complete traceability of material related to mainline works as well as stations / terminal works.
- Consolidate all information in a centralized database.
- Online reports (i.e. daily progress report, History sheets and other customized reports).
- Geographical Information System (GIS) compatibility.
- Online generation of executed all associated works and terminal works report.

Scope of Services shall also include developing the customized system, deploying required resources (personnel and machines) at execution site to directly capture & upload executed progress data from associated execution Contractor(s) and finally handover of complete system to CLIENT for further use in project during operation and maintenance phase.

3.2 Abbreviations & Definition

Company	:	CLIENT
PMC	:	VCS
Contractor	:	Party appointed for providing services as detailed in the tender.
PIMS	:	Pipeline Information Management System
GIS	:	Geographic Information System
AFC	:	Approved for Construction
MT	:	Material Tracking
AGIs	:	Above Ground Installations
DPR	:	Daily Progress Report
AUT	:	Automatic Ultrasonic Testing
MUT	:	Manual Ultrasonic Testing

SV	:	Sectionalizing Valve
ITP	:	Inspection Test Plan
MPR	:	Material Progress Report
LR/ GR	:	Lorry Receipt / Goods Receipt
NDT	:	Non Destructive Tests
QC	:	Quality Control

3.3 System Requirements

3.3.1 The solution shall be a Web based system, which is accessible over the Internet to authorized users. The solution will enable access from geographically distant locations simultaneously.

3.3.2 Online generation of Pipe book at an end of day basis. The pipebook generated by the system will be hyperlinked to all the daily inspection reports / certificates and will provide snapshot view linking daily inspection reports like stringing report, welding report, bending report, AUT and MUT reports along with welder procedure specification,

3.3.3 Real time progress tracking of the construction in the form of web based, user defined progress reports in the following formats:

- Tabular reports
- Graphical reports
- Cumulative reports (to report day wise progress of each activity)
- Query based information retrieval

3.3.4 Web based reporting module to generate various reports for e.g.;

- Day wise Progress report on each activity
- Compliance reporting
- Exception reporting
- Error reporting
- Repair history of welds
- Welder's performance report
- Welding progress report giving a snapshot view of total number of welds, kind of weld, tie ins and open ends in graphical format, on user defined chainage.

3.3.5 Hyperlinked documentation- All the above-mentioned reports will be hyperlinked to the respective daily inspection reports.

3.3.6 Field data shall be collected and uploaded on PIMS database server at site on every evening by PIMS contractor so as to generate DPR (Daily Progress Report) by next day 11 AM. Further, days complete data to be uploaded on PIMS database server at site by next day.

3.3.7 Plot plan of all AGIs like SV/ Intermediate pigging/ terminal stations to be layered on GIS data with different equipments and facilities on the plot hyperlinked to provide complete traceability and hyperlinked / integrated to material tracking.

3.3.8 Error free information reports

- Stringent data validation at the time of data entry.
- Manual and electronic validation of data
- Conflicting reports reported to the owner online before being published

3.3.9 Geographic Information System (GIS) to be used to view Construction progress data, pipe book data, materials data, alignments sheets (AFC and as-built) data, and all related / hyperlinked certificates/ reports on GIS layer.

3.3.10 Search facility based on various criteria shall be available in software.

3.3.11 The software should be based on Pipeline Open Data Standards (PODS) for future seamless connectivity to any software like PAMS, IMS, SCADA, Primavera etc.

3.4 Monitoring Data Requirement

3.4.1 Line pipe & Long Radius Bend tracking

All activities as per approved ITP are required to be tracked and monitored through PIMS and their related evidence documents to be uploaded and hyperlinked suitably. Following are major activities to be covered as minimum:

- Pipe / bend basic dimensions (length, dia, thickness, bend radius).
- Raw material (Steel) procurement by supplier. Inspection and Testing details of plates with heat numbers.
- All testing activities as per approved ITP (i.e. NDT, Hydro-test, expansion, repair, visual inspection, physical & chemical tests etc.)
- Welding Procedure Qualification for Line pipe manufacturing.
- Line pipe coating Inspection & testing reports including batch details of chemical used.
- Calibration of all test equipments and machines in line-pipe manufacturing and Coating.
- Trailer vise line pipe loading & dispatch details (packing list, LR/ GR).

3.4.2 Material Tracking (MT)

All activities as per approved ITP are required to be tracked and monitored through PIMS and their related evidence documents to be uploaded and hyperlinked suitably for following, as minimum number of free issue / bought out materials :

- Coated Line Pipes
- Scrapper Trap with Pig Signaler
- Flow Tee
- Insulating Joint
- Quick Opening and end closure
- Fittings and Flanges
- Assorted Pipes
- Metering Skids
- Ball Valves
- Plug Valves
- SCADA Equipments
- Telecom Equipments
- Solar Power Equipments
- Equipments related to TCP & PCP

Owner's bought out materials for Pipeline Project by their respective vendors as well as bought out by Laying Contractors shall be monitored in MT system by taking inputs from MPR (Material Progress Report) issued time to time by respective vendors/ contractors.

The information touch points of MT will be defined from ITPs and range from Manufacturing location (vendor/ subcontractors/ subcontractors), Land/ Sea dispatch/ receiving points and finally the project site till the final installation and acceptance.

3.4.3 Pipeline Construction Work Tracking

- Route survey to pre-lowering stage
    - Route survey, clearing and grading (all daily progress and inspection reports relating to the same) & updating the cadastral survey data in GIS.
    - Trenching, stringing and bending
    - Welding
        i. Welding procedures
        ii. Welder qualification reports
        iii. Daily progress reports
        iv. All tests and inspection reports related to welding
            a. Radiographic procedure applied

b. Radiographic inspection reports
c. Fit-up test reports
d. Weld visual

v. Random QC test results (e.g. Peel Test)
vi. Weld repair details and results thereof

- Damaged pipe detail
- Cut pipe detail
- Joint coating
- OFC related test reports

- Lowering and restoration stage

  - Padding inspection
  - Lowering reports
  - Tie-in
    i. Welding procedures
    ii. Welder qualification reports
    iii. Daily progress reports
    iv. All tests and inspection reports related to welding

      a. Radiographic procedure applied
      b. Radiographic inspection reports
      c. Subject to availability of Radiography films in a digitized/ scanned soft copy,

  - Cut pipe detail
  - Damaged pipe detail
  - Fiber optic cable laying reports
  - Backfilling reports
  - Restoration reports & updating the cadastral survey data in GIS.
  - Batch test certificates from manufacturers of electrodes
  - Crossing reports
  - All relevant hydro-testing and pre-commissioning data
  - Cathodic protection system survey and test reports.
  - All drawings related to the following will be stored in the system:
    - Route maps
    - Alignment sheets
    - Detailed AFC drawings (road, railway, minor water crossings, major water crossings, valley crossings)
    - Isometric drawings of installations
    - Special Installations e.g. hot taps. Fibre Optic Cable jointing

- Terminal Works

Terminal layouts to be layered over Pipeline GIS system and different blocks/ areas in terminal shall be suitably linked to provide status on following:

- Site Survey & Grading
- Civil works (Foundation, Columns, and Slabs etc.)
- Mechanical works (Fabrication, fit-up, **welding etc)**
- Station Piping and related test and inspection reports
- Furnishing works (doors, flooring, ceiling, furniture, painting etc.)
- Electrical (Power supply systems)
- Instrumentation (Control System setup and erection related test reports)
- Power Source, SCADA & APPS, Telecom & PCP Works
- Equipment Foundations work progress and related equipments status hyperlinked to MT.
- Equipment installation, erection related test reports.
- Terminal material's traceability reports.

