गेल (इंडिया) लिमिटेड
(भारत सरकार का उपक्रम – महारत्न कंपनी)
GAIL (India) Limited
(A Government of India Undertaking— A Maharatna Company)

"स्वान", दूसरी मंज़िल,
#323, कोडिगेहल्ली मेन रोड,
सहकार नगर,
बेंगलुरु – 560092
"Swan", 2nd Floor,
#323, Kodigehalli Main Road,
Sahakarnagar,
Bengaluru – 560092
फ़ोन/Phone : 080-46244111
फैक्स/Fax : 011-26185941

LETTER OF ACCEPTANCE

To
AKASH CONSTRUCTION
.,
Rounchi Bangar Township
D 23 Kadam Vihar
Rounchi Bangar Township
MATHURA-281006
Uttar Pradesh ,India
Tele No : 5652432867

LOA No. : GAIL/C2022-12/5300037473/20106356/BBA
Dated : 09.09.2022

RFQ No. & Date : 3300094669 Dt. 09.09.2022
Your offer/Qtn.No.: .
Qtn. Dt. : 03.08.2022
E Tender No.: NIL
Vendor Type : MSE-MICRO-OT
Vendor GSTN No : 09AKIPG4493P2ZD

Kind Attn :

Name of Work : Rerouting/Shifting of 18"x800 mts long pipeline near Manyata Tech Park in Bangalore city.

Dear Sir/Madam

With reference to your Offer against our RFQ and all subsequent correspondences (if any) till date and in continuation
of our Fax/Letter of Intent (if any) we are pleased to award the subject works highlighting the following salient features:

Scope of Work : Rerouting/Shifting of 18"x800 mts long pipeline near Manyata Tech Park

Contract Value : The estimated contract value including all taxes and duties under this contract works out to

Price Basis:

ITEM	**1**	**PIPELINE RE-ROUTING OF 18" CITYLINE**			**INR**	5,811,500.00

The estimated contract value of the subject job under this contract shall be Rs. 58,11,500/- including GST@18%.

The Order/ contract value mentioned above is subject to Price Reduction Schedule clause.

Schedule of Rates:
The proforma for schedule of rates enclosed with tender document shall be replaced by the Schedule of Rates (SOR) as enclosed to this LOA for purpose of Quantity, UOM & Rate.

Abnormally High Rated Items :
SOR item no. 4.0, 5.10, 5.20, 5.30, 6.0, 7.0, 13.0 & 14.0 are AHR items.

Duration of Contract/Completion Schedule :

The contract period shall be 90 days reckoned from the date of issuance of LOA. The period of completion given excludes the time required for mobilization & demobilization. Mobilization period shall be 10 days from the date of issuance of LOA.

Contractor shall give daily progress report of work done on previous day in the Performa prescribed by the Engineer-In-Charge and shall maintain a separate hindrance register to record any delay not attributable to the contractor and shall be certified by the EIC/SIC on weekly basis.

Performance Bank Guarantee:
The bidder shall submit Contract Performance Security / Security Deposit [CPS/SD] amount @3% of total contract value (excluding GST) i.e. Rs. 1,47,750/- valid upto 10.03.2024 (valid upto-contract end date + DLP+ 3 months), within 30 days of award of contract from GAIL.

The bidder shall furnish the Contract Performance Security (CPS) in accordance with of General Conditions of the Contract & as per Form F-4 of Tender Document only. Further, they also submit covering letter along with CPS as per format at F-4.

Contract Agreement:
I) Contractor is required to execute a contract agreement with GAIL (India) Limited, Bengaluru on non judicial stamp paper of appropriate value from Karnataka State within fifteen (15) days from the date of LOA in exact format available in the tender document. All charges including cost of stamp paper associated with this agreement shall be borne by contractor.

Payment Terms:
(a) GAIL shall pay for the services rendered as per stipulation in the tender through e-banking only. All bank charges of Contractor's bankers shall be to the Contractor's account.
(b) Contractor will invoice GAIL according to the terms and conditions provided in the tender. Contractor shall submit his invoices in hard copy / digital bill processing platform (ANJANI) to GAIL#s representative in the manner as instructed by EIC. Each invoice will be supported by documentation acceptable to GAIL and certified by the GAIL#s representative. Payments made by owner to the contractor for any part of the work shall not deem that the Owner has accepted the work. The progress payment shall be considered only as an advance against the work done. However, these payments shall be finally adjusted against full and final contract value to be made to the contractor.
(c) Payment will be made against the invoice to be submitted by Contractor against the work done on the basis of accepted unit rates as per Contract in the following manner:
i) Contractor can generate a maximum of 1 RA Bills and a final bill.
ii) One RA bill can be raised by contractor based on the executed quantity till that time and 80 % of the RA Bill amount will be released by GAIL. Remaining 20% of the RA bill will be released along with the Final Bill after due certification and clearance by "Engineer In-charge" on completion of all the works covered in the contract.

Paying Authority:
GM/HOD (F&A)
GAIL (India) Limited,
Bengaluru-560092.

PAN Particulars:

GAIL (India) Ltd PAN No. AAACG1209J

"As per CBDT Notification No. 95/2015 dated 30.12.2015, mentioning of PAN no. is mandatory forprocurement of goods / services/works/consultancy services exceeding Rs. 2 Lacs per transaction.

Accordingly, supplier/ contractor/ service provider/ consultant should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs. 2 lakhs. As provided in the notification, in case supplier/ contractor/ service provider/ consultant do not have PAN no., they have to submit declaration in Form 60 along with invoice/ bill for each transaction. ayment of supplier/ contractor / service provider/ consultant shall be processed only after fulfilment of above requirement".

GSTN Details :
Please note that our state/plant wise GSTN details as below for invoicing and other purpose.

NG Trans(DBPL)-Bengaluru (3170) 29AAACG1209J1ZS

Your Bank Details :
Please note that details of your bank account in our system are as under. You are requested to verify the same and intimate discrepancies, if any

Account No. - 38643940395
Bank Name - SBI
IFSC Code - SBIN0003540

Price Reduction Schedule:
Non-mobilization/ Delay in Mobilization after the award of the contract shall be dealt as per PRS clause & other contractual provision in GCC.
Non-performance/Delay at contractor#s end in execution beyond the date of completion/ target as mentioned in the Intimation letter/LOA will attract PRS @ Half percent (1/2 %) of the contract value for each week of delay or part thereof subject to a maximum of Five percent (5%) of the contract value (excluding tax).

Defect Liability Period:
Defects liability period shall be One year from the date of completion for each individual work.
During defect liability period, if any deficiency/ defect noticed in the works, contractor shall rectify and restore the same at his own risk and cost.

Contract Document:

FOI Reference/Regularization:
NIL

Engineer-In-Charge:
Mr. Scaria Mathew, DGM (O&M-NG P/L), GAIL, Bengaluru shall be the Engineer-In-Charge for this job. You are requested to contact him at E-mail Id: smathew@gail.co.in.in for further instructions.

Other Contractual Stipulations:
1. GAIL has implemented "ANJANI" e-measurement book & e-billing portal for ease in submission of measurement book/bill and reduction in paper transaction.

Accordingly, GAIL will process the bill with measurement book through "ANJANI" e-measurement book & e-billing portal (Link: https://gailebank.gail.co.in/MBautomation/frmlogin.aspx). Accordingly, contractor/ service provider/ consultant is requested to forward the RA bill on "ANJANI" e-measurement book & e-billing portal through concerned EIC/CIC/SIC, whichever is applicable.

Further, user manual is also available on aforesaid portal.

In case of any issue while submitting the ra bills in ANJANI portal, kindly contact to engineer-in-charge or team ANJANI; E-mail Id: embhelpdesk@gail.co.in (0120-2446400 extension 11509).

2. Vendors Details:
Sh. Shravan Kumar Gautam
Contact No.: 9837269113; 7017309974
E-mail Id: akashconstruction001@rediffmail.com

3. All other terms & conditions shall be applicable as per Tender no. GAIL/BLORE/CP/OM/C2022-12.

General Conditions of Contract:

As per GCC-Works attached with the tender.

Special Conditions of Contract:
As per SCC & SOW attached with the tender.

Post Order Correspondence:
All post order correspondences shall be made with Engineer-In-Charge (EIC) only.

Enclosures :
Tender no. GAIL/BLORE/CP/OM/C2022-12 dated 18.07.2022.

This order is being issued in triplicate.Two copies of the order duly signed ,stamped and dated on each page,may be returned within 3 days from date of receipt of the order to the undersigned..

For & on behalf of
GAIL (India) Ltd.

Bishar Bin Ali
(बिशर बिन अली)
Digitally signed by Bishar Bin Ali (बिशर बिन अली)
Date: 2022.09.12 11:32:32 +05'30'

(Authorized Signatory)

NAME :
DESIGNATION :

CONTRACTOR'S ACCEPTANCE:

PLACE :

DATE :

SIGNATURE :

NAME :
DESIGNATION :
SEAL :

NOTE: Each page of this order including its annexure should be signed and stamped by the contractor before returning to GAIL (India) Ltd..

SCHEDULE OF RATES

Item : 1 - PIPELINE RE-ROUTING OF 18" CITYLINE
Plant : 3170 - NG Trans(DBPL)-Bengaluru- Karnataka (KAR)

S.No.	Short Description	Qty.	UOM	Rate	Amount	AHR *
10	Pipeline Laying/ Installation	300	M	2,700.00	810,000.00	

Installation of Coated Line Pipes (Pipe OD - 457.2 mm, Wall Thickness - 11.1 mm , Pipe Grade - API 5L Gr X-70, PSL2 , Coating - 3 LPE internally coated). Job includes welding, RT, Joint Coating, lowering, backfilling up to the 500 MM from pipeline top, cleaning, flushing, hydrotesting, de-watering, drying-swabbing. Utility free trench will be provided by BMRCL. Refer Scope of Work (SOW) for detailed Scope.

20	Hydrotesting of Pipeline	530	M	390.00	206,700.00	

Hydrotesting of already laid pipeline of approximately 530 Mtr. length. including cleaning, flushing, filling, gauging, pressurisation, de-watering, swabbing & drying. Payment will be made based on the actual measurement at site. Refer Scope of Work (SOW) for detailed scope.

30	Hook-up with existing facilities	2	NUM	500,000.00	1,000,000.00	

Complete work for hook-up of newly constructed pipeline with existing 18" pipeline including cold cutting, bevelling, alignment, welding, RT, coating, manual excavation near the hook-up point. Refer Scope of Work(SOW) for detailed Scope.

40	Nitrogen Purging of SV-3B to SV-4B	4	MT	150,000.00	600,000.00	**YY**

Inertisation of entire pipeline from station to station by supply of nitrogen, preparation of Temporary header for filling and venting (Volume at STP. Refer Scope of Work(SOW) for detailed Scope.

50	Fabrication of Long Radius Bend					

Fabrication of long radius bends including transportation of pipe from nearby GAIL store Yard to bend fabrication yard of the manufacturer as per the scope of work. Refer Scope of Work(SOW) for detailed Scope.

60	Below 10 degree	2	NUM	115,000.00	230,000.00	**YY**
70	From 10 degree to 45 degree	4	NUM	115,000.00	460,000.00	**YY**
80	From 46 degree to 90 degree	2	NUM	115,000.00	230,000.00	**YY**
90	Transportation	1,000	TPK	180.00	180,000.00	**YY**

Transportation of line pipe from GAIL Store/ designated place to site and return back the same to GAIL store as per instruction of EIC & scope of work. Refer Scope of Work(SOW) for detailed scope.

100	Abandonment of the Existing 18" section	1	LS	556,800.00	556,800.00	**YY**

Abandonment of 18" x 800 mtr. (approximately) of existing sections by plugging at both ends and Purging & inertization with nitrogen. Refer Scope of Work(SOW) for detailed scope.

110	Earth Work in Excavation	200.000	M3	1,000.00	200,000.00	**Y#**

Earthwork as per scope of work as may be required for laying pipeline/ hook-up job to be done by contractor. Refer Scope of Work(SOW) for detailed scope.

120	Plain & Reinforced cement concrete	10.000	M3	7,000.00	70,000.00	

Plain & Reinforced cement concrete (precast) for concrete slab and pipeline protection. Refer Scope of Work(SOW) for detailed scope.

130	Reinforcement	1	MT	115,000.00	115,000.00	**Y#**

Refer Scope of Work(SOW) for detailed Scope.

140	Fabrication of 2" pipeline	1	LS	65,000.00	65,000.00	

Fabrication of 2" pipeline with length of approximately 8-12 Mtr. at SV-4B for interconnecting D/s tap-off point to 2" vent flange at QOEC line including welding, grinding, radiography of joint & hydrotesting. Refer Scope of Work(SOW) for detailed scope.

150	Supply of jointing closure	3	EA	4,500.00	13,500.00	

Supply of jointing closure : 24 fiber, 2 way including all accessories (3M, Siemens, Raychem make only)

160	Joining / splicing of the newly laid OFC	3	EA	50,000.00	150,000.00	**YY**

Item : 1 - PIPELINE RE-ROUTING OF 18" CITYLINE
Plant : 3170 - NG Trans(DBPL)-Bengaluru- Karnataka (KAR)

S.No.	Short Description	Qty.	UOM	Rate	Amount	AHR *
Joining / splicing of the newly laid OFC: including supply & installation of RCC chamber						
170	Laying of HDPE Telecom Duct	300	M	80.00	24,000.00	**YY**
Laying of 40mm HDPE Ducts along pipeline route, trench direct buried or cased crossing through CS / HDPE conduit in all type of soil & terrain, excavated as required, padding, backfilling, etc. including supply of HDPE Duct accessories as per scope of work.						
180	Blowing of Opt.Fbr Cableinside HDPE Duct	350	M	40.00	14,000.00	
All activities pertaining to Blowing of Optical Fibre Cable in through CS / HDPE conduits along the pipeline also at crossing cable, sealing using all materials required, including laying of warning mats, etc. as per direction of EIC.						

Work Order Item 00001 Basic Item Value : INR 4,925,000.00
(RUPEE FOUR MILLION NINE HUNDRED TWENTY-FIVE THOUSAND ONLY)
Item Specific Conditions :
Total Tax = 886,500.00
18 % IGST - Cenvatable-(IX)
Total item value including taxes & duties : INR 5,811,500.00

Total estimated contract value excluding all tax and duties : 4,925,000.00
(RUPEES FORTY-NINE LAC TWENTY-FIVE THOUSAND ONLY)

Total estimated contract value inluding all tax and duties : 5,811,500.00
(RUPEES FIFTY-EIGHT LAC ELEVEN THOUSAND FIVE HUNDRED ONLY)

*Service items marked YY under AHR column are AHR items. Any service item marked #Y or Y# confirmation is required from authorized dealing officer who shall be final authority regarding AHR declaration. However, service items marked #Y or Y# shall be treated as AHR unless confirmed Non-AHR by dealing officer.

GAIL (India) Limited
(A Government of India Undertaking)
A Maharatna Company
"Swan", 2nd Floor, # 323, Kodigehalli Main Road,
Sahakarnagar, Bengaluru – 560 092

Corporate Office: 16, Bhikaiji Cama Place, R.K.Puram, New Delhi-110066
Phone:26172580, 26182955, Fax:011-26185941, Website : www.gailonline.com ,
Corporate ID No. L40200DL1984GOI018976

Tender no. GAIL/BLORE/CP/OM/C2022-12

BID DOCUMENT FOR

REROUTING / SHIFTING OF 18" X 800 MTS LONG PIPELINE NEAR MANYATA TECH PARK IN BANGALORE CITY

SECTION-I

INVITATION FOR BID (IFB)

SECTION-I

"INVITATION FOR BID (IFB)"

Ref No: GAIL/BLORE/CP/OM/C2022-12 **Dt: 18.07.2022**

To,

PROSPECTIVE BIDDERS

SUB: TENDER DOCUMENT FOR REROUTING / SHIFTING OF 18" X 800 MTS LONG PIPELINE NEAR MANYATA TECH PARK IN BANGALORE CITY

Dear Sir/Madam,

1.0 **GAIL (India) Limited, Bangalore [having registered office at 16, Bhikaji Cama Plance, New Delhi 110066 CIN No. L40200DL1984GOI018976],** the largest state-owned natural gas processing and distribution company and the Maharatna, invites bids from bidders for the subject job/works, in complete accordance with the following details and enclosed Tender Documents.

2.0 The brief details of the tender are as under:

(A)	NAME OF WORK / BRIEF SCOPE OF WORK/JOB	**REROUTING / SHIFTING OF 18" X 800 MTS LONG PIPELINE NEAR MANYATA TECH PARK IN BANGALORE CITY**
(B)	TENDER NO. & DATE	GAIL/BLORE/CP/OM/C2022-12 dtd. 18.07.2022
(C)	TYPE OF BIDDING SYSTEM	TWO BID SYSTEM
(D)	TYPE OF TENDER	E-TENDER
(E)	COMPLETION/CONTRACT PERIOD	90 Days as per SCC
(F)	BID SECURITY / EARNEST MONEY DEPOSIT (EMD)	Applicable Amount: INR.1,71,000.00 (Refer clause no.16 of ITB)
(F1)	DECLARATION FOR BID SECURITY	MSEs, Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue) are required to submit Declaration for Bid Security as per proforma at Form F-2A
(G)	AVAILABILITY OF TENDER DOCUMENT ON WEBSITE(S)	From 18.07.2022 (17.00 Hrs, IST) to 02.08.2022 (14.00 Hrs, IST) on following websites: (i) GAIL's Tender Website – www.gailtenders.in (ii) Govt. CPP Portal - https://eprocure.gov.in (iii) Govt. e-Procurement System of

		National Informatics Center (GePNIC) portal [e-tender portal] https://etenders.gov.in/eprocure/app *[in case of e-Tendering]* *(iv)* Government E-Market (Gem) Portal PMC, if any:
(H)	DATE, TIME & VENUE OF PRE-BID MEETING	Date : 23.07.2022 Time : 11.00 Hrs Venue : GAIL, Bengaluru
(I)	DUE DATE & TIME OF BID-SUBMISSION (ON OR BEFORE)	Date : 02.08.2022 Time : 14.00 Hrs
(J)	DATE AND TIME OF UN-PRICED BID OPENING	Date : 03.08.2022 Time : 14.00 Hrs
(K)	CONTACT DETAILS OF TENDER DEALING OFFICER	Name : Bishar Bin Ali Designation: M(C&P) Phone No. & Extn : 080 46244111,Extn.382 E-mail : bisharbinali@gail.co.in
(L)	DEALING GAIL'S OFFICE ADDRESS	GAIL (INDIA) LTD., "Swan", 2nd Floor, Kodigehalli Main Road, Sahakarnagar, Bangalore-560092

In case of the days specified above happens to be a holiday in GAIL, the next working day shall be implied.

3.0 Bids must be submitted strictly in accordance with Clause No. 11 of ITB (Section-III) depending upon Type of Tender [refer Clause no. 2.0 (D) above]. The IFB is an integral and inseparable part of the bidding document.

4.0 In case of E-Tender, bid must be submitted only on https://etenders.gov.in/eprocure/app. Further, the following documents in addition to uploading the bid on e-tender portal shall also be submitted in Original (in physical form) within 7 (seven) days from the bid due date provided the scanned copies of the same have been uploaded in e-tender by the bidder along with e-bid within the due date and time to the address mentioned in Bidding Data Sheet(BDS) [Annexure-IV to Section-III]:-

i) EMD/Bid Security/Declaration for Bid Security (as applicable)
ii) Power of Attorney
iii) Integrity Pact (if applicable)

5.0 In case of Manual Tenders, bids complete in all respect should reach at the address specified in Bid Data Sheet on or before the due date & time. Bids received after the due date and time is liable to be rejected.

6.0 Bidder(s) are advised to quote strictly as per terms and conditions of the tender documents and not to stipulate any deviations/exceptions.

7.0 Any bidder, who meets the Bid Evaluation Criteria (BEC) and wishes to quote against this Tender Document, may download the complete Tender Document alongwith its amendment(s) if any from websites as mentioned at 2.0 (G) of IFB and submit their Bid complete in all respect as per terms & conditions of Tender Document on or before the Due Date & Time of Bid Submission.

8.0 Bid(s) received from bidders to whom tender/information regarding this Tender Document has been issued as well as offers received from the bidder(s) by downloading Tender Document from above mentioned website(s) shall be taken into consideration for evaluation & award provided that the Bidder is found responsive subject to provisions contained in Clause No. 2 of ITB (Section-III).

The Tender Document calls for offers on single point "Sole Bidder" responsibility basis (except where JV/Consortium bid is allowed pursuant to clause no. 3.0 of ITB) and in total compliance of Scope of Works as specified in Tender Document.

9.0 Any revision, clarification, corrigendum, time extension, etc. to this Tender Document will be hosted on the above mentioned website(s) only. Bidders are requested to visit the website regularly to keep themselves updated. In case of manual tendering, Clarification(s)/Corrigendum(s), if any, shall be sent to the prospective bidder(s) by email/post.

10.0 All bidders including those who are not willing to submit their bid are required to submit F-6 (Acknowledgement cum Consent letter) duly filled within 7 days from date of receipt of tender information.

11.0 SAP generated Request for Quotation (RFQ), if any shall also form an integral part of the Tender Document.

This is not an Order.

For & on behalf of
GAIL (India) Limited



Name : Bishar Bin Ali
Designation : M(C&P)
E-mail ID : bisharbinali@gail.co.in
Contact No. : 8879157840

SECTION-II

BID EVALUATION CRITERIA & EVALUATION METHODOLOGY

SECTION-II

BID EVALUATION CRITERIA & EVALUATION METHODOLOGY

A. TECHNICAL CRITERIA

The Bidder must have successfully executed & completed work order for Pipe Line laying/modification/shutdown and commissioning work of hydrocarbon CS pipeline (12" dia or more) for a minimum executed value of Rs. 50.34 lakhs in a single work order in the previous Seven (07) years from the bid due date

***Note**: (i) A Job executed by a Bidder for its own plant/ project cannot be considered as experience for the purpose of meeting BEC of this Tender Document. However, jobs executed for Subsidiary/Fellow subsidiary / Holding company will be considered as experience for the purpose of meeting BEC subject to submission of tax paid invoice (s) duly certified by Statutory Auditor of the Bidder towards payments of statutory tax in support of the job executed for Subsidiary/Fellow subsidiary/ Holding company. Such Bidders to submit these documents in addition to the documents specified to meet BEC.*

B. FINANCIAL CRITERIA :

(a) The minimum Turnover of the Bidder should be Rs. 50.34 Lakhs in any of the 3 preceding financial years.

(b) The Net worth of the Bidder should be positive as per the last audited financial statement.

(c) The bidder should have minimum Working Capital Rs. 10.06 Lakhs as per the last audited financial year.

Note:

(i) If the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their bank having net worth not less than Rs.100 crores (or equivalent in USD), confirming the availability of line of credit for working capital amount mentioned herein above. The line of credit letter from bank to be submitted strictly as per format at F-9.

Declaration Letter/Certificate for line of credit due to short fall of working capital shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will also be acceptable wherein a group of banks can jointly provide line of credit to the bidder.

The bank shall be required to issue the letter for declaration/ certificate of line of credit on their letter head along with the contact details of the issuing authority like email id, contact number etc.

(ii) **Annual Turnover:** Preceding 3 financial years mentioned in aforesaid BEC refer to immediate 3 preceding financial years wherever the closing date of the bid is after 30th Sept. of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th September of the relevant financial year, and audited financial results of the immediate 3 preceding financial years are not available, the audited financial results of the 3 years immediately prior to that will be considered. Further, in case bidder is meeting the Annual Turnover criteria of

BEC based on Audited Financial Statement of any one of the preceding 3 financial years (as mentioned above), the same shall suffice and bidder may submit format F-10 accordingly.

Net Worth/Working Capital: Immediate preceding financial year mentioned in aforesaid BEC refer to audited financial results for the immediate preceding financial year wherever the closing date of the bid is after 30th Sept. of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th September of the relevant financial year, and audited financial results of the immediate preceding financial year is not available, in such case the audited financial results of the year immediately prior to that year will be considered. Bidder is to submit Audited Financial Statement of immediate preceding financial years (as mentioned above) along with format F-10 accordingly for Networth / Working Capital.

C. Exchange rate for Conversion of Currency for evaluation of documents submitted by bidders for BEC which are in other currency than specified in BEC shall be as follows:

(a) **BEC (Technical Criteria):** Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the date of award of contract submitted by bidder.

(b) **BEC (Financial Criteria):**

(i) For Annual Turnover:
The average of Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the First date and Last date of the respective Financial Year.

(ii) For Net-Worth & Working Capital:
The Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the Last date of the respective Financial Year.

(c) In case, the SBI Selling rate is not available as on the date of conversion as specified above for respective cases, the exchange rate for conversion of currency shall be taken from the internet, such as:
https://www.xe.com/currencyconverter
https://economictimes.indiatimes.com/markets/forex/currency-converter
https://www.oanda.com/currency/converter

D. Only documents (Work Order, Completion certificate, Execution Certificate etc.) which have been referred/ specified in the bid shall be considered in reply to queries during evaluation of Bids.

Any shortfall information / documents on the Audited Annual Report / Financial Statement of the Bidder and/or line of credit for working capital issued on or before the final bid due date can only be sought against Commercial queries (CQs). Any information/ documents issued post final bid due date shall not be considered for evaluation.

Experience of bidder acquired as a subcontractor can be accepted against submission of certificate from end user by such bidder along with other specified documents.

E. RELAXATION OF PRIOR TURNOVER AND PRIOR EXPERIENCE FOR STARTUPS (AS DEFINED IN GAZETTE NOTIFICATION NO. D.L-33004/99 DATED 18.02.2016 AND 23.05.2017 OF MINISTRY OF COMMERCE AND INDUSTRY), AS AMENDMED TIME TO TIME

Prior turnover and prior experience as mentioned above in financial and technical criteria of BEC shall not be required for all Startups [whether Micro & Small Enterprises (MSEs) or otherwise] subject to their meeting the quality and technical specifications specified in tender document.

For availing the relaxation, bidder is required to submit requisite certificate towards Startup enterprise registration issued by Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce & Industry and relaxation is to be given to the specific goods / jobs domain wherein they are registered for.

Wherever the "Certificate of Recognition" is stipulating the domain of startup, the domain of startup is be considered based "Certificate of Recognition" issued by Department of Promotion of Industry and Internal Trade (DPIIT). Startups having the "Certificate of Recognition" which do not mention Domain, in such case startups are also required to submit the documents for the same including the application submitted to DPIIT.

New startup "Certificate of Recognition" is stipulating "Industry" and "Sector" as domain of startup. Accordingly, "Industry" and "Sector" as domain of startups mentioned in certificate/ application (in case of old certificate which do not indicate domain) will be considered.

The above documents should be certified by the Chartered Accountant (not being an employee or a Director or not having any interest in the bidder's company/firm) and notary public with legible stamp.

F. DOCUMENTS TO BE SUBMITTED FOR COMPLIANCE TO BEC

(i) Technical Criteria of BEC:

Along with techno-commercial bid, the bidder must submit proof of experience by providing copies of work order along with its Schedule of Rates (SOR) /SOW along with description of jobs and its completion certificate issued by end user / owner (or their consultant who has been duly authorized by them to issue such certificate) only after completion of work / supply in all aspect. The completion certificate must contain the reference of work order no., completed/executed value and actual date of completion of work.

(ii) Financial Criteria of BEC:

(a) Bidder shall submit "Details of financial capability of Bidder" in prescribed format (F-10) **duly signed and stamped by a chartered accountant**.

(b) Further, copy of audited annual financial statements (immediate three preceding financial years) submitted in bid shall be **duly certified/ attested by Notary Public with legible stamp.**

Bidder shall furnish the duly filled and signed Check list for submission of documents for qualification for Bid Evaluation Criteria (BEC) as per format F-8 (B).

G. AUTHENTICATION OF DOCUMENTS TO BE SUBMITTED IN SUPPORT OF BEC:

(i) Technical Criteria of BEC:

All documents in support of Technical Criteria of BEC to be furnished by the Bidder shall necessarily be duly certified/ attested by Chartered Engineer and Notary Public with legible stamp.

(ii) Financial Criteria of BEC:

Bidder shall submit "Details of financial capability of Bidder" in prescribed format (F-10) duly signed and stamped by a chartered accountant/ Certified Public Accountant (CPA).

Further, copy of audited annual financial statements submitted in bid shall be duly certified/ attested by Notary Public with legible stamp.

H. Deleted

I. Apart from above, Bidder must submit all other relevant documents/ information as specified in the Scope of Work/SCC for Technical Evaluation of bid or specified elsewhere in the Tender Document, towards proof of its responsiveness.

J. PROCUREMENT FROM A BIDDER WHICH SHARES A LAND BORDER WITH INDIA

1. Order (Public Procurement No. 1) dated 23.07.2020, Order (Public Procurement No. 2) dated 23.07.2020 and Order (Public Procurement No. 3) dated 24.07.2020, Department of Expenditure, Ministry of Finance, Govt. of India refers. The same are available at website https://doe.gov.in/procurement-policy-divisions.

2. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. For details of competent authority refer to Annexure I of Order (Public Procurement No. 1) dated 23.07.2020.

Further the above will not apply to bidders from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects. Updated lists of countries to which lines of credit have been extended or in which development projects are undertaken are given in the website of the Ministry of External Affairs, Govt. of India

3. **"Bidder"** (including the term 'tenderer', 'consultant' 'vendor' or 'service provider' in certain contexts) **for purpose of this provision** means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore,

including any agency, branch or office controlled by such person, participating in a procurement process.

4. **"Bidder from a country which shares a land border with India"** for the purpose of this:

a. An entity incorporated, established or registered in such a country; or
b. A subsidiary of an entity incorporated, established or registered in such a country; or
c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose beneficial owner is situated in such a country; or
e. An Indian (or other) agent of such an entity; or
f. A natural person who is a citizen of such a country; or
g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

5. **"Beneficial owner"** for the purpose of above (4) will be as under:

i. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means.

Explanation—

a) "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;
b) "Control" shall include the right to appoint the majority of the directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

6. **"Agent"** for the purpose of this Order is a person employed to do any act for another, or to represent another in dealings with third persons

7. <u>SUBMISSION OF CERTIFICATE IN BIDS:</u>

Bidder shall submit a certificate in this regard as Form-I to Section-II.
If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for immediate rejection of the bid/termination and further action as per "Procedure for Action in case of Corrupt/Fraudulent/ Collusive / Coercive Practices" of tender document.

8. The registration, wherever applicable, should be valid at the time of submission of bids and at the time of acceptance of bids. In respect of supply otherwise than by tender, registration should be valid at the time of placement of order. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution.

9. PROVISION FOR WORKS CONTRACTS, INCLUDING TURNKEY CONTRACTS:

The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in Para 4 herein above. A Certificate to this regard is to be submitted by bidder is placed at Form-II to Section-II.

K. EVALUATION METHODOLOGY:

Methodology for Evaluation and Award shall also include price evaluation based on overall lowest evaluated price (L-1) basis.

- In case of a tie at the lowest bid (L1) position between two or more startup/non-startup bidders, the order/LoA will be placed on the bidder who has higher/ highest turnover in last audited financial year.
- In case there is a tie at the lowest bid (L1) position between only startup bidders and none of them has past turnover, the order/LoA will be placed on the startup who is registered earlier with Department of Industrial Promotion and Policy.
- MSE Benefits for purchase preference of L1 +15% shall not be considered.

- This is a non splitable and non-divisible contract.
- The input credit of GST (CGST & SGST/UTGST or IGST) shall be considered for evaluation of bids.
- In case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST (CGST & SGST/UTGST or IGST) during evaluation of bid (if applicable as per act/law in vogue). Where GAIL is entitled for input credit of GST (CGST & SGST/UTGST or IGST), the same will be considered during evaluation as per evaluation methodology of tender document.
- In case any cess on GST is applicable same shall also be considered in evaluation

Form-I

UNDERTAKING ON LETTERHEAD

To,
M/s GAIL (INDIA) LIMITED
Bangalore

SUB: **REROUTING / SHIFTING OF 18" X 800 MTS LONG PIPELINE NEAR MANYATA TECH PARK IN BANGALORE CITY**

TENDER NO:

Dear Sir

We have read the clause regarding Provisions for Procurement from a Bidder which shares a land border with India, we certify that, bidder M/s_____ ***(Name of Bidder)*** is :

(i)	Not from such a country	[ ]
(ii)	If from such a country, has been registered with the Competent Authority. (Evidence of valid registration by the Competent Authority shall be attached)	[ ]

(Bidder is to tick appropriate option (✓or X) above).

We hereby certify that bidder M/s_____ ***(Name of Bidder)*** fulfills all requirements in this regard and is eligible to be considered against the tender.

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal:

SECTION-III

INSTRUCTION TO BIDDERS

(TO BE READ IN CONJUNCTION WITH BIDDING DATA SHEET (BDS)

SECTION-III

INSTRUCTION TO BIDDERS

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INSTRUCTIONS TO BIDDERS [ITB]
(TO BE READ IN CONJUNCTION WITH BIDDING DATA SHEET (BDS)

[A] – GENERAL

1 SCOPE OF BID

1.1 The Employer as defined in the "General Conditions of Contract [GCC]", wishes to receive Bids as described in the Invitation For Bid (the "**Tender Document /Bid Document")** issued by Employer. Employer/Owner/GAIL occurring herein under shall be considered synonymous.

1.2 SCOPE OF BID: The scope of work/ Services shall be as defined in the Tender documents.

1.3 The successful bidder will be expected to complete the scope of Bid within the period stated in Special Conditions of Contract.

1.4 Throughout the Tender Documents, the terms 'Bid', 'Tender' & 'Offer' and their derivatives [Bidder/Tenderer, Bid/Tender/Offer etc.] are synonymous. Further, 'Day' means 'Calendar Day' and 'Singular' also means 'Plural'.

2 ELIGIBLE BIDDERS

2.1 The Bidder shall not be under a declaration of ineligibility by Employer for Corrupt/ Fraudulent/ Collusive/ Coercive practices, as defined in "Instructions to Bidders [ITB], Clause No. 39" (Action in case Corrupt/ Fraudulent/ Collusive/ Coercive Practices).

2.2 The Bidder is not put on 'Holiday' by GAIL or Public Sector Project Management Consultant (like EIL, Mecon only due to "poor performance" or "corrupt and fraudulent practices") or banned/blacklisted by Government department/ Public Sector on due date of submission of bid. Further, neither bidder nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/ Fraudulent/ Collusive/ Coercive Practices) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas.

If the bidding documents were issued inadvertently/ downloaded from website, offers submitted by such bidders shall not be considered for opening/ evaluation/Award and will be returned immediately to such bidders.

In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to GAIL by the bidder.

It shall be the sole responsibility of the bidder to inform about their status regarding para 1 of clause 2.2 herein above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause 39 of ITB.

2.3 The Bidder should not be under any liquidation court receivership or similar proceedings on due date of submission of bid. In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to GAIL by the bidder.

It shall be the sole responsibility of the bidder to inform GAIL there status on above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause no.39 of ITB.

2.4 Bidder shall not be affiliated with a firm or entity:

(i) that has provided consulting services related to the work to the Employer during the preparatory stages of the work or of the project of which the works/services forms a part of or

(ii) that has been hired (proposed to be hired) by the Employer as an Engineer/ Consultant for the contract.

2.5 Neither the firm/entity appointed as the Project Management Consultant (PMC) for a contract nor its affiliates/ JV'S/ Subsidiaries shall be allowed to participate in the tendering process unless it is the sole Licensor/Licensor nominated agent/ vendor.

2.6 Pursuant to qualification criteria set forth in the bidding document, the Bidder shall furnish all necessary supporting documentary evidence to establish Bidder's claim of meeting qualification criteria.

2.7 Power of Attorney:

Power of Attorney (POA) to be issued by the bidder in favour of the authorised employee(s), in respect of the particular tender, for purpose of signing the documents including bid, all subsequent communications, agreements, documents etc. pertaining to the tender and act and take any and all decision on behalf of the bidder (including Consortium). Any consequence resulting due to such signing shall be binding on the Bidder (including Consortium).

(I) In case of a Single Bidder, the Power of Attorney shall be issued as per the constitution of the bidder as below:

a) **In case of Proprietorship:** by Proprietor

b) **In case of Partnership:** by all Partners or Managing Partner

c) **In case of Limited Liability Partnership:** by any bidder's employee authorized in terms of Deed of LLP

d) **In case of Public / Limited Company:** PoA in favourof authorized employee(s) by Board of Directors through Board Resolution or by the designated officer authorized by Board to do so. Such Board Resolution should be duly countersigned by Company Secretary / MD / CMD / CEO.

(II) In case of a Consortium, Power of Attorney shall be issued both by Leader as well as Consortium Member(s) of the Consortium as per procedure defined herein above in favour of employee of Leader of Consortium.

The Power of Attorney should be valid till award of contract / order to successful bidder.

2.8 In case of change of constitution of bidder after submission of bid, the same shall be informed by the bidder to GAIL promptly. Failure to same shall be considered as misrepresentation by the bidder.

3 <u>BIDS FROM "CONSORTIUM</u>" (FOR APPLICABILITY OF THIS CLAUSE REFER BIDDING DATA SHEET (BDS))

3.1 Bids from consortium of two or more members (maximum three including leader) are acceptable provided that they fulfill the qualification criteria and requirements stated in the Bidding Documents. Participating Consortium shall submit the Agreement as per the format F-11 clearly defining the scope and responsibility of each member. Members of consortium shall assume responsibility jointly & severally. The EMD shall be submitted by the Bidder (Consortium).

3.2 The Consortium Agreement must clearly define the leader/ lead partner, who shall be responsible for timely completion of work/ services and shall receive/ send instructions for and on behalf of the consortium during the period the bid is under evaluation as well as during the execution of contract.

3.3 All the members shall authorize the representative from the lead partner by submitting a Power of attorney (on a non judicial stamp paper of appropriate value) signed by legally authorized signatories of all the member(s). Such authorization must be accompanied with the bid. The authorized signatory shall sign all the documents relating to the tender/ contract. However, in case of award, payment shall be made to the consortium.

3.4 A consortium once established at the time of submitting the Bid shall not be allowed to be altered with respect to constituting members of the Consortium or their respective roles/

scope of work, except if and when required in writing by owner. If during the evaluation of bids, a consortium proposes any alteration/ changes in the orientation of consortium or replacements or inclusions or exclusions of any partner(s)/ member(s) which had originally submitted the bid, bid from such a consortium shall be liable for rejection.

3.5 Any member of the consortium/ shall not be eligible either in an individual capacity or be a part of any other consortium to participate in this tender. Further, no member of the consortium/ JV shall be on 'Holiday' by GAIL or Public Sector Project Management Consultant (like EIL, Mecon only due to "poor performance" or "corrupt and fraudulent practices") or banned/ blacklisted by Government department/ Public Sector on due date of submission of bid. Offer submitted by such consortium shall not be considered for opening/ evaluation/Award.

4 ONE BID PER BIDDER

4.1 A Bidder shall submit only 'one [01] Bid' in the same Bidding Process either as single entity or as a member of any consortium (wherever consortium bid is allowed). A Bidder who submits or participates in more than 'one [01] Bid' will cause all the proposals in which the Bidder has participated to be disqualified.

4.2 More than one bid means bid(s) by bidder(s) having same Proprietor / Partners / Limited Liability Partner in any other Bidder (s). Further, more than one bids shall also include two or more bidders having common power of attorney holder.
Failure to comply this clause during tendering process will disqualify all such bidders from process of evaluation of bids.

4.3 Alternative Bids shall not be considered.

4.4 The provisions mentioned at sl. no. 4.1 and 4.2 shall not be applicable wherein bidders are quoting for different Items / Sections / Parts / Groups/ SOR items of the same tender which specifies evaluation on Items / Sections / Parts / Groups/ SOR items basis.

5 COST OF BIDDING

The Bidder shall bear all costs associated with the preparation and submission of the Bid including but not limited to Documentation Charges, Bank charges, all courier charges, translation charges, authentication charges and any associated charges including taxes & duties thereon. Further, GAIL will in no case, be responsible or liable for these costs, regardless of the outcome of the bidding process.

6 SITE VISIT

6.1 The Bidder is advised to visit and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the required job. The costs of visiting the site shall be borne by the Bidder.

6.2 The Bidder or any of its personnel or agents shall be granted permission by the Employer to enter upon its premises and land for the purpose of such visits, but only upon the express conditions that the Bidder, its personnel and agents will release and indemnify the Employer and its personnel, agents from and against all liabilities in respect thereof, and will be responsible for death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of inspection.

6.3 The Bidder shall not be entitled to hold any claim against GAIL for non-compliance due to lack of any kind of pre-requisite information as it is the sole responsibility of the Bidder to obtain all the necessary information with regard to site, surrounding, working conditions, weather etc. on its own before submission of the bid.

[B] – BIDDING DOCUMENTS

7 CONTENTS OF BIDDING DOCUMENTS

7.1 The contents of Bidding Documents / Tender Documents are those stated below, and should be read in conjunction with any 'Addendum / Corrigendum and Clarification(s)' issued in accordance with "ITB: Clause-8 & 9":

- Section-I : Invitation for Bid [IFB]*
- Section-II : BID EVALUATION CRITERIA [BEC] & Evaluation methodology
- Section-III : Instructions to Bidders [ITB], Annexure, Forms & Format**
- Section-IV : General Conditions of Contract [GCC]***
- Section-V : Special Conditions of Contract [SCC]
- Section-VI : Specifications, Scope of Work and Drawing
- Section-VII : Schedule of Rates

*Request for Quotation', wherever applicable, shall also form part of the Bidding Document.

** The subject tender is based on standard formats and applicability of some specific clauses may be seen in Annexure-IV to Section-III i.e. BDS (Bidding Data Sheet).

*** General Conditions of Contract – Works is available on GAIL's Tender website (http://gailtenders.in/Gailtenders/gccs.asp). Further, Hindi version of GCC is available on the GAIL's tender website for reference. However, in case of any discrepancy in English & its Hindi translation, for interpretation and legal aspects, the English version shall prevail.

For participation in e-tender, instructions are mentioned at Annexure-III to Section-III.

7.2 The Bidder is expected to examine all instructions, forms, terms & conditions in the Bidding Documents. The "Request for Quotation [RFQ] & Invitation for Bid (IFB)" together with all its attachments thereto, shall be considered to be read, understood and accepted by the Bidders. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will be at Bidder's risk and may result in the rejection of his Bid.

8 CLARIFICATION OF TENDER DOCUMENTS

8.1 A prospective Bidder requiring any clarification(s) of the Bidding Documents may notify GAIL in writing by email at GAIL's mailing address indicated in the BDS no later than 02 (two) days prior to pre-bid meeting (in cases where pre-bid meeting is scheduled) or 05 (five) days prior to the due date of submission of bid in cases where pre-bid meeting is not scheduled. GAIL reserves the right to ignore the bidders request for clarification if received after the aforesaid period. GAIL may respond in writing to the request for clarification. GAIL's response including an explanation of the query, but without identifying the source of the query will be uploaded on e-tender portal / communicated to prospective bidders by e-mail.

8.2 Any clarification or information required by the Bidder but same not received by the Employer at clause 8.1 (refer BDS for address) above is liable to be considered as "no clarification / information required".

9 AMENDMENT OF BIDDING DOCUMENTS

9.1 At any time prior to the 'Bid Due Date', Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by addenda/ corrigendum.

9.2 Any corrigendum thus issued shall be integral part of the Tender Document and shall be hosted on the websites as provided at clause no. 2.0 (G) of IFB /communicated to prospective bidders by e-mail. Bidders have to take into account all such corrigendum before submitting their Bid.

9.3 The Employer, if consider necessary, may extend the Bid Due Date in order to allow the Bidders a reasonable time to furnish their most competitive bid taking into account the addenda/corrigendum issued thereof.

[C] – PREPARATION OF BIDS

10 LANGUAGE OF BID:

The bid prepared by the Bidder and all correspondence, drawing(s), document(s), certificate(s) etc. relating to the Bid exchanged by Bidder and GAIL shall be written in English language only. In case a document, certificate, printed literature etc. furnished by the Bidder in a language other than English, the same should be accompanied by an English translation duly authenticated by the Indian Chamber of Commerce, in which case, for the purpose of interpretation of the Bid, the English translation shall govern.

11. DOCUMENTS COMPRISING THE BID

11.1 IN CASE OF MANUAL TENDERING

In case the Bids are invited under the Manual two Bid system. The Bid prepared by the Bidder shall comprise the following components sealed in 2 different envelopes:

11.1.1 **ENVELOPE-I: "TECHNO-COMMERCIAL / UN-PRICED BID"** shall contain the following:

(a) 'Covering Letter' on Bidder's 'Letterhead' clearly specifying the enclosed contents with index.

(b) 'Bidder's General Information', as per 'Form F-1'.

(c) Copies of documents, as specified in tender document

(d) Copy of Schedule of Rate (SOR) with prices blanked out mentioning quoted / not quoted (as applicable) written against each item as a confirmation that the prices are quoted in requisite format .

(e) 'Letter of Authority' on the Letter Head, as per 'Form F-3'

(f) 'Agreed Terms and Conditions', as per 'Form F-5'

(g) 'Acknowledgement Cum Consent Letter', as per 'Form F-6'

(h) Duly attested documents in accordance with the "Bid Evaluation Criteria [BEC]" establishing the qualification.

(i) Copy of Power of Attorney /copy of Board Resolution, in favour of the authorized signatory of the Bid, as per clause no.2.7 of ITB

(j) EMD in original (in case of manual tendering) / copy of EMD (in case of e-Tender), as per Clause 16 of ITB. Declaration for Bid Security as per provision of ITB.

(k) ~~Undertaking as per *Form-1 to Annexure-V to Section-III* by MSE bidders and Bidders seeking preference under Policy for purchase preference linked with Local Content (PP-LC), if applicable.~~

(l) Undertaking as per *Form-2 to Annexure-V to Section-III* and Certification from the statutory auditor or cost auditor of the company (in the case of companies) or

from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) as per *Form-3 to Annexure-V to Section-III*.

(m) Undertaking as per *Form-I to Section-II* regarding Provisions for Procurement from a Bidder which shares a land border with India

(n) All forms and Formats including Annexures

(o) 'Integrity Pact' as per 'Form F-14'

(p) 'Indemnity Bond' as per 'Form F-15'

(q) Tender Document, its Corrigendum/Amendment/Clarification(s) duly signed on each page (in case of manual tendering)/ digitally signed (in case of e-Tender) by the Authorized Signatory holding POA.

(r) Additional document specified in BDS, SCC, Scope of Supply or mentioned elsewhere in the Tender Document, its Corrigendum/Amendment/Clarification(s).

(s) Any other information/details required as per Bidding Document

Note: All the pages of the Bid must be signed by the "Authorized Signatory" of the Bidder holding POA.

11.1.2 ENVELOPE-II: Price Bid

i) The Prices are to be submitted strictly as per the Schedule of Rate of the bidding documents. GAIL shall not be responsible for any failure on the part of the bidder to follow the instructions.

ii) Bidders are advised NOT to mention Rebate/Discount separately, either in the SOR format or anywhere else in the offer. In case Bidder(s) intend to offer any Rebate/Discount, they should include the same in the item rate(s) itself under the "Schedule of Rates (SOR)" and indicate the discounted unit rate(s) only.

iii) If any unconditional rebate has been offered in the quoted rate the same shall be considered in arriving at evaluated price. However no cognizance shall be taken for any conditional discount for the purpose of evaluation of the bids.

iv) In case, it is observed that any of the bidder(s) has/have offered suo-moto Discount/Rebate after opening of unpriced bid but before opening of price bids such discount /rebate(s) shall not be considered for evaluation. However, in the event of the bidder emerging as the lowest evaluated bidder without considering the discount/rebate(s), then such discount/rebate(s) offered by the bidder shall be considered for Award of Work and the same will be conclusive and binding on the bidder.

v) In the event as a result of techno-commercial discussions or pursuant to seeking clarifications / confirmations from bidders, while evaluating the un-priced part of the bid, any of the bidders submits a sealed envelope stating that it contains revised prices; such bidder(s) will be requested to withdraw the revised prices failing which the bid will not be considered for further evaluation.

11.1.3 In case of bids invited under Single Bid System (clause no. 2.0(C) of IFB refers), all the documents as specified at Clause 11.1.1 & 11.1.2 of ITB can be submitted in single envelope /folder, as per instructions of Tender Document.

11.2 **IN CASE OF E-TENDERING:**

Bidders are requested to refer instructions for participating in e-Tendering (Annexure-I to Section III), Bidders manual kit and FAQs available in e-tender portal and bids submitted manually shall be rejected. All pages of the Bid must be digitally signed by the "authorized signatory" of the Bidder holding Power of Attorney. The Bid must be submitted on e-tender portal (https://etenders.gov.in/eprocure/app) as follows:-

11.2.1 **PART-I: "TECHNO-COMMERCIAL/UN-PRICED BID"** comprising all the above documents mentioned at 11.1.1 along with copy of EMD/Bid Security/Declaration for Bid Security, copy of Power of Attorney and copy of integrity pact should be uploaded in the technical bid in the e-tender portal.

Further, Bidders must submit the original " EMD, Power of Attorney, Integrity Pact (wherever applicable) and any other documents specified in the Tender Document to the address mentioned in IFB, in a sealed envelope, superscribing the details of Tender Document (i.e. tender number & tender for) within 7 days from the date of un-priced bid opening.
Bidders are required to submit the EMD in original by Due Date and Time of Bid Submission or upload a scanned copy of the same in the Part-I of the Bid. If the Bidder is unable to submit EMD in original by Due Date and Time of Bid Submission, the Bidder is required to upload a scanned copy of the EMD in Part-I of Bid, provided the original EMD, copy of which has been uploaded, is received within 7 days from the Due Date of Bid Opening, failing which the Bid will be rejected irrespective of their status/ranking in tendering process and notwithstanding the fact that a copy of EMD was earlier uploaded by the Bidder.

11.2.2 **PART-II: PRICE BID**
The Prices are to be filled strictly in the Schedule of Rate of the bidding documents and provision mentioned at para 11.1.2 hereinabove and to upload in Financial bid in the e-tender portal.

11.3 In case of bids invited under *single bid system*, a single envelope containing all documents specified at Clause 11.1.1 & 11.1.2 of ITB above form the BID. All corresponding conditions specified at Clause 11.1.1 & 11.1.2 of ITB shall become applicable in such a case.

12 BID PRICES

12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole works as described in Bidding Documents, based on the rates and prices submitted by the Bidder and accepted by the Employer. The prices quoted by the Bidders will be inclusive of all taxes except **GST (CGST & SGST/UTGST or IGST)**.

12.2 Prices must be filled in format for "Schedule of Rates [SOR]" enclosed as part of Tender document. If quoted in separate typed sheets and any variation in item description, unit or quantity is noticed; the Bid is liable to be rejected.

12.3 Bidder shall quote for all the items of "SOR" after careful analysis of cost involved for the performance of the completed item considering all parts of the Bidding Document. In case any activity though specifically not covered in description of item under "SOR" but is required to complete the works as per Specifications, Scope of Work / Service, Standards, General Conditions of Contract ("GCC"), Special Conditions of Contract ("SCC") or any other part of Bidding Document, the prices quoted shall deemed to be inclusive of cost incurred for such activity.

12.4 All duties, taxes and other levies [if any] payable by the Contractor under the Contract, or for any other cause except final **GST (CGST & SGST/ UTGST or IGST)** shall be included in the rates / prices and the total bid-price submitted by the Bidder.

Bidder shall indicate applicable rate of GST (CGST & SGST/ UTGST or IGST) in SOR.

12.5 Prices quoted by the Bidder, shall remain firm and fixed and valid till completion of the Contract and will not be subject to variation on any account unless any price escalation/variation is allowed elsewhere in the Tender Document.

12.6 The Bidder shall quote the prices in 'figures' & words. There should not be any discrepancy between the prices indicated in figures and the price indicated in words. In case of any discrepancy, the same shall be dealt as per clause no. 30 of ITB.

12.7 Bidder shall also mention the **Service Accounting Codes** (SAC) / **Harmonized System of Nomenclature (HSN)** at the designated place in SOR.

13 **GST (CGST & SGST/ UTGST or IGST)**

13.1 Bidders are required to submit copy of the GST Registration Certificate while submitting the bids wherever **GST (CGST & SGST/UTGST or IGST)** is applicable.

13.2 Quoted prices should be inclusive of all taxes and duties, except **GST (CGST & SGST or IGST or UTGST)**. Please note that the responsibility of payment of **GST (CGST & SGST or IGST or UTGST)** lies with the Contractor only. Contractor providing taxable service shall issue an e-Invoice/Invoice/Bill, as the case may be as per rules/ regulation of GST. Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

Payments to Contractor for claiming **GST (CGST & SGST/UTGST or IGST)** amount will be made provided the above formalities are fulfilled. Further, GAIL may seek copies of challan and certificate from Chartered Accountant for deposit of **GST (CGST & SGST/UTGST or IGST)** collected from Owner.

13.3 In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent government agency brings to the notice of GAIL that the Contractor has not remitted the amount towards GST (CGST & SGST/UTGST or IGST) collected from GAIL to the government exchequer, then, that Contactor shall be put under Holiday list of GAIL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on GAIL.

13.4 In case of statutory variation in **GST (CGST & SGST/UTGST or IGST),** other than due to change in turnover, payable on the contract value during contract period, the Contractor shall submit a copy of the 'Government Notification' to evidence the rate as applicable on the Bid due date and on the date of revision.

Beyond the contract period, in case GAIL is not entitled for input tax credit of **GST (CGST & SGST/UTGST or IGST)**, then any increase in the rate of **GST (CGST & SGST/UTGST or IGST)** beyond the contractual delivery period shall be to Contractor's account whereas any decrease in the rate **GST (CGST & SGST/UTGST or IGST)** shall be passed on to the Owner.

Beyond the contract period, in case GAIL is entitled for input tax credit of **GST (CGST & SGST/UTGST or IGST)**, then statutory variation in quoted **GST (CGST & SGST/UTGST or IGST)** on supply and on incidental services, shall be to GAIL's account.

Claim for payment of **GST (CGST & SGST/UTGST or IGST)**/ Statutory variation, should be raised within two [02] months from the date of issue of 'Government Notification' for payment of differential (in %) **GST (CGST & SGST/UTGST or IGST)**, otherwise claim in respect of above shall not be entertained for payment of arrears.

The base date for the purpose of applying statutory variation shall be the Bid Due Date.

13.5 Where GAIL is entitled to avail the input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-

13.5.1 Owner/GAIL will reimburse the **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/ regulation of GST to enable Owner/GAIL to claim input tax credit of **GST (CGST**

& SGST/UTGST or IGST) paid. In case of any variation in the executed quantities, the amount on which the **GST (CGST & SGST/UTGST or IGST)** is applicable shall be modified in same proportion. Returns and details required to be filled under GST laws & rules should be timely filed by supplier with requisite details.

13.5.2 The input tax credit of quoted **GST (CGST & SGST/UTGST or IGST)** shall be considered for evaluation of bids, as per evaluation criteria of tender document.

13.6 Where GAIL is not entitled to avail/take the full input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-

13.6.1 Owner/GAIL will reimburse **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/ regulation of GST subject to the ceiling amount of **GST (CGST & SGST/UTGST or IGST)** as quoted by the bidder, subject to any statutory variations, except variations arising due to change in turnover. In case of any variation in the executed quantities (If directed and/or certified by the Engineer-In-Charge) the ceiling amount on which **GST (CGST & SGST/UTGST or IGST)** is applicable will be modified on pro-rata basis.

13.6.2 The bids will be evaluated based on total price including quoted **GST (CGST & SGST/UTGST or IGST)**.

13.7 GAIL will prefer to deal with registered supplier of goods/ services under GST. Therefore, bidders are requested to get themselves registered under GST, it not registered yet.

However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable **GST (CGST & SGST/UTGST or IGST)** while evaluation of bid (if applicable as per Govt. Act/ Law in vogue). Where GAIL is entitled for input credit of **GST (CGST & SGST/UTGST or IGST)**, the same will be considered for evaluation of bid as per evaluation methodology of tender document. Further, an unregistered bidder is required to mention its Income Tax PAN in bid document.

13.8 In case GAIL is required to pay entire/certain portion of applicable **GST (CGST & SGST/UTGST or IGST)** and remaining portion, if any, is to be deposited by Bidder directly as per **GST (CGST & SGST/UTGST or IGST)** laws, entire applicable rate/amount of **GST (CGST & SGST/UTGST or IGST)** to be indicated by bidder in the SOR.

Where GAIL has the obligation to discharge **GST (CGST & SGST/UTGST or IGST)** liability under reverse charge mechanism and GAIL has paid or is /liable to pay **GST (CGST & SGST/UTGST or IGST)** to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to GAIL or ITC with respect to such payments is not available to GAIL for any reason which is not attributable to GAIL, then GAIL shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by GAIL to Contractor / Supplier.

13.9 Contractor shall ensure timely submission of correct invoice(s) /e-invoice(s), as per GST rules/ regulation, with all required supporting document(s) within a period specified in Contract to enable GAIL to avail input credit of GST (CGST & SGST/UTGST or IGST). Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

If input tax credit is not available to GAIL for any reason not attributable to GAIL, then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, against any amounts paid or becomes payable by GAIL in future to the Contractor under this contract or under any other contract.

13.10 **Anti-profiteering clause**

As per Clause 171 of GST Act it is mandatory to pass on the benefit due to reduction in rate of tax or from input tax credit to the consumer by way of commensurate reduction in prices. The Contractor may note the above and quote their prices accordingly.

13.11 In case the GST rating of contractor on the GST portal / Govt. official website is negative / black listed, then the bids may be rejected by GAIL. Further, in case rating of bidder is negative / black listed after award of work, then GAIL shall not be obligated or liable to pay or reimburse GST to such c and shall also be entitled to deduct / recover such GST along with all penalties / interest, if any, incurred by GAIL.

13.12 GST (CGST & SGST/UTGST or IGST) is implemented w.e.f. 01.07.2017 which subsumed various indirect taxes and duties applicable before 01.07.2017. Accordingly, the provisions of General Condition of Contract relating to taxes and duties which are subsumed in GST are modified to aforesaid provisions mentioned in clause no. 12 and 13 of ITB.

13.13 GST, as quoted by the bidder in Schedule of Rates, shall be deemed as final and binding for the purpose of bid evaluation (applicable for tenders where bidder quotes the GST rates). In case a bidder enters "zero/blank" GST or an erroneous GST, the bid evaluation for finalizing the L1 bidder will be done considering the "Zero" or quoted GST rate, as the case may be. No request for change in GST will be entertained after submission of bids.

In cases where the successful bidder quotes a wrong GST rate, for releasing the order, the following methodology will be followed:

- In case the actual GST rate applicable is lower than the quoted GST rate, the actual GST rate will be added to the quoted basic prices. The final cash outflow will be based on actual GST rate.
- In case the actual GST rate applicable is more than the quoted GST rate, the basic prices quoted will be reduced proportionately, keeping the final cash outflow the same as the overall quoted amount.

Based on the Total Cash Outflow calculated as above, GAIL shall place orders.

13.14 Wherever TDS under GST Laws has been deducted from the invoices raised / payments made to the Contractors, as per the provisions of the GST law / Rules, Contractors should accept the corresponding GST-TDS amount populated in the relevant screen on GST common portal (www.gst.gov.in). Further, Vendors should also download the GST TDS certificate from GST common portal (reference path: Services > User Services > View/Download Certificates option).

13.15 **Provision w.r.t. E- Invoicing requirement as per GST laws:**

Supplier who is required to comply with the requirements of E-invoice for B2B transactions as per the requirement of GST Law will ensure the compliance of requirement of E Invoicing under GST law. If the invoice issued without following this process, such invoice can-not be processed for payment by GAIL as no ITC is allowed on such invoices. Therefore, all the payments to such supplier who is liable to comply with e-invoice as per GST Laws shall be made against the proper e-invoice(s) only. Further, returns and details required to be filled under GST laws & rules against such e-invoices should be timely filed by Supplier of Goods with requisite details.

If input tax credit is not available to GAIL for any reason attributable to supplier (both for E-invoicing cases and non-E-invoicing cases), then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the supplier under this contract or under any other contract.

To ensure compliance, undertaking in requisite format is to be submitted by supplier as per

format F-17 along with documents for release of payment.

13.16 **New Taxes & duties:** Any new taxes & duties, if imposed by the State/ Central Govt. of India after the due date of bid submission but before the Contractual Completion Date, shall be reimbursed to the Service Provider on submission of copy of notification(s) issued from State/ Central Govt. Authorities along with documentary evidence for proof of payment of such taxes & duties, but only after ascertaining it's applicability with respect to the Contract.

13.17 Full payment including GST will be released at the time of processing of invoice for payment, where the GST amount reflects in Form GSTR-2A of GAIL. However, in case where the GST amount doesn't reflect in Form GSTR-2A of GAIL, the amount of GST will be released after reflection of GST amount of corresponding invoice in Form GSTR-2A of GAIL.

14 BID CURRENCIES:

Bidders must submit bid in Indian Rupees only.

15 BID VALIDITY

15.1 Bids shall be kept valid for period specified in BDS from the final Due date of submission of bid'. A Bid valid for a shorter period may be rejected by GAIL as 'non-responsive'.

15.2 In exceptional circumstances, prior to expiry of the original 'Bid Validity Period', the Employer may request the Bidders to extend the 'Period of Bid Validity' for a specified additional period. The request and the responses thereto shall be made in writing or by email. A Bidder may refuse the request without forfeiture of his EMD / Bid Security.

A Bidder agreeing to the request will not be required or permitted to modify his Bid, but will be required to extend the validity of its EMD for the period of the extension and in accordance with "ITB: Clause-16" in all respects.

16 EARNEST MONEY DEPOSIT

16.1 Bid must be accompanied with earnest money **(i.e Earnest Money Deposit (EMD)** also known as **Bid Security)** in the form of **'Demand Draft' / 'Banker's Cheque' [**in favour of **GAIL (India) Limited** payable at place mentioned in **BDS]** or **'Bank Guarantee'** strictly as per the format given in form F 2 of the **Tender Document**. Bidder shall ensure that EMD submitted in the form of **'Bank Guarantee'** should have a validity of at least 'two [02] months' beyond the validity of the Bid. EMD submitted in the form of **'Demand Draft'** or **'Banker's Cheque'** should be valid for three months**.**
Bid not accompanied with EMD, or EMD not in requisite format shall be liable for rejection. The EMD shall be submitted in Indian Rupees only.

16.2 GAIL shall not be liable to pay any documentation charges, Bank charges, commission, interest etc. on the amount of EMD. In case EMD is in the form of a 'Bank Guarantee', the same shall be from any Indian scheduled Bank or a branch of an International Bank situated in India and registered with 'Reserve Bank of India' as Scheduled Foreign Bank. However, in case of 'Bank Guarantee' from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having net worth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the 'Bank Guarantee' itself or separately on its letterhead.

16.3 Any Bid not secured in accordance with "ITB: Clause-16.1 & Clause-16.3" may be rejected by GAIL as non-responsive.

16.4 Unsuccessful Bidder's EMD will be discharged/ returned as promptly as possible, but not later than 'thirty [30] days' after finalization of tendering process.

16.5 The successful Bidder's EMD will be discharged upon the Bidder's acknowledging the 'Award' and signing the 'Agreement' (if applicable) and furnishing the 'Contract Performance Security (CPS)/ Security Deposit' pursuant to clause no. 38 of ITB.

16.6 Notwithstanding anything contained herein, the EMD may also be forfeited in any of the following cases:

(a) If a Bidder withdraws his Bid during the 'Period of Bid Validity'

(b) If a Bidder has indulged in corrupt/fraudulent /collusive/coercive practice

(c) If the Bidder modifies Bid during the period of bid validity (after Due Date and Time for Bid Submission).

(d) Violates any other condition, mentioned elsewhere in the Tender Document, which may lead to forfeiture of EMD.

(e) In the case of a successful Bidder, if the Bidder fails to:

(i) to acknowledge receipt of the "Notification of Award" / Fax of Acceptance[FOA]",

(ii) to furnish "Contract Performance Security / Security Deposit", in accordance with "ITB: Clause-38"

(iii) to accept 'arithmetical corrections' as per provision of the clause 30 of ITB.

16.7 In case EMD is in the form of 'Bank Guarantee', the same must indicate the Tender Document No. and the name of Tender Document for which the Bidder is quoting. This is essential to have proper correlation at a later date.

16.8 MSEs (Micro & Small Enterprises) are exempted from submission of EMD in accordance with the provisions of PPP-2012 and Clause 40 of ITB. However, Traders/Dealers/ Distributors /Stockiest /Wholesaler are not entitled for exemption of EMD.The Government Departments/PSUs are also exempted from the payment of EMD. Further, Startups are also exempted from the payment of EMD.

16.9 In addition to existing specified form (i.e. Demand Draft (DD)/ Banker's Cheque/ Bank Guarantee) mentioned in tender documents for submission of EMD/Bid Bond, the bidder can also submit the EMD through online banking transaction i.e. IMPS/NEFT/RTGS etc. While remitting, the bidder must indicate EMD and tender/E-tender no. under remarks. Bidders shall be required to submit/ upload the successful transaction details along-with their bid/e-bid in addition to forwarding the details to dealing officer through email/letter along with tender reference number immediately after remittance of EMD.

In absence of submitting/ uploading the remittance details, the bids are likely to be considered as bid not accompanied with EMD. Further, in case of the above online transaction, submission of EMD in original is not applicable.

16.10 In case of forfeiture of EMD/ Bid Security, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by GAIL. The forfeiture amount will be subject to final decision of GAIL based on other terms and conditions of order/ contract."

16.11 EMD/Bid Bond will not be accepted in case the same has reference of 'remitter'/'financer' other than bidder on the aforementioned financial instrument of EMD/ Bid Bond submitted by the bidder and bid of such bidder will be summarily rejected.

16A **DECLARATION FOR BID SECURITY**

MSEs, Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue) are required to submit Declaration for Bid Security as per proforma at Form F-2A.

17 **PRE-BID MEETING (IF APPLICABLE)**

17.1 The Bidder(s) or his designated representative are invited to attend a "Pre-Bid Meeting" which will be held at address specified in IFB. It is expected that a bidder shall not depute more than 02 representatives for the meeting.

17.2 Purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage and give hands-on e-tendering.

17.3 Text of the questions raised and the responses given, together with any responses prepared after the meeting, will be uploaded on e-tender portal against the Tender as specified in "ITB: Clause-8. Any modification of the Contents of Bidding Documents listed in "ITB: Clause-7.1", that may become necessary as a result of the Pre-Bid Meeting shall be made by the Employer exclusively through the issue of an Corrigendum pursuant to "ITB: Clause-9", and not through the minutes of the Pre-Bid Meeting.

17.4 Non-attendance of the Pre-Bid Meeting will not be a cause for disqualification of Bidder.

18 FORMAT AND SIGNING OF BID

18.1 The original and all copies of the Bid shall be typed or written in indelible ink [in the case of copies, photocopies are also acceptable] and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder (as per POA). The name and position held by each person signing, must be typed or printed below the signature. All pages of the Bid except for unamendable printed literature where entry(s) or amendment(s) have been made shall be initialed by the person or persons signing the Bid.

18.2 The Bid shall contain no alterations, omissions, or additions, unless such corrections are initialed by the person or persons signing the Bid.

18.3 In case of e-tendering, digitally signed documents to be uploaded as detailed in addendum to ITB (Annexure-III to Section III).

19 ZERO DEVIATION AND REJECTION CRITERIA

19.1 ZERO DEVIATION: Deviation to terms and conditions of "Bidding Documents" may lead to rejection of bid. GAIL will accept bids based on terms & conditions of "Bidding Documents" only. Bidder may note GAIL will determine the substantial responsiveness of each bid to the Bidding Documents pursuant to provision contained in clause 29 of ITB. For purpose of this, a substantially responsive bid is one which conforms to all terms and conditions of the Bidding Documents without deviations or reservations. GAIL's determination of a bid's responsiveness is based on the content of the bid itself without recourse to extrinsic evidence. GAIL reserves the right to raise technical and/or commercial query(s), if required, may be raised on the bidder(s). The response(s) to the same shall be in writing, and no change in the price(s) or substance of the bids shall be sought, offered or permitted. The substance of the bid includes but not limited to prices, completion, scope, technical specifications, etc. Bidders are requested to not to take any deviation/exception to the terms and conditions laid down in this "Tender Documents", and submit all requisite documents as mentioned in this "Tender Documents", failing which their offer will be liable for rejection. If a bidder does not reply to the queries in the permitted time frame then its bid shall be evaluated based on the documents available in the bid.

19.2 **REJECTION CRITERIA:** Notwithstanding the above, deviation to the following clauses of Tender document shall lead to summarily rejection of Bid:

(a) Firm Price
(b) Earnest Money Deposit / Bid Security/ Bid Security declaration, as applicable
(c) Specifications & Scope of Work
(d) Schedule of Rates / Price Schedule / Price Basis

(e) Duration / Period of Contract/ Completion schedule
(f) Period of Validity of Bid
(g) Price Reduction Schedule
(h) Contract Performance Security
(i) Guarantee / Defect Liability Period
(j) Arbitration / Resolution of Dispute/Jurisdiction of Court
(k) Force Majeure & Applicable Laws
(l) Integrity Pact, if Applicable
(m) Any other condition specifically mentioned in the tender document elsewhere that non-compliance of the clause lead to rejection of bid

Note: Further, it is once again reminded not to mention any condition in the Bid which is contradictory to the terms and conditions of Tender document.

20 E-PAYMENT

GAIL (India) Limited has initiated payments to Contractors electronically, and to facilitate the payments electronically through '**e-banking**'.

[D] – SUBMISSION OF BIDS

21 SUBMISSION, SEALING AND MARKING OF BIDS

21.1 In case of e-tendering, bids shall be submitted through e-tender mode in the manner specified elsewhere in tender document. No Manual/ Hard Copy (Original) offer shall be acceptable. Physical documents shall be addressed to the owner at address specified in IFB.

21.2 In case of manual tendering bid must be submitted in sealed envelope. If the envelope is not sealed & marked as per Clause No. 11 of ITB, the employer will assume no responsibility for misplacement or pre-mature opening of the bid.

21.3 All the bids shall be addressed to the owner at address specified in IFB.

21.4 Bids submitted under the name of AGENT / REPRESENTATIVE /RETAINER/ ASSOCIATE etc. on behalf of a bidder/affiliate shall not be accepted.

22 DEADLINE FOR SUBMISSION OF BIDS

22.1 In case of e-bidding, the bids must be submitted through e-tender mode not later than the date and time specified in the tender documents/BDS.

22.2 In case of manual tendering EMD along with bid must be submitted within the due date & time, as specified in Clause no. 2.0 (I) of IFB and place mentioned in BDS.

22.3 GAIL may, in exceptional circumstances and at its discretion, extend the deadline for submission of Bids (8.0 and/or 9 of ITB refers). In which case all rights and obligations of GAIL and the Bidders, previously subject to the original deadline will thereafter be subject to the deadline as extended. Notice for extension of due date of submission of bid will be uploaded on e-tender portal / communicated to the bidders.

23 LATE BIDS

23.1 Any bids received after the notified date and time of closing of tenders will be treated as late bids.

23.2 In case of e-tendering, e-tendering system of GePNIC shall close immediately after the due date for submission of bid and no bids can be submitted thereafter.

In case of manual tendering, bids received by GAIL after the due date for submission of bids shall not be considered. Such late bids shall be returned to the bidder within "10 days" in 'unopened conditions'. The EMD of such bidders shall be returned along with the un-opened bid. In case of e-tendering, where the EMD/physical documents has been received but the bid is not submitted by the bidder in the e-tendering portal, such bid bond/ physical documents shall be returned immediately.

23.3 EMD /physical documents received to address other than one specifically stipulated in the Tender Document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.

2.3.4 Unsolicited Bids or Bids received to address other than one specifically stipulated in the tender document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.

24 MODIFICATION AND WITHDRAWAL OF BIDS

24.1 Modification and withdrawal of bids shall be as follows:-

24.1.1 **IN CASE OF E- TENDERING**

The bidder may withdraw or modify its bid after bid submission but before the due date and time for submission as per tender document.

24.1.2 **IN CASE OF MANUAL BIDDING**

The bidder may withdraw or modify its bid after bid submission but before the due date for submission as per tender document provided that the written notice of the modification/ substitution/ withdrawal in received by GAIL prior to the deadline for submission of bid.

24.2 The modification shall also be prepared, sealed, marked and dispatched in accordance with the provisions of the clause 11, 21 & 22 of ITB with relevant 'Cut-Out Slip' duly pasted and mentioning on top of the envelope as "MODIFICATION". In case of withdrawal of bid, the Envelope containing withdrawal letter duly superscribing the envelope as "WITHDRAWAL" and "Tender Document number :…."/ communication regarding withdrawal of bid with "Tender Document number :…."/ must reach concerned dealing official of GAIL within Due date & Time of submission of Bid. No bid shall be modified/ withdrawn after the Due Date & Time for Bid submission.

24.3 Any withdrawal/ modification/substitution of Bid in the interval between the Due Date & Time for Bid submission and the expiration of the period of bid validity specified by the Bidder in their Bid shall result in the Bidder's forfeiture of EMD pursuant to clause 16 of ITB invocation of action as per Bid Security declaration and rejection of Bid.

24.4 The latest Bid submitted by the Bidder before Bid Due Date & Time shall be considered for evaluation and all other Bid(s) shall be considered to be unconditionally withdrawn.

[E] – BID OPENING AND EVALUATION

25 EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

GAIL reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids, at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligations to inform the affected Bidder

or Bidders of the ground for GAIL's action. However, Bidder if so desire may seek the reason (in writing) for rejection of their Bid to which GAIL shall respond quickly.

26 BID OPENING

26.1 ***Unpriced Bid Opening :***
GAIL will open bids, in the presence of bidders' designated representatives who choose to attend, at date, time and location stipulated in the BDS. The bidders' representatives, who are present shall sign a bid opening register evidencing their attendance.

26.2 ***Priced Bid Opening***:

26.2.1 GAIL will open the price bids of those bidders who meet the qualification requirement and whose bids is determined to be technically and commercially responsive. Bidders selected for opening of their price bids shall be informed about the date of price bid opening. Bidders may depute their authorized representative to attend the bid opening. The bidders' representatives, who are present shall sign a register evidencing their attendance and may be required to be present even on a short notice.

26.2.2 The price bids of those Bidders who were not found to be techno-commercially responsive shall not be opened in both manual tendering and e-tendering.

26.3 In case of bids invited under the single bid system, bid shall be opened on the specified due date & time.

27 CONFIDENTIALITY

Information relating to the examination, clarification, evaluation and comparison of Bids, and recommendations for the award of a Contract, shall not be disclosed to Bidder(s) or any other persons not officially concerned with such process.

28 CONTACTING THE EMPLOYER

28.1 From the time of Bid opening to the time of award of Contract, if any Bidder wishes to contact the Employer on any matter related to the Bid, it should do so in writing.