3.4.4 The software shall be capable to recall all the reports from various work packages and provide all statistics to the COMPANY which includes:

- Project S-Curve
- Progress
- Material Availability
- Resources Availability
- HSE Reports
- Quality data
- Equipment status (MCEDS reports etc.)
- ROU Availability
- Compensation payment to landowners/ farmers

3.5 PIMS MODULES

PIMS application shall include modules for documenting documents related to engineering, material procurement, construction, Land Management etc.

Modules shall be designed as follows:

LAND MANAGEMENT MODULE

- Land Record Master
- Route Map
- Cadastral Maps
- GPS Route Link
- GIS Mapping & Digitization
- RoU Details
- RoU Compensation Records
- Land Registry/ Lease

CONSTRUCTION MANAGEMENT MODULE

- Inspection (QA/ QC) Reports
- Activity Monitoring
- Real Time Pipebook
- DPR, WPR, MPR
- Station activity details
- Minutes of Meeting
- Exception & compliance reports

PIPELINE INFORMATION MANAGEMENT SYSTEM (PIMS)

MATERIAL MANAGEMENT MODULE

- Purchase Order
- Order Tracking
- Material Inspection Report
- Inspection Release Note
- Goods Receipt Voucher
- Goods Issued Voucher
- Material Reconciliation
- Vendor Management

ELECTRONIC DOCUMENTATION MANAGEMENT SYSTEM (eDMS) MODULE

- Scanning & Archiving
- Document Indexing
- Search with keyword
- Reports, Manuals, Certificates, Drawings & other documents
- Document Tracking

Land Management Module:

This module shall capture the RoU as well as permanent land acquisition plot details of pipeline route. It shall cover other important details e.g. details of geography, demography, statutory and administrative boundaries of entire pipeline route. The application shall include land acquisition data for pipeline construction, survey data, crossing data including permissions, details of plot purchased/ leased for stations and anode beds. The module should have the following minimum details:

- ROU Details

The land owner details including permanent and alternative address. Mutation details, land usage details of the property owner including the crop details. The information on the compensation paid to the owner.

- Notification history.
-Crop Details
-Payment details.
-Alignment sheets, TP/IP's, Bench Marks/ GPS control points
-Population Density Index
-Alignment sheet
-ROU corridor details
-Crossing Details
-Land details for setting up of SV stations, dispatch, receiving and intermediate pigging stations.
-Environmental Sensitive Locations
-Emergency Details

-Administrative Boundaries
-MOEF clearance and TOR details
-EIA data

- Cadastral Maps

Cadastral maps of the route showing revenue data such as khasra no., etc.

- Permissions

Permissions, clearance and restoration acceptance from applicable statutory authorities such as forest department, railways, Irrigation, PWD, etc.

Construction Management Module:

It comprises of day wise construction progress including planning, quality and inspection reports activity details of which are as follows:

I. Route survey to pre-lowering stage
a) Route survey, clearing and grading (all daily progress and inspection reports relating to the same) & updating the cadastral survey data in GIS.

b) Trenching, stringing and bending
c) Batch test certificates from manufacturers of electrodes
d) Welding
- Welding procedures
- Welder qualification reports
- Daily progress reports
- All tests and inspection reports related to welding
    - Radiographic inspection reports
    - Fit-up test reports
    - Weld visual
    - Random QC test result.
    - Weld repair details and results there of Subject to availability of radiography films in a digitized/ scanned soft copy.

- Joint coating
- Concrete Weight Coating
- OFC related test reports

II. Lowering and restoration stage
a) Padding inspection
b) Lowering reports
c) Tie-in
- Welding procedures

- Welder qualification reports
- Daily progress reports
- All tests and inspection reports related to welding
- Radiographic procedure applied
- Radiographic inspection reports Subject to availability of Radiography films in a digitized/ scanned soft copy.
- Cut pipe detail
- Damaged pipe detail
- Fiber optic cable laying reports
- Backfilling reports
- Restoration reports & updating the cadastral survey data in GIS.

III. Crossing reports
a) HDD crossings
b) Railway Crossings
c) NH / SH Crossing
d) Other Road and foreign pipeline Crossings.

IV. Hydro-testing and pre-commissioning data
a) Water Filling, Pressurization & Hydrostatic test Reports
b) Dewatering Inspection Reports
c) Magnetic Cleaning Reports
d) EGP Reports
e) Swabbing Inspection Reports
f) Drying Inspection Reports
g) Inertization, preservations, inspection, commissioning reports

V. Cathodic protection system survey and test reports.
VI. Terminal Works

Terminal layouts to be layered over Pipeline GIS system and different blocks/areas in terminal shall be suitably linked to provide status on following.
- Site Survey & Grading
- Civil works (Foundation, Columns, and Slabs etc.)
- Mechanical works (Fabrication, fit-up, welding etc.)
- Station piping and related test and inspection reports
- Furnishing works (doors, flooring, ceiling, furniture, painting etc).
- Electrical (Power supply systems)
- Instrumentation (Control System setup and erection related test reports).
- Equipment Foundations work progress and related equipment status
- Equipment installation, erection related test reports.
- Terminal material’s traceability reports.

VII. All drawings related to project shall be stored in the system.

VIII. Pre-Commissioning and Commissioning:
- All the data related to pre-commissioning and commissioning shall be captured
- Bidder to develop pre-commissioning and commissioning sub-module to control and monitor the pre-commissioning and commissioning activities through approved pre-commissioning and commissioning procedures.
- All related data shall be collected by Bidder from Contractor / Owner.

Project Certification System shall be a front end application & should be able to store track and report on the Completion of a facility, system or sub- system. The purpose of the system shall be to assist in the management of System Handover for Mechanical Completion, Pre-Commissioning and Commissioning. It shall enable progressive verification of physical installation work according to the design and specifications of equipment and systems, providing data traceability against relevant drawings ensuring compliance with performance standards, specifications, codes and regulations.

In addition, the system shall provide a collaborative real-time environment for fast and reliable tracking, monitoring and reporting on consolidated Punch list data stage completion.

The certificates and commissioning procedures to ensure project requirements are met for smooth transition process and turn-over of pre-defined systems and Equipment, stage completion certificates and Commissioning procedures to ensure project requirements are met for smooth transition process and turn-over of predefined systems and Equipment.

The system shall be able to generate the completion certificate online through web interface which can be used by Owner.

Material Management Module:

This module is dedicated for tracking of procurement and supply of all materials for the project. It shall include various stages from procurement order, manufacturing, coating- painting, testing, inspection, dispatch and storage at site of all items used in the project as per OWNER's approved ITP. Major focus of this module shall be to access delivery progress of all critical items such as line pipes, valves, etc. including its consumption and stock availability at store yards. This tracking shall have sequential hyper-linking for upload of documents by vendors and contractors. The material tracking system shall manage the material status from PO release to item used. Each material shall be listed with a unique item Code. Planning and scheduling shall be as per the Quantity required, scheduled PO release, scheduled Delivery date range. The system shall also have a PO tracking system along with vendor management. Quantity receipt consolidation should be supported by approved documentation like material receipts and Inspection reports. Appropriate material test certificates are also uploaded along each delivery.

Recommended Features:

- Tender
- Purchase Order
- Reorder alert report
- Manufacturing status
- Delivery due date list
- Quantity delivered v/s ordered
- Reconciliation statement

Line pipe & Long Radius Bend tracking

All activities as per approved ITP are required to be tracked and monitored through PIMS and their related evidence documents to be uploaded and hyperlinked suitably.

Following are major activities to be covered as minimum:

- Pipe / bend basic dimensions (length, diameter, thickness, bend radius).
- Raw material (Steel) procurement by supplier. Inspection and Testing details of plates with heat numbers.
- All testing activities as per approved ITP (i.e. NDT, Hydro-test, expansion, repair, visual inspection, physical & chemical tests etc.)
- Welding Procedure Qualification for Line pipe manufacturing.
- Line pipe coating Inspection & testing reports including batch details of chemical used. Trailer wise line pipe loading & dispatch details (packing list, LR / GR).

Relative evidence documents for all items to be uploaded and hyperlinked suitably for following, as minimum number of materials;

- Steel Plate/ Coil
- Line Pipes
- Actuators
- Ball Valves
- Other Valves such as Globe, Plug, check, etc.
- Scrapper Trap with Pig Signaler
- Flow Tee
- Insulating Joint
- Quick Opening and end closure
- Reducers
- Flanges
- Station Pipes
- Metering System
- SCADA Equipment
- Telecom Equipment

- Solar Power Equipment
- Equipment related to TCP & PCP.
- DG Set
- UPS
- Electrical & Instrumentation systems
- Any other item as required

Materials for above packages and items procured by respective vendors and materials procured by Contractors shall be monitored by taking inputs data from MPR (Material Progress Report) of respective vendors/ Contractors.

eDMS Module:

This eDMS Module refers database for all discipline wise project data of each package for pre-construction, construction, post- construction related activities and any other required information but not limited to, as following:

- Letter of authorization
- Tender document
- Design basis
- Pipe information (Manufacturing history, inspection documents, test certificates of pipes/ plates).
- Pipe reconciliation statement
- Material acceptance (Joint coating material manufacturers test certificates).
- Manufacturers test certificates and site qualification test reports like filler material, electrode etc.
- Procedure reports.
- Approved procedures, job procedures, welding procedures specification and qualification
- Scanning and digitization of gazette notifications
- Design Calculations/ Analysis
- Route maps
- Alignment sheets
- Detailed AFC drawings (road, railway, minor water crossings, major water crossings, etc.)
- Plot plan
- General Arrangement Drawings (GAD)
- Isometric drawings of installations
- Special Installations e.g. hot taps etc.
- Hydro testing and pre-commissioning documents/ data including water filling, pressurization and hydro test reports, dewatering inspection reports, magnetic cleaning reports, EGP reports drying inspection reports, inertisation, preservation inspection/commissioning reports.
- HAZOP report
- Emergency Response Plan
- QAP
- As-built drawings and documents
- Vendor / Contractor bills / invoice along with payment history.

Engineering and document and drawing approval status is tracked using this module.

a) PIMS configures the Document/ Drawing list from the Document control log & Material Control Log.
- Document/Drawing Code
- Category
- Sub Category
- Document Name
- Proposed date of Creation
- Estimated date range of Internal Document Control.
- Date range for Submitting to Client for comments
- Date range for incorporating comments
- Date range for Issuing for approval
- Date of Approval (AFC).

b) When a document/drawing is approved, it is scanned and attached.
c) Exhaustive search and summary reports are generated.
d) The document/drawing is uploaded as soon as its status is “approved”.

The eDMS module is searchable using metadata like category, sub category, type of document, vendor, material, remarks and document number, etc.

3.6 Pre-Commissioning and Commissioning Module

All the data related to pre-commissioning and commissioning shall be captured on PIMS. Data related to PESO/ OISD/ Internal audits shall also be recorded.

Contractor to develop pre-commissioning and commissioning module to control and monitor the pre-commissioning and commissioning activities through approved pre-commissioning and commissioning procedures.

3.7 Data Capture Interfaces

Monitoring data capture and then its uploading on PIMS shall be the responsibility of contractor & PMC. All monitoring data shall be collected on daily basis from respective vendors/ contractors. Interface document for this shall be prepared and agreed with Contractor after award of PIMS work.

3.8 System Handover

It is responsibility of contractor to ensure complete backup, safety and confidentially of the data. After commissioning of Project, PIMS contractor shall handover the complete information management system database with all licensed software (for lifetime) to Company. Handover shall consist of installation and running of PIMS on Company’s serve to the satisfaction of the Company.

4.0 SCOPE OF SUPPLY

4.1 Items to be Supplied By COMPANY as Free Issue

Company shall supply all inputs like construction / supply drawings, documents, data, etc. required for implementation of Web & GIS based Pipeline Information Management System to the Contractor at an appropriate time during the execution stage as free issue items on refundable basis.

4.1.1 Conditions for COMPANY Supplied Items

i. The Contractor shall be responsible for taking over of the material and subsequent handling during performance of actual work at site & safe keeping of the inputs drawings, documents, data, etc.

ii. The Contractor shall inspect all COMPANY supplied free issue items at the time of taking over from the COMPANY and defects noticed, if any, shall be brought to the notice of COMPANY / COMPANY representative and jointly recorded. Once the item has been taken over by the Contractor, all the responsibility for safe keeping of the items shall rest with the Contractor.

iii. Every month the Contractor shall submit to the COMPANY an account for the item issued to the Contractor in the Performa prescribed by Engineer-in-Charge.

iv. On completion of the works Contractor shall submit “Item Appropriation Statement” for all items supplied by the COMPANY as free issue items.

4.2 Item to be supplied by CONTRACTOR

The procurement and supply, in sequence and at appropriate time and place, including inspection and expediting, of all Items and consumables required for completion of the WORK as defined in this BID document except the Items specifically listed under para 4.1 above as COMPANY free issue Item, shall be entirely the CONTRACTOR's responsibility and the item rates quoted for the execution of the WORK shall be inclusive of supply of all these Items. All Items supplied by the CONTRACTOR shall be strictly in accordance with the requirements of relevant COMPANY specifications enclosed with the Contract document. All equipment, machines, instruments, components etc. shall be new and specifically purchased for this job from Company approved vendors, duly inspected by

approved third party inspection agency (Only manufacturer certificate may not be adequate).