28.2 Any effort by the Bidder to influence the Employer in the Employer's 'Bid Evaluation', 'Bid Comparison', or 'Contract Award' decisions may result in the rejection of the Bidder's Bid and action shall be initiated as per procedure for action in case Corrupt / Fraudulent / Collusive / Coercive practices in this regard, apart from forfeiture of EMD/ Bid Security, if any.

29 EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

29.1 The employer's's determination of a bid's responsiveness is based on the content of the bid only. Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid:-

(a) Meets the "Bid Evaluation Criteria" of the Bidding Documents;
(b) Has been properly signed;
(c) Is accompanied by the required 'Earnest Money / Bid Security / Bid Security Declaration ';
(d) Is substantially responsive to the requirements of the Bidding Documents; and
(e) Provides any clarification and/or substantiation that the Employer may require to determine responsiveness pursuant to "ITB: Clause-29.2"

29.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bidding Documents without material deviations or reservations or omissions for this purpose employer defines the foregoing terms below:-

a) "Deviation" is departure from the requirement specified in the tender documents.
b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirement in the tender documents.
c) "Omission" is the failure to submit part or all of the information or documentation required in the tender document for evaluation of bid.

29.3 A material deviation, reservation or omission is one that,

a) If accepted would,
   i) Affect in any substantial way the scope, quality, or performance of the job as specified in tender documents.
   ii) Limit, in any substantial way, inconsistent with the Tender Document, the Employer's rights or the tenderer's obligations under the proposed Contract.
b) If rectified, would unfairly affect the competitive position of other bidders presenting substantially responsive bids.

29.4 The employer shall examine all aspects of the bid to confirm that all requirements have been met without any material deviation, reservation or omission.

29.5 If a Bid is not substantially responsive, it may be rejected by the Employer and may not subsequently be made responsive by correction or withdrawal of the of material deviation, reservation or omission.

30 CORRECTION OF ERRORS

30.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors in Price Schedule/Schedule of Rates (SOR) will be corrected by the Employer as follows:

(i) When there is a difference between the rates in figures and words, the rate which corresponds to the amount worked out by the Bidder (i.e. by multiplying the quantity and rate) shall be taken as correct.
(ii) When the rate quoted by the Bidder in figures and words tallies but the amount is incorrect, the rate quoted by the bidder shall be taken as correct and not the amount. The amount shall be re-calculated/ corrected accordingly.
(iii) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in words shall be adopted and the amount worked out, for comparison purposes.
(iv) In case any bidder does not quote for any item(s) of "Schedule of Rates" and the estimated price impact is more than 10% of the quoted price, then the bid will be rejected. If such price impact of unquoted items is 10% or less of his quoted price, then the unquoted item(s) shall be loaded highest of the price quoted by the other bidders . If such bidder happens to be lowest evaluated bidder, price of unquoted items shall be considered as included in the quoted bid price.

30.2 The amount stated in the bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors. If the bidder does not accept the corrected amount of bid, its bid will be rejected, and the bid security shall be forfeited / actions shall be invoked as per Declaration for Bid Security.

31 CONVERSION TO SINGLE CURRENCY FOR COMPARISON OF BIDS

Not Applicable. All bids submitted must be in the currency specified at clause 14 of ITB.

32 EVALUATION AND COMPARISON OF BIDS

Bid shall be evaluated as per evaluation criteria mentioned in Section-II of bidding documents on lowest bid.
In case of a tie at the lowest bid (L1) position between two or more bidders, the order/LoA will be placed on the bidder who has higher/ highest turnover in last audited financial year.
In case there is a tie at the lowest bid (L1) position between only startup bidders and none of them has past turnover, the order/LoA will be placed on the startup who is registered earlier with Department for Promotion of Industry and Internal Trade.

33 COMPENSATION FOR EXTENDED STAY *[FOR APPLICABILITY OF THIS CLAUSE REFER BDS]*:-

33.1 In the event of the time of completions of work getting delayed beyond the time schedule indicated in the bidding document plus a grace period equivalent to 1/5th of the time schedule or 2 months whichever is more, due to reasons solely attributable to Employer, the Contractor shall be paid compensation for extended stay (ESC) to maintain necessary organizational set up and construction tools, tackles, equipment etc. at site of work.

33.2 The bidder is required to specify the rate for ESC on per month basis in the "PRICE PART" of his bid, which shall be considered for loading on total quoted price during price bid evaluation. The loading shall be done of a period of 1/5th of the time schedule or 1 month whichever is less. In case bidder does not indicate the rate for ESC in price part of his bid, it will be presumed that no ESC is required by the bidder and evaluation shall be carried out accordingly.

34 PURCHASE PREFERENCE

Purchase Preference to Local Content (PP-LC) bidders / Domestically Manufactured Telecom Products (DMTP) shall be allowed as per Government instructions in vogue, as applicable from time to time.
The policy for providing Purchase Preference (linked with Local content) is enclosed as Annexure V to ITB herewith.

[F] – AWARD OF CONTRACT

35 AWARD

Subject to "ITB: Clause-29", GAIL will award the Contract to the successful Bidder whose Bid has been determined to be substantially responsive and has been determined as the lowest provided that bidder, is determined to be qualified to satisfactorily perform the Contract.
"GAIL intent to place the contract directly on the address from where Goods are produced/dispatched or Services are rendered. In case, bidder wants contract at some other address or supply of Goods/ Services from multiple locations, bidder is required to provide in their bid address on which order is to be placed".

GAIL will place the Contract directly on the successful bidder from whom the bid has

been received & evaluated and will not place order on other entities such as subsidiary, business associate or partner, dealer/distributor etc. of the Bidder.

36 NOTIFICATION OF AWARD / FAX OF ACCEPTANCE

36.1 Prior to the expiry of 'Period of Bid Validity', Notification of Award for acceptance of the Bid will be intimated to the successful Bidder by GAIL either by E - mail /Letter or like means defined as the "Fax of Acceptance (FOA)". The Contract shall enter into force on the date of FOA and the same shall be binding on GAIL and successful Bidder (i.e. Contractor). The Notification of Award/FOA will constitute the formation of a Contract. The detailed Letter of Acceptance shall be issued thereafter incorporating terms & conditions of Tender Document, Corrigendum, Clarification(s), Bid and agreed variation(s)/acceptable deviation(s), if any. GAIL may choose to issue Notification of Award in form of detailed Letter of Acceptance without issuing FOA and in such case the Contract shall enter into force on the date of detailed Letter of Acceptance only.

36.2 Contract period shall commence from the date of "Notification of Award" or as mentioned in the Notification of Award. The "Notification of Award" will constitute the formation of a Contract, until the Contract has been effected pursuant to signing of Contract Agreement as per "ITB: Clause-37".

36.3 Upon the successful Bidder's / Contractor's furnishing of 'Contract Performance Security / Security Deposit', pursuant to "ITB: Clause-38", GAIL will promptly discharge his 'Earnest Money Deposit / Bid Security', pursuant to "ITB: Clause-16"

36.4 The Order/ contract value mentioned above is subject to Price Reduction Schedule clause.

36.5 GAIL will award the Contract to the successful Bidder, who, within 'fifteen [15] days' of receipt of the same, shall sign and return the acknowledged copy to GAIL.

37 SIGNING OF AGREEMENT

37.1 The successful Bidder/Contractor shall be required to execute an 'Agreement' in the proforma given in this Bidding Document on a 'non-judicial stamp paper' of appropriate value [cost of the 'stamp-paper' shall be borne by the successful Bidder/Contractor] and of ' State of India' specified in Bidding Data Sheet (BDS) only, within 'fifteen [15] days' of receipt of the "Fax of Acceptance [FOA]" of the Tender by the successful Bidder/Contractor failure on the part of the successful Bidder/Contractor to sign the 'Agreement' within the above stipulated period, shall constitute sufficient grounds for forfeiture of EMD/Security Deposit / Action as per Bid Security declaration.

37.3 Bidders can request Bilingual (Hindi & English) Contract Agreement. The format for signing Contract Agreement in English is attached with this Bidding Document.

38 CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT [CPS/SD]

38.1 Within 30 days of the receipt of the notification of award/ Fax of Acceptance from GAIL, the successful bidder shall furnish the Contract Performance Security (CPS) in accordance with of General Conditions of the Contract. The CPS shall be in the form of either Banker's Cheque or Demand Draft or Bank Guarantee or Letter of Credit and shall be in the currency of the Contract. However, CPS shall not be applicable in cases wherein the individual contract value as specified in Notification of Award is less than INR 5 Lakh (exclusive of GST).

38.2 The contract performance security shall be for an amount equal to specified in Bidding Data Sheet (BDS) towards faithful performance of the contractual obligations and

performance of equipment. For the purpose of CPS, Contract/order value shall be exclusive of **GST (CGST & SGST/UTGST or IGST)**.

Bank Guarantee towards CPS shall be from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalized Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect should be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.

38.3 Failure of the successful bidder to comply with the requirements of this article shall constitute sufficient grounds for consideration of the annulment of the award and forfeiture of the EMD / action as per declaration for Bid Security.

38.4 The CPS has to cover the entire contract value including extra works/services also. As long as the CPS submitted at the time of award take cares the extra works/ services executed and total executed value are within the awarded contract price, there is no need for additional CPS. As soon as the total executed value is likely to burst the ceiling of awarded contract price, the contractor should furnish additional CPS.

38.5 Further, Ministry of Finance (MOF) Department of financial service has issued direction for submission of Bank Guarantee through online vide letter ref number F.No.7/112/2011-BOA dated 17th July 2012. The successful bidder can submit CPS online through issuing bank to GAIL directly as per the above direction including its revisions, if any. In such cases confirmation will not be sought from issuing banker by GAIL.

38.6 In addition to existing specified form (i.e. Demand Draft (DD)/ Banker's Cheque/ Bank Guarantee/Letter of Credit) mentioned in tender documents for submission of Security Deposit/ Contract Performance Security, the successful bidder can also submit the Security Deposit/ Contract Performance Security through online banking transaction i.e. IMPS/NEFT/RTGS/SWIFT etc. For this purpose, the details of GAIL's Bank Account is mentioned in BDS. Further, in case a successful Bidder is willing to furnish CPS through SWIFT, the details may be obtained from Purchase Officer immediately after receipt of FOA.

While remitting such online transaction, the bidder must indicate "**Security Deposit/ Contract Performance Security against FOA/DLOA no. _____ (contractor to specify the FOA/DLOA No.)**" under remarks column of such transaction of respective bank portal. The contractor/vendor shall be required to submit the successful transaction details to the dealing officer immediately through email/letter and necessarily within 30 days from the date of Fax of Acceptance.

38.7 In case of forfeiture of Contract Performance Security/ Security Deposit in terms of GCC, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by GAIL. The forfeiture amount will be subject to final decision of GAIL based on other terms and conditions of order/ contract.

38.8 The Contractor will also submit covering letter along with CPS as per format at F-4.

38.9 CPBG/Security Deposit will not be accepted in case the same has reference of 'remitter'/'financer' other than bidder on the aforementioned financial instrument of CPBG/ Security Deposit submitted by the Contractor.

39 PROCEDURE FOR ACTION IN CASE CORRUPT/ FRAUDULENT/COLLUSIVE/ COERCIVE PRACTICES

39.1 Procedure for action in case Corrupt/ Fraudulent/Collusive/Coercive Practices is enclosed at Annexure-I.

39.2 The Fraud Prevention Policy document is available on GAIL's website (www.gailonline.com)

39.3 Name and contact details of nodal officer- Refer BDS for details

39.4 **NON-APPLICABILITY OF ARBITRATION CLAUSE IN CASE OF BANNING OF VENDORS/ SUPPLIERS / CONTRACTORS/BIDDERS/ CONSULTANTS INDULGED IN FRAUDULENT/ COERCIVE PRACTICES**

Notwithstanding anything contained contrary in GCC and other "CONTRACT DOCUMENTS", in case it is found that the Contractors / Bidders indulged in fraudulent/ coercive practices at the time of bidding, during execution of the contract etc., and/or on other grounds as mentioned in GAIL's "Procedure for action in case Corrupt/Fraudulent/Collusive/Coercive Practices" (Annexure-I to Section-III), the contractor/bidder shall be banned (in terms of aforesaid procedure) from the date of issuance of such order by GAIL (India) Ltd., to such Contractors/Bidders.

The Contractor/ Bidder understands and agrees that in such cases where Contractor/ Bidder has been banned (in terms of aforesaid procedure) from the date of issuance of such order by GAIL (India) Limited, such decision of GAIL (India) Limited shall be final and binding on such Contractor/ Bidder and the 'Arbitration clause' in the GCC and other "CONTRACT DOCUMENTS" shall not be applicable for any consequential issue /dispute arising in the matter.

40 PUBLIC PROCUREMENT POLICY FOR MICRO AND SMALL ENTERPRISES

40.1 Government of India, vide Gazette of India No. 503 dated 26.03.2012 proclaimed the Public Procurement Policy for Micro and Small Enterprises (MSEs). The following benefit is available in case of work contract also:

i) Issue of tender document to MSEs free of cost.

ii) Exemption to MSEs from payment of EMD/Bid Security.

40.2 In case bidder is a Micro or Small Enterprise, the bidder shall submit the following :

(i) Ministry of MSME vide Gazette notification no. CG-DL-E-26062020-220191 dated 26.06.2020 had notified certain criteria for classifying the enterprises as Micro, Small and Medium Enterprises and specified form and procedure for filing the memorandum (Udyam Registration) w.e.f. 01.07.2020 (for complete details of policy refer website of Ministry of MSME i.e. https://msme.gov.in/).
Accordingly, Micro and Small Enterprises (MSEs) shall be required to submit Udyam Registration Certificate for availing benefit under Public Procurement Policy for MSEs-2012

(ii) An enterprise registered prior to 30.06.2020 and who is not re-registered with Udyam Registration, shall continue to be valid for a period upto 30.06.2022. Such enterprise shall submit EM Part-II or Udyog Aadhaar Memorandum (UAM) for availing benefits of PPP-2012.

The above documents submitted by the bidder shall be duly certified by the Chartered Accountant (not being an employee or a Director or not having any interest in the bidder's company/firm) and notary public with legible stamp.
If the bidder does not provide the above confirmation or appropriate document or any evidence, then it will be presumed that they do not qualify for any preference admissible in the Public Procurement Policy (PPP) 2012.

Further, MSEs who are availing the benefits of the Public Procurement Policy (PPP) 2012 get themselves registered with MSME Data Bank being operated by NSIC, under SME Division, M/o MSME, in order to create proper data base of MSEs which are making supplies to CPSUs.

40.3 If against an order placed by GAIL, successful bidder(s) (other than Micro/Small Enterprise) is procuring material/services from their sub-vendor who is a Micro or Small Enterprise as per provision mentioned at clause no.40.2 with prior consent in writing of the purchasing authority/Engineer-in-charge, the details like Name, Registration No., Address, Contact No. details of material & value of procurement made, etc. of such Enterprises shall be furnished by the successful bidder at the time of submission of invoice/Bill.

40.4 The benefit of policy are not extended to the traders/dealers/ Distributors /Stockiest/Wholesalers.

40.5 NSIC has initiated a scheme of "Consortia and Tender Marketing Scheme" under which they are assisting the Micro & Small enterprises to market their products and services through tender participation on behalf of the individual unit or through consortia.
Accordingly, if the MSEs or the consortia, on whose behalf the bid is submitted by NSIC, is meeting the BEC and other terms and conditions of tender their bid will be considered for further evaluation.
Further, in such cases a declaration is to be submitted by MSE/ consortia on their letter head (s) that all the terms and conditions of tender document shall be acceptable to them.

40.6 It may be noted that Government of India has implemented Trade Receivable Discounting System (TReDS) to address challenges faced by MSMEs in delayed payments (after receipt/acceptance of Material/Services) from Government buyers leading to shortfall of Working Capital. TReDS is an online electronic institutional mechanism for facilitating the financing of trade receivables of MSMEs through multiple financiers. GAIL is already registered on the following TReDS platform:

- M/s Receivable Exchange of India (RXIL), Mumbai
- M/s Mynd Solutions Private Limited (Mynd), New Delhi
- M/s A. TREDS (Invoicemart), Mumbai

MSME Bidders are required to register on the TReDS platform. The MSME vendors can avail the TReDS facility, if they want to.

40.7 Interest payment on delayed payments to MSME is payable in line with Micro, Small and Medium Enterprises Development Act, 2006

41 AHR ITEMS

In item rate contract where the quoted rates for the items exceed 50% of the estimate rates, such items will be considered as Abnormally High Rates (AHR) items and payment of AHR items beyond the SOR stipulated quantities shall be made at the lowest amongst the following rates:

I) Rates as per SOR, quoted by the Contractor.

II) Rate of the item, which shall be derived as follows:

a. Based on rates of Machine and labour as available from the contract (which includes contractor's supervision, profit, overheads and other expenses).

b. In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour plus 15% to cover contractor's supervision profit, overhead & other expenses.

42 VENDOR PERFORMANCE EVALUATION

Shall be as stipulated Annexure II to ITB herewith.

43 INCOME TAX & CORPORATE TAX

43.1 Income tax deduction shall be made from all payments made to the contractor as per the rules and regulations in force and in accordance with the Income Tax Act prevailing from time to time.

43.2 Corporate Tax liability, if any, shall be to the contractor's account.

43.3 **TDS**

(i) TDS, wherever applicable, shall be deducted as per applicable act/law/rule.

(ii) **Higher rate of TDS for non-filers of ITR**
As per Section 206AB of Income Tax Act, 1961, in case of any vendor/customer who does not filed their Income Tax Return for both of the two previous years preceding to current year and aggregate amount of TDS is more than or equal to 50,000/- in each of those previous two years (or limit defined by Govt. from time to time), then TDS will be deducted at the higher of following rates:
(I) Twice the rate mentioned in relevant TDS section.
(II) Twice the rate or rates in force
(III) 5%

43.4 **MENTIONING OF PAN NO. IN INVOICE/BILL**

As per CBDT Notification No. 95/2015 dated 30.12.2015, mentioning of PAN no. is mandatory for procurement of goods / services/works/consultancy services exceeding Rs. 2 Lacs per transaction or as amended from time to time.
Accordingly, contractor should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs. 2 lakhs or as amended from time to time. As provided in the notification, in case contractor do not have PAN no., they have to submit declaration in Form 60 along with invoice/ bill for each transaction.
Payment of contractor shall be processed only after fulfilment of above requirement

44 DISPUTE RESOLUTION MECHANISM

44.1 QUARTERLY CLOSURE OF THE CONTRACT AND SAMADHAN MECHANISM

During execution of orders, various issues may arise. In order to timely detect and to address the contractual issue(s) during the execution of contracts, GAIL has introduced a mechanism of Quarterly Closure of the contract, under which all the related issues /disputes will be monitored and addressed on quarterly basis for resolution. Vendor (hereinafter referred 'Vendor') should first refer any issues/disputes to Engineer-in-Charge (EIC) for LOA/contracts/ Dealing C&P Executive for Purchase Orders and co-operate them for smooth execution of the contract and to timely address the issues, if any. For applicability of 'Quarterly Closure', please refer BDS.

In case issue is not resolved by above, Supplier may submit their issue(s) to Vendor Grievance Portal "Samadhan", which will be addressed by GAIL within 15 days. The Samadhan Portal is available at https://gailebank.gail.co.in/grievance/welcome.aspx .

Accordingly, the methodology for resolution of issue(s)/ grievance (s) of Vendor/Supplier shall be as under:

(i) Any issue should be first referred to EIC for LOA/contracts/ Dealing C&P Executive for Purchase Orders.
(ii) In case issue is not resolved, Vendor may submit their issue/ grievance through online Vendor Grievance Portal-"Samadhan".
(iii) In case, Vendor is not satisfied, there is a provision of escalation of issue to higher authority in GAIL. This option is available two times to vendor.
(iv) Further, issue(s) can only be submitted upto 1 month after closure of respective Contract.
(v) Vendor should refer their issue/ grievance through above mode only. Issue/ grievance received through any other mode shall not be entertained.

44.2 CONCILIATION AND ARBITRATION

1.0 CONCILIATION

GAIL (India) Limited has framed the Conciliation Rules 2010 in conformity with Part – III of the Arbitration and Conciliation Act 1996 as amended from time to time for speedier, cost effective and amicable settlement of disputes through conciliation. All issue(s)/dispute(s) arising under the Contract, which cannot be mutually resolved within a reasonable time as per clause no. 44.1, may be referred for conciliation in accordance with GAIL Conciliation Rules 2010 as amended from time to time A copy of the said rules have been made available on GAIL's web site i.e www.gailonline.com.

Where invitation for Conciliation has been accepted by the other party, the Parties shall attempt to settle such dispute(s) amicably under Part-III of the Arbitration and Conciliation Act, 1996 and GAIL (India) Limited Conciliation Rules, 2010. It would be only after exhausting the option of Conciliation as an Alternate Dispute Resolution Mechanism that the Parties hereto shall invoke Arbitration Clause. For the purpose of this clause, the option of 'Conciliation' shall be deemed to have been exhausted, even in case of rejection of 'Conciliation' by any of the Parties.

2.0 ARBITRATION

All issue(s)/dispute(s) excluding the matters that have been specified as excepted matters and listed at clause no. 2.6 and which cannot be resolved through Conciliation, such issue(s)/dispute(s) shall be referred to arbitration for adjudication by Sole Arbitrator.

The party invoking the Arbitration shall have the option to either opt for Ad-hoc Arbitration as provided at Clause 2.1 below or Institutionalized Arbitration as provided at Clause 2.2 below, the remaining clauses from 2.3 to 2.7 shall apply to both Ad-hoc and Institutional Arbitration:-

2.1 On invocation of the Arbitration clause by either party, GAIL shall suggest a panel of three independent and distinguished persons (Retd Supreme Court & High Court Judges only) to the other party from the Panel of Arbitrators maintained by 'Delhi International Arbitration Centre (DIAC) to select any one among them to act as the Sole Arbitrator. In the event of failure of the other party to select the Sole Arbitrator within 30 days from the receipt of the communication from GAIL suggesting the panel of arbitrators, the right of selection of the sole arbitrator by the other party shall stand forfeited and GAIL shall appoint the Sole Arbitrator from the suggested panel of three Arbitrators for adjudication of dispute(s). The decision of GAIL on the appointment of the sole arbitrator shall be final and binding on the other party. The fees payable to Sole Arbitrator shall be governed by the fee Schedule of ''Delhi International Arbitration Centre'.

OR

2.2 If a dispute arises out of or in connection with this contract, the party invoking the Arbitration shall submit that dispute to any one of the Arbitral Institutions i.e ICADR/ICA/DIAC/SFCA and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd Supreme Court/High Court Judge to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.

2.3 The cost of arbitration proceedings shall be shared equally by the parties.

2.4 The Arbitration proceedings shall be in English language and the seat, venue and place of Arbitration shall be New Delhi, India only.

2.5 Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matter relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.

2.6 List of Excepted matters:

a) Dispute(s)/issue(s) involving claims below Rs 25 lakhs and above Rs 25 crores.

b) Dispute(s)/issue(s) relating to indulgence of Contractor/Vendor/Bidder in corrupt/fraudulent/collusive/coercive practices and/or the same is under investigation by CBI or Vigilance or any other investigating agency or Government.

c) Dispute(s)/issue(s) wherein the decision of Engineer-In-Charge/owner/GAIL has been made final and binding in terms of the Contract.

2.7. Disputes involving claims below Rs 25 Lakhs and above Rs. 25 crores:- Parties mutually agree that dispute(s)/issue(s) involving claims below Rs 25 Lakhs and above Rs 25 crores shall not be subject matter of Arbitration and are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.

3. **GOVERNING LAW AND JURISDICTION**:

The Contract shall be governed by and construed in accordance with the laws in force in India. The Parties hereby submit to the exclusive jurisdiction of the Courts situated at New Delhi for adjudication of disputes, injunctive reliefs, actions and proceedings, if any, arising out of this Contract.

45. DISPUTES BETWEEN CPSE'S/GOVERNMENT DEPARTMENT'S/ ORGANIZATIONS

Subject to conciliation as provided above, in the event of any dispute (other than those related to taxation matters) or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs/ Port Trusts) inter se and also between CPSEs and Government Departments /Organizations), such dispute or difference shall be taken up by either party for resolution

only through AMRCD as mentioned in OPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

Any party aggrieved with the decision of the Committee at the First level (tier) may prefer an appeal before the Cabinet Secretary at the Second level (tier) within 15 days from the date of receipt of decision of the Committee at First level, through it's administrative Ministry/Department, whose decision will be final and binding on all concerned.

The above provisions mentioned at clause no.44 & 45 shall supersede provisions relating to Conciliation, Arbitration, Governing Law & Jurisdiction and Disputes between CPSE's/ Government Department's/ Organizations mentioned in General Conditions of Contract (GCC) and elsewhere in tender document.

46.0 INAM-PRO (PLATFORM FOR INFRASTRUCTURE AND MATERIALS PROVIDERS)

INAM-Pro (Platform for infrastructure and materials providers) is a web based platform for infrastructure provides and materials suppliers and was developed by Ministry of Road Transport and Highways (MoRT&H) with a view to reduce project execution delays on account of supply shortages and inspire greater confidence in contractors to procure cement to start with directly from the manufacturers. Presently, numerous cement companies are registered in the portal and offering cement for sale on the portal with a commitment period of 3 years. These companies have bound themselves by ceiling rates for the entire commitment period, wherein they are allowed to reduce or increase their cement rates any number of times within the ceiling rate, but are not permitted to exceed the said ceiling rate.

MoRT&H is expanding the reach of this web-portal by increasing both the product width as well as the product depth. They are working on incorporating 60 plus product categories. The product range will span from large machineries like Earth Movers and Concrete Mixers, to even the smallest items like road studs. MoRT&H intend to turn it into a portal which services every infrastructure development related need of a modern contractor.

GAIL's contractors may use this innovative platform, wherever applicable. The usage of web – Portal is a completely voluntary exercise. The platform, however, can serve as a benchmark for comparison of offered prices and products.

47 PROMOTION OF PAYMENT THROUGH CARDS AND DIGITAL MEANS

To promote cashless transactions, the onward payments by Contractors to their employees, service providers, sub-contractors and suppliers may be made through Cards and Digital means to the extent possible

48 CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY

While engaging the contractual manpower, Contractors are required to make efforts to provide opportunity of employment to the people belonging to Scheduled Castes and weaker sections of the society also in order to have a fair representation of these sections.

49. PROVISIONS FOR STARTUPS (AS DEFINED IN GAZETTE NOTIFICATION NO. D.L-33004/99 DATED 18.02.2016 AND 23.05.2017 OF MINISTRY OF COMMERCE AND INDUSTRY AND AS AMENDED FROM TIME TO TIME) *[FOR APPLICABLITY REFER BDS]*

As mentioned in Section-II, Prior turnover and prior experience shall not be required for all Startups [whether Micro & Small Enterprises (MSEs) or otherwise] subject to their meeting the quality and technical specifications specified in tender document and submission of document specified in Section -II.

Further, the Startups are also exempted from submission of EMDs (if applicable).

If a Startup emerge lowest bidder, the LoA on such Startup shall be placed for entire tendered quantity/group/item/part (as the case may be). However, during the Kick of Meeting monthly milestones/ check points would be drawn. Further, the performance of such contractor/ service provider will be reviewed more carefully and action to be taken as per provision of contract in case of failure/ poor performance.

50. PROVISION REGARDING INVOICE FOR REDUCED VALUE OR CREDIT NOTE TOWARDS PRS

PRS is the reduction in the consideration / contract value for the services covered under this contract. In case of delay in execution of contract, service provider should raise invoice for reduced value as per Price Reduction Schedule Clause (PRS clause). If service provider has raised the invoice for full value, then service provider should issue Credit Note towards the applicable PRS amount with applicable taxes.
In such cases if service provider fails to submit the invoice with reduced value or does not issue credit note as mentioned above, GAIL will release the payment to service provider after giving effect of the PRS clause with corresponding reduction of taxes charged on service provider's invoice, to avoid delay in payment.
In case any financial implication arises on GAIL due to issuance of invoice without reduction in price or non-issuance of Credit Note, the same shall be to the account of service provider. GAIL shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) together with penalties and interest, if any, against any amounts paid or becomes payable by GAIL in future to the service provider under this contract or under any other contract.

51. UNIQUE DOCUMENT IDENTIFICATION NUMBER BY PRACTICING CHARTERED ACCOUNTANTS

Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them as per provisions of Tender Document.
However, UDIN may not be required for documents being attested by Chartered Accountants in terms of provisions of Tender Document.

52. ANJANI PORTAL

GAIL has implemented "Anjani" e-Measurement Book & e-Billing Portal for ease in submission of measurement book/bill and reduction in paper transaction.
Accordingly, GAIL will process the Bill with Measurement Book through "Anjani" e-Measurement Book & e-Billing Portal (link: https://gailebank.gail.co.in/MBAutomation/frmlogin.aspx). Accordingly, Contractor/ Service Provider/ Consultant is requested to forward the RA Bill on "Anjani" e-Measurement Book & e-Billing Portal through concerned EIC/CIC/SIC, whichever is applicable.
Further, User Manual is also available on aforesaid portal.

Annexure-I to Section-III

PROCEDURE FOR ACTION IN CASE CORRUPT/FRAUDULENT/COLLUSIVE/COERCIVE PRACTICES

A Definitions:

A.1 "Corrupt Practice" means the offering, giving, receiving or soliciting, directly or indirectly, anything of value to improperly influence the actions in selection process or in contract execution.
"Corrupt Practice" also includes any omission for misrepresentation that may mislead or attempt to mislead so that financial or other benefit may be obtained or an obligation avoided.

A2 "Fraudulent Practice" means and include any act or omission committed by a agency or with his connivance or by his agent by misrepresenting/ submitting false documents and/ or false information or concealment of facts or to deceive in order to influence a selection process or during execution of contract/ order.

A3 "Collusive Practice amongst bidders (prior to or after bid submission)" means a scheme or arrangement designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

A.4 "Coercive practice" means impairing or harming or threatening to impair or harm directly or indirectly, any agency or its property to influence the improperly actions of an agency, obstruction of any investigation or auditing of a procurement process.

A.5 "Vendor/Supplier/Contractor/Consultant/Bidder" is herein after referred as "Agency"

A.6 "Appellate Authority" shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).

A.7 "Competent Authority" shall mean the authority, who is competent to take final decision for Suspension of business dealing with an Agency/ (ies) and Banning of business dealings with Agency/ (ies) and shall be the "Director" concerned.

A.8 "Allied Agency" shall mean all the concerns within the sphere of effective influence of banned/ suspended agencies. In determining this, the following factors may be taken into consideration:
(a) Whether the management is common;
(b) Majority interest in the management is held by the partners or directors of banned/ suspended firm.
(c) substantial or majority shares are owned by banned/ suspended agency and by virtue of this it has a controlling voice.

A.9 "Investigating Agency" shall mean any department or unit of GAIL investigating into the conduct of Agency/ party and shall include the Vigilance Department of the GAIL, Central Bureau of Investigation, State Police or any other agency set up by the Central or state government having power to investigate.

B Actions against bidder(s) indulging in corrupt /fraudulent/ collusive/ coercive practice

B.1 Irregularities noticed during the evaluation of the bids :

If it is observed during bidding process/ bids evaluation stage that a bidder has indulged in corrupt/fraudulent /collusive/coercive practice, the bid of such Bidder (s) shall be rejected and its Earnest Money Deposit (EMD) shall be forfeited.
Further, such agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.

B.2 Irregularities noticed after award of contract

(i) **During execution of contract:**

If an agency, is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, action shall be initiated for putting the agency on banning list.

After conclusion of process and issuance of Speaking order for putting party on banning list, the order (s)/ contract (s) where it is concluded that such irregularities have been committed shall be terminated and Contract cum Performance Bank Guarantee (CPBG) submitted by agency against such order (s)/ contract (s) shall also be forfeited. Further such order/ contract will be closed following the due procedure in this regard.

The amount that may have become due to the contractor on account of work already executed by him shall be payable to the contractor and this amount shall be subject to adjustment against any

amounts due from the contractor under the terms of the contract. No risk and cost provision will be enforced in such cases.

Suspension of order/ contract:

Further, only in the following situations, the concerned order (s)/ contract(s) (where Corrupt/Fraudulent/ Collusive/ Coercive Practices are observed) and payment shall be suspended after issuance of Suspension cum Show Cause Notice:

(i) Head of Corporate Vigilance Department/CVO based on the investigation by them, recommend for specific immediate action against the agency.
(ii) Head of Corporate Vigilance Department/CVO based on the input from investigating agency, forward for specific immediate action against the agency.

Suspension cum Show Cause Notice being issued in above cases after approval of the competent authority (as per provisions mentioned under Clause no. D) shall also include the provision for suspension of Order (s)/ Contract (s) and payment. Accordingly, after issuance of Suspension cum Show Cause Notice, the formal communication for suspension of Order (s)/ Contract (s) and payment with immediate effect will be issued by the concerned person of GAIL.

During suspension, Contractor/ Service Providers will be allowed to visit the plant/ site for upkeep of their items/ equipment, GAIL's issued materials (in case custody of same is not taken over), demobilizing the site on confirmation of EIC, etc.

(ii) After execution of contract and during Defect liability period (DLP)/ Warranty/Guarantee Period:

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after execution of contract and during DLP/ Warranty/Guarantee Period, the agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.
Further, the Contract cum Performance Bank Guarantee (CPBG)/Contract Performance Security (CPS) submitted by agency against such order (s)/ contract (s) shall be forfeited.

(iii) After expiry of Defect liability period (DLP)/ Warranty/Guarantee Period

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after expiry of Defect liability period (DLP)/ Warranty/Guarantee Period, the agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.

B.2.2 Period of Banning

The period of banning of agencies indulged in Corrupt/ Fraudulent/ Collusive/Coercive Practices shall be as under and to be reckoned from the date of banning order:

S. No.	Description	Period of banning from the date of issuance of Banning order
1	Misrepresentation/False information other than pertaining to BEC of tender but having impact on the selection process. For example, if an agency confirms not being in holiday in GAIL/PSU's PMC or banned by PSUs/ Govt. Dept., liquidation, bankruptcy & etc. and subsequently it is found otherwise, such acts shall be considered in this category.	02 years

2	Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/Coercive Practices	03 years
2.1	If an agency again commits Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/ Coercive Practices in subsequent cases after their banning, such situation of repeated offense to be dealt with more severity and following shall be the period of banning:	
	(v) Repeated once	7 years (in addition to the period already served)
	(vi) Repeated twice or more	15 years (in addition to the period already served)
3	Indulged in unauthorized disposal of materials provided by GAIL	7 years
4	If act of vendor/ contractor is a threat to the National Security	15 years

C Effect of banning on other ongoing contracts/ tenders

C.1 If an agency is put on Banning, such agency should not be considered in ongoing tenders/future tenders.

C.2 However, if such an agency is already executing other order (s)/ contract (s) where no corrupt/fraudulent/ collusive/coercive practice is found, the agency should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract.

C.3 If an agency is put on the Banning List during tendering and no irregularity is found in the case under process:

C.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.

C.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.

C.3.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. If the agency is put on banning list for fraud/ mis-appropriation of facts committed in the same tender/other tender where errant agency emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.

D. Procedure for Suspension of Bidder

D.1 Initiation of Suspension

Action for suspension business dealing with any agency/(ies) shall be initiated by Corporate C&P Department when

(i) Corporate Vigilance Department based on the fact of the case gathered during investigation by them recommend for specific immediate action against the agency.

(ii) Corporate Vigilance Department based on the input from Investigating agency, forward for specific immediate action against the agency.

(iii) Non performance of Vendor/Supplier/Contractor/Consultant leading to termination of Contract/ Order.

D.2 Suspension Procedure:

D.2.1 The order of suspension would operate initially for a period not more than six months and is to be communicated to the agency and also to Corporate Vigilance Department. Period of suspension can be extended with the approval of the Competent Authority by one month at a time with a ceiling of six months pending a conclusive decision to put the agency on banning list.

D.2.2 During the period of suspension, no new business dealing may be held with the agency.

D.2.3 Period of suspension shall be accounted for in the final order passed for banning of business with the agency.

D.2.4 The decision regarding suspension of business dealings should also be communicated to the agency.

D.2.5 If a prima-facie, case is made out that the agency is guilty on the grounds which can result in banning of business dealings, proposal for issuance of suspension order and show cause notice shall be put up to the Competent Authority. The suspension order and show cause notice must include that (i) the agency is put on suspension list and (ii) why action should not be taken for banning the agency for future business from GAIL.

The competent authority to approve the suspension will be same as that for according approval for banning.

D 3 Effect of Suspension of business:

Effect of suspension on other on-going/future tenders will be as under:

D.3.1 No enquiry/bid/tender shall be entertained from an agency as long as the name of agency appears in the Suspension List.

D.3.2 If an agency is put on the Suspension List during tendering:

D.3.2.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.

D.3.2.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.

D.3.2.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. If the agency is put on Suspension list for fraud/ mis-appropriation of facts conducted in the same tender/other tender where errant agency emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.

D.3.3 The existing contract (s)/ order (s) under execution shall continue.

D.3.4 Tenders invited for procurement of goods, works and services shall have provision that the bidder shall submit a undertaking to the effect that (i) neither the bidder themselves nor their allied agency/(ies) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas and (ii) bidder is not banned by any Government department/ Public Sector.

F. Appeal against the Decision of the Competent Authority:

F.1 The agency may file an appeal against the order of the Competent Authority for putting the agency on banning list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of banning order.

F.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.

F.3 Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.

G. Wherever there is contradiction with respect to terms of 'Integrity pact' , GCC and 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice', the provisions of 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice' shall prevail.