4.3 Storage of Items / Materials

4.3.1 All items / materials shall be preserved against deterioration due to poor or improper storage while under the custody of the Contractor.

4.3.2 All items / materials shall be duly protected by the CONTRACTOR at his own cost.

4.3.3 Openings of equipment, machines, instruments, etc. shall be kept in covered condition to prevent entry of foreign matter.

5.0 MANPOWER AND EQUIPMENT TO BE DEPLOYED BY CONTRACTOR

Sl. No	Manpower	Number Per Camp per Part	Qualification	Location	Equipment
1	Site Engineer	2	Mechanical Engineer	Camp Office	1 No. Laptop along with high speed internet connectivity (minimum 1 Mbps), A3 Scanner, 1 A4 Printer
2	Surveyor	1	Surveyor	Camp Office	GPS Device
3	Co-ordinator	1	Mechanical/ Civil Engineer	Back Office/ Camp	
4	QA Engineer	1	Mechanical Engineer	Back Office	
5	GIS Analyst	1	BCA/ MCA or equivalent in GIS	Back Office	
6	Developer	1	BCA/ MCA/ B.Tech (Computer Science/ IT)	Back Office	

6.0 SITE VISIT

Bidders are advised to make site visits to familiarize themselves with all the salient features of site and available infrastructure along the pipeline route / site. Contractor shall be deemed to have considered all constraints and eventualities on account of site conditions along pipeline route while formulating his bid. Contractor shall not be eligible for any compensation in terms of cost and/ or time, on account of site conditions along pipeline route varying to any extent from whatever described in the Bid Package and the drawings furnished along with the Package.

7.0 PRIORITIES

COMPANY may, at its sole option, assign priority of work to any part of the total pipeline or terminal works. Contractor shall comply with such priority of execution without any time and cost implication to the COMPANY.

8.0 CONFLICT / DISPUTE

In case of any dispute / conflict arises within Particular Job Specification (PJS) and their associated documents (like Appendix & Annexures), the most stringent requirement will govern. However engineer-in-charge's discretion shall also govern on the above issues based on the applicability as per site conditions.

GENERAL TECHNICAL SPECIFICATION (GTS) FOR PIPELINE INFORMATION MANAGEMENT SYSTEM

PIPELINE INFORMATION MANAGEMENT SYSTEM (PIMS)

1.0 INTRODUCTION

The Pipeline Information management system is a web based solution, designed to monitor the construction progress on a real time basis. Data that is entered on daily basis is indexed and linked with scanned documents that provide validated data. Reports are generated in a telescopic format that helps to browse from the route map to details of each pipe laid. The solution is designed to provide real time information about pipeline laying progress alongwith all associated works including stations/ terminal works during following three stages, project planning, project execution/ construction, pre-commissioning & commissioning, operation and maintenance. Electronic documentation, graphical reports, pipe book, joint history etc. are some of modules of PIMS.

The pipeline information management system is a web based solution, designed to

a) Act as a Monitoring system
b) Help decision making in construction planning
c) Show real time progress on web
d) Generate online report
e) Consolidate all information in a centralized database
f) Archive documents online
g) Help in project execution / construction, pre-commissioning & commissioning.
h) Assist operation & Maintenance

This document would be the reference document for any details related to the project scope and implementation procedure.

2.0 PIMS SCOPE OF WORK

2.1 The bidder is required to make use of software solution to track construction progress of the project on a real time basis updated daily. The progress needs to be displayed electronically on a web based format. Proper secured access is to be provided to the consultant and client enabling review of construction progress on a daily basis.

2.2 Along with the technical submission, the consultant/ client may call upon the bidder to demonstrate the software proposed to be used.

2.3 All pipeline construction related documentation (QA/ QC reports, procedures, project planning documents, test certificates, records of meetings, land records, photographs, inspection material reports and audit compliance documentation) including the pipe book, weld book are required to be handed over to the client in an electronic form in appropriate formats and system.

2.4 Apart from storing all paper documentation, the software should have requisite feature/ facility to generate as-built alignment sheets from varying points of the pipeline ROW. It shall be the contractor's responsibility to collect GPS co-ordinates at each weld joint using hand-held portable GPS co-ordinates.

2.5 The software should also have the feature/ facility that the daily progress can be shown (apart from tabular reports) on a web, with progress of different activities, geo referenced to the surroundings land base.

2.6 All NDT test reports are required to be handed over to the client in an electronic format, duly geo referenced as part of the software archival features.

2.7 The proposed software solution should have search/ query features. The fields may be sorted/ searched by chainages, joint number, etc. It should also have the feature to print the query.

2.8 The software shall have the facility to auto-generate pipe book.

2.9 The software shall have the option of reconciliation of free issue materials, electronic documentation and material management.

2.10 The contractor will impart training to the client, consultant and laying contractor on usage of the PIMS solution and its application

2.11 All survey data, engineering documents, construction reports, ROU details, user manuals shall be uploaded to respective modules (as applicable) of GIS Software developed by CLIENT**.**

2.12 The Contractor / PIMS service provider shall be solely responsible for arranging all resources, facilities and logistic supports etc. required to complete the work under this contract. In broad, the contractor shall be responsible for providing the following:

i) Establishment of offices with proper storage and security arrangement for all spreads at suitable locations in the nearby area of owner's camp office to carry out his activities in close coordination and in an efficient manner.

ii) Deployment of requisite manpower for project implementation, providing all qualified skilled/unskilled personnel to carry out the entire job and facilities required to complete the job to the entire satisfaction of the owner in accordance with the requirements of the tender document.

iii) Deployment of all requisite hardware (servers, computers, printers, scanners, UPS, etc.) loaded with requisite software application to run MS-Office GIS model, other software and applications required for the project implementation

iv) Insurance of all his hardware/ software and other equipment and personnel deployed for the execution of the above work.

v) All consumables for scanning, printing, storing, and creation of backup data

vi) CD's/DVDs and alternate consumables of backing up of data

vii) Organizing the onsite team's travel to site for GIS survey

viii) Boarding and lodging for all its personnel deployed for the execution of the above work

ix) Local transport / conveyance for commuting to onsite location from the place of boarding and commuting on the ROW for the GIS survey

x) Establishment of suitable communication network with a provision of Internet connection for communication, email and uploading and downloading of scanned documents

xi) Meeting all requirements of documentation.

xii) Certification of the quality and accuracy of work carried out.

xiii) Right of access for audit of the quality and accuracy of work done.

xiv) Contractual requirement for quality of code.

xv) Arrangements should be made to ensure that all parties involved in the contract are aware of their security responsibilities.

xvi) The integrity and confidentiality of the Owner's information assets are to be maintained and tested.

xvii) Adequate physical and logical controls should be used to restrict and limit the access to the Owner's business information to the authorized users.

xviii) The level of physical security to be provided for equipment.

xix) Owner should have the right to audit/ third party audit the information security management system of contractor.

xx) Contractor shall be responsible for settling all compensation and disputes arising out of any damages caused by him or his workmen during the execution of work. Contractor shall carry out all work in strict compliance with applicable documents enclosed with the tender document and as per the instructions of owner's representative. The scope of work shall also include any other item/work required to complete the work in all respects as per specifications, drawings and instructions of owner's representative whether specifically mentioned here in or not, but required to fulfill the intended purpose of this tender document.

2.13 The software solution chosen by the contractor should have been used and tested on previous pipeline projects.

3.0 FEATURES OF PIMS SYSTEM

The proposed PIMS software should have the following features as a minimum:

3.1 Technical features

a) Security of data base and world class data recovery management
b) Simultaneous monitoring from different locations/ spreads by contractor, CLIENT / VCS .
c) Protection from virus attack and other malignant programs
d) Scale dependent feature drawings and application execution
e) Feature labeling including label collision mediation
f) Fully customizable template driven output
g) True type fonts
h) Map element automation (scale bar , reference map and legend)
i) Thematic mapping using logical or regular expression based classes
j) Support for popular scripting and development environments (PHP, Python, Perl, Ruby, Java and C# etc.)
k) Cross Platform support
l) Compatible with Linux, Windows, Mac OS, Solaris etc.
m) Remote daily back-up using r-sync or equivalent technology
n) SSH encryption
o) On the fly compression
p) FTP access
q) No data transfer limit
r) Indexing and archive documents online in a searchable format

3.2 General features

a) Monitoring of pipeline construction activity
b) Linking of surrounding landmarks and data in corridor manager
c) Data updating on a daily basis
d) Generation of alignment sheet using survey data
e) Online alignment sheet generation
f) Auto-generation of pipe book
g) Real time pipeline laying progress monitoring
h) Monitor online records of progress
i) Monitoring of material availability and quality documents
j) Uniformity of documentation and reports
k) Real time creation of pipe book , weld book
l) Real time creation of welder performance reports, pipe reconciliation reports.
m) Pre hydro test and pre lowering compliance report generation

3.3 Planning and material management

a) Material management from starting from order placement, manufacturing & inspection at vendor works, receipt at site, issue to vendor, erection/ commissioning, reconciliation (including test

certificates, inspection certificates, goods receipt voucher (GRV), store issue voucher (SIV), incoming material inspection report (IMIR), inspection release/ waiver certificate etc.)

b) Document control log
c) Material control log
d) S-Curve to assess the current project status w.r.t planned schedule for each activity as well as overall (weighted based)
e) Velocity chart : work done for a particular activity in chainage vs week
f) Graphical progress: to give an overview of work done in each chainage
g) Reconciliation of each type of free issue material issued to the pipeline contractor (Refer Annexure-8 for guidelines on reconciliation)

3.4 Real time web progress monitoring

a) Dynamic generation of DPR with planned time line and asking rate.
b) Real time generation of pipe book with hyperlinked scanned ITR (Inspection test reports)
c) Tie in Chart with complete history (WPS no. , welder details, pipe details, NDT details etc.) of each activity for each joint.
d) View/ export pipe book in real time, Daily DPR, Activity data sheets, Joint schematic, Station piping etc.
e) Reports of minimum following activities shall be digitized for monitoring for real time progress monitoring:

- Clearing & Grading
- Stringing
- Bending
- Trenching
- Welding
- Tie in Welding
- Welding Repair
- Non Destructive Testing – Radiography / AUT
- Non Destructive Testing – Ultrasonic Testing
- Non Destructive – Magnetic Particle testing
- Non Destructive- Liquid Penetration testing
- Joint coating
- Lowering
- Back Filling
- Restoration
- Hydro Testing
- TCP / PCP
- Crossings
  - HDD
  - Cased Crossing
  - Thrust Boring
  - Open Cut
- Concrete Coating

- Coating Repair
- Cathodic protection system reports
- Station piping fit-up
- Station piping welding
- Station piping NDT
- Station piping Painting
- Civil works (building, road, boundary wall etc.)
- Instrumentation works
- Electrical Works
- Fire-fighting works
- Structural works
- Corrosion Monitoring System Works
- Telecom works
- SCADA works

3.5 Generation of compliance reports

a) Query for exceptions like joint coating done but NDT not done, lowering done but joint coating not done etc.
b) Welder performance report
c) Unqualified welder report
d) Duplicate pipe control

3.6 Indexing and archive documents online in a searchable format

a) Exhaustive document/ drawing scanning & indexing with searchable metadata. All pre-construction, construction, as built and hand over documents must have search/ query options. There should also be provision to print the queried data.

3.7 ROU Data digitization

a) Collection of revenue data such as village maps, Ownership records from concerned Revenue Department/ client for acquired RoU
b) Scanning, geo-referencing and Digitization of the village map, and transferring the pipeline alignment and RoU corridor.
c) Preparation of seamless cadastral map (RoU Land map) to the scale of 1:5,000 incorporating survey number and ownership details with in the acquired RoU. The land details (ownership details, compensation details etc.) shall also be presentable in graphical mode
d) Conversion of RoU land maps and digitized cadastral records to .shp file.
e) Conversion of already existing cadastral maps/ data to .shp files
f) Collection of available data from CLIENT (soft/ hard copy) pertaining to revenue map, ownership details of RoU, compensation details etc. and digitizing the same for graphical representation of data.

3.8 Graphical Representation of survey information

a) Land records
b) Crossing and utilities
c) Location of crossings, SV / IP
d) Photographs of crossings/ mainline activities
e) Crossing drawings
f) Representation of surroundings features
g) Structure and monuments in vicinity
h) Tracking work progress using color codes
i) Generation of web based PIMS alignment sheet using third party application integrated with Arc GIS.