Annexure-II to Section III

PROCEDURE FOR EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/ CONTRACTORS/ CONSULTANTS

1.0 GENERAL

A system for evaluation of Vendors/ Suppliers/Contractors/ Consultants and their performance is a key process and important to support an effective purchasing & contracting function of an organization.
Performance of all participating Vendors/ Suppliers/Contractors/ Consultants need to be closely monitored to ensure timely receipt of supplies from a Vendor, completion of an assignment by a Consultant or complete execution of order by a contractor within scheduled completion period. For timely execution of projects and meeting the operation & maintenance requirement of operating plants, it is necessary to monitor the execution of order or contracts right from the award stage to completion stage and take corrective measures in time.

2.0 OBJECTIVE

The objective of Evaluation of Performance aims to recognize, and develop reliable Vendors/ Suppliers/Contractors/ Consultants so that they consistently meet or exceed expectations and requirements.
The purpose of this procedure is to put in place a system to monitor performance of Vendors/ Suppliers/Contractors/ Consultants associated with GAIL so as to ensure timely completion of various projects, timely receipt of supplies including completion of works & services for operation and maintenance of operating plants and quality standards in all respects.

3.0 METHODOLOGY

i) Preparation of Performance Rating Data Sheet
Performance rating data Sheet for each and every Vendor/ Supplier/Contractor/Consultant for all orders/Contracts with a value of Rs. 50 Lakhs and above is recommended to be drawn up. Further, Performance rating data Sheet for orders/contracts of Vendor/Supplier/Contractor/ Consultant who are on watch list/holiday list/ banning list shall be prepared irrespective of order/ contract value. These data sheets are to be separately prepared for orders/ contracts related to Projects and O&M. Format, Parameters, Process, responsibility for preparation of Performance Rating Data Sheet are separately mentioned.

ii) Measurement of Performance
Based on the parameters defined in Data Sheet, Performance of concerned Vendor/ Supplier/Contractor/ Consultant would be computed and graded accordingly. The measurement of the performance of the Party would be its ability to achieve the minimum scoring of 60% points in the given parameters.

iii) Initiation of Measures:
Depending upon the Grading of Performance, corrective measures would be initiated by taking up the matter with concerned Vendor/ Supplier/Contractor/ Consultant. Response of Vendor/ Supplier/Contractor/ Consultant would be considered before deciding further course of action.

iv) Implementation of Corrective Measures:
Based on the response of Vendor/ Supplier/Contractor/ Consultant, concerned Engineer-in-Charge for the Projects and/or OIC in case of O&M would recommend for continuation or discontinuation of such party from the business of GAIL.

v) Orders/contracts placed on Proprietary/OEM basis for O&M will be evaluated and, if required, corrective action will be taken for improvement in future.

4.0 EXCLUSIONS:

The following would be excluded from the scope of evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants :

i) Orders/Contracts below the value of Rs. 50 Lakhs if Vendor/ Supplier/Contractor/ Consultant is not on watch list/ holiday list/ banning list.

ii) Orders for Misc./Administrative items/ Non stock Non valuated items (PO with material code ending with 9).

However, concerned Engineer-in-Charge /OICs will continue to monitor such cases so as to minimize the impact on Projects/O&M plants due to non performance of Vendors/ Suppliers/Contractors/ Consultants in all such cases.

5.0 PROCESS OF EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/ CONTRACTORS/ CONSULTANTS

5.1 FOR PROJECTS

i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of PROJECTS shall be done immediately with commissioning of any Project.

ii) On commissioning of any Project, EIC (Engineer-in-charge)/ Project-in-charge shall prepare a Performance Rating Data Sheet (Format at Annexure-1) for all Orders and Contracts.

iii) Depending upon the Performance Rating, following action shall be initiated by Engineer-in-charge/Project-in-charge:

Sl.No.	Performance Rating	Action
1	POOR	Seek explanation for Poor performance
2	FAIR	Seek explanation for Fair performance
3	GOOD	Letter to the concerned for improving performance in future
4	VERY GOOD	No further action

iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.

v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

A) Where performance rating is "POOR" (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)

Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
   - **(a) First Instance: Holiday (Red Card) for Two Years**
   - **(b) Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years**

2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
   - (a) **First such instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.
   - **(b) Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year**
   - **(c) Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.**

B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 32 (C) of GCC-Works)

(a) **First instance**: **Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.
Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken. However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).
The Yellow card will be automatically revoked after a period of three years unless the same is converted into Red Card due to subsequence instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.

(b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.

(c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Three Years and they shall also to be considered for Suspension.**

(C) Where Performance rating is "FAIR":
Issuance of warning to such defaulting Vendor/ Supplier/Contractor/ Consultant to improve their performance.

5.2 FOR CONSULTANCY JOBS

Monitoring and Evaluation of consultancy jobs will be carried out in the same way as described in para 5.1 for Projects.

5.3 FOR OPERATION & MAINTENANCE

i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of Operation and Maintenance shall be done immediately after execution of order/ contract.

ii) After execution of orders a Performance Rating Data Sheet (Format at Annexure-2) shall be prepared for Orders by Site C&P and for Contracts/Services by respective Engineer-In-Charge.

iii) Depending upon Performance Rating, following action shall be initiated by EIC:

Sl. No.	Performance Rating	Action
1	**POOR**	Seek explanation for Poor performance
2.	**FAIR**	Seek explanation for Fair performance
3	**GOOD**	Letter to the concerned for improving performance in future.
4	**VERY GOOD**	No further action

iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.

v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

A) Where performance rating is "POOR" (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)

Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
   (a) First Instance: Holiday (Red Card) for Two Years
   (b) Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years

2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
   (a) First such instance: Advisory notice (Yellow Card) shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.
   (b) Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year
   (c) Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.

B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 32 (C) of GCC-Works)

(a) First instance: **Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.
Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken. However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).
The Yellow card will be automatically revoked after a period of three years unless the same is converted into Red Card due to subsequence instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.

(b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.

(c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Three Years and they shall also to be considered for Suspension.**

(C) Where Performance rating is "FAIR"
Issuance of warning to such defaulting Vendors/Contractors/Consultants to improve their performance.

6.0 REVIEW & RESTORATION OF PARITES PUT ON HOLIDAY

6.1 An order for Holiday passed for a certain specified period shall deemed to have been automatically revoked on the expiry of that specified period and it will not be necessary to issue a specific formal order of revocation.

Further, in case Vendor/ Supplier/Contractor/ Consultant is put on holiday due to quality, and new order is placed on bidder after restoration of Vendor/ Supplier/Contractor/ Consultant, such order will be properly monitored during execution stage by the concerned site.

7.0 EFFECT OF HOLIDAY

7.1 If a Vendor/ Supplier/Contractor/ Consultant is put on Holiday, such Vendor/ Supplier/Contractor/ Consultant shall not be considered in ongoing tenders/future tenders.

7.2 However, if such Vendor/ Supplier/Contractor/ Consultant is already executing any other order/ contract and their performance is satisfactory in terms of the relevant contract, should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract. In such a case CPBG will not be forfeited and payment will be made as per provisions of concerned contract. However, this would be without prejudice to other terms and conditions of the contract.

7.3. Effect on other ongoing tendering:

7.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the party shall be ignored.

7.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the party shall not be opened and BG/EMD submitted by the party shall be returned to the party.

7.3.3 after opening of price, BG/EMD made by the party shall be returned; the offer of the party shall be ignored & will not be further evaluated. If errant party emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.

8.0 While putting the Vendor/ Supplier/Contractor/ Consultant on holiday as per the procedure, the holding company, subsidiary, joint venture, sister concerns, group division of the errant Vendor/ Supplier/Contractor/ Consultant shall not be considered for putting on holiday list.

Any bidder, put on holiday, will not be allowed to bid through consortium route also in new tender during the period of holiday.

9.0 If an unsuccessful bidder makes any vexatious, frivolous or malicious complaint against the tender process with the intention of delaying or defeating any procurement or causing loss to GAIL or any other bidder, such bidder will be put on holiday for a period of six months, if such complaint is proved to be vexatious, frivolous or malicious, after following the due procedure.

10. APPEAL AGAINST THE DECISION OF THE COMPETENT AUTHORITY:

(a) The party may file an appeal against the order of the Competent Authority for putting the party on Holiday list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of Holiday order.

(b) Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.

(c) Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.

(d) "Appellate Authority" shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).

11. **ERRANT BIDDER**

In case after price bid opening the lowest evaluated bidder (L1) is not awarded the job for any mistake committed by him in bidding or withdrawal of bid or modification of bid or varying any term in regard thereof leading to re-tendering, GAIL shall forfeit EMD if paid by the bidder and such bidders shall be debarred from participation in retendering of the same job(s)/item(s).

Further, such bidder will be put on Watch List (Yellow Card) for a period of three years after following the due procedure. However, during the period in watch list such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

In case of subsequent instances of default in other tender(s) during aforesaid watch list period, the action shall be initiated as per provision of sl. no. 2 of para A of Clause no. 5.1 (v) and 5.3 (v).

The Yellow card will be automatically revoked after specified period unless the same is converted into Red Card

12. In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent government agency brings to the notice of GAIL that the Supplier has not remitted the amount towards GST (CGST & SGST/UTGST or IGST) collected from GAIL to the government exchequer, then, that Supplier shall be put under Holiday list of GAIL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on GAIL.

Annexure-1

GAIL (India) Limited
PERFORMANCE RATING DATA SHEET
(FOR PROJECTS/ CONSULTANCY JOBS)

i) Project/Work Centre :
ii) Order/ Contract No. & date :
iii) Brief description of Items Works/Assignment :
iv) Order/Contract value (Rs.) :
v) Name of Vendor/Supplier/ Contractor/ Consultant :
vi) Contracted delivery/ Completion Schedule :
vii) Actual delivery/ Completion date :

Performance Parameter	Delivery/ Completion Performance	Quality Performance	Reliability Performance#	Total
Maximum Marks	40	40	20	100
Marks Allocated				

Note:
Remarks (if any)

PERFORMANCE RATING (**) [ ]

Note :
(#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance.
(*) Allocation of marks should be as per enclosed instructions
(**) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of Authorised Signatory:

Name:

Designation:

Instructions for allocation of marks

1. Marks are to be allocated as under :

1.1 DELIVERY/ COMPLETION PERFORMANCE **40 Marks**

Delivery Period/ Completion Schedule	**Delay in Weeks**	**Marks**
a) Upto 3 months	Before CDD	40
	Delay upto 4 weeks	35
	" 8 weeks	30
	" 10 weeks	25
	" 12 weeks	20
	" 16 weeks	15
	More than 16 weeks	0
b) Above 3 months	Before CDD	40
	Delay upto 4 weeks	35
	" 8 weeks	30

" 10 weeks	25
" 16 weeks	20
" 20 weeks	15
" 24 weeks	10
More than 24 weeks	0

1.2 QUALITY PERFORMANCE **40 Marks**

For Normal Cases : No Defects/ No Deviation/ No failure: 40 marks

i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
ii) When quality failure endanger system integration and safety of the system	Failure of severe nature - Moderate nature - low severe nature	0 marks 5 marks 10-25 marks
iii) Number of deviations	1. No deviation 2. No. of deviations $\leq$ 2 3. No. of deviations > 2	5 marks 2 marks 0 marks

1.3 RELIABILITY PERFORMANCE **20 Marks**

A.	**FOR WORKS/CONTRACTS**	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	**FOR SUPPLIES**	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks

Annexure-2

GAIL (India) Limited
PERFORMANCE RATING DATA SHEET
(FOR O&M)

i) Location :
ii) Order/ Contract No. & date :
iii) Brief description of Items Works/Assignment :
iv) Order/Contract value (Rs.) :
v) Name of Vendor/Supplier/ Contractor/ Consultant :
vi) Contracted delivery/ Completion Schedule :
vii) Actual delivery/ Completion date :

Performance Parameter	Delivery Performance	Quality Performance	Reliability Performance#	Total
Maximum Marks	40	40	20	100
Marks Allocated (*)				

Remarks (if any)

PERFORMANCE RATING (**)

Note :
(#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance
(*) Allocation of marks should be as per enclosed instructions
(**) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of Authorised Signatory:

Name:

Designation:

Instructions for allocation of marks (For O&M)

1. Marks are to be allocated as under :

1.1 DELIVERY/ COMPLETION PERFORMANCE **40 Marks**

Delivery Period/ Completion Schedule	**Delay in Weeks**	**Marks**
a) Upto 3 months	Before CDD	40
	Delay upto 4 weeks	35
	" 8 weeks	30
	" 10 weeks	25
	" 12 weeks	20
	" 16 weeks	15
	More than 16 weeks	0
b) Above 3 months	Before CDD	40
	Delay upto 4 weeks	35
	" 8 weeks	30
	" 10 weeks	25
	" 16 weeks	20

	" 20 weeks	15
	" 24 weeks	10
	More than 24 weeks	0

1.2 QUALITY PERFORMANCE **40 Marks**

For Normal Cases : No Defects/ No Deviation/ No failure: 40 marks

i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
ii) When quality failure endanger system integration and safety of the system	Failure of severe nature - Moderate nature - low severe nature	0 marks 5 marks 10-25 marks
iii) Number of deviations	1. No deviation 2. No. of deviations $\leq$ 2 3. No. of deviations > 2	5 marks 2 marks 0 marks

1.3 RELIABILITY PERFORMANCE **20 Marks**

A.	**FOR WORKS/CONTRACTS**	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	**FOR SUPPLIES**	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks

Annexure-III to Section-III

ADDENDUM TO INSTRUCTIONS TO BIDDERS
(INSTRUCTIONS FOR PARTICIPATION IN E-TENDER)

1. General

This section contains detailed instructions regarding bid submission procedure under e-tendering system (e-tender portal). Bidders are required to read the following instructions in addition to various instructions mentioned elsewhere in this document for e-tendering, Bidders manual kit and FAQs etc. The instructions mentioned herein related to bid submission procedure shall supersede and shall prevail over the conditions enumerated elsewhere in the bid/tender document.

2. About E-Tender Portal (Web)

GAIL (India) Ltd. has associated with Govt. e-Procurement System of National Informatics Center (NIC) for processing e-tenders. CPP is a secured and user friendly e-tender system enabling bidders to Search, View, Download tender document(s) directly from the portal **https://etenders.gov.in/eprocure/app** (referred hereunder as "E-Tender Portal") and also enables the bidders to participate and uploading of SOR/Price Schedule (Price Bid) and technical bids in the portal in secured and transparent manner maintaining absolute confidentiality and security throughout the tender evaluation process and award. More information useful for submitting online bids on the CPP Portal may be obtained at: **https://etenders.gov.in/eprocure/app**

3. Bidders Manual Kit

Bidders who wish to participate in e-tenders must download **Bidders Manual Kit** from (https://etenders.gov.in/eprocure/app) which contains instructions in respect of e-Tendering, Instructions To Bidder for Online Bid Submission, Registration of Bidders(obtaining unique login ID and password, re-setting the password, registering of Digital Signature Certificate(DSC) with respective user id),Bidders Manual for Tender Cum Auction, Online e-Bid Submission (downloading of Tender document and uploading of Offer/Bid etc.), Online Bid Withdrawal, Online Bid Re-submission, Clarifications (Tender Status, My Archive...), Frequently encountered problems and solutions under Trouble Shooting, BoQ Preparation Guidelines Etc.

Further, the troubleshooting issues are also available in the form of FAQs, which can be accessed from CPP Portal (**https://etenders.gov.in/eprocure/app**).

4. Pre-requisite for participation in bidding process

The following are the pre-requisite for participation in e-Tendering Process:

4.1 PC/Laptop with Windows OS, Internet Explorer

- A computer system with a high speed internet connectivity.
- Internet Explorer 10 or above, Mozilla Firefox version to version 49 or Firefox ESR 52

- Operating system: Windows based or Linux OS, with which your DSC (Digital Signature Certificate) is compatible.
- Java Run Time Engine : Java version 8 update 161 and above

4.2 Internet Broadband Connectivity

The Bidder must have a high speed internet connectivity with at least 2Mbpsspeed (512 kbps Speed) (preferably Broadband) to access e-Tender Portal for downloading the Tender document and uploading/submitting the Bids.

4.3 A valid e-mail Id of the Organization/Firm

Bidder must possess an e-mail Id, preferably of the Organisation (in case of a company)/Individual (in case of proprietorship concern)/Partner having Power of Attorney (in case of a partnership firm) to create login Id. The e-mail Id should not be changed frequently. All communication related to e-tendering including system generated mails shall be sent on this e-mail Id only. The communication to bidder is fully automated through the system and hence email-id of bidder is very important for online communication with bidder during various stages of tendering process and should be preferably common e-mail Id of the Organisation.

4.4 User ID and Password for new Bidder(s)

To participate in the bidding process, it is mandatory on the part of bidder(s) to have user Id and password. Without user Id (Login Id), bidders cannot participate in E-tender. There will be single login Id for a bidder.

To obtain User Id and Password Vendor/Bidder must visit **https://etenders.gov.in/eprocure/app** and perform the following steps:

i) Click on button "Online bidder Enrollment"

ii) Fill the **Online Enrollment of Corporate/Bidder** form and submit. Ensure that the e-mail address and mobile number given in the form is valid and active. These would be used for any communication from the E-tender Portal.

iii) Ensure that all the mandatory fields (identified with a * mark) are filled in the Online Enrollment of Corporate/Bidder for User Id creation.

iv) Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.

v) Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.

vi) It is advised to take extreme precaution while mapping digital certificate to a particular user profile. Once a digital certificate is enrolled to a user account, it cannot be used for any other registration in the system.

vii) Bidder then logs in to the site through the secured log-in by entering their USER ID / password and the password of the DSC / e-Token.

User Id and password is unique for each vendor and the vendor can use the same to view/download/participate in all e-tenders of GAIL.

In their own interest, Bidder(s) are advised to apply for User Id immediately on publishing of tender or well in advance of the bid due date. User Id shall normally be issued immediately after complete information has been furnished by the vendor in "Online Enrollment of Corporate/Bidder" and on successful submission of the same. GAIL/CPP shall not be responsible for any delays in allocation of User Id/password and in registering Digital Signature Certificate and the ensuing consequences including but not limited to timely submission of bids.

4.5 Procedure for change of E-mail Id of the Bidder

The e-mail-id of the bidder/Vendor Code is captured and registered in CPP Portal when a bidder submits his request for user-id / password.

In case bidder desires for change in the registered e-mail id in CPP Portal, the same has to be updated in CPP portal only.

4.6 About Digital Signature Registration

(I) What is a Digital Signature?

This is a unique digital code which can be transmitted electronically and primarily identifies a unique sender. The objective of digital signature is to guarantee that the individual sending the message is who he or she really claims to be just like the written signature. The Controller of Certifying Authorities of India (CCA) has authorized certain Certifying Authorities (CA) to issue Digital Certificates. Digitally signed documents are legally valid as per the Indian IT Act 2000.

One Digital Certificate is valid for a specified period and can be used for digitally signing any number of documents.

(a) In case of Proprietorship/Partnership

Both i.e. (i) Class 3 Digital Signatures issued to authorized individuals on their KYC basis and (ii) Class 3b Digital Signatures issued to authorized individuals with their organization KYC basis are acceptable.

(b) In case of Firm/ Company

Only Class 3b Digital Signature is acceptable where individuals are using their digital signatures on behalf of the Organization and digital Signature should be in the name of authorized signatory who has signed the bid on behalf of bidder.

Bidder can submit only digitally signed documents/bids/offers in **https://etenders.gov.in/eprocure/app**

(II) Why Digital Signature is required?

In order to bid for GAIL e-tenders bidders are required to obtain a legally valid Digital Certificate as per Indian IT Act 2000 from the licensed Certifying Authorities (CA) operating under the Root Certifying Authority of India (RCAI), Controller of Certifying Authorities (CCA) of India.

(III) How to obtain Digital Signatures from Certifying Authority (CA)?

Valid Digital Certificate can be obtained from Certifying Agency (C.A). Information about CA's can be obtained through CCA India website (http://www.cca.gov.in).

Digital Signatures can be obtained using following steps:

a) Visit the site of the licensed CA* using internet browser.
b) Apply for a class 3b or class 3(as applicable) Digital Certificate with signing facility.
c) Follow the instructions on the CA's website for submission of requisite documents for issue of the Digital Certificate and making payment.

***Links to some of the licensed CA's are provided below**

1. https://www.ncodesolutions.com
2. https://www.sifycorp.com
3. https://www.e-mudhra.com
4. https://www.Certificate.Digital
5. https://www.vsign.in
6. https://pantasign.com

Note: The Digital signatures should be obtained directly from certifying authority (CA). Digital signature taken from Sub CA will not be acceptable in the e-tendering system.

GAIL/Owner reserves the right to verify the Authenticity of above digital signatures after bid opening and in case the digital signature is not authorized / valid, the bid will be rejected. Bidder shall be responsible for ensuring the validity of digital signatures and proper usage of the same.

5. How to submit On-line Bids/Offers electronically against E-tenders?

Bidders who wish to participate against e-tenders uploaded on e-tender website (**https://etenders.gov.in/eprocure/app**) (e-tender portal) should follow the steps mentioned in the "**Bidders Manual Kit**" available on e-tender portal which shall guide them to Search, Display/View, Download and Submit **electronic Bids/Offers** online in a secured manner ensuring confidentiality.

6. How to search, view and download e-tender?

There are various search options built in E-tender Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.
Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. To download the tender Click on the Latest Active Tenders, and search the tender in e-tender website (**https://etenders.gov.in/eprocure/app**) (e-tender portal) that you are interested in using certain search criteria documents. However, it is advised to login to the system and set the tender as favorite so that these tenders can be moved to the respective 'My Tenders' folder. This would enable the E-tender Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum/addendum issued to the tender document.

The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

7. PREPARATION OF BIDS

1) Bidder should take into account any corrigendum published on the tender document before submitting their bids.

2) Please go through the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted

3) Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR /JPG formats. Bid documents may be scanned with 100 dpi with black and white option, which helps in reducing size of the scanned document.

4) To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" or ''Other Important Documents'' area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

   Note: My Documents space is only a repository given to the Bidders to ease the uploading process. If Bidder has uploaded his Documents in My Documents space, this does not automatically ensure these Documents being part of Technical Bid.

8. Directions for submitting online offers, electronically, against e-procurement tenders directly through internet

i) Vendors are advised to log on to the website (**https://etenders.gov.in/eprocure/app**) and arrange to register themselves at the earliest, if not done earlier.

ii) Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues

iii) Vendors are advised in their own interest to ensure that their bids are submitted in e-Procurement system well before the closing date and time of bid. If the vendor intends to change/revise the bid already submitted, they shall have to change / revise the bid and submit once again. Bid once withdrawn cannot be resubmitted.

iv) The server time (IST) (which is displayed on the bidders' dash board) shall be considered as the standard time for referencing the deadlines for submission of the document by the bidders and determining the expiry of due date and time of the tender and no other time shall be taken into cognizance.

v) Bidder has to select the payment option as "offline" to pay the tender fee / EMD as applicable and enter details of the instrument.

vi) The BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for that tender. Bidders are allowed to enter the Bidder Name and Values only.

vii) Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard BoQ format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the BoQ file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the BoQ file is found to be modified by the bidder, the bid is liable for rejection.

The BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for that tender. Bidders are allowed to enter the Bidder Name and Values only.

viii) In case vendor is not able to complete the submission of the changed/revised bid within due date & time, the system would consider it as no bid has been received from the vendor against the tender and consequently the vendor will be out of contention. The process of change / revise may do so any number of times till the due date and time of submission deadline. However, no bid can be modified after the deadline for submission of bids.

ix) Bids / Offers shall not be permitted in e-procurement system after the due date / time of tender. Hence, no bid can be submitted after the due date and time of submission has elapsed.

x) All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid opener's public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.

xi) The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

xii) Upon the successful and timely submission of bids (i.e. after Clicking "Freeze Bid Submission" in the portal), the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

xiii) Once the entire process of submission of online bid is complete, they will get an auto mail/SMS from the system stating you have successfully submitted your bid in the following tender with tender details.

xiv) No manual bids/offers along with electronic bids/offers shall be permitted.

xv) It is important to note that, the bidder has to Click on the Freeze Bid Button, to ensure that he/she completes the Bid Submission Process. Bids Which are not Frozen are considered as Incomplete/Invalid bids and are not considered for evaluation purposes.

xvi) The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

Note:

i) Bidder may save/store the bid documents in the PC/Laptop before submitting the bid into in e-tender portal.

ii) Bidder is required to fill up the price(s)/rate(s) strictly in the Schedule of Rate (SOR)/Price Schedule attached with the tender.

9. Earnest Money Deposit (EMD)

Bidders are required to submit the Earnest Money Deposit (EMD)/Bid Bond in original in the prescribed formats and in the manner prescribed in the tender at the time of bid submission in sealed envelope.

However, if the bidder is unable to submit EMD/Bid Bond in original on the due date, he may upload scanned copy of the EMD/Bid Bond while submitting the bid electronically, provided the original EMD/Bid Bond, copy of which has been uploaded, is received within 7 (seven) days from the date of un-priced bid opening, failing which the bid will

be rejected irrespective of their status / ranking in tender and notwithstanding the fact that a copy of the Earnest Money Deposit/Bid Bond was earlier uploaded by the bidder.

10. E-Tender demo during pre-bid conference

During the pre-bid conference, GAIL shall also arrange demonstration for submission of bids in e-tender portal for interested bidders.

11. Last date for submission of bids

System does not allow for submission or modification of bids beyond the deadline for bid submission. However, if the bidder for some reason intends to change the bid already entered, he may change/revise the same on or before the last date and time of submission. The system time displayed on e-tender webpage shall be final and binding on the bidders for all purposes pertaining to various events of the subject tender and no other time shall be taken into cognizance.

Bidders are advised in their own interest to ensure that bids are uploaded in e-tender system well before the closing date and time of bid.

12. Internet connectivity

If bidders are unable to access e-tender portal **https://etenders.gov.in/eprocure/app** or Bid Documents, the bidders may please check whether they are using proxy to connect to internet or their PC is behind any firewall and may contact their system administrator to enable connectivity.

13. In case of any clarification pertaining to e-procurement process, the vendor may contact the concerned dealing officer/purchasing officer mentioned in tender document along with marking copy to etender@gail.co.in **.**

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Disclaimer:

a) No responsibility will be taken by GAIL or the e-procurement service provider for any delay due to connectivity and availability of website. They shall not have any liability to vendors for any interruption or delay in access to the site irrespective of the cause. It is advisable that vendors who are not well conversant with e-tendering procedures, start filling up the tenders much before the due date /time so that there is sufficient time available with him/her to acquaint with all the steps and seek help if they so require. Even for those who are conversant with this type of e-tendering, it is suggested to complete all the activities ahead of time. It should be noted that the individual bid becomes viewable only after the opening of the bid on/after the due date and time. Please be reassured that your bid will be viewable only to you and nobody else till the due date/ time of the tender opening. The non availability of viewing before due date and time is true for e-tendering service provider as well as GAIL officials.

b) GAIL or the e-procurement service provider shall not be responsible for any direct or indirect loss or damages and or consequential damages, arising out of the bidding process including but not limited to systems problems, inability to use the system, loss of electronic information etc.

Important Links for Hassle free bid submission:

Bidders Manual Kit :

https://etenders.gov.in/eprocure/app?page=BiddersManualKit&service=page

Help For Contractors:

https://etenders.gov.in/eprocure/app?page=HelpForContractors&service=page

Information about DSC:

https://etenders.gov.in/eprocure/app?page=DSCInfo&service=page

Guidelines for hassle_free_bid_submission:

https://eprocure.gov.in/cppp/hassle_free_bid_submission.pdf

FAQ:

https://etenders.gov.in/eprocure/app?page=FAQFrontEnd&service=page

Feedback:

https://etenders.gov.in/eprocure/app?page=FrontFeedback&service=page

ANNEXURE-IV to Section-III

BIDDING DATA SHEET (BDS)

ITB TO BE READ IN CONJUNCTION WITH THE FOLLOWING:

A. GENERAL	
ITB clause	**Description**
	The Invitation for Bids/ Tender no is: GAIL/BLORE/CP/OM/C2022-12 dtd. 18.07.2022
1.1	The Employer/Owner is: GAIL (India) Limited
2.1	The name of the Works/Services to be performed is: **REROUTING / SHIFTING OF 18" X 800 MTS LONG PIPELINE NEAR MANYATA TECH PARK IN BANGALORE CITY**
3	BIDS FROM CONSORTIUM/ JOINT VENTURE- NOT APPLICABLE
B. BIDDING DOCUMENT	
ITB clause	**Description**
8.1	For **clarification purposes** only, the communication address is: GAIL (India) Limited, Swan", 2nd Floor, # 323, Kodigehalli Main Road, Sahakarnagar, Bengaluru – 560 092, E-Mail: bisharbinali@gail.co.in
C. PREPARATION OF BIDS	
ITB clause	**Description**
11.1.1 (u)	Additional documents to be submitted by the Bidder with its Part-I (Techno-commercial/ Unpriced bid) : SCC/Scope of Work refers
12	Additional Provision for Schedule of Rate/ Bid Price are as under: _____ _____
12&13	Whether GAIL will be able to avail input tax credit in the instant tender: YES Details of Buyer: Services to be rendered at: GAIL (India) Limited, Station list of DBPL as per Scope of Work attached PAN No.: AAACG1209J GST no.: *29AAACG1209J1ZS* GAIL Bank details: Account Holder's Name: GAIL (INDIA) LIMITED Account Number: 625305016694 IFSC Code: ICIC0006253 Other details: MICR Code : 560229012
14	The currency of the Bid shall be INR
16.1, 16.10 and 38.6	In case **'Earnest Money / Bid Security' or "Contract Performance Security**" is in the form of **'Demand Draft'** or **'Banker's Cheque'**, the same should be favor of **GAIL (India) Limited**, payable at Bengaluru In case of submission through online banking transaction i.e. IMPS / NEFT / RTGS / SWIFT, etc, the details of GAIL's Bank account are as under:

	Account Holder's Name: GAIL (INDIA) LIMITED Account Number: 625305016694 IFSC Code: ICIC0006253 Other details: MICR Code : 560229012 Bidder to mention reference no. "EMD/……." in narration while remitting the EMD / Bid Security amount and to mention reference no. "CPS/……." in narration while remitting the CPS amount in GAIL's Bank Account.
D. SUBMISSION AND OPENING OF BIDS	
ITB clause	**Description**
18	In addition to the original of the Bid, the number of copies required is one. Not applicable in case of e-tendering.
22.3, 26 and 4.0 of IFB	For **bid submission purposes** only (Manual) or the submission of physical document as per clause no. 4.0 of IFB, and **Bid Opening Purpose** the Owner's address is: Attn: Mr. Bishar Bin Ali, M(C&P) GAIL (India) Limited, Swan", 2nd Floor, # 323, Kodigehalli Main Road, Sahakarnagar, Bengaluru – 560 092.
E. EVALUATION, AND COMPARISON OF BIDS	
ITB clause	**Description**
32	Evaluation Methodology is mentioned in Section-II.
33	Compensation for Extended Stay: Not Applicable
F. AWARD OF CONTRACT	
ITB clause	**Description**
37	State of India which stamp paper is required for Contract Agreement: KARNATAKA _____
38	Contract Performance Security/ Security Deposit APPLICABLE: YES NOT APPLICABLE: The value/ amount of Contract Performance Security/ Security Deposit CPS/SD @ 3% of Total Order / Contract value.
39.2	Name and contact details of nodal officer are as under: Shri U S Pandey Tel: 080-46244120 Email: uspandey@gail.co.in
41	Provision of AHR Item: APPLICABLE
44.1	Quarterly Closure of Contract: APPLICABLE
Clause no. 27.3 of GCC	Bonus for Early Completion: NOT APPLICABLE
49	Applicability of provisions relating to Startups: **NOT APPLICABLE**
SCC	Documents required for accepting the Works: Refer cl.no. …….of SCC.

FORMS & FORMAT

LIST OF FORMS & FORMAT

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F-1

BIDDER'S GENERAL INFORMATION

To,
M/s GAIL (INDIA) LIMITED
_____

TENDER NO:

1	Bidder Name	M/s……..
2	Status of Firm	Proprietorship Firm/Partnership firm/ Limited Liability Partnership (LLP) firm/Public Limited/ Pvt. Limited/ Govt. Dept. / PSU/ Others If Others Specify:_____ [Enclose relevant certificates / partnership deed/certificate of Registration, as applicable]
3a	Name of Proprietor/Partners/Directors of the firm/company [As per cl.no.4.0 of Section-III of Tender Document]	
3b	Name of Power of Attorney holders of bidder	
4	Number of Years in Operation	
5	Address of Registered Office: *In case of Partnership firm, provide current address of the firm for ordering purpose	
		City:
		District:
		State:
		PIN/ZIP:
6	Bidder's address where order/contract is to be placed	
		City:
		District:
		State:
		PIN/ZIP:
7	Office responsible for executing the contract with GST no. * (In case supply of works are from multiple locations, addresses and GST no. of all such locations are to be provided).	City: District: State: PIN/ZIP: GST No.:
8	Telephone Number/ Mobile no. of address where order is to be placed	_____ (Country Code) (Area Code) (Telephone No.)
9	E-mail address	
10	Website	
11	Mobile Number:	

12	ISO Certification, if any	{If yes, please furnish details}
13	PAN No.	
14	GST No. (refer sl. no. 7 above)	
15	EPF Registration No.	
16	ESI code No.	
17	Whether Micro or Small Enterprise	Yes / No (*If Yes, Bidder to submit requisite documents as specified it ITB:Clause No. 40*)
	Whether MSE is owned by SC/ST Entrepreneur(s)	Yes / No (*If Yes, Bidder to submit requisite documents as specified it ITB:Clause No. 40*)
	Whether MSE is owned by Women	Yes / No (*If Yes, Bidder to submit requisite documents as specified it ITB:Clause No. 40*)
	Whether payment is required through TReDS	Yes / No *If Yes, please provide the name of portal* ……
18	Whether Bidder is Startups or not	Yes / No (*If Yes, Bidder to submit requisite documents as specified it ITB: Clause No.50*)
	In case of Start-up confirm the following: (i) Date of its incorporation/ registration [The certificate shall only be valid for the entity upto ten years from the date of its incorporation/ registration] (ii) Whether turnover for any financial years since incorporation/ registration has exceed Rs.100 Crores.	

Note: * *GAIL intent to place the contract directly on the address from where Works are to be supplied. In case, bidder wants contract at some other address or Works are to supplied from multiple locations, bidder is required to provide in their bid, the address on which contract is to be placed.*

.

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal:

FORMAT F-2

PROFORMA OF "BANK GUARANTEE"
FOR "EARNEST MONEY / BID SECURITY"
(To be stamped in accordance with the Stamp Act)

To, M/s GAIL (India) Limited _____	**Bank Guarantee No.**	
	Date of BG	
	BG Valid up to	
	Claim period up to (There should be three months gap between expiry date of BG & Claim period)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

In accordance with Letter Inviting Tender under your reference No _____ M/s. _____ having their Registered / Head Office at _____ (hereinafter called the Tenderer), wish to participate in the said tender for_____

As an irrevocable Bank Guarantee against Earnest Money for the amount of _____ is required to be submitted by the Tenderer as a condition precedent for participation in the said tender which amount is liable to be forfeited on the happening of any contingencies mentioned in the Tender Document.

We, the _____ Bank at _____having our Head Office _____ (Local Address) guarantee and undertake to pay immediately on demand without any recourse to the tenderers by GAIL (India) Ltd., the amount _____ _____ without any reservation, protest, demur and recourse. Any such demand made by GAIL, shall be conclusive and binding on us irrespective of any dispute or difference raised by the Tenderer.

This guarantee shall be irrevocable and shall remain valid up to _____ [this date should be two (02) months beyond the validity of the bid].If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from M/s. _____ whose behalf this guarantee is issued.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this _____day of _____ 20__ at _____.

Notwithstanding anything contained herein:

a) The Bank's liability under this Guarantee shall not exceed (currency in figures) . . . . . (currency in words only) . . . . .
b) This Guarantee shall remain in force upto _____ (this expiry date of BG should be two months beyond the validity of bid) and any extension(s) thereof; and
c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of …….(indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if

extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of GAIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

WITNESS:

(SIGNATURE)
(NAME)

(SIGNATURE)
(NAME)
Designation with Bank Stamp

(OFFICIAL ADDRESS)

Attorney as per
Power of Attorney No. _____
Date: _____

INSTRUCTIONS FOR FURNISHING "BID SECURITY / EARNEST MONEY" BY "BANK GUARANTEE"

1. The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per "Stamp Duty" applicable. The non-judicial stamp paper should be in the name of the issuing Bank.

2. The expiry date should be arrived at in accordance with "ITB: Clause-16.1".

3. The Bank Guarantee by bidders will be given from Bank as specified in "ITB:Clause-16.2".

4. A letter from the issuing Bank of the requisite Bank Guarantee confirming that said Bank Guarantee / all future communication relating to the Bank Guarantee shall be forwarded to the Employer at its address as mentioned at "ITB".

5. Bidders must indicate the full postal address of the Bank along with the Bank's E-mail / Phone from where the Earnest Money Bond has been issued as per proforma provided below.

6. If a Bank Guarantee is issued by a commercial Bank, then a letter to Employer confirming its net worth is more than Rs. 1,000,000,000.00 [Rupees One Hundred Crores] or equivalent along with documentary evidence or in the Bank Guarantee itself.

Annexure

MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE

1 **BANK GUARANTEE NO** :

2 **VENDOR NAME / VENDOR CODE** :

NAME	
VENDOR CODE	

3 **BANK GUARANTEE AMOUNT** :

4 **PURCHASE ORDER/ LOA NO** :

5 **NATURE OF BANK GUARANTEE** :
(Please Tick (√) Whichever is Applicable

PERFORMANCE BANK GUARANTEE	SECURITY DEPOSIT	EMD	ADVANCE

6 **BG ISSUED BANK DETAILS** :

(A) **EMAIL ID** :

(B) **ADDRESS** :

(C) **PHONE NO/ MOBILE NO.** :

FORMAT F-2A

DECLARATION FOR BID SECURITY

To,

M/s GAIL (INDIA) LIMITED
_____

SUB:
TENDER NO:

Dear Sir

After examining / reviewing provisions of above referred tender documents (including all corrigendum/ Addenda)**,** we M/s_____ ***(Name of Bidder)*** have submitted our offer/ bid no. …….

We, M/s_____ ***(Name of Bidder)*** hereby understand that, according to your conditions, we are submitting this Declaration for Bid Security.

We understand that we will be put on watch list/holiday/ banning list (as per polices of GAIL in this regard), if we are in breach of our obligation(s) as per following:

(a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or

(b) having been notified of the acceptance of our Bid by the GAIL during the period of bid validity:
   (i) fail or refuse to execute the Contract, if required, or
   (ii) fail or refuse to furnish the Contract Performance Security, in accordance provisions of tender document.
   (iii) fail or refuse to accept 'arithmetical corrections' as per provision of tender document.

(c) having indulged in corrupt/fraudulent /collusive/coercive practice as per procedure.

Place: [Signature of Authorized Signatory of Bidder]
Date: Name:
Designation:
Seal:

F-3
LETTER OF AUTHORITY

[Pro forma for Letter of Authority for Attending 'Pre-Bid Meetings' /'Un-priced Bid Opening' / 'Price Bid Opening']

Ref: Date:
To,
M/s GAIL (INDIA) LIMITED
_____

SUB:
TENDER NO:

Dear Sir,
I/We, _____ hereby authorize the following representative(s) for attending any 'Meetings [Pre-Bid Meeting]', 'Un-priced Bid Opening', and 'Price Bid Opening' against the above Tender Documents:

[1] Name & Designation _____ Signature _____
Phone/Cell:
E-mail: …….. @ ……

[2] Name & Designation _____ Signature _____
Phone/Cell:
E-mail: …….. @ ……

We confirm that we shall be bound by all commitments made by aforementioned authorised representative(s).

Place: [Signature of Authorized Signatory of Bidder]
Date: Name:
Designation:
Seal:

Note:
(i) This "Letter of Authority" should be on the **"letterhead"** of the Bidder and should be signed by a person competent and having the 'Power of Attorney' to bind the Bidder. Not more than 'two [02] persons per Bidder' are permitted to attend 'Pre-Bid Meetings' /'Un-priced Bid Opening' / 'Price Bid Opening'.
(ii) Bidder's authorized representative is required to carry a copy of this authority letter while attending the 'Pre-Bid Meetings' /'Un-priced Bid Opening.

F-4

PROFORMA OF "BANK GUARANTEE" FOR "CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT"
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

To, M/s GAIL (India) Limited _____	**Bank Guarantee No.**	
	Date of BG	
	BG Valid up to	
	Claim period up to (There should be three months gap between expiry date of BG & Claim period)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

M/s. _____ having registered office at _____ (herein after called the "contractor" which expression shall wherever the context so require include its successors and assignees) have been placed/ awarded the job/work of _____ vide LOA /FOA No. _____dated_____ for GAIL (India) Limited having registered office at 16, Bhikaiji Cama Place, R.K. Puram, New Delhi (herein after called the "GAIL" which expression shall wherever the context so require include its successors and assignees).

The Contract conditions provide that the CONTRACTOR shall pay a sum of Rs. _____ (Rupees _____) as full Contract Performance Guarantee in the form therein mentioned. The form of payment of Contract Performance Guarantee includes guarantee executed by Nationalized Bank/Scheduled Commercial Bank, undertaking full responsibility to indemnify GAIL (INDIA) LIMITED, in case of default.

The said M/s._____ has approached us and at their request and in consideration of the premises we having our office at _____ have agreed to give such guarantee as hereinafter mentioned.

1. We _____ hereby undertake to give the irrevocable & unconditional guarantee to you that if default shall be made by M/s. _____ in performing any of the terms and conditions of the tender/order/contract or in payment of any money payable to GAIL (INDIA) LIMITED we shall on first demand pay without demur, contest, protest and/ or without any recourse to the contractor to GAIL in such manner as GAIL may direct the said amount of Rupees _____ only or such portion thereof not exceeding the said sum as you may require from time to time.
2. You will have the full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the order/contract with the said M/s. _____ and to enforce or to forbear from endorsing any powers or rights or by reason of time being given to the said

M/s._____ and such postponement forbearance would not have the effect of releasing the bank from its obligation under this debt.

3. Your right to recover the said sum of Rs. _____ (Rupees _____) from us in manner aforesaid is absolute & unequivocal and will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. _____ and/or that any dispute or disputes are pending before any officer, tribunal or court or arbitrator or any other authority/forum and any demand made by you in the bank shall be conclusive and binding. The bank shall not be released of its obligations under these presents by any exercise by you of its liberty with reference to matter aforesaid or any of their or by reason or any other act of omission or commission on your part or any other indulgence shown by you or by any other matter or changed what so ever which under law would, but for this provision, have the effect of releasing the bank.
4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up dissolution or changes of constitution or insolvency of the said contractor but shall in all respects and for all purposes be binding and operative until payment of all money due to you in respect of such liabilities is paid.
5. The bank undertakes not to revoke this guarantee during its currency without your previous consent and further agrees that the guarantee shall continue to be enforceable until it is discharged by GAIL in writing. However, if for any reason, the contractor is unable to complete the work within the period stipulated in the order/contract and in case of extension of the date of delivery/completion resulting extension of defect liability period/guarantee period of the contractor fails to perform the work fully, the bank hereby agrees to further extend this guarantee at the instance of the contractor till such time as may be determined by GAIL. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instruction from M/s. _____ (contractor) on whose behalf this guarantee is issued.
6. Bank also agrees that GAIL at its option shall be entitled to enforce this Guarantee against the bank (as principal debtor) in the first instant, without proceeding against the contractor and notwithstanding any security or other guarantee that GAIL may have in relation to the contractor's liabilities.
7. The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by GAIL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.
8. Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of _____(amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the order/contract and without caveat or argument, any sum or sums within the limits of (amounts of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.
9. We have power to issue this guarantee in your favor under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney, dated _____ granted to him by the Bank.
10. Notwithstanding anything contained herein:

a) The Bank's liability under this Guarantee shall not exceed (currency in figures) . . . . . (currency in words only) . . . . .

b) This Guarantee shall remain in force upto _____ (this date should be expiry date of defect liability period of the Contract) and any extension(s) thereof; and

c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of …….(indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of GAIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Yours faithfully,

_____

Bank by its Constituted Attorney

Signature of a person duly
Authorized to sign on behalf of the
Bank

INSTRUCTIONS FOR FURNISHING
"CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT" BY "BANK GUARANTEE"

1. The Bank Guarantee by successful Bidder(s) will be given on non-judicial stamp paper as per 'stamp duty' applicable. The non-judicial stamp paper should be in name of the issuing bank.
2. The Bank Guarantee by Bidders will be given from bank as specified in cl.no. 38.3 of ITB [Section-III] of Tender Document.
3. A letter from the issuing bank of the requisite Bank Guarantee confirming that said Bank Guarantee and all future communication relating to the Bank Guarantee shall be forwarded to Employer.
4. If a Bank Guarantee is issued by a commercial bank, then a letter to Employer and copy to Consultant (if applicable) confirming its net worth is more than Rs. 100,00,00,000.00 [Rupees One Hundred Crores] or its equivalent in foreign currency alongwith documentary evidence OR in the Bank Guarantee itself.
5. Contractor shall submit attached cover letter (Annexure) while submitting Contract Performance Security

Annexure

MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE

1 BANK GUARANTEE NO :

2 VENDOR NAME / VENDOR CODE :

NAME	
VENDOR CODE	

3 BANK GUARANTEE AMOUNT :

4 PURCHASE ORDER/ LOA NO :

5 NATURE OF BANK GUARANTEE :
(Please Tick (√) Whichever is Applicable

PERFORMANCE BANK GUARANTEE	SECURITY DEPOSIT	EMD	ADVANCE

6 BG ISSUED BANK DETAILS :

(A) EMAIL ID :

(B) ADDRESS :

(C) PHONE NO/
MOBILE NO. :

F-5

AGREED TERMS & CONDITIONS

To,

M/s GAIL (INDIA) LIMITED
_____

SUB:
TENDER NO:

This Questionnaire duly filled in, signed & stamped must form part of Bidder's Bid and should be returned along with Un-priced Bid. Clauses confirmed hereunder need not be repeated in the Bid.

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
1	Bidder's name, Vendor Code of GAIL (if any) and address (FOA/Order shall be released in this name)	Bidder's name : GAIL's Vendor Code: Address:
2.	Bidder confirms the currency of quoted prices is in Indian Rupees.	
3.	Bidder confirms quoted prices will remain firm and fixed till complete execution of the order (except where price escalation/variation is allowed in the Tender).	
4	Bidder confirms that they have quoted **GST (CGST & SGST/ UTGST or IGST)** in Price Schedule/ SOR of Price bid.	
4.1	Whether in the instant tender services/works are covered in reverse charge rule of **GST (CGST & SGST/UTGST or IGST)** If yes, Bidder confirms that they have quoted rate of applicable GST (CGST & SGST/ UTGST or IGST**)** in Price Schedule / Schedule of Rates of Price Bid	Yes/ No
4.2	Bidder confirms that they have mentioned Harmonized System Nomenclature (HSN)/Service Accounting Code (SAC) in Price Bid	
4.3	Bidder hereby confirms that the quoted prices are in compliance with the Section 171 of CGST Act/ SGST Act as mentioned as clause no. 13.10 of ITB (Anti-profiteering clause).	
4.4	Whether bidder is liable to raise E-Invoice as per GST Act.	
	If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	
5.	Bidder confirms acceptance of relevant Terms of Payment specified in the Bid Document.	
6.	Bidder confirms that Contract Performance Security will be furnished as per Bid Document within 30 days of FOA in case of successful bidder.	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
7.	Bidder confirms that Contract Performance Security shall be from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalised Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect shall be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.	
8.	Bidders confirms compliance to Completion Schedule as specified in Bid document and the same shall be reckoned from the date of Fax of Acceptance.	
9.	Bidders confirms acceptance of Price Reduction Schedule for delay in completion schedule specified in Bid document. In case of delay, the bills / invoices shall be submitted after reducing the price reduction due to delay (refer PRS Clause).	
10.	a) Bidder confirms acceptance of all terms and conditions of Bid Document (all sections). b) Bidder confirms that printed terms and conditions of bidder are not applicable.	
11.	Bidder confirms their offer is valid for period specified in BDS from Final/Extended due date of opening of Techno-commercial Bids.	
12.	Bidder have furnished EMD/Bid Security details as under: a) EMD/ Bid Security No. & date b) Value c) Validity d) Bank Address/e-mail ID/Mobile no. [in case of BG] **OR** Bidder furnishes bid security declaration [applicable for MSEs, Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue)]	
13.	As per requirement of tender, bidder (having status as Pvt. Ltd. or Limited company) must upload bid duly digitally signed on e-portal through class-3B digital signature (DS). In case, class of DS or name of employee or name of employer is not visible in the digitally signed documents, the bid digitally signed as submitted by the person shall be binding on the bidder.	
14.	Bidder confirms that (i) none of Directors (in Board of Director) of bidder is a relative of any Director (in Board of Director) of GAIL or (ii) the bidder is not a firm in which any Director (in Board of Director) of GAIL or their relative is a partner.	
15.	All correspondence must be in ENGLISH language only.	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
16.	The contents of this Tender Document have not been modified or altered by Bidder. In case, it is found that the tender document has been modified / altered by the bidder, the bid submitted by them shall be liable for rejection.	
17.	Bidder confirms that all Bank charges associated with Bidder's Bank regarding release of payment etc. shall be borne by Bidder.	
18.	No Deviation Confirmation: It may be note that any 'deviation / exception' in any form may result in rejection of Bid. Therefore, Bidder confirms that they have not taken any 'exception / deviation' anywhere in the Bid. In case any 'deviation / exception' is mentioned or noticed, Bidder's Bid may be rejected.	
19.	If the Bidder becomes a successful Bidder pursuant to the provisions of the Tender Document, the following Confirmation shall be automatically become enforceable: "We agree and acknowledge that the Employer is entering into the Contract/Agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood & agreed that the Government of India is not a party to the Contract/Agreement and has no liabilities, obligations or rights thereunder. It is expressly understood and agreed that the Purchaser is authorized to enter into Contract/Agreement, solely on its own behalf under the applicable laws of India. We expressly agree, acknowledge and understand that the Purchaser is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Agreement. Accordingly, we hereby expressly waive, release and forego any and all actions or claims, including cross claims, VIP claims or counter claims against the Government of India arising out of the Agreement and covenants not to sue to Government of India as to any manner, claim, cause of action or things whatsoever arising of or under the Agreement."	
20.	Bidder to ensure all documents as per tender including clause 11 of Section III and all Formats are included in their bid	
21.	Bidder understands that Tender Document is not exhaustive. In case any activity though specifically not covered in description of 'Schedule of Rates' but is required to complete the work as per Scope of Work, Conditions of Contract, or any other part of Bidding document, the quoted rates will deemed to be inclusive of cost incurred for such activities unless otherwise specifically excluded. Bidder confirms to perform for fulfilment of the contract and completeness of the supplies in all respect within the scheduled time frame and quoted price.	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
22.	Bidder hereby confirms that they are not on 'Holiday' by GAIL or Public Sector Project Management Consultant (like EIL, Mecon only due to "poor performance" or "corrupt and fraudulent practices") or banned by Government department/ Public Sector on due date of submission of bid. Further, Bidder confirms that neither they nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/ Fraudulent/ Collusive/ Coercive Practices) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas. Bidder also confirms that they are not under any liquidation, court receivership or similar proceedings or 'bankruptcy'. In case it comes to the notice of GAIL that the bidder has given wrong declaration in this regard, the same shall be dealt as 'fraudulent practices' and action shall be initiated as per the Procedure for action in case of Corrupt/Fraudulent/Collusive/Coercive Practices. Further, Bidder also confirms that in case there is any change in status of the declaration prior to award of contract, the same will be promptly informed to GAIL by them.	
23.	Bidder confirms that they have read and understood the General Conditions of Contract – Works available on GAIL's Tender website (http://gailtenders.in/Gailtenders/gccs.asp) & no 'exception / deviation' anywhere has been taken in the same and that they shall abide by provisions of relevant GCC.	
24.	Bidder certifies that they would adhere to the Fraud Prevention Policy of GAIL [available on GAIL's website (www.gailonline.com)] and shall not indulge themselves or allow others (working in GAIL) to indulge in fraudulent activities and that they would immediately apprise GAIL of the fraud/suspected fraud as soon as it comes to their notice. Concealment of facts regarding their involvement in fraudulent activities in connection with the business transaction(s) of GAIL is liable to be treated as crime and dealt with by the procedures of GAIL as applicable from time to time.	
25.	Bidder confirms that (i) any variation in GST at the time of supplies for any reasons, other than statutory, including variations due to turnover, shall be borne by them and (ii) any error of interpretation of applicability of rate of GST (CGST & SGST/ UTGST or IGST) on components of an item and/or various items of tender by them shall be dealt as per clause no. 13.13 of Section-III.	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
26.	Bidders confirm to submit signed copy of Integrity Pact (wherever included in tender). If Bidder is a partnership concern or a consortium, this agreement must be signed by all partners or consortium members.	
27.	Bidder confirms that, in case of contradiction between the confirmations provided in this format and to the terms & conditions mentioned elsewhere in the offer, the confirmations given in this format shall prevail.	

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal:

F-6

ACKNOWLEDGEMENT CUM CONSENT LETTER

(On receipt of tender document/information regarding the tender, Bidder shall acknowledge the receipt and confirm his intention to bid or reason for non-participation against the enquiry /tender through e-mail to concerned executive in GAIL issued the tender, by filling up the Format)

To,

M/s GAIL (INDIA) LIMITED

_____

SUB:
TENDER NO:

Dear Sir,

We hereby acknowledge receipt of a complete set of bidding document along with enclosures for subject item/job and/or the information regarding the subject tender.

- We intend to bid as requested for the subject item/job and furnish following details with respect to our quoting office:

  Postal Address with Pin Code: .....
  Telephone Number : .....
  Contact Person : .....
  E-mail Address : .....
  Mobile No. : .....
  Date : .....
  Seal/Stamp : .....

- We are unable to bid for the reason given below:

  Reasons for non-submission of bid:

_____

Agency's Name : .....
Signature : .....
Name : .....
Designation : .....
Date : .....
Seal/Stamp : .....

F-7
BIDDER'S EXPERIENCE

To,

M/s GAIL (INDIA) LIMITED
_____

SUB:
TENDER NO:

Sl. No	Description of the Services	LOA /WO No. and date	Full Postal Address & phone nos. of Client. *Name, designation and address of Engineer/ Officer-in-Charge (for cases other than purchase)*	Value of Contract/Order (*Specify* Currency Amount)	Date of Commencement of Services	Scheduled Completion Time (Months)	Date of Actual Completion	Reasons for delay in execution, if any
(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal:

Note: As per cl.no.D of Section-II, only documents (Work Order, Completion certificate, Execution Certificate etc.) which have been referred/ specified in the bid shall be considered in reply to queries during evaluation of Bids.

F-8 (A)
CHECK LIST

Bidders are requested to duly fill in the checklist. This checklist gives only certain important items to facilitate the bidder to make sure that the necessary data/information as called for in the bid document has been submitted by them along with their offer. This, however, does not relieve the bidder of his responsibilities to make sure that his offer is otherwise complete in all respects.

Please ensure compliance and tick (√) against following points:

S. No.	DESCRIPTION	CHECK BOX	REFERENCE PAGE NO. OF THE BID SUBMITTED
1.0	Digitally Signing (in case of e-bidding)/ Signing and Stamping (in case of manual bidding) on each sheet of offer, original bidding document including SCC, ITB, GCC ,SOR drawings, corrigendum (if any)		
2.0	Confirm that the following details have been submitted in the Un-priced part of the bid		
i	Covering Letter, Letter of Submission		
ii	EMD / Declaration for Bid Security [as applicable] as per provisions of Tender		
iii	Digitally signed (in case of e-tendering) or 'signed & stamped (in case of Manual tender) tender document along with drawings and addendum (if any)		
iv	Power of Attorney in the name of person signing the bid.		
v	Confirm submission of document alongwith unpriced bid as per bid requirement (including cl.no.11.1.1 of Section-III).		
3.0	Confirm that all format duly filled in are enclosed with the bid duly Digitally Signed (in case of e-bidding)/ Signed and Stamped (in case of manual bidding) by authorised person(s)		
4.0	Confirm that the price part as per Price Schedule format submitted with Bidding Document/ uploaded in case of e-bid.		
~~5.0~~	~~Confirm that Undertaking as per Form 1 of Annexure-III to Section-III has been submitted (applicable for MSE and PP-LC bidder).~~		
6.0	Confirm that Undertaking as per *Form-2 to Annexure-V to Section-III* and Certification from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) as per *Form-3 to Annexure-V to Section-III* are submitted.		

7.0	Confirm that Undertaking as per Form-1 to Section-II have been submitted by the bidder (Guidelines from Procurement from a Country sharing a Land Border with India)		
8.0	Confirm submission of Checklist against Bid Evaluation Criteria as per format F-8(B)		

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:

F-8(B)

CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS

(refer Section II of Tender document)

BEC Clause No.	Description	Documents required for qualification	Documents Submitted by Bidder	Documents attested as per Section-II of Tender	Reference Page No. of the Bid submitted
	Technical BEC				
1.	**Experience**	(a) ……. (b) …….. (c) ……..		Yes/No	
2	**Experience of bidder acquired as a subcontractor**	certificate from end user		Yes/No	
3.	**Job executed for Subsidiary / Fellow subsidiary/ Holding company.**	Tax paid invoice(s) duly certified by statutory auditor of the bidder towards payment of statutory tax in support of the job executed for Subsidiary / Fellow subsidiary/ Holding company.		Yes/No	
4.	**Any other technical criteria in BEC**	(a) ……. (b) …….. (c) …….. ***(Dealing Officer to specify the details of documents above).***		Yes/No	
	Financial BEC				

1.	**Annual Turn Over**	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year. [In case the Annual Turnover criteria is not met in last Audited Financial Year, then the Audited Financial Statements for previous two years of last Audited Financial Year is to be submitted]	Submitted (*Mention specific year……*)	Yes/No	
2.	**Net Worth**	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year.	Submitted (M*ention specific year ……*)	Yes/No	
3.	**Working Capital**	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year. If the bidder's working capital is negative or inadequate, the bidder shall submit a letter (in prescribed format) from their bank having net worth not less than Rs.100 Crores, confirming the availability of line of credit for at least working capital requirement as stated above.	Submitted (*Mention specific year……*) Submitted/ Not Applicable *(Bidder to tick appropriate option)*	Yes/No	
4.	**Format for Details of financial capability of Bidder**	Bidder shall submit "Details of financial capability of Bidder" in prescribed format duly signed and stamped by a chartered accountant / Certified Public Accountant (CPA).	Submitted		

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal

F-9

FORMAT FOR CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS INADEQUATE/NEGATIVE

(To be provided on Bank's letter head)

Date:

To,
M/s. GAIL (India) Limited

Dear Sir,

This is to certify that M/s …….. (name of the Bidder with address) (hereinafter referred to as Customer) is an existing Customer of our Bank.

The Customer has informed that they wish to bid for GAIL's Tender No. ..... dated …… for ……..(Name of the supply/work/services/consultancy) and as per the terms of the said Tender Document they have to furnish a certificate from their Bank confirming the availability of line of credit.

Accordingly M/s …….. (name of the Bank with address) confirms availability of line of credit to M/s …….. (name of the Bidder) for at least an amount of Rs. _____

It is also confirmed that the net worth of the Bank is more than Rs. 100 Crores (or Equivalent USD) and the undersigned is authorized to issue this certificate.

Yours truly

for …… (Name & address of Bank)

(Authorized signatory)
Name of the signatory:
Designation :
Email Id :
Contact No. :
Stamp

Note:
This Declaration Letter for line of credit shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will be acceptable wherein a group of banks can jointly provide line of credit to the bidder.

F-10

FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE/ CERTIFIED PUBLIC ACCOUNTANT (CPA) FOR FINANCIAL CAPABILITY OF THE BIDDER

We have verified the Audited Financial Statements and other relevant records of M/s…… (Name of the bidder) and certify the following:

A. AUDITED ANNUAL TURNOVER* OF LAST 3 YEARS:

Year	Amount (Currency)
Year 1:	
Year 2:	
Year 3:	

B. NETWORTH* AS PER LAST AUDITED FINANCIAL STATEMENT:

Description	**Year _____**
	Amount (Currency)
1. Net Worth	

C. WORKING CAPITAL* AS PER LAST AUDITED FINANCIAL STATEMENT :

Description	**Year _____**
	Amount (Currency)
1. Current Assets	
2. Current Liabilities	
3. Working Capital (Current Assets-Current liabilities)	

Refer Instructions

Note:

1.0 It is further certified that the above mentioned applicable figures are matching with the returns filed with Registrar of Companies (ROC) [Applicable only in case of Indian Companies]

2.0 We confirm that above figures are after referring instructions at page 2 of 2 of F-10.

3.0 Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them

Name of Audit Firm:
Chartered Accountant/CPA
Date:

[Signature of Authorized Signatory]
Name:
Designation:
Seal:
Membership No.:
UDIN:

(Page 1 of 2)

Instructions:

1. The Separate Pro-forma shall be used for each member in case of JV/ Consortium.

2. The financial year would be the same as one normally followed by the bidder for its Annual Report.

3. The bidder shall provide the audited annual financial statements as required for this Tender document. Failure to do so would result in the Proposal being considered as non-responsive.

4. For the purpose of this Tender document:

   (i) **Annual Turnover** shall be "Revenue from Operations" as per Profit & Loss account of audited annual financial statements
   (ii) **Working Capital** shall be "Current Assets less Current liabilities" and
   (iii) **Net Worth** shall be Paid up share capital plus Free Reserves & Surplus less accumulated losses, deferred expenditure and miscellaneous expenditure not written off, if any.

5. Above figures shall be calculated after considering the qualification, if any, made by the statutory auditor on the audited financial statements of the bidder including quantified financial implication.

6. This certificate is to be submitted on the letter head of Chartered Accountant/CPA.

(Page 2 of 2)

F-11

FORMAT FOR CONSORTIUM AGREEMENT

(ON NON- JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

CONSORTIUM/JV AGREEMENT

This Consortium Agreement executed on this ….. Day of ……. Between M/s ……, a company incorporated under the law of …… and having its registered/principal office at…….. (herein after called the '"Member-I'/ 'Lead Member' which expression shall include its successors, executors and permitted assigns) and M/s ……., a company incorporated under the laws of ……., and having its registered/principal office at …….. (herein after called the 'Member – II'/ 'Second Member' which expression shall include its successors, executors and permitted assigns) …….. 'and M/s ……., a company incorporated under the laws of ……., and having its registered/principal office at …….. (herein after called the 'Member – III'/ 'Third Member' which expression shall include its successors, executors and permitted assigns), for the purpose of making a bid and entering into a contract (in case of award) in response to bid document no…… for the work of ……

(Name of Project) of **M/s …….. (herein after called the 'Owner').**

WHEREAS, the Owner invited bids vide its bid document no. …… for the work of ……

AND WHEREAS as per tender documents, Consortium entities will also be considered by the Owner provided they meet the specific requirements in that regard. As a pre-condition of bidding documents, the Consortium bidder shall provide in its bid a Consortium Agreement in an acceptable format in which the Members to the Consortium are jointly and severally liable to the Owner to bind themselves to the bid conditions accept the contract award, if selected and perform all the contractual obligations thereto.

AND WHEREAS the bid is being submitted to the Owner vide our proposal dated …….. based on the Consortium Agreement being these presents and the bid with its bid forms and submission documents, in accordance with the requirement of tender conditions and requirements have been signed by both the Members and submitted to the Owner.

NOW THIS INDENTURE WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the Members to this Consortium/JV do hereby now agree as follows:

1. We the Members in the Consortium hereby confirm that the name and style of the Consortium shall be …… Consortium.

2. In consideration of the bid submission by us to the Owner and the award of Contract by the Owner to the Consortium (if selected by the Owner),we the Members to the Consortium, hereby agree that the Member I (M/s…….) shall act as the lead Member for self, and for and on behalf of Member II/ Member III and further declare and confirm that we shall jointly and severally be bound unto the Owner for execution of the contract in accordance with the contract terms and shall jointly and severally be liable to the Owner to perform all contractual obligations including technical guarantees. Further, the lead Member is authorized to incur liabilities and receive instructions for and on behalf of any or both Members of the Consortium and the entire execution of the Contract.

3. In case of any breach of the said Contract by any of the Members of the CONSORTIUM, we hereby agree to be fully responsible for the successful execution/performance of the Contract in accordance with the terms of the Contract.

4. Further, if the Owner suffered any loss or damage on account of any breach of the Contract or any shortfall in the completed equipment/plant, meeting the guaranteed performance parameters as per the technical specifications/ contract documents, the Second & Third Member of these presents undertakes to promptly make good such loss or damage caused to the Owner, on the Owner's demand without any demure. It shall neither be necessary nor obligatory on the part of the Owner to proceed against the Lead Member to these presents before proceeding against the Second & Third Member.

5. The financial liability of the Member (s) to this Consortium/JV Agreement, to the Owner with respect to the any or all claims arising out of the performance or non-performance of the Contract shall, however be not limited in any way so as to restrict or limit the liabilities of either of the Member.

6. Division of responsibilities of Scope of work among different Consortium/JV members is as per **APPENDIX I (Responsibility Matrix)** to this Consortium/JV Agreement.

7. It is expressly understood and agreed between the Members to this agreement that the responsibilities and obligations of each of the Members shall be as delineated in '**APPENDIX I'** to this agreement. It is further agreed by the Members that the above sharing of responsibilities and obligations shall not in any way be a limitation of the joint and several responsibilities of the Members under the Contract.

8. This Consortium Agreement shall be governed, construed and interpreted in accordance with Laws of India courts of Delhi shall have exclusive jurisdiction in all matters arising thereunder.

9. In case of award of contract, we the Member s to this Consortium/JV Agreement do hereby agree that we shall furnish the contract performance guarantee in favour of the Owner from a bank acceptable / approved by the Owner for a value as stipulated in the Contract Award and such guarantee shall be in the names of Consortium/JV.

10. It is further agreed that this CONSORTIUM Agreement shall be irrevocable and shall form an integral part of the Contract and shall continue to be enforceable till the Owner discharges the same. It shall be effective date first above mentioned for all purposes and intents.

11. In case bid submitted by Joint Venture, the details of equity partnership and assets of the JV shall be attached as a separate annexure to this agreement.

12. This agreement remains in force till the end of Defects Liability Period.

IN WITNESS WHEREOF, the Members to this Consortium/JV agreement have, through their respective authorized representatives, have executed these presents and affixed their hands and common seal of their respective companies on the day, month and year first abovementioned.

1. Seal of M/s. has been affixed in my/our presence pursuant to Board Resolution dated ……..
Signature ……..
Designation

For M/s. (…….. Member
……
(Signature of authorised Representative)
Name:
Designation:

1. Seal of M/s. has been affixed in my/our presence pursuant to Board Resolution dated ……..
Signature ……..
Designation

For M/s. (…….. Member II
……
(Signature of authorised Representative)
Name:
Designation:

1. Seal of M/s. has been affixed in my/our presence pursuant to Board Resolution dated ……..

For M/s. (…….. Member III
……
(Signature of authorised Representative)
Name:

F-12

BIDDER'S QUERIES FOR PRE BID MEETING

To,

M/s GAIL (INDIA) LIMITED

Sub :

Tender No :

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	GAIL'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		

NOTE: The Pre-Bid Queries may be sent by e-mail before due date for receipt of Bidder's queries.

SIGNATURE OF BIDDER: _____

NAME OF BIDDER : _____

F-13

E-Banking Mandate Form

(To be issued on vendors letter head)

1. Vendor/customer Name :

2. Vendor/customer Code:

3. Vendor /customer Address:

4. Vendor/customer e-mail id:

5. Particulars of bank account
   a) Name of Bank
   b) Name of branch
   c) Branch code:
   d) Address:
   e) Telephone number:
   f) Type of account (current/saving etc.)
   g) Account Number:
   h) RTGS IFSC code of the bank branch
   i) NEFT IFSC code of the bank branch
   j) 9 digit MICR code

I/We hereby authorize GAIL(India) Limited to release any amount due to me/us in the bank account as mentioned above. I/We hereby declare that the particulars given above are correct and complete. If the transaction is delayed or lost because of incomplete or incorrect information, we would not hold the GAIL (India) Limited responsible.

(Signature of vendor/customer)

BANK CERTIFICATE

We certify that ---------- has an Account no. ---------- with us and we confirm that the details given above are correct as per our records.
Bank stamp

Date (Signature of authorized officer of bank)

F-16

FREQUENTLY ASKED QUESTIONS (FAQs)

SL.NO.	QUESTION	ANSWER
1.0	Can any vendor quote for subject Tender?	Yes. A Vendor has to meet Bid Evaluation Criteria given under Section II of Tender document in addition to other requirements.
2.0	Should the Bid Evaluation Criteria documents be attested?	Yes. Please refer Section II of Tender document
3.0	Is attending Pre Bid Meeting mandatory.	No. Refer Clause No. 17 of Instruction to Bidders of Tender Document. However attending Pre Bid Meeting is recommended to sort out any issue before submission of bid by a Bidder.
4.0	Can a vendor submit more than 1 offer?	No. Please refer Clause No. 4 of Instruction to Bidders of Tender Document.
5.0	Is there any Help document available for e-Tender.	Refer FAQs as available on Govt. e-Procurement System of National Informatics Center (NIC) https://etenders.gov.in/eprocure/app
6.0	Are there are any MSE (Micro & Small Enterprises) benefits available?	Yes. Refer Clause No. 40 of Instructions to Bidders of Tender Document.
7.0	Are there are any benefits available to Startups?	Refer Clause No. 49 of Instructions to Bidders of Tender Document.

All the terms and conditions of Tender remain unaltered.

F-17

UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE (E-INVOICE AS PER GST LAWS)

(to be submitted on letter head along with documents for release of payment)

To,
M/s GAIL (INDIA) LIMITED
……

SUB: ……
PO NO: …….

Dear Sir,

We _____ (Name of the Supplier) hereby confirm that E-Invoice provision as per the GST Law is

(i) Applicable to us [ ]

(ii) Not Applicable to us [ ]

(Supplier is to tick appropriate option [✓]above).

In case, same is applicable to us, we confirm that we will submit E-Invoice after complying with all the requirements of GST Laws. If the invoice issued without following this process, such invoice can-not be processed for payment by GAIL as no ITC is allowed on such invoices. We also confirm that If input tax credit is not available to GAIL for any reason attributable to Supplier (both for E-invoicing cases and non-E-invoicing cases), then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the Supplier under this contract or under any other contract.

Place: [Signature of Authorized Signatory of Bidder]
Date: Name:
Designation:
Seal:

SECTION-IV
GENERAL CONDTION OF CONTRACT(GCC)

1. *General Conditions of Contract- Works is available on GAIL's Tender website (http://gailtenders.in/Gailtenders/gccs.asp).*

2. The bidders will be required to submit a confirmation in "Agreed Terms & Conditions" stating that *they have read and understood the General Conditions of Contract- Works available on GAIL's Tender website (http://gailtenders.in/Gailtenders/gccs.asp) & no 'exception / deviation' anywhere has been taken in the same and that they shall abide by provisions of relevant GCC.*

SECTION-V & VI

SPECIAL CONDITIONS OF CONTRACT (SCC)

&

SCOPE OF WORK(SOW)

Special Conditions of Contract (SCC)

Sub: Rerouting / Shifting Of 18" X 800 Mtr. Long Pipeline Section Near Manyata Tech Park in Bangalore City.

1.0 General

(a) Special Conditions of Contract shall be read in Conjunction with the General Conditions of Contract, specification of work, Drawing and any other documents forming part of this contract wherever the context so requires.

(b) Notwithstanding the sub-division of the documents into these separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the contract so far as it may be practicable to do so.

(c) Where any portion of the General Condition of Contract is repugnant, to or at variance with any provisions of the Special Conditions of Contract, unless a different intention appears, the provisions of the Special Conditions of Contract shall be deemed to over-ride the provisions of the General Condition of Contract and shall to the extent of such repugnancy, or variations, prevail.

(d) Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the contractor shall do so at his cost and the value of contract shall be deemed to have included cost of such performance and provisions, so mentioned

(e) In case of an irreconcilable conflict between Indian and other applicable standards, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings or Schedule of Rates, the decision of GAIL/EIC shall be final.

(f) It will be Contractor's responsibility to bring to the notice of Engineer-In-Charge any irreconcilable conflict in the contract documents before starting the work(s) or making the supply with reference which the conflict exists.

(g) In the absence of any specifications covering any, material, design of work(s) the same shall be performed/ supplied/ executed in accordance with Standard Engineering Practice as per the instructions/ directions of the Engineer-In-Charge, which will be binding on the Contractor.

2.0 Scope of Work

Attached separately.

3.0 Period of Completion

(a) Entire work given in the scope of work of this tender shall be completed within **90 days** reckoned from the date of issue of Fax of Intent/Letter of Intent whichever is issued earlier. The period of completion given excludes the time required for mobilization & demobilization.

(b) Contractor shall give daily progress report of work done on previous day in the Performa prescribed by the Engineer-In-Charge and shall maintain a separate hindrance register to record any delay not attributable to the contractor and shall be certified by the EIC/SIC on weekly basis.

(c) Time for mobilization is 10 days

4.0 Construction Water & Power Supply

(a) Contractor should be responsible for making arrangements for water and power at his own cost. No water and power will be provided by GAIL.

5.0 Land for Residential Accommodation

Contractor should be responsible for making arrangements for residential accommodation of contractor's employees and labour. Accommodation facilities shall not be provided by GAIL.

6.0 Measurement of Works

a) Payment will be made on the basis of joint measurements, taken by Contractor & "Site In-charge" and duly certified by "Engineer in charge".

b) Wherever works is executed based on instruction of "Site In-charge"/ "Engineer in charge", or details are not available or inadequate, physical measurements will be taken by the contractor in the presence of the Representative of the "Site In-charge"/ "Engineer in charge"

7.0 Terms of Payment

(a) GAIL shall pay for the services rendered as per stipulation in the tender through e-banking only. All bank charges of Contractor's bankers shall be to the Contractor's account.

(b) Contractor will invoice GAIL according to the terms and conditions provided in the tender. Contractor shall submit his invoices in hard copy / digital bill processing platform (ANJANI) to GAIL's representative in the manner as instructed by EIC. Each invoice will be supported by documentation acceptable to GAIL and certified by the GAIL's representative. Payments made by owner to the contractor for any part of the work shall not deem that the Owner has accepted the work. The progress payment shall be considered only as an advance against the work done. However, these payments shall be finally adjusted against full and final contract value to be made to the contractor.

(c) Payment will be made against the invoice to be submitted by Contractor against the work done on the basis of accepted unit rates as per Contract in the following manner:

i) Contractor can generate a maximum of 1 RA Bills and a final bill.

ii) One RA bill can be raised by contractor based on the executed quantity till that time and 80 % of the RA Bill amount will be released by GAIL. Remaining 20% of the RA bill will be released along with the Final Bill after due certification and clearance by "Engineer In-charge" on completion of all the works covered in the contract.