4.0 Project Roles & Responsibilities

4.1 Tentative Responsibility Matrix

Sr. No.	Information / Document Required	Client/ PMC / Supplier/ Execution Contractor
1.	Pre-Construction and Project Configuration Information	Planning
2.	All Standards & Approved procedure documents.	QA / QC
3.	Approved engineering documents	QA / QC
4.	Approved construction related documents	QA / QC
5.	Engineering / Document status control information	Engineering
6.	Approval of structure/fields of pipe book and other forms that are to be filled at site for progress as well record of work	Planning
7.	Submitting daily activity ITR's /Progress. Details/GPS coordinates	Construction
8.	Activity Completion Certificates	Construction
9.	Reporting of changes like, route, TP angles, new crossings, scope of work, work schedule etc	Construction
10.	Inspection / Quality certificates Material, WQT, WPS	QA / QC
11.	Ensuring correction of NCR generated by PIMS .	QA/ QC
12.	Procurement status and receipt information/documents	Materials
13.	Pipe Details / List from manufacturer, Yard Receipts.	Pipe Manufacturer / Materials

5.0 Work Procedure

5.1 Execution Methodology

a) PIMS site engineers shall enter the data from their own camp offices located at site.

b) PIMS site engineer shall collect approved field inspection reports from contractor office daily in the evening.

c) These reports shall then be entered in the PIMS (PIMS site engineer shall exercise due diligence to the accuracy of the reports and discrepancy, if any, shall be reported directly to VCS).

d) Reports shall automatically be generated in real-time.

e) Quality Engineer at head office shall verify all reports/ document data by 11.00AM next day.

f) Current information. Next day plan, daily progress report, document status, documents, procurement status for uploading (preferably in .xls format) shall be provided to PIMS engineer on a daily basis.

g) Digital Photographs/ videos duly labeled (with chainage/ location) for crossings, stations, special utilities/ surroundings etc. should be linked to pipe route schematic. These photographs must be updated as and when progress is done.

h) Deviation reports for route changes, process changes, etc. along with their documents shall be provided.

i) Comprehensive training shall be imparted by the PIMS Contractor to the Client's personnel on usage of PIMS software.

5.2 Configuration & Pre-Construction

a) The following are the details, information, drawings and documents required for configuring the PIMS. Only approved for construction information will be digitized.

i. Project details as per project tender specifications.
ii. Tender Docs to be uploaded in documentation.
iii. Company profiles of Contractor, PMC and Client.
iv. Route Map and Line Diagram.

b) Survey data is required for generating PIMS alignment sheet and route Corridor Manager. Corridor is generated based on chainages. Survey data has to be digitized on PIMS approved format and then imported in the solution. The survey data to be included is as follows :

i. TP and IP numbers, angles and locations.
ii. Crossings, CS numbers, Crossings type, Crossing width and locations.
iii. Topographic details of ROW.
iv. Ground Level profile
v. Soil resistivity survey details

vi. Soil stratification details
vii. Population Density (PDI)
viii. Cadastral records with survey numbers, village, taluka, district, state and maps, referenced with chainage.
ix. Planned Pipe specifications

c) Alignment Sheets: Pipeline alignment sheets in CAD format.

d) Project Schedule: Generating project schedule and Gant chart using PIMS tools.

e) Activity Settings: Configuring activity scope and weightages for S-curve generation.

f) Document & Material Control Log: For Indexing the engineering approval status.

g) Procurement Status: Material list with schedules and scope.

h) Customization of following Reports as minimum :

i. Formats of various reports to be customized like;
ii. Pipe Book
iii. DPR
iv. Setting up WPS types
v. Importing pipe list
vi. Configuring Welder cards
vii. Customizing input forms of various activities.

5.3 Welding Procedure Specification (WPS) :

The following minimum details are to be configured:

i. WPS Number
ii. Diameter of Pipe (From- To)
iii. Wall thickness (From- To),
iv. Material
v. Welder ID's qualified for each WPS
vi. Procedure qualification report (PQR).
vii. Voltage & current parameter range.

5.4 Defect Types

A list of different type of defects (Weld Defects) will be configured as per CLIENT Quality records.

5.5 Bend Type

A list of different type of bends shall be provided, complete with details of relevant chainage.

5.6 Welder Details

The following details shall be configured as a minimum:

a. Welder ID
b. Qualification Certificates.
c. For evaluating the welder performance, the NDT analysis should reflect or trace the weld defect to a specific welder.
d. In weld repair, the defect welder should be mentioned.

5.7 Field Inspection Report Numbering

Field Inspection report numbering procedure is to be defined. A unique number is to be provided to each inspection report of each activity that is to be managed through the construction management module.
In case project is divided into multiple Spreads, Spread number must be mentioned on each activity report separately. For example: If there are four spreads in a project, reports can have SP-1 for 1st Spread and SP-2 for 2nd Spread.
For any single activity, report number should not repeat within spread. Report number can be same for two spreads. Eg. For spread number SP-1, Trenching should not have two reports of Number 01. But Spread 2 (SP-2) can have report number 01.

5.8 Pipe Number Specifications

It is advisable that PIMS imports the pipe-list provided in .xls format by the manufacturer. Apart from the pipe number, the PIMS system must list the pipe specification, manufacturer, coating company, dispatch date, manufacturer test certificate.

If any pipe 'X' has Pipe No = "2V07K30779" then no other pipe can have same. PIMS differentiates the pipes not just by the pipe number, but also compares the heat number and coating number.
PIMS engineers should not enter the pipe number manually throughout the activity of digitization process (Stringing, Bending, Welding, NDT, Joint Coating etc). They should only select the pipe number from the drop down pipe list.

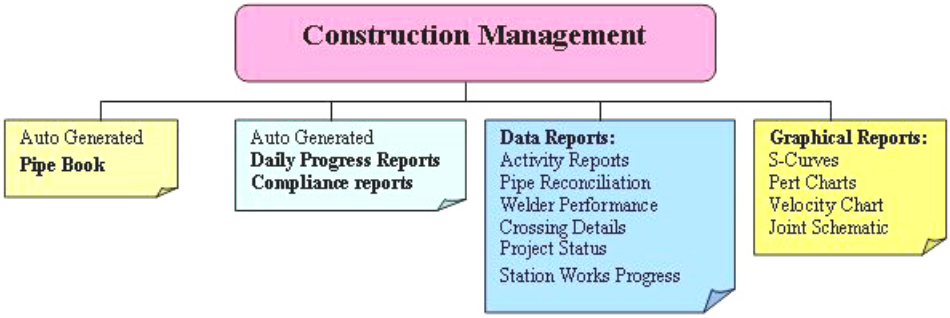
Naming convention for Cut/Pup Pipes

If pipe “2V07K30779” is cut into two pup pieces, then both the pieces shall be numbered by suffix. The terminology will be as per CLIENT’s quality records.

The pipe list report should have a special reconciliation section where pup pipe list should be elaborated along with their actual length. If a pup pipe's length is less than 2 meter (or as specified in the specification for reconciliation of free issue material attached elsewhere in the tender), it will be listed as scrap.

6.0 PIMS Modules

Modules followed for the project shall cover all the aspects of the tender. Indicative diagram / layout has been shown below:



PIMS MODULES

Construction Management
Activity Monitoring
Real Time Pipebook
Daily Progress Report
Crossings
Station Reports
Exceptions & QA reporting
Compliance Reports

Electronic Documentation
Pre-Construction Documents
Survey Documents
Construction Documents
Approved Drawings
Approved Engineering Procedures/ Documents
ROU data
Georeferencing of land data along the pipeline

Material Management
Material Receipt
Material Issued to Contractor
Material reconciliation
Material Documents (TC, IRN etc.)
User Manuals/ Approved Vendor docume

GPS Referencing
Alignment Sheet Generation
Corridor Management
GPS route Link
GIS Mapping & digitization
Graphical Land Record Master

7.0 REPORTS

Following minimum reports can be uploaded for users to view and download. These are to be sorted date wise.

a) Daily Progress Report
b) Weekly Progress Report
c) Monthly Progress Report
d) Station works progress
e) Approved & Updated Project Schedule

f) 3 Months Look Ahead Schedule
g) 6 Weeks Look Ahead Schedule

7.1 Quality Methodology

a) Error Reports for all activities are generated online and will be sent to CLIENT.
b) PIMS generated exceptions for example;
Duplicate Pipe & Joints
Incorrect Pipe number in report
Unqualified welder report
All data entry is verified by PIMS QA Engineer.
c) Visual Inspection of ITR's at site by PIMS engineers for any legibility/ incorrect format / incomplete entries / ambiguous data etc.
d) Exception reports are submitted to CLIENT along with the feedback form as below.