8.0 Taxes, Duties, Octroi, Levies Etc.

(a) The quoted prices shall be deemed to be inclusive of all taxes, duties, octroi, levies etc. if any etc. till the completion of the contract and contractor shall not be eligible for any compensation on this account. No statutory variation on this account will be payable by Owner.

(b) Income Tax deductions shall be made from all payments made to the Contractor as per the rules and regulations in force in accordance with the Income Tax Act prevailing from time to time.

(c) Without prejudice to stipulation in General Conditions of Contract, the bidders should quote firm prices inclusive of all taxes, duties and other levies on which no variation will be allowed. The quoted prices shall not subject to price escalation till the work is completed in all respects.

(d) Royalties for construction materials where applicable are included in the unit rates and shall be borne and paid by the Contractor to concerned government authorities of State/ Centre. Owner shall bear no liability in respect of this.

(e) The Contractor shall produce documentary evidence as may be called for Purchaser in respect of taxes, duties, etc., paid by the contractor, along with RA Bill

9.0 Mobilization Advance

No Mobilization Advance will be paid. All payments shall be made as per payment terms

10.0 Site Cleaning

The contractor shall take care for cleaning the working site from time to time for easy access to work site and also from safety point of view

Working site should be always kept cleaned upto the entire satisfaction of the “Site In-charge”/ “Engineer in charge”. Before handing over the works to owner, the Contractor in addition to other formalities to be observed as detailed in the document shall clear the site to the entire satisfaction of “Site In-charge”/ “Engineer in charge”.

11.0 Existing Services

The Contractor will familiarize himself with and obtain information and details which are readily available with the Owner in respect of all existing structures, overhead lines, existing pipelines and utilities existing at the job site before commencing work.

- Drains, pipes, cables, overhead wires and similar services encountered in course of the works shall be guarded from injury by the contractor at his own cost, so that they may continue in full and uninterrupted use to the satisfaction of the Owners thereof, or otherwise occupy any part of the site in a manner likely to hinder the operation of such services.

- Should any damage be done by the contractor to any mains, pipes, cables or lines (whether above or below ground etc.), any other utilities, the contractor must make good or bear the cost of making good the same without delay to the satisfaction of the “Site In-charge”/ “Engineer in charge”.

- Contractor shall ensure that during the progress of the work no damage shall occur to installations due to any reason, if so happens, contractor shall have to repair/replace the same at his own risk and cost.

Contractor shall be solely responsible for making available for executing the work, all requisite Construction Equipment’s, Special Aids, Cranes, Tools, Tackles and testing equipments and appliances. Such construction equipment’s etc. shall be subject to examination by owner and approval for the same being in first class operating condition. Any discrepancies pointed out by owner shall be immediately got rectified, repaired or the equipment replaced altogether, by contractor. Owner shall not in any way be responsible for providing any such equipment, machinery, tools and tackles, etc. The owner reserves the right to rearrange such deployment depending upon the progress and priority of work in various sections

12.0 Additional Works/Extra Works:

Owner reserves their right to execute any additional works/extra works, during the execution of work, either by themselves or by appointing any other agency even though such works are incidental to and necessary for the completion of works awarded to the contractor. In the event of such decisions taken by owner, contractor is required to extend necessary cooperation, and act as per the instructions of “Site In-charge”/ “Engineer in charge”.

The "Schedule of Rates [SOR]" shall be read in conjunction with "SCC", "GCC", "Specifications & Scope of Work" and any other document forming a part of this Contract. The quantities indicated in the "SOR" for the various items are only approximate / indicative, and are subject to wide variations on both ways.

GAIL reserves the right to interpolate or extrapolate the rates for any new item of work not covered in "SOR" from the similar items already available in "SOR". All the works, item-wise, shall be measured upon completion and paid for at the contracted rates. In case, any activity, though specifically not covered in the "SOR" description, but the same is covered under "Specifications & Scope of Work" or required for completion of work in all respect, etc., no extra claim on this account shall be entertained.

13.0 AHR Items

- In items where the quoted rates exceed 50% of the estimated rates, such items will be considered as Abnormally High Rate (AHR) items and payments for AHR items beyond the SOR stipulated quantities shall be made at the lowest amongst the following rates:

- Rate as per SOR, quoted by the Contractor.

- Rate of the item, which shall be derived as follows:

- Based on rates of Machine and Labor as available from the contract (which includes contractor's supervision, profit, overheads and other expenses)

- In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labor plus 15% to cover contractor's supervision profit, overheads & other expenses. Extra Items

- In case any item is not covered in the tender SOR, then the payment for the same shall be made as per the following:

- If the item is not covered in SOR but there is similar item in SOR then rate will be derived from a similar item of SOR

- If the item is not covered in SOR and rate cannot be derived from similar item of SOR then rate analysis will be made on the basis of prevailing market rates plus 15% for contractor's profit and overheads.

14.0 Quality Assurance System:

The bidder shall include in his offer the Quality Assurance Program containing the overall quality management and procedures which is required to be adhered to during the execution of contract. After the award of the contract, detailed quality assurance program to be followed for the execution of contract under various divisions of works will be mutually discussed and agreed to.

Quality Assurance System plans/procedure of the contractor shall cover details of the personnel responsible for the quality assurance, plans or procedure to be followed for quality control in respect of work.

GAIL or their representative shall reserve the right to inspect/witness, review any or all stages or work at site as deemed necessary for quality assurance.

In case contractor fails to follow the instructions of Engineer-In-Charge/Site in Charge with respect to above clauses, payment due to him shall not be released unless until he complies with the instructions to the full satisfaction of Engineer-In-Charge

15.0 Completion Documents:

Contractor shall submit the documents as listed in scope of work as a part of completion document. This document will be in addition to these mentioned in General Conditions of Contract.

16.0 Safety Norms:

- All safety rules and regulations /acts shall be strictly adhered as per Factory Act, 1948 and existing safety rules. Contractor shall ensure that all safety precautions required shall be observed at all times during the execution of the job.

• Health, Safety and Environment (HSE) management requirement to be complied with by the contractors during execution of work.

17.0 Nuisance:

• The contractor or his representative shall not at any time cause any nuisance on the site or do and thing which shall cause unnecessary disturbance to owner or tenants or occupants or their properties near the site and to the public generally.

18.0 Responsibility of Contractor:

• All expenses towards mobilization at site and demobilization including bringing in equipment, work force, materials, dismantling the equipment, clearing the site, etc., shall be deemed to be included in the price quoted and no separate payments on account expenses shall be entertained.

• Contractor shall lay the pipeline in the utility free trench provided by M/s BMRCL as per the specifications mentioned in the contract. However, Liasoning with local agencies and general public, Traffic/road diversion, obtaining additional permissions from the concerned authorities like PWD, High way authorities, Public utilities like Water/Electricity/Telecom etc., State/District/Bangalore Municipal Corporation etc., during the execution of the job is under the scope of the contractor for which no additional payment shall be made.

• Contractor shall be solely responsible for executing the work in all respect. Material, machine & manpower required for the completion of job shall be solely in the scope of contractor. GAIL shall not in any way be responsible for providing any such equipment, machinery, tools and tackles etc.

• GAIL is not responsible for any accident/damage caused to the men, machine & materials of the contractor during the course of attending the job.

• Providing all qualified/skilled personnel to carry out the entire job as per specification given in tender documents and all survey, other equipments, tools, tackles including pipe/cable locator and all other necessary materials and facilities required to complete the job to the entire satisfaction of the Company Representative in accordance with the requirements of the tender document.

• Arranging, acquiring all data, access, permissions and other activities/services required for and/or incidental to performing the work tendered.

• Settling all compensation and disputes arising out of any damages caused by Contractor or Contractor's workmen during the execution of the work.

• Contractor shall carryout all works in strict compliance with applicable documents enclosed with the tender documents.

• The scope of work shall also include any other item/work required to complete the work in all respect as per specifications and instructions of Company Representative whether specifically mentioned here in or not, but required to fulfil this work in all respect.

• Wherever applicable contractor shall obtain all necessary permission/clearance from competent authority to carry out the job. ENGINEER-IN-CHARGE [EIC]:

• There shall be an "Engineer-In-Charge" nominated by GAIL (India) Limited "for these works.

• The "EIC" shall look after general supervision and directions for effectively carrying out the work. He will be authorized to stop the work, whenever such stoppage may be necessary to ensure proper execution of the Contract. He shall also have authority to reject all works, which do not conform to the specifications.

• The "EIC" reserves the right to suspend the work or part thereof at any time and no claim whatsoever on this account shall be entertained. In case of any dispute, the Contractor may appeal to the "EIC", whose decision shall be final and binding on the Contractor.

19.0 Defence of Suits:

• If any action in court is brought against the owner or an officer or agent of the Owner, for the failure, omission or neglect on the part of the Contractor to perform any acts, matters, convenient or things under the Contract or damage or injury caused by the alleged omission or negligence on the part of the Contractor, his agents, representative or his sub-Contractors or in connection with any claim based on lawful demand of sub-Contractor's workmen suppliers or employees, the Contractor shall in such cases indemnify and keep the Owner and/or their representatives harmless from all lessons, damages, expenses or decrease arising out of such action.

20.0 Instructions to Bidder:

• All bidders are required to read tender documents carefully and do the site inspection before quoting rates and submission of tender paper.

• Payment will be made strictly on the basis of SOR only. No separate/other payment shall be made on account of works which are not mentioned in the tender document but some are required to be done for completion of work in all respect.

• It will be assumed that tender documents have been fully read understood by the tendered irrespective of the fact whether they have done so or not and no claim on this account shall be entertained at a later date.

• It is presumed that the bidder /tendered has physically seen /understood the site /scope of work prior to bidding and any clarification to this effect has been clarified from GAIL. No clarification or withdrawal of bid should be entertained after submission of same. DEFECT LIABILITY PERIOD

• Defects liability period shall be One year from the date of completion for each individual work.

• During defect liability period, if any deficiency/ defect noticed in the works, contractor shall rectify and restore the same at his own risk and cost. SECURITY DEPOSIT / CONTRACT PERFORMANCE GUARANTEE • Clause in GCC pertaining to Security Deposit / Contract Performance Guarantee is modified to the extent stipulated below:

• A sum of 3% (in the form of DD or Bank Guarantee) of the basic contract value shall be deposited by the contractor as “Security Deposit / Contract Performance Guarantee” with the OWNER within 30 days of FOA/LOA, which will be kept valid for 3 months beyond the Defect Liability period.

• The security deposit shall remain at the entire disposal of the Owner as a security for the satisfactory completion of defect liability period in accordance with the conditions of contract.

• No interest shall be payable by the company to the contractor for the amount of S.D.

21.0 Supervision of Work:

- The contractor shall have one or more experienced supervisors, as per the requirement and site conditions. He should be able to manage site activities while executing the job at site and guide his personnel to carry out the work as and when required as per the instructions of the Engineer In charge.

22.0 Price Reduction Schedule:

- **Non-mobilization/ Delay in Mobilization** after the award of the contract shall be dealt as per PRS clause & other contractual provision in GCC.

- **Non-performance/Delay** at contractor's end in execution beyond the date of completion/ target as mentioned in the Intimation letter/LOA will attract PRS @ Half percent (1/2 %) of the contract value for each week of delay or part thereof subject to a maximum of Five percent (5%) of the contract value (excluding tax).

23.0 Defect Liability Period:

- Defects liability period shall be One year from the date of completion for each individual work.
- During defect liability period, if any deficiency/ defect noticed in the works, contractor shall rectify and restore the same at his own risk and cost.

Annexure-II

STANDARD CONDITIONS OF SCC: PART II

Compliances under various Labour Laws

The Contractor has to fully comply with all applicable Labour Laws and Regulations passed, modified and notified from time to time by the Central, State and Local Government agencies/authorities. Specific attention of the Contractor is drawn to the following obligations amongst others:

1. **The Minimum Wages Act, 1948, Payment of Wages Act, 1936 and Payment of Bonus Act 1965** or **The Code on Wages, 2019 (after it comes into force)**

1.1. **Minimum Wages:**

a. During the tenure of the contract, the Contractor must ensure the payment of minimum wages, as notified by the Central Government or State Government whichever is higher, as per the provisions of the Minimum Wages Act, 1948 / Code on Wages, 2019 (after it comes into force).

b. **Wage period and monthly wages**: Wage period shall be monthly and wages for a month shall be calculated by multiplying daily rate of Minimum Wages by 26. The monthly wages include the wages of the weekly days of rest as applicable to the office/establishment of GAIL. Deduction in case of any days of absence other than weekly days of rest shall be calculated using the following formula:

Deduction for absence = days of absence x applicable wage rate

1.2. **Payment of Wages:**

The Contractor shall disburse monthly wages **through e-banking / digital mode through cashless transaction only**, and avoid illegitimate deductions and maintain records /returns as prescribed. The Contractor shall be solely responsible for the payment of wages and other dues to the resources, if any, deployed by him latest by 7th day of the subsequent month as per the provisions of the Payment of Wages Act, 1936 / as applicable under Code on Wages, 2019 (after it comes into force) in the presence of Engineer In-charge (EIC) or authorized representative of GAIL. After disbursement of wages, the representative of the Contractor and EIC/ authorised representative of GAIL have to certify the payment of wages to the resources and sign the Wage Register - Form B (under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017) / FORM-I of Code on Wages, 2019 (after it comes into force) with specific seal detailing name/designation/Company.

1.3. **Payment of Bonus:**

Contractor shall ensure payment of bonus as per the provisions of the Payment of Bonus Act, 1965 / Code on Wages, 2019 (after it comes into force). Present minimum rate of payment of Bonus as per the Payment of Bonus Act, 1965 is 8.33% of minimum wages per month or 8.33% of Rs.7,000/- p.m. whichever is higher. The rate shall be subject to amendments made from time to time to the legislation.

Payment of Bonus / ex-gratia (if Bonus is not applicable) shall be made preferably before Deepawali festival falling after the end of relevant financial year(s) and the balance payment at the time of closure of contract.

For service contracts, the payment towards the bonus/ex-gratia (made on yearly basis) shall be released / reimbursed to the contractor, after submission of proof of payment. No reimbursement shall however be applicable in work contract.

2. Leaves/ Leave with wages/ Holiday:

The Contractor shall comply with all the applicable leave Rules including leave with wages in terms of applicable labour legislations i.e. Factories Act, 1948 / Shops & Establishment Act/ **Industrial Establishment** (**national** & **festival holidays**, **casual** & **sick leave**) **Act**, 1965.

The Contractor shall extend the leave with wages and maintain the Register of Leave pertaining to the resource deployed. The payment towards un-availed leave, as per the Factories Act, 1948 / Shops & Establishment Act, shall be settled with the resource at the time of closure of the contract or separation of resource from the contract by the contractor.

i. As per the **Factories Act, 1948 (if applicable**):- Annual leave with wages @ 01 day for every 20 days of work performed by him in the previous calendar year becomes due.
ii. As per the **Shops & Establishment Act (if applicable)** : Privilege Leave not less than 15 days and Sickness/Casual Leave not less than 12 days (this provision may vary from state to state).

iii. **As per the Industrial Establishment (National & Festival Holidays, Casual & Sick Leave) Act, 1965 (if applicable) / Negotiable Instrument Act 1881 / Shops & Establishment Act (as applicable):** (a) three national holidays of one whole day each on the 26th January, 15th August and 2nd October (b) five other holidays on any of the festivals specified in the - Schedule appended to this Act. (c) Every worker shall in each calendar year, be allowed by the employer 07 casual leave and 14 sick leave in such manner and on such conditions as may be prescribed (This provision may vary from state to state).

3. The Employees' Provident Fund & Miscellaneous Provisions Act 1952

a) The Contractor shall have independent PF code no. with the RPFC as required under the Employees' PF & Misc. Provisions Act, 1952.

b) The Contractor has to ensure compliance (as per prevailing rates) and extend benefits under the Employees' Provident Fund Scheme 1952, the Employees' Pension Scheme 1995 & the Employees' Deposit Linked Insurance Scheme, 1976 to the resources deployed by him.

c) The Contractor is required to submit copies of ***separate e-Challans / ECR alongwith proof of payment/receipt*** in respect of resources engaged through this contract only, on monthly basis. **Common challans would not be acceptable in GAIL**. The Contractor should submit copies of previous months EPF e-Challans / ECR alongwith current month's bill. The TRRN. No. of the ECR would be verified online from EPFO portal by the Engineer-in-charge to confirm the status of payment and names of the resources deployed.

d) **PF is mandatory irrespective of the number of resources deployed** by the Contractor under this contract. PF membership and deposit of PF contribution(by both employee and employer) is also mandatory even if the wage payment to the resource is exceeding the prescribed monthly wage ceiling (i.e. Rs. 15,000/-) under the Employees' PF & Misc. Provisions Act, 1952 and in such case the liability of the Contractor towards PF contribution shall be limited to the prescribed monthly wage ceiling notified from time to time (i.e. Rs. 15,000/- currently).

e) In case, the Contractor deploys any "**International Worker**", the Contractor should also make compliance under para 83 of EPF Scheme, 1952 i.r.o the "International Workers" and must register on the ***International Worker Portal of EPFO***.

4. The Employees' State Insurance Act, 1948 (If applicable and as per prevailing rates)

a) The Contractor shall have his own ESI code No. allotted by Employees' State Insurance Corporation (ESIC) as required under the Employees' State Insurance Act, 1948.

b) The Contractor has to arrange **Smart Cards (i.e. ESI Identity Card) /e-Pehchan Card** for the resource(s) engaged by him from the Corporation.

5. The Employees' Compensation Act 1923 (wherever applicable in lieu of ESI)

In case, the work place is out of the notified coverage area under ESIC i.e. ESIC is not implemented in the area **or** in case of excluded employees under ESIC, the Contractor is required to take Employee Compensation / Workmen Compensation Policy from IRDAI approved Insurance Company taking into consideration the maximum compensation liability as

per provisions of Employees' Compensation Act, 1923. It must be ensured that the contractor/contracting firm should extend coverage to the contract workers through Employee Compensation Policy, to meet the Compensation Liability under **Employee's Compensation Act, 1923 along with Medi-claim Floater Policy with a coverage of Rs 3 Lakhs per resource covering his/her spouse and two children.**

6. Group Personal Accident Insurance Policy

The Contractor is required to take a Group Personal Accident Insurance Policy with coverage of **Rs. 5 Lakhs (covering death, permanent disability + partial disability)** per resource for the entire period of contract covering all resources deployed under the contract.

7. **The Payment of Gratuity Act, 1972**

In case of Death or permanent disablement of a resource during execution of work under the contract, the Contractor has to pay the Gratuity as per the provision under the Payment of Gratuity Act, 1972 to the nominee(s) of the resource as per the details maintained in the duly signed Nomination Form maintained by the Contractor. **The proof of disbursement may be submitted to the EIC for claiming reimbursement of amount paid towards death Gratuity from GAIL**.

8. **The Contract Labour (R&A) Act, 1970**

a) The Contractor is required to obtain Labour license under the provisions of the Contract Labour (R&A) Act, 1970 from the office of Licensing Officer, Central Labour Authority, Ministry of Labour and Employment, Govt. of India having jurisdiction of the Region.

b) The Contractor shall discharge obligations as provided under the Contract Labour (R&A) Act, 1970 rules and regulations framed under the same and enforced from time to time.

c) The Contractor shall ensure regular and effective supervision and control over the resources deployed for which a supervisor / representative of the Contractor should be available at all the times for giving suitable direction for undertaking the Contractual Obligations.

d) The Contractor is solely responsible for payment of wages to each resource deployed by him and such wages shall be paid before the expiry of such period as may be prescribed.

e) It shall be the duty of the Contractor to ensure the disbursement of wages to resource(s) through e-banking/digital mode. In case the resource does not have a bank account, the disbursement of wages may be made in cash in the presence of the Engineer-in-charge / authorized representative of GAIL initially and Contractor shall simultaneously arrange for opening the bank account of each contract labour deployed by him.

f) In case, the Contractor fails to make payment of wages and deposit of PF contribution within the prescribed period or makes short payment of wages / short deposit of PF contribution, it shall be treated as FAILURE and action as per the provisions of General Conditions of Contract shall be taken. Further, GAIL, as Principal Employer, will make payment of wages in full or the unpaid balance due, as the case may be, to the resource(s) deployed by the Contractor and deposit the PF contribution with PF authorities. Such amounts will be recovered from the

Contractor either by deduction from any amount payable to the Contractor under any contract or as a debt payable by the Contractor.

9. The contractor is required to comply with all applicable labour laws and regulations including, but not limited to the following:

a) The Factories Act, 1948 / The Shops & Establishment Act, 1948 (which ever applicable)
b) The Maternity Benefit Act, 1961
c) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1979 & Building and Other Construction Workers Welfare Cess Act, 1996
d) The Inter State Migrant Workmen (RECS) Act 1979 (if applicable)
e) Contract Labour (R&A) Act-1970
f) Employees' Provident Fund & Misc. Provisions Act- 1952
g) Employees' State Insurance Act-1948
h) Employees' Compensation Act, 1923
i) Payment of Gratuity Act, 1972
j) Minimum of Wages Act,1948
k) The Payment of Wages Act,1936
l) The Payment of Bonus Act,1965

STANDARD CONDITIONS OF SCC: PART III

Responsibilities of the Contractor

1. The Contractor shall be solely responsible and indemnify GAIL against all charges, dues, claim etc. arising out of the disputes relating to the dues and employment of resources, if any, deployed by him.

2. The Contractor shall indemnify GAIL against all losses or damages, if any, caused to it on account of acts of the resource(s) deployed by him.

3. The Contractor shall indemnify GAIL from all claims, demands, actions, cost and charges etc. brought by any court, competent authority / statutory authorities against GAIL.

4. The Contractor shall also indemnify GAIL for any action brought against him for violation, non-compliance of any act, rules & regulation of center / state / local statutory authorities.

5. All resources deployed by the Contractor are deemed to be on the rolls of the Contractor.

6. **Age**: No resource below the age of **18 years** shall be deployed by the contractor for the execution of the contract. However, maximum age of resources deployed under the contract would be 60 years. (In case of Security and Fire & Safety Services, no resource below the age of 18 years shall be deployed by the contractor for the execution of the contract. However, in view of nature of duty, for efficacy & efficiency purpose, resources will be deployed up to the age of 58 years. However, the age limit can be relaxed for a further period of two (02) years up to the age of 60 years if the contract worker is competent, efficient and medically fit i.e. physically fit with good health, good eye sight without any disease. The contractor has to produce Medical Fitness Certificate, to this effect, against such contract workers if deployed beyond 58 years).

7. **Appointment/Nomination of supervisor:**
   As a part of the contract, the Contractor is required to appoint/nominate a supervisor (s) who will supervise, control and give directions to the resource(s) for discharging the contractual obligations. Accordingly, the Contractor has to give in writing the name and contact details of the supervisor (s) to the EIC. A copy of the same is also to be sent to HR In-charge and Security In-charge for records.

8. A copy of the Letter of Acceptance (LOA) should be submitted to the Security Department by the Contractor / his representative or supervisor for facilitating the movement of resource(s) including machine & materials involved in the contract.

9. The resources to be deputed/ deployed by the Contractor shall observe all security, fire and safety rules of GAIL while at the site/work. All existing and amended safety / fire rules of GAIL are to be followed at the work site by the Contractor and his deployed resource(s).

10. **Personal Protective Equipment / Safety Kit and Liveries**: Contractor shall ensure adequate supply of personal protective equipment / Safety Kit and Liveries as mentioned in the Scope of Work to all such resources deployed.

11. In case of accident, injury or death caused to the resource(s) while executing the Work under the contract, the Contractor shall be solely responsible for payment of adequate compensation, insurance money etc. to the next kith & kin of injured / diseased. Contractor shall indemnify GAIL from such liabilities.

12. The Contractor shall not deploy any resource suffering from any contagious or infectious disease. The Contractor shall get the deployed resource(s) examined from a civil Govt. Doctor / GAIL's Doctor.

13. No resource(s) or representatives of Contractor (including Contractor) are allowed to consume alcoholic drinks or any narcotics within the premises of GAIL (including Plant, Office and Residential etc.). If found under the influence of above, the Contractor shall immediately replace that resource(s) with intimation to the EIC.

14. While engaging / deploying the resources, the Contractor is required to make efforts to provide opportunity of employment to resources belonging to **Schedule Caste, Schedule Tribe** and **Other Backward Class** in order to have a fair representation of these sections of the society.

15. While engaging the resources, the Contractor is required to make efforts to provide an **opportunity to** candidates with experience of **apprentice training in GAIL** under the provisions of the Apprentices Act, 1961.

16. The Contractor is required to maintain all Registers and other records in an **office** within the premises of GAIL or at a place **within a radius of three kilometers**.

17. Contractor shall provide proper **Employment cards (FORM XII)** for the resource to be deployed by him, duly signed by the Contractor or authorized person on behalf of Contractor.

18. **Gate/ Entry Pass or Authorization:**
    Entry to the premises of GAIL is restricted and is subject to appropriate entry authorization in the prescribed format of a Gate Pass or any other entry authorization w.r.t police verification as per instruction of Security department from time to time. Similarly, entry for material/ equipment's/ tools/ tackles etc. is restricted & subject to entry authorization by security department.

19. The Contractor shall issue **Identity cards** in his firm's name to the resource deployed.

20. Discipline of the resource(s) during discharge of duties must be regulated by the Contractor himself or by his representative.

21. **Police verification**
    a) The Contractor (including his sub-Contractors/Petty Contractors etc, if allowed) will undertake police verification in respect of the resource(s) engaged by him in GAIL's premises. Such verification will have to be carried out from concerned police station of their permanent place of residence/present place of residence.
    b) Further, the Contractor is advised not to deploy any resource having past criminal record in the establishment/premises of GAIL under this contract awarded to him.
    c) In the event of violation of above clauses at (a) and (b), the Contractor will be solely responsible for the same.

d) If any such resource(s) having criminal record is deployed by the Contractor in the premises of GAIL and has come to the notice of GAIL at any point of time, the Contractor shall immediately replace that resource(s), failing which that particular resource(s) of the Contractor will not be allowed to enter into the premises of GAIL.

22. While confirming to any of these conditions, the Contractor must ensure that all applicable Laws of State regarding labour, their welfare, conduct etc. are complied.

23. The contractor shall ensure the KYC of contract workers in EPFO portal at all time during the period of contract and submit as proof of the same to the Engineer-in-charge periodically.

24. The contractor shall ensure that the nomination of contract workers deployed by him under the said contract is duly updated in the EPFO Portal periodically.

STANDARD CONDITIONS OF SCC: PART IV

Compliance of Government of India Directives

1. Pradhan Mantri Suraksha Bima Yojna (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY)

Contractor shall, ensure that all its resources deployed under the contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of GAIL. The contractor shall submit evidence / proof to GAIL in this respect. Both the schemes are to be regulated continuously on yearly basis and the same should be renewed on each successive relevant date in subsequent years during the period of the contract.

2. Labour Identification Number (i.e. LIN) Registration (Mandatory)

The Unified Shram Suvidha Protal, developed by Government of India, facilitates reporting of Inspections & submission of Returns and has also been envisaged as a single point of contact between employer, resources and enforcement agencies bringing in transparency in their day-to-day interactions. For integration of data among various enforcement Agencies, the Contractor, as an inspectable unit, is required to register and obtain Labour Identification Number (i.e. LIN) from Shram Suvidha Portal and submit the same in GAIL.

3. Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) / Aatmanirbhar Bharat Rozgar Yojana (ABRY)/ Pradhan Mantri Garib Kalyan Yojana– if applicable

In order to support the Govt. of India's Initiative on Employment Generation, the Contractor must register for Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) Scheme / Aatmanirbhar Bharat Rozgar Yojana (ABRY)/ Pradhan Mantri Garib Kalyan Yojana (as applicable). In service contracts, the Contractor shall inform GAIL/Engineer in Charge about the benefit availed, if any, against the scheme for adjustment against the invoice(s) / bill(s).

Annexure-V

STANDARD CONDITIONS OF SCC: PART V

Records and Registers

1. Maintenance of records and registers

The Contractor is required to maintain statutory records and registers for applicable labour laws as prescribed under the following rules:

a) Ease of Compliance to Maintain Registers under the various Labour Laws, 2017
b) Rationalization of Forms and Reports under Certain Labour Laws Rules, 2017
c) Labour Codes (after they are made effective by Government of India)

2. The Contractor has to maintain the following (but not limited to) Registers/ Forms/ Reports / Returns at all times:

a) Employee Register in FORM A (to be replaced by FORM – IV of Code on Wages-2019 after it comes into force)
b) Wage Register in FORM B (to be replaced by Register of Wages, Overtime, Fine, Deduction for damage and Loss in FORM – I of Code on Wages-2019 after it comes into force)
c) Register of Loan / Recoveries in FORM C
d) Attendance Register in FORM D
e) Register of rest/leave/leave wages in FORM E
f) Copies of Wage Slips in FORM XIX (to be replaced by FORM – V of Code on Wages-2019, after it comes into force)
g) Copies of Employment Card in FORM XII

3. Documents to be submitted by the Contractor to EIC at various stages during the currency of the contract

a) Immediately after issuance/receiving of Letter of Acceptance (LOA)

i. Details as required for issuance of **FORM - VII (Notice of Commencement of Work)**
ii. Application for issuance of **FORM –III** (**Form of Certificate by Principal Employer)** for obtaining Labour License from Licensing Authority for engaging 20 or more resources.
iii. Copy of **FORM - VI** (**License**) before commencement of work if 20 or more resources are engaged.
iv. Copy of **Provident Fund Registration Certificate** issued by concerned Regional Provident Fund Commissioner.
v. Copy of **ESI Registration Certificate** issued by concerned ESIC.
vi. Copies **Insurance Policy(ies)** as mentioned at ***Annexure-iv***
vii. Copy of **Labour Identification Number (i.e. LIN)** Registration done in **Shram Suvidha Portal** of Govt. of India.
viii. Copy of registration under the Building and other Construction Workers (RE&CS) Act, 1996 in case the contractor employs ten or more building workers in any building workers in any building, or other construction work.

b) At the time of submission of monthly bills

i. Copy of **Employee Register in FORM – A** under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017 (to be replaced by FORM **– IV** (of Code on Wages-2019, after it comes into force).
ii. Copy of **Wage Register in FORM – B** under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017 (to be replaced by Register of Wages, Overtime, Fine, Deduction for damage and Loss in FORM – I of Code on Wages-2019, after it comes into force) duly certified by **authorized representative** of the Contractor and **authorised person** in GAIL certifying as "***Certified that the amount shown in the column No. ---- has been paid to the workman concerned in my presence on------(date) at***

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-------(place)" along with **copy of bank statement** duly certified by bank and copy of online transaction statement against each resource with details of name, account number, amount paid & date of payment as proof of **Cashless Transaction / Payment of wages through e-banking/digital mode**.

iii. As a part of compliance and proof of depositing Provident Fund, EDLI and ESI contributions the Contractor shall submit copies of the ***Separate eChallans / ECR,*** bank receipts/bank statement in respect of resources deployed in GAIL in the previous month in this contract. The documents should also contain details of resources, PF account No., ESI No., contributions of resources and employer etc.

iv. Dully filled in details as per ***Annexure- i.***

v. Copy of Wage Slips in FORM XIX

vi. Proof of deposit of Cess under The Building and other Construction Workers' Welfare Cess Act, 1996, (if applicable)

c) At the time of closure of contract

i. **Indemnity Bond** of Rs. 100/- duly notarized from Notary indemnifying GAIL from all liabilities w.r.t. the resource engaged by the Contractor regarding payment of wages, Provident Fund/ESI contributions, Insurance and other statutory payments. Format for Indemnity Bond is enclosed at ***Annexure- ii.***

ii. Copy of the **Wage Register** in **FORM – B** (to be replaced by FORM-I of Code on Wages-2019 after it comes into force) for the last month.

iii. Copies of **Service Certificates** issue to resource in **FORM VIII**

iv. Copy of the ECR related to EPF and ESIC Compliance in respect of Resource.

v. Details as required for issuance of **FORM - VII (Notice of Completion of Work)**

vi. Copies of FORM-C & FORM –D under the Payment of Bonus Act 1965 as proof of payment towards Bonus.

vii. Copy of proof towards release of Leave Encashment

viii. Copies of No Dues Certificate from contract workers stating they have received all statutory payments and social benefits.

ix. Proof towards PF KYC compliance of contract workers

x. Proof of deposit of total Cess under The Building and other Construction Workers' Welfare Cess Act, 1996 (if applicable) with final assessment from respective Cess Collector(s).

4. **Verifications of bills and documents submitted by the Contractor**

Before certifying/verifying the running/ final bill/invoice of the Contractor, the designated EIC of the respective contract of GAIL, shall verify from the ECRs of PF/ESI, through respective web portals, the detail/status of the payment made by the Contractor. In case the information furnished by the Contractor is found to be incorrect, GAIL shall take appropriate action against the Contractor under relevant conditions as available in the tender document.

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Annexure-i

Details in support of RA Bill for the Month of _____, 20__

(1) Name of the Firm/Agency/Contractor _____
(2) Nature of Contract: Job/ Service _____
(3) Period of Contract: From _____to _____
    (a) Extension Period of Contract, if any from _____to _____
    (b) Place where contract workmen are working _____
(4) Postal address of the Contractor: _____
(5) Phone No. of the Contractor: _____
(6) Fax No. and Email of the Contractor: _____
(7) Name and Address of PF office from where EPF Code No. has been allotted:
(8) _____
(9) EPF Code No. allotted by PF office: _____
(10) Name and Address of ESIC office from where ESI Code No. has been allotted: _____
(11) ESI Code No. allotted by ESIC office: _____
(12) Labour License No. _____ dated _____
(13) Validity period of Labour License from _____to _____
(14) Detail of Resource engaged by the Contractor:

Category	**No. of Resources**		**Prevailing Minimum Wages**
	Male	**Female**	
Unskilled			
Semi-skilled			
Skilled			
Highly skilled			
Total			

(15) Copy of Wage Register in FORM – B (to be replaced by FORM-I as per Code on Wages-2019, after it comes into force)
(16) Details of deposit of contribution towards EPF:
    a) EPF Challan No. _____Amount _____ Date_____
(17) Details of Deposition of contribution towards ESI
    a) ESI Challan No. _____Amount _____ Date _____
(18) Whether any arrangement / agreement has been entered with any resource for extending benefits under Inter-state Migrant Workmen (RE&CS) Act, 1979: ____ (Yes / No)
    If Yes, No. of such Inter-state Migrant Workers: _____

SIGNATURE OF CONTRACTOR/AUTHORIZED REPRESENTATIVE
Place:
Date:

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Annexure-ii

INDEMNITY BOND

WHEREAS GAIL(India) Limited (hereinafter referred to as GAIL) which expression shall, unless repugnant to the context include their legal representatives, successors and assigns, having their Registered Office at 16, Bhikaiji, Cama Place, R.K. Puram, New Delhi has entered into a CONTRACT with <***name of the Contractor***> Incorporated (hereinafter referred to as the ('CONTRACTOR') which expression shall unless repugnant to the context include their legal representatives, successors and assigns, having their Registered Office ---------- for Rs. ----------for <***NAME OF THE CONTRACT***> **---- for a period of**----------" and on the terms and conditions as set out, inter-alia in the Letter of Acceptance No. ----------and various documents forming part thereof hereinafter collectively referred to as the 'CONTRACT' which expression shall include all amendments, modifications and / or variations thereto.

GAIL has also requested the CONTRACTOR to execute an Indemnity Bond in favour of GAIL indemnifying it from all consequences which may arise out of any Case filed by any Resources/ vendors/ sub- Contractors /partner etc. who may have been engaged by the CONTRACTOR directly or indirectly with or without consent of GAIL for above works , which may be pending before any court of Law including Quasi-Judicial Authority , Competent Authority, Labour Court , Arbitrator , Tribunal etc. and the Contractor has readily agreed for the same.

NOW, THEREFORE, in consideration of the promises aforesaid; the CONTRACTOR hereby irrevocably and unconditionally undertakes to indemnify and keep indemnified GAIL from any loss, which may arise out of any such contract/Case. The CONTRACTOR undertakes to compensate to GAIL forthwith, on demand, without protest the loss suffered by GAIL together direct / indirect expenses.

AND THE CONTRACTOR hereby agrees with GAIL that:

(i) This Indemnity Bond shall remain valid and irrevocable for all claims of GAIL arising from any such contract/case for which GAIL has been made party until now or here-in- after.

(ii) This Indemnity Bond shall not be discharged / revoked by any change / modification / amendment / deletion in the constitution of the firm / Contractor or any conditions thereof including insolvency etc. of the CONTRACTOR but shall be in all respects and for all purposes binding and operative until any claims for payment are settled by the Contractor.

The undersigned has full power to execute this Indemnity Bond on behalf of the CONTRACTOR and the same stands valid.

SIGNATURE OF CONTRACTOR/AUTHORIZED REPRESENTATIVE

Place:
Date:

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Annexure-iii

UNDERTAKING

(To be submitted along with un-priced bid)

I/We hereby undertake that I/We have completely understood the terms & conditions of the Tender including minimum resources required to be deployed and the cost involved thereof in deployment of resources.

I/We further undertake to ensure all compliances of the tender conditions. Any non-compliance may be construed as deficiency in the performance of the contract. If such non-compliance is noticed GAIL/owner is at liberty to take action in line with the tender conditions including termination of the contract.