Sr. No.	Date of reporting	Activity	Report No	Non conformity	Date submitted to CLIENT	Date Rectified

7.2 PIMS construction activity digitization

All pipeline construction activity reports are digitized, scanned and uploaded. The fields needed for digitization may not be limited to the following;
a) ROW/ Clearing & Grading/Trenching/Stringing

Sl. No	Date	Chainage in Meters (From)	Chainage in Meters (To)	Distance in Meters	Remarks

b) Bending

Sl. No	Date	Chainage in Meters	Pipe No.	TP No.	Bend angle	Bend Type	Remarks

c) Welding

Sl.No.	Date	Joint No.	Pipe no. (Left)	Pipe No. (Right)	WPS No.	Welder (Root/ Hotpass)	Welder (Filler/ Capping)	Electrode Batch no	Remarks

d) Tie-In Welding

Sl. No	Date	Joint No	Pipe no. (Left)	Pipe No. (Right)	Cut Pipe Details	WPS No.	Welder (Root/ Hotpass)	Welder (Filler Capping)	Electrode Batch no	Remarks

e) Welding Repair

Sl. No	Date	Joint No (R, R2, Cut-out)	Segment	WPS No.	Welder No.	Electrode Batch No	Remarks

f) Non Destructive Testing - Radiography/AUT

Sl. No	Date	Joint No	Segment	Observation	Root Defects	Hot pass defects	Filler defects	Capping defects

g) Non Destructive Testing - Ultrasonic Testing

Sl. No	Date	Joint No	Segment	Observation	Remarks

h) Joint Coating

Sl. No	Date	Joint No	Holiday Test	Average Pipe Coating Thk (on body)	Average Weld Coating Thk (on seam)	Surface Preparation	Pre-Heat Temp	Peel Test	Remarks

i) Lowering

Sl. No	Date	Joint (From	Joint (To)	Section Length	Holiday Check	Pipe Cover	Northing (GPS)	Easting (GPS)

j) Back-filling

Sl. No	Date	Joint (From)	Joint (To)	Section Length	Remarks

k) Restoration

Sl. No.	Date	Joint (From	Joint (To)	Section Length	Work Done	Remarks

l) Hydro-testing

Sl. No	**Date**	**Joint (From)**	**Joint (To)**	**Attach Documents**	**Remarks**
				Hydrotest Plan, Safety Plan, Mechanical Completion Certificate, Air Cleaning Report, Brushing Report, Gauge Inspection Report, Water Filling Report, Thermal Stabilization Report, Pressurization -50%, 75%, 100% Air Volume Calculation, Pressure hold 24 Hrs, Hydrostatic Test Calculation, Hydrostatic Test Evaluation, De-Pressurization	

m) TCP/PCP

i) TLP Installation

Sl. No.	Date	Report No.	Type of TLP	Joint No.	Chainage in Mtr.	Remarks

ii) TCP Anode Installation

Sl. No.	Date	Report No.	Chainage	Remarks

iii) Anode Bed Installation

Sl. No.	Date	Report No.	Location	Remarks

n) Concrete Coating

Sl. No.	Date	Report No.	Chainage (from)	Chainage (to)	Remarks

o) Coating Repair

Sl. No.	Date	Report No.	Joint No.	Remarks

8.0 WORK PROCEDURE – WELD MAP UPDATING

The weld map updating procedure in PIMS shall consist of digitization the following reports:

a) WPS numbers and respective details and document.
b) Welder numbers and respective WQT or welder card.
c) Welding field inspection reports.
d) NDT inspection reports.
e) Weld repair reports.

8.1 Weld Joint Nomenclature

a) The welding joint nomenclature shall be as per approved weld joint numbering procedure is as below:

b) Weld joints on the pipeline shall be numbered consecutively for each kilometer, starting at 0 Chainage.

c) Each Joint shall be Prefix'ed or Suffix'ed with the Letters in Capital as per the approved methodology with EIC. The indicative description shall be as follows:

Prefix	Denotes	Description	Examples
M	Mainline	Joint is of Mainline	5 M 40
S	Stations	Joint is with in a ball valve station	S 2-21

T	Tie in		5 T 43
FT	Final tie in	Joints between free section ends	9 FT 82
GT	Golden Joint	Golden Joint on hydro test section ends	15 GT 83
TR	Transition Welds	Joints with different wall thickness	12 TR 12
R1	Repair	First Weld repair	14 H 56 R1
R2	Second Repair	Second Weld Repair	14 H 56 R2
RW	Reweld	Joint is cutout but retains original number	56 H 47 RW
CO	Cut Out	Cut Out Joint detail	14 H 56 CO
A, B ,C	Additional joints	Due to creation of void between sections having successive joint numbers	… 17 H 24 , 17 H 25, 17 H 25A , 17 H 25B , 17 H 25 C , 17 H 25 D , 17 H 26…..

d) The weld number, e.g. 5 M 4L where 5 indicates the 6^{th} kilometers (i.e. between KP 5 and KP 6) and 41 indicates weld number 41.

e) Tie-in welds shall be given the prefix "T" and use the same numbering as the mainline (as above).

f) FT will indicate joints tied between two sections involving cutting of pipe and stress developed during fitting of two ends.

g) GT will indicate Golden tie-in's performed between hydro-test sections.

h) TR will indicate weld joints performed between pipes with different thickness.

i) If a weld has been repaired it shall retain the original number but followed by the letter RI (e.g. 5 M 41 RI). If it is repaired a second time the weld number shall be followed by "R2" (e.g. 5 M 41 R2).

j) If a weld has been cut out and replaced by a pup pipe, creating Iwo welds, then the original weld will be posted in cut-out log having the original number followed by the letters "CO" (e.g. 5 H 4) CO). This joint will not be considered in the pipe book but will be shown in cutout joint log: The new length of the pipe will be updates for reconciliation. Pipe numbers will be suffixed with A, B, C and so on.

k) If a good or accepted weld has been cut out and replaced by a new weld, then that weld shall retain the original number followed by the letter "RW" (e.g. 5 M 41RW).

l) Welds in valve stations shall be given the prefix "S", followed by the station number and then the weld number (e.g. S 2-21).