Signature of Bidder…….
Name of Bidder……

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Annexure -iv

Summary of Insurance Policies

Contractor is required to cover all resources deployed by him with the following insurances / schemes:

Sl. No.	**SCHEME**	**APPLICABILITY**	**PREMIUM/ CONTRIBUTION**	**SUM ASSURED/ BENEFITS**	**REMARKS**
1	The Employees' State Insurance Act, 1948	Applicable to all resources of the Contractor (within ESI wage limit) working in notified area.	3.25% of wages by employer 0.75% of wages by employees	Benefits under the Employees' State Insurance Act, 1948.	
2	The Employees' Compensation Act, 1923 (in lieu of ESI – mentioned at Sl. 1)	Applicable to excluded employees under ESI and those who are working in non-notified area to extend similar benefits as available under ESI Act, 1948	Premium to be calculated considering wage limit under EC Act, 1923 (i.e. Rs. 15,000/- p.m currently)	Maximum **Compensation Liability** under Employee's Compensation Act, 1923 along with **a Medi-claim Floater policy** with a coverage of Rs 3 Lakhs per resource covering his/her spouse and two children	Provides compensation and medical facility to resources.
3	Group personal Accident Insurance	Applicable to all resources of the Contractor	Based on the coverage	Insured value: Rs. 5 Lakh to cover expenses associated with any accident.	Death, permanent disablement, temporary total disability or any other medical expenses related to accident.
4	Pradhan Matri Suraksha Bima Yojana (PMSBY)	Eligibility – age group 18 to 70 years	Rs. 12/- per annum	**Accidental** death and permanent disability: (i) Permanent total disability – Rs. 2 lakhs. (ii) Permanent partial disability – Rs. 1 Lakh.	
5	Pradhan Mantri Jeevan Jyoti Bima Yojana(PMJJB)	Eligibility – age group 18 to 50 years. (can continue upto 55 years)	Rs. 330/- per annum.	Risk coverage – Rs. 2 Lakhs- in case of **death due to any reason**	

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ENERGISING QUALITY	**SCOPE OF WORK**	GAIL
	CLIENT JOB NO	BEN-006-4100000327-047-04.02.2019
	TOTAL SHEETS	22

DOCUMENT NO.	1015	47	PP	SOW	2001

GAIL (INDIA) LIMITED

REROUTING / SHIFTING OF 18" X 800 MTR. LONG PIPELINE SECTION NEAR MANYATA TECH PARK IN BANGALORE CITY

00	19.07.2020	ISSUED FOR BID	RK	MD	AD
D2	17.07.2020	ISSUED FOR CLIENT APPROVAL	RK	MD	AD
D1	28.04.2020	ISSUED FOR CLIENT APPROVAL	RK	MD	AD
C1	27.03.2020	ISSUED FOR CLIENT REVIEW	AK	MD	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

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1. INTRODUCTION

GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain and its related services. In a rapidly changing scenario, GAIL is spearheading the move to a new era of clean fuel industrialization, creating a quadrilateral of green energy corridors that connect major consumption center in India with major Gas Fields, LNG terminals and other cross border gas sourcing points. GAIL is also expanding its business to become a player in the International Market. M/s. GAIL (India) Limited envisages to strengthen local gas grid network in various parts of India.

VCS Quality Services Private Limited has been appointed as Engineering Consultant by GAIL for “REROUTING / SHIFTING OF 18" PIPELINE AT MANYATA TECH PARK IN BANGALORE REGION” due to coinciding with Proposed Metro corridor in Bangalore City.

2. PROJECT SCOPE

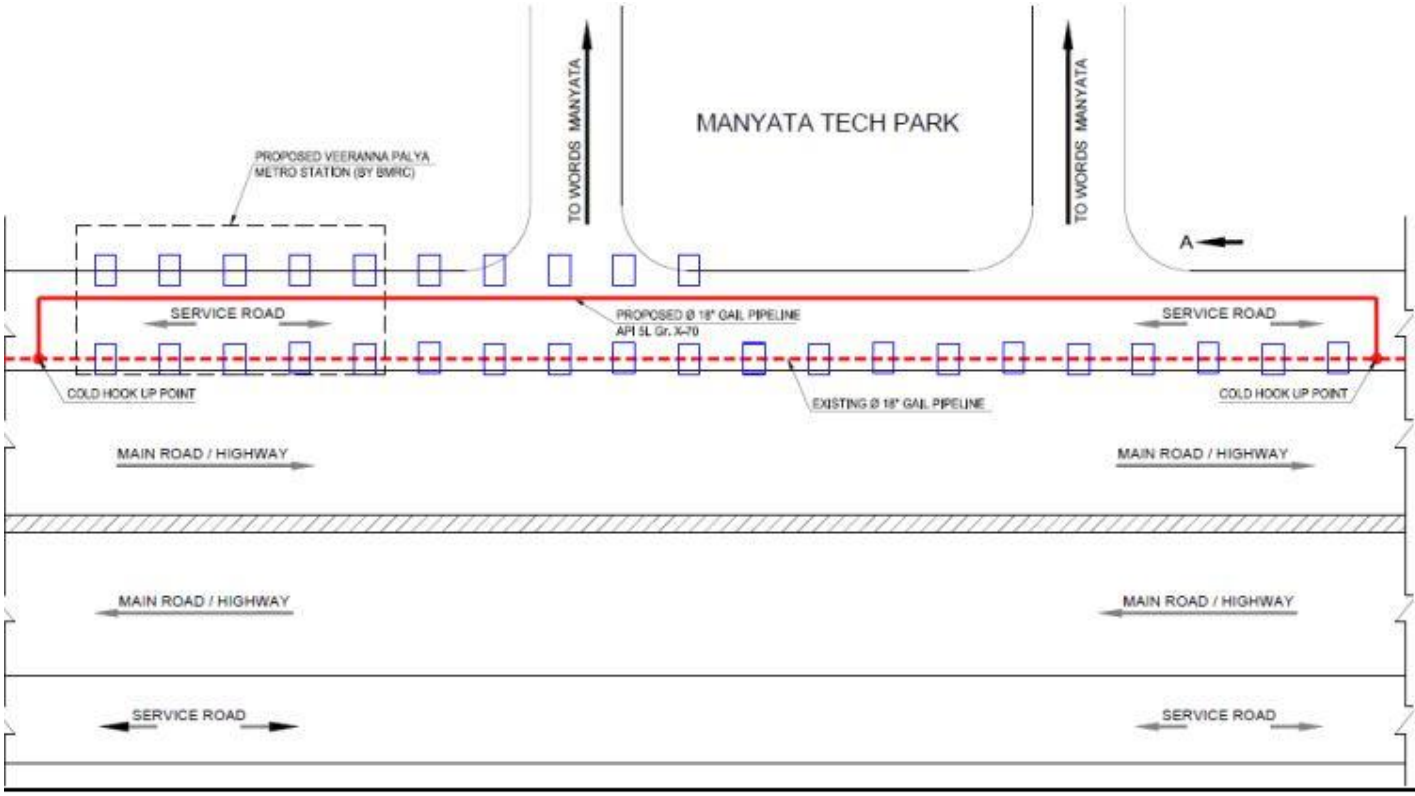
This document covers the details of existing Pipeline to be abandoned, laying of proposed re-routed pipeline section & scope of material supply pertaining to pipeline and hook up works and other requirements

The scope consists of Re-routing of existing underground 18” DBPL pipeline of GAIL’s to facilitate proposed Metro pillar construction in that route and Laying of rerouted section at Ch. 39.400 Km to Ch. 40.200 km– In front of Manyata Tech Park along the outer ring road Bangalore city. The total length of the section required to be re-routed is approximately 800 Mtr. out of which approximately 530 Mtr. has already been constructed and laid. Remaining 250-300 Mtr., approximately, line section to be laid through this contract. Hook-up of the entire 800 Mtr. section along with hydrotest, drying-swabbing & back filling up to 500 mm from pipe top of new section of 250-300 Mtr. will be the part of the scope of this contract.

The scope of work can broadly be classified as below.

1. Construction of 18” x 250-300 Mtr. new line section along with cleaning, hydrotesting, drying, backfilling up to 500 mm from pipeline top, civil work required during line laying, supply & installation of OFC duct, joint kit, blowing of OFC (supply of OFC will be in the scope of GAIL). Trenching will be done by BMRCL, however, minor manual excavation which may be required during laying line shall be in the scope of this contract. Backfilling of remaining portion of trench including road restoration shall not be part of this contract.

2. Hydrotesting of 18" x 530 Mtr. section including cleaning, flushing, de-watering, drying-swabbing. This line section has already been laid & backfilling is also done.
3. Hook-up of the entire 800 Mtr. section (530 Mtr. already laid plus 270 Mtr. to be laid) with existing 18" Bangalore city line.



3. DEFINITIONS

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

PROJECT	REROUTING / SHIFTING OF 18" PIPELINE NEAR MANYATA TECH PARK, ANGALORE REGION
OWNER	GAIL (India) Limited
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of OWNER for the Engineering Services.
MANUFACTURER	The party, which manufactures and supplies equipment and services to the OWNER or to Contractor

SOW	Scope of Work
DBPL	18" Dabhol Banglore Pipeline

4. WORK TENDERED

Rerouting/ shifting of 18" X 0.800 Km (Approx.) Long Pipeline Section at Ch. 39.400 Km to Ch. 40.200, in between SV-3B to SV-4B near Manyata Tech Park:

- Excavating up to required depth and Dismantling of 18" pipeline section at Ch. 39.400 Km and Ch.40.200 Km including cutting, grinding, Beveling of ends and Abandonment of the existing sections by plugging at both ends and inertization by nitrogen purging.
- Nitrogen Purging of existing 18" pipeline from SV 3B to SV 4B by mobilizing Liquid Nitrogen Tankers and vaporizers to free from hydrocarbon particles and to make ready for hook up and for re-commissioning.
- Laying of 18" x 0.270 km (approx.) long pipeline section
- Pipeline shall be laid by open cut method in utility free trench provided by M/s BMRCL for laying of the pipeline. Contractor shall visit site prior to bidding and shall consider all these eventualities while bidding. Contractor may plan to work in the Night shift to avoid traffic and to keep minimum disturbance during day time.
- Hook up of new proposed pipelines with existing main line at both the end.
- Hook up needs at each location to be planned and completed in a single day of 24 hr. shutdown time. Deployment sufficient crews for completion of Hook Up in stipulated time
- Hydro test, dewatering, swabbing, drying of the new section.
- All works related pre-commissioning & commissioning assistance of the new section of pipeline including purging and supply of nitrogen.
- Updating earlier as built drawings based up on the new facilities introduced.
- Liaisoning with various authorities during work.
- Fabrication of 2" line including welding, cutting, grinding, radiography of joint, hydrotesting up to 50 Kg/cm2 for 4 Hrs,. Installation of the fabricated line between the flanges inside SV-4B including supplying gaskets, fasteners etc. Cutting the fabricated line after the job to the desired size of pieces as per EIC instruction. Lifting the material from GAIL store, transportation and returning back the used/ unused material

5. Detailed Description of SOR.

All the SOR jobs shall be done as per the SOR description given below, detailed specification & standard specifications given/ attached with this Scope of Work.

SOR-1.0- Pipeline Laying/ Installation

Laying/ installation of coated line pipe, associated fittings and accessories, etc. as per specifications, drawings, other provisions of Contract and instructions of Engineer-in-Charge, including but not limited to carrying out the following: "Receiving and taking-over", handling, loading including stringing on the work site; Arrangement of all additional land required for Contractor's storage, fabrication, access for construction; supply of all materials (except Owner supplied materials), consumables, equipment, labour, etc.; Additional excavation required in the existing trench provided by M/S BMRCL to maintain the required minimum distance from utilities & minimum cover for smooth execution of pipeline laying and Hook-Ups etc., where ever required, to accommodate the pipeline and/or optical fiber cable/cable conduit as specified in scope document and as per the relevant standards, specifications, etc.; providing trench padding as required with sand/ graded earth; Carrying out repairs of pipe and coating defects; Thorough internal cleaning of all pipes by suitable methods to remove debris, shots, grits etc. to the satisfaction of Engineer-in-Charge; Stringing of line pipes including providing straw bags, soft padding/sand padding; Aligning, bending, cutting and beveling (as required) of pipes for welding and field adjustments NDT of re-beveled area, welding, carrying out destructive/ non- destructive testing of welds as required including radiography and providing all requisite equipment, labour, supervision, materials, films, consumables, all facilities and personnel to process, develop, examine and interpret radiographs and other tests, as required; carrying out repairs of weld joints found defective by Engineer-In-Charge, carrying out re- radiography and other non-destructive tests as required on repaired joints, etc. Coating of all field weld joints, long radius bends, buried fittings, valves etc.;

"Lowering the pipelines in utility free trench provided by M/S BMRCL including providing sand bag separators, providing required padding over and around the pipeline with sand/ graded material (in rocky areas), Supply & laying of Warning Mat, Backfilling of the trench with fine quality soil up to the 500 mm level from pipe top, excavated soil can be used if it is found suitable . Backfilling of the remaining portion of trench up to road level, compaction, providing GSB & WMM & restoration of the roads shall be done by BMRCL & SHALL not be in scope of contractor. Warning mat shall be supplied by contractor under this SOR item only. Contractor to quote accordingly.

Carrying out hydrostatic testing including air cleaning, flushing, filling, gauging, pressurization of fabricated pipeline @ 1.5 times of design pressure providing all equipment, pumps, fittings, instruments, dead weight tester, all types of pigs etc., and services, supervision, labour, consumables, water including supply of corrosion inhibitor, air, etc. as required, locating of leaks and rectification of defects attributable to Contractor, re-testing after rectification, successful completion of hydro-testing of fabricated pipeline section , de-watering, swabbing & drying. Hydrotesting of already laid pipeline of approximately 530 Mtr. is not included in this SOR and covered separately in SOR-2.0;

All tie-ins, the tie-in(s) with the main pipeline / piping (covered separately) including cutting of test header, re-beveling as required; Carrying out all temporary, ancillary, auxiliary works and all incidental works required to make the pipeline ready for hooking up the fabricated section with the mainline and re-commissioning of relevant section.

Repair of defects recorded during gauge plate run or otherwise including cutting, beveling, welding, radiography, field joint coating etc.;

Disposal of debris and returning all surplus material to designated disposal areas/storage yard, as directed by Engineer-In- Charge; Preparation of as-built drawings, pipe-book and other records. SOR shall be read in conjunction with scope of work, job specific requirements, specifications, standards, drawings and other provision of contract document. All above works for buried pipeline as per following details:"

"All works for locating major leak/ burst (occurred during hydrostatic testing) including necessary repairing/replacing defective pipe length, including cutting and removing out defective pipes, pretesting of replacement pipe and welding into mainline, NDT of welds and re-bevelled area, repair and re-testing of defective welds, coating of welded joints, clean-up, retesting the pipeline including providing all necessary equipment's, labour, materials, consumables and inputs other than Owner supplied materials and performing all works as per drawings, specifications enclosed with the Contract.

Note: Soft soil as per the standard to be used while laying, if excavated soil is found to be satisfactory, same can be used else contractor has to arrange for suitable soft soil/ sand as per the specification to be arranged.

Pre-commissioning activities and recommissioning checks to be specified acceptance criteria, making the entire pipeline system ready for commissioning , providing assistance during the complete duration of commissioning operations, supply of all equipment, manpower, consumables (including pigs and required quantity of nitrogen for valve operations) materials for all temporary works and performing all associated works, complete as per relevant specifications, other provisions of contract document and instructions of Engineer-in Charge

"Dewatering and swabbing of new pipeline sections before carrying out hook up activities
Note- For Swabbing combination of low density and high-density pigs shall be carried out"

"Complete work of carrying out drying and commissioning of new pipeline sections including supply of manpower, equipment's & consumables materials for all temporary works and performing associated works, complete as per the relevant specifications, other provisions of contract document and EIC.

Carrying out all commissioning checks and making the new section of Pipeline ready (after completion of hook up) ready for commissioning including supply of all adequate nitrogen for pipeline purging equipment, manpower, consumables (including all types of pigs and required materials), materials for all temporary works and performing all associated works, complete as per the relevant specifications, other provisions of Contract document and instructions of Engineer-in-Charge.

"Note: -
(1) Excavation of Trench shall not be in contractors' scope. Utility free trench for laying of the pipeline shall be provided by M/S BMRCL to contractor. bidder to quote

accordingly.

(2) Backfilling up to 500 mm from the line top shall be in the scope of contractor. Backfilling of remaining portion of trench, compaction & restoration of Roads shall be done by M/s BMRCL. Hence, not included in the contractor's Scope of Work. Bidder to quote accordingly.

(3) Contractor to prepare Alignment sheets.

(4) Contractor has to co-ordinate with BMRCL & various authorities for work.

NOTE: Work of laying pipeline & OFC duct for 530 Mtr. is already completed and this SOR is not applicable for this already laid pipeline portion. This SOR is applicable for laying of additional 270 to 300 Mtr. of new pipeline.

SOR-2.0- Hydrotesting of Pipeline

This SOR is applicable only for the already laid pipeline section of approximately 530 Mtr. length & not applicable for the new line section to be laid. Carrying out hydrostatic testing including air cleaning, flushing, filling, gauging, pressurization of fabricated pipeline @ 1.5 times of design pressure providing all equipment, pumps, fittings, instruments, dead weight tester, all types of pigs etc., and services, supervision, labour, consumables, water including supply of corrosion inhibitor, air, etc. as required, locating of leaks and rectification of defects attributable to Contractor, re-testing after rectification, successful completion of hydro-testing of fabricated pipeline section , de-watering, swabbing & drying.

SOR-3.0- Hook-up with existing facilities

Complete work for hook-up of fabricated line section including decommissioning & recommissioning of the pipeline section from SV 3B to SV 4B with existing pipeline Excavation, cold cutting, bevelling, alignment, welding and supply of all consumables, manpower radiography, joint coating etc. as per the SOW

1. Excavation required in the existing trench smooth execution of Hook-Ups included in the Contractor's Scope of Work
2. Completion of hook-up within the time period as will be intimated by EIC. to keep the shutdown period minimum. Making arrangement of 02 dedicated group of fabrication team for parallel working at both the hook-up point.
3. Provision of fire extinguishers, blankets etc. and strict compliance of safety & PPE included under this item
4. Nitrogen cylinder shall be available in each Hook up points for localized purging as interstation of localized gas pockets
5. Shuttering, keeping the trench dry, barricading, de-watering etc.
6. All equipemts, consumables, machineries & manpower required for completing the job in all respect.

SOR-4.0- Nitrogen Purging of existing Pipeline from SV-3B to 4B

Inertisation of entire pipeline from SV 3B to SV 4B (7.9 km) by Supply, transportation and delivery of Liquid nitrogen along with atmospheric vaporizer (minimum 2000 m3/hr capacity), arrangement of flexible hoses with Temporary

header for purging including all required manpower, machinery etc. to remove hydrocarbon from the pipeline before cutting & dismantling and before re-commissioning / gas-in as directed by Engineer In charge/ Owner.

SOR-5.0- Fabrication of Long Radius Bend

"Fabrication of long radius bends including transportation of pipe from nearby GAIL store Yard to bend fabrication yard of the manufacturer, testing of fabricated bend, coating of fabricated bend & transportation of fabricated bend to site for installation from free issue line pipe of 18"" dia API 5 L Gr. X-70,11.1 mm/ 14.3 mm thickness. All the Fabrication, Testing shall be as per specification. Coating of the pipeline shall be in the scope of contractor. Already available bend, if any, to be used as per EIC instruction and no payment against this SOR will be admissible.

SOR-6.0- Transportation

The Contractor shall receive and take over Owner-supplied bare / 3 LPE Coated line pipe from GAIL's store, inspection of material at dispatch point as well as destination point, and its transportation to work-site (including return of project surplus / sparable material from Project site / Contractor's store to GAIL's store / warehouse including loading on trucks / trailers, transportation, unloading & stacking on wooden sleepers at Contractor's own stock-yard near work-site(s) / GAIL store (as applicable), including arrangement of truck / trailers / cranes / other material / machinery / manpower / consumables. Above work shall be carried out as per standard drawing, specification, instruction of Owner and other provision of Contract Document.

"Note: (1) Unit of measurement MT - Km is product of Weight (in MT) of Material to be transported & road distance (in Kilometers) between dispatch point & destination point. Accordingly, unit rate will be Rs per MT-KM
(2) The quantities given in above item no. are tentative only and shall not be considered to be binding. The quantities may be increased, decreased or deleted as per the actual site requirement and instructions / recommendations of Owner. The unit rate shall be operated to work out the final payment to the contractor.
(3) Above price shall be inclusive of all type of taxes & duties, transit insurance during transportation & other insurance, etc. including all financial & commercial implication as per the tender document. No other payment except as per quoted unit rate & executed quantities will be payable by the Owner."

SOR-7.0- Abandonment

Abandonment of 18" x 800 mtr. (approximately) of existing sections by plugging at both ends and Purging & inertisation with nitrogen to make the pipeline section free from oxygen including supply of required quantity of nitrogen and all equipments, tools and tackles, manpower etc. required for the works and as per instruction of engineer in charge. Complete with necessary regulator, hoses, pressure guage, connections with tools and tackles. Submission of purging plan for approval before actual work and complete assistance for purging. By filling and pressurizing with nitrogen.

SOR-8.0- Earth Work in Excavation

"Earth work in Excavation below ground level for all kinds of works in ALL TYPES OF SOIL as classified in specification including removal of vegetation, shrubs and debris, Dismantling of Asphalt road (flexible pavements),cement concrete road and pavement, R.C.C./ Brickwork/ Stone Masonry/ Stone Soling, Flexible pavements etc. and disposal of dismantled materials up to a lead of 1000 meters, cutting and dressing of sides in slopes, levelling, grading and ramming of bottoms, dewatering of accumulated water from any source and keeping the surface dry for subsequent works and disposal or stacking of excavated material within a lead of 100m, as directed including providing temporary supports to existing service lines like water pipes, sewage pipes, electric overhead and underground cables etc. all complete and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed"

SOR-9.0- Plain & Reinforced cement concrete

Supplying and placing in position HIGH STRENGTH DEFORMED STEEL BARS REINFORCEMENT (conforming to IS:1786, Grade Fe 415), for R.C.C. work including transporting the Steel, straightening, cleaning, decoiling, cutting, bending to required shapes and lengths as per details, binding with contractor's own 16 SWG black soft annealed binding wire at every intersection, supplying and placing with proper cover blocks, supports, chairs, overlaps, welding, spacers, fanhooks etc. for all heights and depths etc. all complete as directed.

SOR-10.0- Reinforcement

Supplying and placing in position HIGH STRENGTH DEFORMED STEEL BARS REINFORCEMENT (conforming to IS:1786, Grade Fe 415), for R.C.C. work including transporting the Steel, straightening, cleaning, decoiling, cutting, bending to required shapes and lengths as per details, binding with contractor's own 16 SWG black soft annealed binding wire at every intersection, supplying and placing with proper cover blocks, supports, chairs, overlaps, welding, spacers, fan hooks etc. for all heights and depths etc. all complete as directed.

SOR-11.0- Fabrication of 2" pipeline

- Fabrication of 2" pipeline of 8-12 Mtr. length , approximately, including welding, cutting, grinding, radiography of joint, hydrotesting up to 50 Kg/cm2 for 4 Hrs,. Installation of the fabricated line between the flanges inside SV-4B including supplying gaskets, fasteners etc. Cutting the fabricated line after the job to the desired size of pieces as per EIC instruction. Lifting the material from GAIL store, transportation and returning back the used/ unused material.

SOR-12.0- Supply of jointing closure

Supply of jointing closure 24 Fiber, 2 way including all accessories (3M, Siemens, Raychem make only) as per standard.

SOR-13.0- Joining / splicing of the newly laid OFC

Jointing/splicing of the newly laid OFC (along the rerouted pipeline) with existing OFC.

SOR-14.0- Laying of HDPE Telecom Duct

Laying of HDPE Telecom Duct: Laying of 40mm HDPE Ducts along pipeline route, trench direct buried or cased crossing through CS / HDPE conduit in all type of soil & terrain, excavated as required, padding, backfilling, etc. including supply of HDPE Duct accessories required including plastic couplers, end plugs, cable sealing plugs, end caps, etc. suitable & sufficient for above supplied ducts, cleaning and sealing of ducts at the end laid drum lengths, preparation and supply of cable blowing pit at each Km jointing of HDPE conduit, testing OD HDPE Duct and accessories after laying preparation of report and final drawing and documents as per specification, joint location marking, erection accessories, as-built, etc.

SOR-15.0- Blowing of Optical Fiber Cable inside HDPE Duct

Blowing of Optical Fiber Cable inside HDPE Duct: All activities pertaining to Blowing of Optical Fiber Cable in through CS / HDPE conduits along the pipeline also at crossing cable, sealing using all materials required, including laying of warning mats, etc. as per direction of EIC

6. CONSTRUCTION (Special Requirements)

- Company has already carried out GPR survey for the entire route and width. However, contractor shall have to do the necessary survey to recheck the presence of any underground utilities and finalize the route with BMRCL before Execution of the project.
- Contractor shall carry out the joint survey with Owner and BMRCL to finalize the exact Pipeline centerline route and Prepare pipeline IFC drawings such as alignment sheets and crossing drawings before laying of Pipeline.
- The Pipeline shall be laid along the road in utility free trench up to required depth provided by M/s BMRCL for laying of the pipeline. Contractor shall consider all these eventualities while bidding.
- Pipeline shall be laid by open cut method only throughout the route.
- The work front of 50 to 100-meter utility free trench shall be provided by M/s BMRCL for the entire length of both the re-routing sections. Contractor shall maintain Hindrance register for the same.
- Providing Protection Slab over pipeline for Power cable running parallel to the proposed corridor of Gas pipeline, if any. However, CP for new pipeline will be carried out by Gail in- house.
- Excavation job required in the existing trench provided by M/S BMRCL for smooth execution of pipeline laying and Hook-Ups etc.
- Contractor may plan to work in the Night shift to avoid traffic and to keep minimum disturbance during day time. But Contractor has to plan and take

approval from Engineer In charge/ Client and Concerned Authorities before start of construction. Contractor to arrange all lighting and safety precaution for the same.

- Due to restricted area and existing trench of proposed route, Hot induction (LR) bends shall be used for tie-in at required locations in the route.
- Contractor shall carry out field survey for requirement of additional Hot Induction bends before taking up of work.
- During any crossing of the existing utilities by the new proposed pipeline, the new propose pipeline has to be laid below the existing utilities
- Contractor shall obtain working permission and necessary liasoning with the concerned authorities for obtaining the permission. The company will provide recommendation letters to the party for submission to various authorities.
- Contractor shall do the follow up with the concerned authorities to get the permissions to execute the job in time. However, all statutory payments, if any, 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 for laying pipeline.
- Immediately after award of work, Contractor shall make a site visit along with the M/S BMRCL to establish the utility free route, and familiarize with the working conditions so as to plan for deployment of man and machinery.
- Contractor shall barricade the working area for safety. Excavated trench & pits in area near heavy traffic and other areas for kept for movement, shall not be left open without barricading. Contractor shall consider all these & quote accordingly.
- Contractor shall also inform all local authorities in advance and obtain all necessary approvals for crossing underground utilities/ pipelines wherever encountered along the pipeline route. Contractor shall be required to carry out all the works as mentioned in the work permit.
- The detail work shall take into consideration of stipulations, practices followed by various authorities for all types of laying along existing trench. Contractor shall provide all data/drawings/calculations as required for statutory clearances including obtaining necessary engineering and construction approvals.
- Line Pipe coating cut back length is 150 mm and tolerance of plus 20mm & minus 0 mm. Contractor shall quote accordingly considering the width of heat shrink sleeve required for this project. No extra payment shall be made on this account latter on.
- Contractor shall be responsible for claims if any arising out of damage/ obstruction to public utilities like OFC lines of DOT, water pipelines etc. where the claims will cover repairing the damages & restoring to original condition, the restoration costs as well as loss of revenue due to down time.
- Review and approval of Contractor's entire work(s) by Company shall in no way relieve the Contractor of his sole responsibility for safe and efficient installation and subsequent operation of pipeline system.
- Carrying out the work based on staggered route/ Complying to the Terms and

Conditions laid down by various statutory authorities for crossing approvals, Completing the work within the permitted duration, Liasoning with the authorities, completing the pipeline laying activities including the back filling to the satisfaction of concerned owner/ statutory authority & obtaining satisfactory performance certificate on completion. Obtaining all necessary work permits from Concerned local authorities having jurisdiction during pipeline laying, arranging hot work permit from company for performing the work in existing Facilities area particularly hook up points. Arranging of adequate firefighting equipment fire extinguisher, shielding from existing facilities, oxygen mask etc. for carrying out the work safely in existing terminals to the satisfaction of Company.

- All associated civil, structural, HDPE duct & OFC laying and telecom works shall be performed in accordance with relevant specifications and requirements enclosed elsewhere in the bid package.
- Backfilling of the trench with fine quality soil up to the 500 mm from pipeline top.
- Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.
- All works related to testing, dewatering, swabbing, drying, pre-commissioning and commissioning of the work tendered.
- All construction works i.e. "Fabrication, Laying, Testing, Commissioning, of Pipeline shall be carried out in all types of soils, at all slopes / nallah / all types of roads
  /utilities / other pipeline crossings, as per the Schedule of Rate (SOR), technical specifications as detailed in this tender document and as per applicable Oil Industry Safety Directorate Standards: OISD 226 and ANSI B31.8.(latest editions)", "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall also need prior approval from the Company and revision of drawings.

7. PROCUREMENT

Contractor shall procure and supply all materials other than Company supplied materials, required for permanent installation of pipeline system in sequence and at appropriate time. All equipment, materials, components etc. shall be suitable 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.

8. PIPELINE LAYING WORKS

- Carrying out inspection of Company supplied free-issue coated and bare line pipes at the time of receiving and taking-over and recording of defects, etc. noticed in the presence of Company's representative. All defects to pipe and pipe coating noticed at the time of taking over.
- Contractor shall carry out repair of all defects/ damages occurring during

transportation and/or handling.

- For pipes where cutting out involves more than 25mm from pipe ends, ultrasonic inspection shall be carried out at pipe ends as per specification enclosed with the

  tender. Contractor shall take prior approval from Company for the agency engaged for carrying out ultrasonic inspection.

- Loading, transportation, unloading, handling, stacking, storing at workshop/ work site of all materials other than corrosion coated and bare line pipes that shall be used for the construction of pipeline system supplied by Contractor.
- Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumables and other resources etc. as required for the execution of complete work. Based on the exigencies of the work, Client may direct/ assign priority of construction to the CONTRACTOR to undertake works in different areas under CONTRACTOR‟s scope, which may entail shifting of resources (plant & machinery, manpower etc.), brought back again to the area where the work was progressing prior to shifting of resources. CONTRACTOR under such circumstances shall execute this requirement of Client expeditiously without any extra cost to Client.
- Obtaining all necessary approvals from concerned local authorities having jurisdiction for performing the work including shifting/ relocation and restoration of telephone/ electrical poles and underground pipes and other crossings & utilities etc., as required by local authorities and as directed by Company.
- Transportation of coated pipes to site along the route, stringing, aligning, bending, welding, NDT including radiographic inspection, field weld joint coating, sand padding including supply of sand/ soft soil, laying and lowering of the pipeline, laying of Warning Mat, back filling including supply of select backfill wherever required, road, arranging all additional temporary land/ area required for construction purposes. as shown in approved drawings and as directed by Company, supply of select backfill material as required, clean-up, pigging, flushing, gauging, hydrostatic testing, dewatering with the addition of approved chemicals to neutralize the effect of inhibitor added, at required dosage, swabbing, pre-commissioning and all associated works for complete pipeline system as per relevant specifications, standards and approved drawings.
- Thorough internal cleaning of all pipes to remove debris, shots, grit etc. to the satisfaction of Engineer-in-Charge. However, adequate care shall be taken so as to avoid damage to the internal coating.
- Welding of all tie-in joints including tie-in joints and bends with adjoining pipeline/ existing facilities as required.
- Field weld joint coating shall be by heat shrink sleeve as per specification enclosed with bid package. Holiday testing & repairing of coating damages of GAIL supplied line pipe shall be in the scope of contract and no separate payment will be made on account of this coating repairing job.
- Sand/ soft soil padding around pipe wherever required in areas where trenching has been done in pebble murom/ rock or any other soil which may cause damage to the coating. The thickness of sand/soft soil padding at the bottom of pipe shall be 150mm in these areas. The pipeline trench shall not be filled with gravel & large stones or boulders. Extra digging of trench shall be carried out to comply with above

requirements & to provide minimum cover over pipeline.

- Pre-construction surveys, preparation of detailed construction method statement and calculations for Company's approval.
- Geo-technical investigations, if required.
- Site preparation, arranging required land for setting up of string fabrication yard and obtaining necessary permissions from concerned authorities.
- Backfilling of the trench up to the 500 mm from top of line.
- Corrosion coating of long radius bends by heat shrink sleeve as per specification.
- Carrying out cleaning including supply of all types of pigs, spares, consumables, manpower etc. as per specification enclosed with bid/ contract document.
- Carrying out cleaning, flushing, swabbing, dewatering, testing and pre-commissioning of pipeline locating all major and minor leaks during hydro testing if any.
- Repair of any leaks/burst occurring during testing of main pipeline.
- If required, idle time preservation of the pipeline for the specified period by filling with by nitrogen to a positive pressure of 5 bar (g) (if required) including supply of nitrogen etc.
- Preparation of as built drawings, pipe books, 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.
- All incidental and associated works and any other works not specifically listed herein but are required to be carried out to complete entire work related to pipelines and the associated facilities and making the entire pipeline system ready for operation.
- Installation of carrier pipe in utility free Trench by open cut method, as directed by Company. Contractor to note that the minimum elastic bend radius to be adopted shall be as per pipeline engineering design basis enclosed with the tender.
- Loading, unloading, handing over and transportation of all surplus Company supplied free issue line pipe after completion of works Company's designated warehouse as directed by Engineer-in-Charge and stacking the same. Stacking of surplus pipe shall be inclusive of supplying of sand bags etc. at Company store for proper stacking.

9. OTHER CONDITIONS OF WORK

a) Site Visits

- Bidders are advised to make site visits to make their own assessment with regard to nature of work involved prior to quoting to familiarize themselves with
  all the salient features of terrain, availability of Trench and infrastructure along the pipeline route. 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 is described in the bid package and the survey drawings/data furnished along with the bid package
- Appraisal and taking cognizance of site-conditions, Central Government, w.r.t State Government rules and regulations/ bye-laws, applicable Indian Standards and Codes, authorities having jurisdiction over the work site(s), environmental and pollution concerns including conditions/ stipulations laid down by the concerned authorities etc. The Contractor is deemed to have recognized any restrictive features and constraints of the site(s) or specific requirements of the work and made due allowance for it in the work to be performed by him.
- Interpretation and verification of data/ information furnished by Company. Any additional information/ data/ surveys etc. required by Contractor for execution of the works shall be obtained by him. Company may assist him in obtaining such information/ data by arranging visit to site.

b) Work Permits

- Contractor shall obtain the necessary approvals, cold work permits & statutory permits for all works, from the Company and other authorities (wherever applicable) before the actual works are taken up.
- All stipulations/ conditions/ recommendations of the said authorities shall be strictly complied with at no extra cost to Company. Company may, however assist the Contractors for obtaining such permission to the extent of issuing recommendation letters only.

c) Survey

Immediately after award of work, Contractor to submit drawings for approval

- Pipeline route and profile analysis, determination of area requiring special designs.
- Methodology for utility crossings etc.

d) Drawings

Following Pipeline survey drawings for the final route shall be submitted.

- Area map and pipeline route maps.
- Pipeline Alignment Drawings
- Crossing details and drawings

e) HOOK-UP with Existing Pipeline

- Cold cutting of existing pipeline at the hook-up locations for hook-up with new pipeline shall be carried out. Before cold cutting. Entire section from station to station shall be purged with nitrogen to remove hydrocarbon from the pipeline. Arrangement of localized purging with cylinder shall be done during welding to avoid localized hydrocarbon pockets.

- Completion of Hook up at each location shall be planned in a single day of 24

hr shutdown time. Deployment independent welding crews for each Hook up along with NDT, coating and backfilling crew.

- Contractor shall prepare a method statement with drawing for carrying out the hook-up works and submit the same to Company for review and approval. The hook-up work shall be carried out based on the approved methodology, drawings and/or as per site conditions and as per instruction of Engineer-in-Charge. Contractor shall check and ensure the safe working at the existing hook-up locations.

f) Statutory Permissions and Liaisoning

- 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 also obtain the necessary permits like work permit for all works from the authorities having jurisdiction before the actual execution of various phases of the works and all stipulations/ conditions/ recommendations of the said authorities shall be strictly complied with no extra cost to Company.
- Contractor shall also obtain all necessary permissions from the concerned authorities for installation of pipeline. Company may, however, assist Contractor in obtaining such permissions, wherever required, by issuing recommendation letters etc. In case of damage to other utilities/infrastructure, Contractor shall be responsible and the required compensation, as per the directions of concerned authorities, shall be paid by the Contractor.

g) Safety

- Contractor shall obtain all necessary permissions for working in/around the facility and shall be fully responsible for the safety of the existing pipeline areas during all phases of work and shall fully abide by and comply with the restrictions and conditions imposed on Contractor from time to time.
- The Contractor shall provide all safety appliances, gas detectors, fire screens required during execution of the work.
- The structure/electric poles etc. existing in the vicinity of proposed area shall be properly taken care so that the stability of structure is not affected during construction.
- All engineers and workers shall have safety training.
- Use all health & safety appliance for manpower during working.
- Approved dress/ Dungaree/ safety dress, safety boots & helmet shall be worn during the work period.
- Adequate Lighting and safety arrangement during work at night.
- Providing barricading in Open trench and Tie in/ hook up points
- Obtaining all necessary approvals and work permits from Company/ Concerned authorities including hot work permit as applicable for performing the work in existing terminal facilities.