8.2 Weld Schematic

The weld schematic is a graphical representation of the weld joints of each chainage. It graphically represents the following;

a) Each pipe alongwith its number and heat number. Pipe color depicts its thickness. A mouse over on the pipe displays its details.

b) Each block represents a joint. Its color coding indicates its status, whether welded, NDT done or rejected, joint coating lowered, backfilled. The letter below each block indicate if the joint is a tie-in (T), free tie in (FT), re-take (RT), re-weld (RW) etc.

c) Click on any joint displays its weld history with links to inspection reports.

d) Below is the legend of symbols that will be used in joint graphical.

8.3 Weld Data Report

A detailed weld report having all joints welded with their status, welder number, WPS, electrode number etc. are displayed. A special query is generated for listing the cutout.

8.4 Quality Methodology

a) Error reports for all activities are generated online and will be sent to contractor as well as VCS .

b) PIMS generated exceptions for example; Duplicate pipe & joints, incorrect pipe number in report, unqualified welder report.

c) All data entry is verified by PIMS QA engineer.

d) Visual inspection of ITR's at site by PIMS engineers for any legibility / incorrect format / incomplete entries / ambiguous data etc.

e) Exception reports are submitted to the contractor alongwith the feedback form as below :

Sr. No.	Date of Reporting	Activity	Report No.	Non Conformity	Date submitted to contractor	Date Rectified by contractor

9.0 Crossings

PIMS software shall have details of crossing reports. The following information shall be configured as a minimum:

a) Crossing No.
b) Crossing Drawing
c) Name of Crossing
d) Type of Crossing (HDD, Thrust Casing, Open Cut)
e) Chainage Point from-to
f) Crossing Width
g) Permission Authority
    i) Authority Name
    ii) Date of Permission
    iii) Expiry of Permission

h) Stage Inspection Report

10.0 Station Piping

Generation of station piping DPR requires the following fields from the inspection report of each terminal;

a) SV Number (with scope of work for each activity).
b) Date
c) Report Number
d) Fit-up (Inch Dia)
e) Weld Visual (Inch Dia) Radiography (Inch Dia)
f) Manual UT (Inch Dia)
g) DPT (Inch Dia).

11.0 Snap Shot of Main Reports

11.1 Daily Progress Report

11.2 Joint Tie-in Chart

A joint tie-in chart report represents and gives detail of each joint from welding to backfilling. Tie-in and free tie-in joints, repaired joints etc. are also represented with respective legend as shown in below figure. Each joint will have UTM Coordinates.

11.3 S-Curve

11.4 Cumulative Chainage wise progress graphical

11.5 Cumulative Activity (Schematic)

11.6 Compliance Reports

Feature to query any left out activity for any joint within a range prior to lowering or hydro testing.

a) Pre-lowering compliance report generation.
b) Pre-hydro test compliance report generation.

Lowering compliance report gives the complete history of joints with the conformation that pre-selected is ready to lower with the details of calculated section length to be lowered. It gives exception of activities not performed or not reported.

11.7 Free Issue Reconciliation Report

a) Pipe Tracking Report

The pipe tracking report shall have the following minimum fields:

Despatch Date	Receipt Date	Pipe No.	Heat No.	Length	Dia	Thk.	Grade	Type	Coating Type	Mfg. Name	GRV no.	SIV no.	TC no.	Left Joint	Right Joint

The despatch date shall have the inspection release note/ inspection waiver hyperlinked to it. Also the GRV no. , SIV no. , TC no. shall have GRV, SIV and TC hyperlinked to them respectively.

b) Other Free Issue Material Tracking Report

Despatch Date	Receipt Date	Item Description	Size	Rating	Material	Mfg. Name	GRV no.	SIV no.	TC no.	IRN no.	Remarks

c) Reconciliation Report
The free issue material needs to be reconciled. The reconciliation shall be done as per the specification for reconciliation of free issue material attached elsewhere in the bid document. The software solution must have the ability to reconcile all the free issue materials.

11.8 Real Time Pipe Book Generation

The proposed software shall have the capability to auto-generate pipe book from digitized inspection reports. It should have provision to query fields, chainages and joint number range.

12.0 GIS Route Digitization & Layering

GIS vector / raster images and maps with links of all TP's having layered details chainage progress till date, digital pictures / documents / material list of special sections. Links should get dynamically

generated as and when data entry is done. Shape files containing the GIS system shall be handed over to the client for their reference.

a) Survey Information

i) Land Records
ii) Soil Corrosion Records
iii) Geo References

b) Local & External Data

i) Shape files of Alignment Sheets
ii) Imagery (Landsat, ICKNOS Quick Bird, SPOT) are superimposed

c) Crossings & Utilities

i) Location of Crossings, SV
ii) Photographs of Crossings
iii) Crossing Drawings
iv) NOC's Related Documents

d) Pipeline Route

i) Planed route on satellite imagery
ii) Structures and monuments in vicinity
iii) Layers of road maps superimposed by route.

12.1 Pipe Route Linkages

This graphical representation of the route has nodal points referenced against chainages for the following; SV/ IP station, turning points, crossings, KM posts, warning signs, city / town crossings and certain important landmarks. These points are hyperlinked to provide more details. Further click on a point gives descriptions like as date progress, digital video of special sections, IP stations, view related pipe book page, etc.

12.2 Corridor Management – Graphical

12.3 PIMS Alignment Sheet Generation

The proposed PIMS software solution shall have the ability to generate as-built alignment sheets. The survey data shall be digitized to generate the alignments sheets. During construction process, the contractor shall record GPS co-ordinates at each weld joint and based on them generate as-built alignment sheets. The levels/ cover at each joint should be collected from the laying contractor and

incorporated in the as-built alignment sheet. The mouse tip should display the UTM coordinate of a particular joint.

The web based, auto generated PIMS alignment sheet shall have all the features of the standard alignment sheet provided by the survey agency. The data used for generation should also be tabulated. The information to be shown in the alignment sheet layers is as follows:

a) Planimetry
   TP / IP Details
   Weld Coordinates, weld chainage

b) Crossings & Topographic Locations
   Crossings
   Geo-reference

c) Profile
   Ground level, pipe cover

d) Marker locations and details

e) PDI / Class

f) Pipe Types

g) Soil Resistvity

h) Soil Stratification

13.0 Electronic Documentation System

All construction reports, progress reports, test reports, specification and procedures etc. should be linked to the relevant data reports. Each document should be accompanied with unique meta-tags that can make a specific search easier later. The following aspects should be covered under this section;

a) Pipe information (Manufacturing history, inspection documents, raw material test certificates, test certificates of pipes and plates, inspection release note)
b) Other free issue material (valves, IJ, flow tee etc.) information (Manufacturing history, inspection documents, raw material test certificates, test certificates, inspection release note)
c) Pipe reconciliation statements
d) Material acceptance (Joint coating material manufacturers test certificates).
e) Manufacturers test certificates and site qualification test reports like filler material, electrode, epoxy etc.
f) Equipment data sheets and test certificates.