- The Contractor is cautioned to exercise extreme care and take necessary precautions to prevent damage to the existing pipeline(s), facilities, electrical and other cables during execution of the entire works. Restoration/reconstruction of all structures/ facilities affected during pipeline construction shall be carried out by Contractor.

h) Pipeline Burial

- The pipeline shall be buried normally at a depth of minimum 1.5 meter below natural ground level except rail/ road/ canal/drain crossing where minimum cover shall be as given in Design Basis or as per the requirements of statutory/local authorities whichever is more stringent. Increased cover shall be provided at critical locations and crossings.
- Additional soil covers other than specified above shall be provided at locations indicated by statutory/ local authorities or in areas likely to have an increased risk of impact damage or third-party interference as per agreements between COMPANY and authorities.

i) Non-Destructive Testing (NDT)

NDT requirements shall be 100%. Repeat Radiography due to defective radiograph on repaired joints due to Contractor's fault and/ or additional radiography necessitated due to poor performance of Contractor's welders shall be done at Contractor's cost.

Third party inspector shall be approved by GAIL.

10. LINEPIPE AND COATING

a. Taking over of Pipes

Company shall supply bare and externally/ internally coated line pipes. Contractor shall receive and take over the pipes progressively as per construction requirements. At the time of taking-over from Coating Contractor/ Client storage yard, Contractor shall perform inspection of pipes and pipe coating for all defects in the presence of Company's Representative. Contractor shall repair all defects occurring after taking over including those during transportation and handling. Rebuffing for dents (in bevels) less than 1 mm in depth shall be carried out by Contractor ahead of welding in the field at no extra cost to Company. Contractor shall progressively takeover the required quantity of bare & coated line pipe from the warehouse.

Return of surplus bare & coated line pipes at warehouse to Company's designated storage yard is installation Contractor's scope including loading, transportation, unloading, handling, stacking of pipes at company's storage yard and getting the pipes inspected from Company's representative at storage yard.

b. Repair of Coating

Any repairs to 3-layer polyethylene coating shall be carried out by Contractor using suitable material compatible with parent coating system and meeting the requirements of coating system specified in specification attached with the Bid Package.

Repair of PE coated pipes in field shall be carried out as follows in accordance with bid specification.

I. Damages caused to coating by handling such as scratches, cuts, dents, gouges, not picked up during holiday test, having a total reduced thickness on damaged portion not less than 2.0 mm and an area not exceeding 20 cm2 shall be rebuild by heat shrink patch only and without exposing to bare metal.

II. Defects of size exceeding above mentioned area or holidays of width less than 300 mm shall be repaired with heat shrink repair patch by exposing the bare metal surface.

III. Defects exceeding the above and in number not exceeding 2 per pipe and linear length not exceeding 500mm shall be repaired using heat shrinkable.

11. HYDROSTATIC TESTING, DEWATERING, SWABBING, DRYING AND COMMISSIONING

a. Pipeline

Hydrostatic testing of mainline shall exclude facilities like valve etc. Temporary test headers shall be provided and the mainline shall be hydrostatically tested between the temporary test headers only. The pipeline shall be hydrostatically tested to the minimum test pressure of 1.5 of design pressure. Holding time shall be 24 hrs after pressure stabilization.

Hydrotest shall be done with corrosion inhibitor and dosage of corrosion inhibitor shall be suitable for 3 months. The highest point of the test section shall be subjected to the minimum test pressure as specified above. The maximum hydrotest pressure for any section shall not cause stress exceeding 90% of SMYS of the lowest wall thickness of that section.

Subsequent to separate hydro testing of pipeline, tie-in/hook up shall be carried out by the Contractor. Pipes/ prefabricated assembly used for such tie-in shall be pretested to a test pressure specified for the pipeline. All materials required for the fabrication of the test headers shall be provided by the Contractor at no extra cost to Company. After successful completion of hydrostatic testing, the Contractor shall de water the pipeline as per the directions of Engineer-in-charge.

b. Dewatering and Swabbing

It is envisaged that dewatering and swabbing operations shall be carried out as a part of pre-commissioning activities. Dewatering of pipeline after hydrostatic testing shall be taken up by Contractor only when Contractor is ready for swabbing operations. Till such time Contractor is ready to start pre-commissioning activities, the pipeline/section of pipeline after hydrostatic testing shall be left filled with inhibited water or preserved with Nitrogen. In case, dewatering of any test section is proposed by Contractor for any reason depending upon site conditions (e.g. using test water for adjoining section due to non-availability of water), the Contractor shall swab such sections as per applicable requirements of Contract and fill the section with nitrogen at a pressure of 5 bar (g) with residual content of oxygen less than 1% v/v at no extra cost to the Company in case overall commissioning of the pipeline system is expected to be taken up later than three months from such dewatering. Decision of Company/ Engineer-in charge shall be final in such cases.

In no case shall the pipeline section be kept empty i.e. without nitrogen filling.

c. Drying

In order to remove the remining water after swabbing at low points in the pipeline and body cavities of valve, instruments and in other connecting piping, drying of pipeline system shall be performed. The drying shall be carried out by super dry air or evaporations method. Digital dew point meter shall be used for checking the dryness. Wet bulb with dry ice is not acceptable.

d. Leak Detection

Contractor shall submit a detailed procedure for leak detection during hydrotest. Such method of detection shall consume minimum possible time to complete the hydrotest activity within contractual completion schedules. This procedure needs approval of the Engineer-in-charge.

All works for locating and repair of major leak/burst attributable to Company (occurred during hydrostatic testing) including necessary repairing/replacing/ cutting and removing out defective pipe length as defined in the specification and shall be payable as per relevant items of schedule of rates.

All works for locating and repair of minor leak attributable to Company (occurred during hydrostatic testing) which require sectionalizing of pipeline shall be payable as per relevant items of schedule of rates.

Contractor shall carry out repairing / replacing of defective pipe length including cutting and removing of defective pipes, pre testing of replacement pipe for 24 hours and welding into main line, NDT of the welds, coating of the weld joints, clean up, re testing of pipeline including providing all equipment's, manpower & consumables.

e. Magnetic cleaning, caliper pigging and commissioning

Contractor shall carry out magnetic cleaning (EGP) before hook-up to avoid further shutdown or cutting after re-commissioning of the pipeline system as per requirements stipulated in the bid document.

Rectification of defects observed during pig run, shall be carried out by individual Contractor including digging, cutting, replacement, repair, welding, NDT etc.

f. Commissioning

Overall commissioning of the pipeline section which was isolated earlier shall be carried out by Company. However, all assistance including supply of manpower, temporary equipment, tools and tackles etc. during commissioning shall be provided by Contractor. Contractor shall retain minimum manpower required to rectify the workmanship defects, if any, noted during commissioning. Nitrogen for Purging shall be supplied by the contractor.

g. Failure of Hydrotesting

In case of failure of Hydrotesting of entire 800 Mtr. section, contractor has to identify the fault location and has to do the necessary repairing without any cost to GAIL. However, if it is found that Hydrotesting fails due to fault in already laid 530 Mtr. section additional qty of 1.5 times of actual qty for hydrotesting will be certified i.e. final certified quantity for hydrotesting shall be 2.5 times of actual quantity. In case the SOR for Hydrotesting becomes AHR, additional quantity as mentioned above shall be certified with new SOR rate to be evaluated as per AHR related clause. Further for rectification of defects, certification will be done as extra item, rate of which is to be evaluated as per relevant clauses for extra item/ works.

12. SCOPE OF SUPPLY:

a. Company Scope of Supply

Company shall supply following free issue material to the Contractor at an appropriate time during the execution stage.

- Line Pipe (18”)
- OFC Cable
- 2"-line pipe & fittings required for modification job at SV-4B.

b. Contractor’s Scope of Supply:

The procurement and supply of all consumables required for completion of the Work as defined in this tender document except the materials specifically listed under Company supplied free-issue material, shall be entirely the Contractor's responsibility. The item rates quoted for execution of work shall be inclusive of all these materials. All materials supplied by the Contractor shall be strictly in accordance with the

requirements of relevant applicable Company Material Specifications in tender document. All equipment, materials, components etc. shall be new and specifically purchased for this job from Company approved vendors, duly inspected by Company approved third party inspection agency (Only manufacturer's certificates shall not be adequate). Contractor shall submit all details to company for review and approval before placement of order. As a minimum, such materials to be supplied by the Contractor shall include, but not limited to the following:

All materials (other than those mentioned in clause A above, consumables, equipment required for completion and successful commissioning of entire pipeline system shall be procured and supplied by the Contractor

As a minimum, the materials to be supplied by Contractor shall, but not limited by any way, be as follows:

a. The procurement and supply, in sequence and at appropriate time, of all materials and consumables required for completion of the Work as defined in this bid document except the Company free issue material, shall be entirely the Contractor's responsibility and price quoted for the execution of the Work shall be inclusive of supply of all these materials.

b. All materials supplied by the Contractor shall be strictly in accordance with the requirements of relevant Company material specifications enclosed with the tender document.

c. All equipment's, materials, components etc. shall be new and specifically purchased for this job. All material to be supplied by the Contractor shall be purchased from the approved vendors of the Company, duly inspected by Third party inspection agencies.

d. All consumable such as welding electrodes, oxygen, acetylene, inert gases, all types of welding electrodes, filler wires, solder wires, brazing rods, flux etc. for welding/cutting and soldering purposes.

e. All materials, equipment's, consumables including pigs required for cleaning and.

f. All materials and consumables required for external corrosion coating and concrete coating (where required) of field weld joints.

g. All materials required for weld joint coating, corrosion coating of LR bends, pup pieces of sectionalizing valves and repair of damaged corrosion coating of line pipe. Contractor shall confirm that proposed field joint coating material is suitable for type of terrain encountered along pipeline route. Contractor shall take prior approval from Company for field joint coating material to be used.

h. All materials required for sand/soft soil padding around pipeline and optical fiber cable, select backfill of approved quality, wherever required.

i. Supply of Warning Mat shall be in contractor's scope.

j. All materials including consumables required for hook-up with adjoining pipeline section or wherever required.

k. All temporary materials and consumables required for filling and

pressurizing in connection with hydrostatic testing, dewatering, swabbing and pre- commissioning activities, etc. Including pipes, flanges, fittings, gaskets, bolts, nuts, etc. required for fabrication of temporary pig traps and /or test headers.

l. All materials required for repair/restoration of pavements, temporary water pipes, walls, other structures affected/damaged by Contractor's construction

activities. Materials shall be equivalent/superior to those used for original construction of the facility.

m. All pigs for cleaning, gauging, de-watering, swabbing, filling, pre-commissioning and commissioning of the pipeline.

n. Pumps and water to be used for hydrostatic testing/ flushing. All materials & consumables such as Corrosion inhibitor, oxygen scavengers and bactericides, required during hydro testing and idle time preservation, as required.

o. Carbon steel pipes for optical fiber cable (OFC) conduits in required quantities.

p. Cold cutting equipment. All equipment and materials including consumables required for hook-up wherever required

q. All consumables and equipment's required for all types of tests and NDT such as radiography, ultrasonic testing, magnetic particle, dye penetrant examination etc. including radiography film etc.

r. All safety tools and tackles, devices, apparatus, equipment, personal safety gazettes to be used as personal protective equipment (such as helmets, safety belts, safety shoes, etc.) including ladders and scaffolding etc. complete as recommended by Engineer-in-Charge as per relevant safety standards.

s. All materials and equipment for excavating trench or grading the pipe laying/installation and other works.

t. All materials, manpower, spares, tools & tackles and consumables for carrying out pre-commissioning activities and during commissioning (including bi- directional and foam pigs, compressor, nitrogen required for achieving the specified criteria for pipeline inertisation/ purging prior to declaring pipeline fit for commissioning) and manpower required during pre-commissioning and commissioning.

u. Supply of Liquid Nitrogen & atmospheric vaporizer.

v. Required quantities of Nitrogen for idle time preservation, pre-commissioning & commissioning works.

w. Corrosion resistant straps required for strapping CS/ HDPE conduit with mainline at crossings of water bodies and other crossings.

x. All spares for pre-commissioning and commissioning as required for all items supplied by Contractor for the entire pipeline system.

y. All materials, equipment and personnel required for videography and all associated works.

z. Any other material not specifically listed herein, but required for successful completion of the Work.

c. Conditions for Company Supplied Material:

i) The Contractor shall be responsible for taking over of the material and subsequent handling, hauling, transportation to the actual work site(s)/fabrication yard(s) and storage & safe keeping of the materials.

ii) The Contractor shall inspect all Company supplied free issue materials 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 material has been taken over by the Contractor, all the responsibility for safe keeping of the materials shall rest with the Contractor. The Contractor shall also be responsible for repair of such defects noticed at the time of taking over and shall be compensated in accordance with the provisions of the contract.

iii) On completion of the works Contractor shall submit a "Material Appropriation Statement" for all materials supplied by the Company as free issue materials.

iv) The scrap allowances shall be permissible as per the provision of contract document. The percentage allowance shall be accounted on the basis of erected pipe length of approved fabrication drawings.

v) All unused and scrap material shall be the property of the Company and shall be returned by Contractor to Company at Company's designated storage point(s) including transportation of the same from Contractor's stock yard(s)/worksite(s)/work shop(s) to the Company's designated storage point(s). Contractor shall be responsible for the proper measurements of the unused/scrap materials to be returned to the Company.

13. STORAGE OF MATERIALS:

i) All materials shall be preserved against deterioration and corrosion due to poor or improper storage while under the custody of the Contractor.

ii) All materials shall be duly protected by the Contractor at his own cost with the appropriate preservatives like primer, lacquer, coating, grease etc. and shall be covered with suitable material to prevent them from direct exposure to sun, rain, wind and dust.

iii) The Contractor shall check that equipment's, pipes, specials etc. are not subjected to corrosion from hydrostatic test water. Any such condition when detected should be brought to the notice of Engineer-in-Charge and remedial measures taken as directed.

iv) All machined surface shall be properly greased and should be maintained and protected from damages.

14. AS-BUILT DOCUMENTS

Following documents shall be submitted by Contractor:

(i) Updated existing alignment sheets.

(ii) Project Records

In addition, the above documents shall also be submitted in electronic media i.e. CD ROM diskettes. Software used for the presentation of these documents shall be as follows:

	Type of document	Software
a)	Reports	MS Word/ Excel (MS Office 2000)
b)	Drawings	AutoCAD

For the purpose of preparation of as-built drawings, Contractor shall update the "Issued for Construction" (IFC) drawings approved by the Company. Contractor shall be provided with electronic file of all 'IFC' drawings/ alignment sheets. Contractor shallupdate all the drawings issued by the Company. As-built drawings shall be prepared on AutoCAD.

15. DOCUMENTS TO BE SUBMITTED AT THE TIME OF BIDDING

No technical documents are required to be submitted at the time of bidding. Bidder is advised to comply with all the requirements of bid document without any deviations. Company reserves the right to reject any bid with deviations without making any reference to bidder.

16. GENERAL

In case of conflict between the requirements given in this document and the requirements of other specifications enclosed with the tender document, the requirements specified in Scope of Work document shall govern.

Should there be conflict, discrepancy, inconsistency or dispute between the various documents, they shall be referred in the order of priority as given below:

a. Schedule of Rates.
b. Data Sheets
c. Piping Material Specification
d. IFC drawings
e. Job Specifications
f. Job Standards
g. Specifications
h. Standards
i. Sketch
j. Other documents not covered

17. CONTRACTOR'S RESPONSIBILITIES

Contractor's responsibilities, besides the scope of work to be performed by him defined earlier, shall also include the following:

i. Appraisal and taking cognizance of site-conditions, pipeline route, Central Government, State Government rules and regulations/ bye-laws, applicable Indian Standards and Codes, authorities having jurisdiction over the work site(s), environmental and pollution concerns including conditions/ stipulations laid down by the concerned authorities etc. The Contractor is deemed to have recognized any restrictive features and constraints of the site(s), pipeline route and /or specific requirements of the work and made due allowance for it in the work to be performed by him.

ii. Company has provided the available information and survey data along pipeline route. Company gives no guarantee or warranty as to the accuracy or completeness of the information provided. It is the Contractor's sole responsibility to obtain sufficient information / data.

iii. Interpretation and verification of data/information furnished by Company. Any additional information/data/surveys etc. required by Contractor for detailed engineering and execution of the works, shall be obtained by him. Company may assist him in obtaining such information/ data by issuing recommendatory letters.

iv. Entire, engineering for procurement & fabrication, engineering for installation including drawings, QA/QC procedures, etc. performed by the Contractor for the pipeline system shall be reviewed and approved by Company. Contractor shall submit six sets of design/detailed engineering documents, drawings, procedures Company's review and approval. All works shall be executed based on approved documents only.

v. Review and approval of Contractor's entire work(s) by Company shall in no way relieve the Contractor of his sole responsibility for safe and efficient design, engineering, installation and subsequent operation of system.

vi. Furnishing and mobilizing at site(s) of all construction equipment, manpower, tools and tackles, construction spreads, fully equipped and fully manned with other required support facilities etc. commensurate for spreads needed for successful execution of the works.

vii. Pre-commissioning/ commissioning of entire pipeline /piping system.

viii. Preparing and furnishing calculation books, pipe books, material/ purchase requisitions, final purchase orders including specifications, Vendor's data books (including Guarantees), fabrication and construction drawings, all survey reports, inspection and testing reports, as-built records for all phases of work.

ix. The Contractor is cautioned to exercise extreme care and take necessary precautions to prevent damage to the existing facilities, electrical and other cables during execution of the entire works. Restoration/reconstruction of all structures/ facilities affected during construction shall be carried out by Contractor.

x. Contractor shall carry out all testing and inspection of materials, equipment etc. in independent testing institutions, laboratories, if so desired by Company.

xi. Disposal and treatment of treated hydro-testing water, excavated materials and surplus materials etc. as per local authority's requirements.

Any other work not specifically listed but required for successful completion of entire system.

xii. The availability of working strip / space for preparation of string & welding etc.

xiii. Co-ordination with BMRCL & its associates for work strip & traffic movement.

xiv. Identification of other utilities in coordination with BMRC while trenching, lowering and cutting the string if felt necessary.

xv. All day / night working time to accommodate the traffic in consultation with BMRC & Traffic police/ Permission/ intimation etc.

xvi. Provision of fire extinguishers, blankets etc. and strict compliance of safety & PPE.

18. AS BUILT DOCUMENT

On successful completion, the Contractor shall prepare As Built drawings / reports piping system as specified in scope of work. All “As Built” drawings / reports shall be submitted as below.

- All purchase specification & procurement documents.
- Alignment sheet updation.
- All Inspection, Testing and NDT records. Radiographs/ UT of all weld joints.

ENERGISING QUALITY		

PIPELINE DESIGN BASIS	**CLIENT JOB NO**	BEN-006-4100000327-047-04.02.2019
	TOTAL SHEETS	11

DOCUMENT NO	1015	047	PL	DB	001

GAIL (INDIA) LIMITED

REROUTING / SHIFTING OF 18" PIPELINE IN BANGALORE REGION

			Aditya Kunwar		
C1	28.03.2020	ISSUED FOR CLIENT REVIEW	AK	MD	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

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1. INTRODUCTION

GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain and its related services. In a rapidly changing scenario, GAIL is spearheading the move to a new era of clean fuel industrialization, creating a quadrilateral of green energy corridors that connect major consumption center in India with major Gas Fields, LNG terminals and other cross border gas sourcing points. GAIL is also expanding its business to become a player in the International Market. M/s. GAIL (India) Limited envisages to strengthen local gas grid network in various parts of India.

VCS Quality Services Private Limited has been appointed as Engineering Consultant by GAIL for "REROUTING / SHIFTING OF 18" PIPELINE AT 2 LOCATIONS IN BANGALORE REGION".

2. PROJECT DESCRIPTION

The brief project details of the pipeline are as follows: -

- Re-routing of 18" DBPL GAIL's Natural Gas pipeline from Ch. 57.25 to 58.25 KM at Kadubeesanahalli under pass, Bangalore city;
- Re-routing of 18" DBPL GAIL's Natural Gas pipeline from Ch. 39.40 to 39.95 KM at Manyata Tech Park, Bangalore city;

3. SCOPE

This document establishes minimum design parameters and basis for design and detailed engineering of the Pipeline and Associated facilities covered under this project as defined briefly herein below and Scope of work (Doc. No. 1015-047-PL-SW-001).

4. DESIGN CODES AND STANDARDS

Pipelines and terminal facilities envisaged shall be designed and engineered primarily in accordance with the provisions of the latest edition of Code ASME B 31.8: Gas Transmission and Distribution Piping Systems and OISD 226: Natural Gas Transmission Pipelines and City Gas Distribution Networks and PNGRB guidelines. In addition, requirements, as applicable to gas service of following codes/standards shall be complied with.

OISD Std. 138	Inspection of Cross-Country Pipelines-Onshore
OISD 226	Natural Gas Transmission Pipelines and City Gas Distribution Networks.
ASME B 31.8	Gas Transmission and Distribution piping system
ASME B 31.3	Chemical Plant & Petroleum Refinery Piping
API Std. 1102	Steel Pipeline Crossing Railways & Highways
API Std. 1104	Standard for Welding Pipelines and Related Facilities
ISO 13623	Petroleum & natural gas industries – Pipeline transportation systems
PNGRB	Petroleum & Natural Gas Regulatory Board

In addition to above, codes and standards listed in Annexure-A shall also be referred.

In case of conflict between the requirements of ASME B31.8/OISD 226 and other codes/Standards referred above, requirement of ASME B 31.8/OISD 226 shall govern. In case of conflict between requirements of B31.8/OISD 226 and this document, requirements of this document shall govern.

5. DESCRIPTION OF PIPELINE & ASSOCIATED FACILITIES

The pipeline facilities relocation/ modification/ addition is described briefly herein below Scope of work (Doc. No. 1015-047-PL-SW-001).

Main Pipeline

Pipeline facilities are schematically indicated in Schematic drawing no.1015-047-PL-SMD-001. Approximate length of entire pipeline to re-routed at two locations is 1.4 Km (approx.) and 18" Size.

6. DESIGN DATA

Main pipeline shall be designed for conditions as follows:

Pipeline Design Parameters	
Description	**Value**
Main line	18 "
Products	Natural Gas
Design Pressure (kg/cm^{2}g)	98.0
Operating Pressure (kg/cm^{2}g)	30.0
Max. Design Temperature, Deg. C i. Above ground section ii. Underground section	 -29 to 65.0 -29 to 60.0
Operating temperature, °C	22 – 25
Economic Design Life, years	30
Corrosion Allowance, mm	0

7. PIPELINE AND ASSOCIATED FACILITIES DESIGN

7.1. General

Pipeline to be installed as a part of this project shall be designed and engineered in accordance with the standards/codes referred in section 4.0 of this document.

7.2. Pipeline

Pipeline shall be designed in accordance with requirements of ASME B 31.8 and OISD 226 & PNGRB guidelines. The pipeline shall withstand all installation, testing and operating condition/ loads. All necessary calculations shall be carried out to verify structural integrity and stability of the pipeline for the combined effect of pressure,

temperature, bending (elastic), soil/ pipe interaction, external loads and other environmental parameters as applicable during all phases of work from installation to operation. Allowable stress limit shall be as per ASME B 31.8. Such calculations shall include, but are not limited to following:

- Buoyancy control and stability analysis for pipeline section to be installed in areas subjected to flooding/submergence.
- Stress analysis at crossing of rail and highway etc.
- Crossing analysis of rivers by HDD as applicable.
- Pipeline expansion and its effect on station piping (above ground/below ground).

Pipeline shall also be checked for adequacy against anticipated earthquake loading and any special measures such as increase in wall thickness/ grade/ select backfill etc. as required to ensure safety and integrity of the pipeline system shall be implemented.

Pipeline and its associated facilities shall be designed using the applicable design code and as modified below.

The pipeline shall be designed to meet the Location Class as defined in ASME B31.8, except as modified below.

DESIGN FACTORS FOR STEEL PIPE CONSTRUCTION				
Facility	**Location Class**			
	1	2	3	4
Pipelines, mains, and service lines	0.72	0.60	0.50	0.40
Crossings of roads, without casing: (a) Unimproved public roads (b) Roads, highways, or public streets, with hard surface	 0.60 0.50	 0.60 0.50	 0.50 0.50	 0.40 0.40
Crossings of roads, with casing: (a) Unimproved public roads (b) Roads, highways, or public streets, with hard surface (c) Railway crossings	 0.72 0.60 0.50	 0.60 0.50 0.50	 0.50 0.50 0.50	 0.40 0.40 0.40
Pipelines on bridges	0.50	0.50	0.50	0.40
Parallel Encroachment of pipeline mains	0.60	0.60	0.50	0.40
River Crossing- open cut	0.60	0.50	0.50	0.40
Horizontal direction Drilling (HDD)	0.50	0.50	0.50	0.40
Compressor station piping, IP station, regulating stations or measuring station	0.50	0.50	0.50	0.40
Near concentration of people in Location Classes 1 and 2 *	0.50	0.50	0.50	0.40
Fabricated assembly (Scrapper traps, SV stations, pressure /flow control and metering facilities etc.,)	0.60	0.60	0.50	0.40

7.3. Materials

Pipeline and its appurtenances shall be provided with carbon steel materials suitable for the intended service, as detailed in subsequent paragraphs

Line pipe for main line

Line pipe shall conform to API 5L and Company specifications. Type of line pipe to be used shall be Seamless. Line pipe size, material grade shall be 18" (457.2 mm) OD, API 5L Gr. X-70 for thickness for 11.1 mm/ 14.3 mm.

Other Materials

All other materials flanges, fittings, valves shall be carbon steel suitable for the service conditions and shall be compatible with the line pipe material.

7.4. External/ Internal corrosion coating

Pipeline to be installed below ground shall be protected against external corrosion by a combination of high integrity externally applied coatings and permanent impressed Cathodic protection system. Externally applied coating shall be three-layer side extruded polyethylene coating.

7.5. Pipeline Burial

The pipeline shall be buried normally at a depth of 1.0 meter below natural ground level except river/ rail/ road/ canal/waterways crossing where minimum cover shall be as given below or as per the requirements of statutory/local authorities whichever is more stringent. Increased cover shall be provided at critical locations and crossings.

Sl. No.	Location	Minimum Cover (m)
1.0	Industrial, commercial and residential area	1.0
2.0	Flat terrain	1.0
3.0	Minor water crossing/ canal/ drain/ nala/ waterways	1.5
4.0	HDD crossing of canals (below bed)	2.5
5.0	River crossings for which scour depth is defined (below scour)	1.5
6.0	Other River/ water crossings (Below Bed)	2.5 (For normal soil) 1.5 (For rocky strata)
7.0	Cased/uncased road crossing	1.2
8.0	Cased railway crossing	1.7
9.0	Drainage, ditches at roads/railway crossings	1.2
10.0	Marshy land/Creek area	2.5

Additional Cover

Additional soil cover other than specified above shall be provided at locations indicated by statutory/ local authorities or in areas likely to have an increased risk of impact damage or third-party interference as per agreements between COMPANY and authorities. In case, any private dwelling, industrial building or place of public assembly falls within 15m of pipeline, additional cover of minimum 300mm shall be provided over and above the cover indicated in the above table.

7.6. Marshy Areas/ Areas Prone to Flooding

Wherever marshy areas/areas prone to flooding are encountered along the pipeline route, pipeline shall be provided with anti-buoyancy measures viz. continuous concrete coating/ Geotextile gravel filled bags.

7.7. Backfilling

In normal cross-country areas, the pipeline trench shall be backfilled with excavated soil. Select rockfill/ slope breakers shall be provided in the trench in steep areas (slope generally 10% and more) to prevent erosion. In case of rivers/water bodies prone to scour and erosion, the safety cover shall be provided below the predicted scour level. In addition to the cover, anti-buoyancy measures (concrete coating) shall be provided at river crossings.

Contractor shall keep top 150 mm of excavated top soft soil (free of gravels) aside, which shall be back filled in the end as top layer.

Select backfill shall be provided at approaches to terminal up to transition point (below ground/above ground) inside terminal.

Select back fill shall also be provided as applicable for areas prone to seismic activity.

In rocky/pebbles, marram areas, the trench bottom shall have sand/soft soil padding of 150 mm. After laying of pipeline, sand/soft soil padding shall be placed around and on top of the pipe so that thickness of compacted padding on top of pipe corrosion coating shall be at least 150 mm.

Disposal of debris and surplus material to designated disposal areas or designated place(s), as the case may be and as directed by Engineer-in-charge shall be carried out.

8. HYDROSTATIC TESTING

After installation, the entire pipeline system shall be hydrotested with inhibited water. The water shall be tested, as applicable prior to using for hydrotesting. The minimum hydrostatic pressure in any section shall be as per ASME B 31.8 for gaseous hydrocarbon pipelines. The maximum hydrostatic test pressure at any location of the pipeline shall not exceed the pressure required to produce a hoop stress equal to 95% of SMYS of the pipe material based on minimum wall thickness in the test section. The test duration shall be minimum 24 hours. Pre Hydrostatic testing of section shall be carried out separately and shall be tested at 1.5 times the design pressure. The test duration shall be 4 hours. Mainline valves shall be installed only after successful completion of hydrotesting.

9. DEWATERING AND SWABBING

Dewatering, swabbing and pre-commissioning operations shall be carried out after hydrotesting and prior to commissioning of the pipeline as per Project specifications. Swabbing shall be carried out prior to installation of Sectionalizing valves. After swabbing operation, the pipeline sections shall be dried.

10. CROSSINGS

Road Crossing

Road crossings shall comply with the requirements of API 1102 and the requirements of the concerned road authorities. Unless otherwise required by concerned Authorities, casing pipe shall not be used. However, at national highway road crossings pipeline shall be provided with casing pipe, which shall extend min. 600 mm beyond Road ROW on either side. The casing pipe shall be installed by trenchless method like ramming/ boring/ jacking/ Micro Tunneling. Provision of casing at locations other than national highways shall be decided based on type of road crossing and as per requirements of local authorities if necessary. The casing pipe shall be three nominal pipe sizes larger than carrier pipe. The crossing angle shall be as close to 90º as possible. Casing insulators and end seals shall be provided to ensure electrical isolation of carrier pipe and casing pipe.

Existing Pipeline Crossing/ Other utility Crossing

The specific requirements of Owner/operator of existing pipeline shall generally be followed. The minimum clearance between the lines shall be 500 mm unless specified otherwise. A Concrete slab shall be provided 300mm above the 8” Pipeline or below in case the 8” Pipeline is laid above existing utilities. In both the cases, the cover over Pipeline shall not anyway less the requirements

11. PIPELINE BENDS

In order to accommodate changes in vertical and horizontal alignment in piggable section of pipeline, elastic bends/cold field bends/hot formed long radius bends shall be used. Miter bends shall not be used for change in direction. Minimum bend radius shall be as follows:

Minimum Bend Radius			
Pipeline Details	Elastic Bend Radius, m	Cold Field Bend Radius	LR Bend Radius
18”, X-70, 11.1 mm/ 14.3 mm	500	R=30D	R=6D

ANNEXURE - A

LIST OF CODES AND STANDARDS

In addition to the codes/standards mentioned in Para 3.0, the latest edition of the below listed equivalent codes and standards shall also be used for design of proposed pipeline. The listing includes, but is not limited to, the following:

1. Line Pipes

API 5L	Specification for Line pipe
API 5L1	Recommended Practice for Railroad Transportation of Line pipe
API 5LW	Recommended Practice for Transportation of Line pipe on Barges & Marine Vessels

2. Valves

API 6D	Specification for pipeline valves (Steel Gate, Plug, Ball and Check Valves)
API 602	Compact Steel Gate Valves-Flanged, Threaded, Welding & Extended Body ends.
ASTM A694	Forgings, Carbon & Alloy steel for Pipe Flanges, Fittings, Valves & parts for High Pressure Transmission Service.
MSS-SP-6	Finishes for Contact Faces of connecting End Flanges of Ferrous Valves and Fittings.
MSS-SP-25	Standard Marking System for Valves, Fittings & Unions
BS 5351	Steel Ball Valves for the Petroleum, Petrochemical and Allied Industries

3. Flanges & Fittings

MSS-SP-44	Steel Pipeline Flanges
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI 16.20	Ring-joint Gaskets & Grooves for Steel Pipe Flanges
ASTM A105	Forgings, Carbon Steel for Piping Components
ASTM A193	Carbon & Alloy Steel Bolts & Studs for High Temperature Service
API 601	Standards for Metallic Gaskets for Raised-Face Pipe Flanges & Flanged Connections
ANSI B16.9	Factory Made Wrought Steel Butt Welding Fittings
ANSI B16.11	Forged Fittings, Socket Welded & Threaded
ANSI B16.26	Butt Welding Ends

ASTM A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A694	Forgings, Carbon & Alloy Steel for Pipe Flanges, Fittings, Valves & Parts for High Pressure Transmission Service.
MSS-SP-75	Specification for High Test Wrought Butt Welding Fittings
MSS-SP-97	Integrally Reinforced Forced Branch Outlet Fittings – Socket Welding, Threaded and Butt-Welding Ends.
PFI-ES-24	Pipe Bending Methods, Tolerances, Processes & Material Requirements

4. Testing & Welding

ANSI/AWS D1.1	Structural Steel Welding
API 1104	Standard for Welding Pipelines and Related Facilities
AWS A3.0	Welding Terms and Definitions
AWS A5.1	Welding Electrodes
AWS A5.5	Specification for Low Alloy Steel Covered Arc Welding Electrodes
ASTM E165	Liquid Dye Penetrant Inspection of Pipeline Welds
ASTM A370	Standard Methods and Definitions for Mechanical Testing of Steel Products.
ASTM E18	Standard Hardness Test for Metals
ASTM E23	Standard for Impact Test for Metals
ASTM E84	Standard Test Method for Micro-hardness of Metals
ASTM E92	Standard Test Method for Vickers Hardness of Metallic Materials
ASTM E110	Standard Test Method Indentation Hardness for Metallic Materials by Portable Hardness Testers
ASTM E709	Standard Guides for Magnetic Particle Examination
MSS-SP-53	Quality Standard for Steel Casting & Forging-Magnetic Particle Method
MSS-SP-54	Quality Standard for Steel Casting & Forging-Radiographic Examination
MSS-SP-55	Quality Standard for Steel Castings & Forgings-Visual Method.

5. Surface Preparation, Painting and Coating

SIS-05-59	Pictorial Surface Preparation Standards for Painting Steel Surfaces

SSPC-SP-01	Solvent Cleaning
SSPC-SP-03	Power Tool Cleaning
SSPC-SP-05	Joint Surface Preparation Standard: White Metal Blast Cleaning
SSPC-SP10	Structural Steel Painting Council – Joint Surface
NACE No.2	Preparation Standard - Near-White Metal Blast Cleaning
SSPC-PA-02	Measurement of Dry Paint Thickness and Magnetic Gauges
ASTM E12	Measurement of Pipeline Dry Film Coating Thickness
ASTM-G6	Abrasion Resistance of Pipeline Coating
ASTM G8	Cathodic Disbonding of Pipeline Coatings
NACE-RP-0274	High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
IEC 454 – 2	Specification for Pressure-Sensitive Adhesive Tapes for Electrical Purposes
	CSA Z245.20-02 External Fusion Bond Epoxy Coating for Steel Pipe

ENERGISING QUALITY	**PROJECT NUMBER: 1015**	

HOOKUP/ TIE-IN DETAILS		**CLIENT JOB NO**		BEN-006-4100000327-047-04.02.2019	
		TOTAL SHEETS		08	
DOCUMENT NO.	1015	047	PL	RPT	001

GAIL (INDIA) LIMITED

REROUTING / SHIFTING OF 18" PIPELINE AT NEAR MANYATA TECH PARK, BENGALURU

REV	DATE	DESCRIPTION	PREP	CHK	APPR
C1	28.03.2020	ISSUED FOR CLIENT REVIEW	PNS	MD	AD

DEFINITIONS

PROJECT	REROUTING / SHIFTING OF 18" PIPELINE N BANGALORE REGION
OWNER	GAIL (India) Limited
CONSULTANT	VCS Quality Services Private Limited (VCSQSPL) the party to act for and on behalf of OWNER for the Engineering Services.
MANUFACTURER	The party, which manufactures and supplies equipment and services to the OWNER or to Contractor
SOW	Scope of Work
DBPL	18” Dahej Banglore Pipeline

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2. OBJECTIVE 4
3. SCOPE OF WORK 4
4. HOOKUP & TIE-IN DETAILS 6
a) Route Description 6
b) Design Data 7
c) Tie-In Basic Information 7
5. REFERENCE DOCUMENTS FOR TIE-IN POINTS 8

1. INTRODUCTION

GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain and its related services. In a rapidly changing scenario, GAIL is spearheading the move to a new era of clean fuel industrialization, creating a quadrilateral of green energy corridors that connect major consumption center in India with major Gas Fields, LNG terminals and other cross border gas sourcing points. GAIL is also expanding its business to become a player in the International Market. M/s. GAIL (India) Limited envisages to strengthen local gas grid network in various parts of India. VCS Quality Services Private Limited has been appointed as Engineering Consultant by GAIL for "REROUTING / SHIFTING OF 18" PIPELINE NEAR MANYATA TECH PARK" due to coinciding with Proposed Metro corridor in Bangalore City.

2. OBJECTIVE

The objective of this document is to provide a general idea of how the project Hookup/ tie-in of Proposed Rerouted 18" Pipeline sections in Bangalore with Existing 18" DBPL Pipeline.

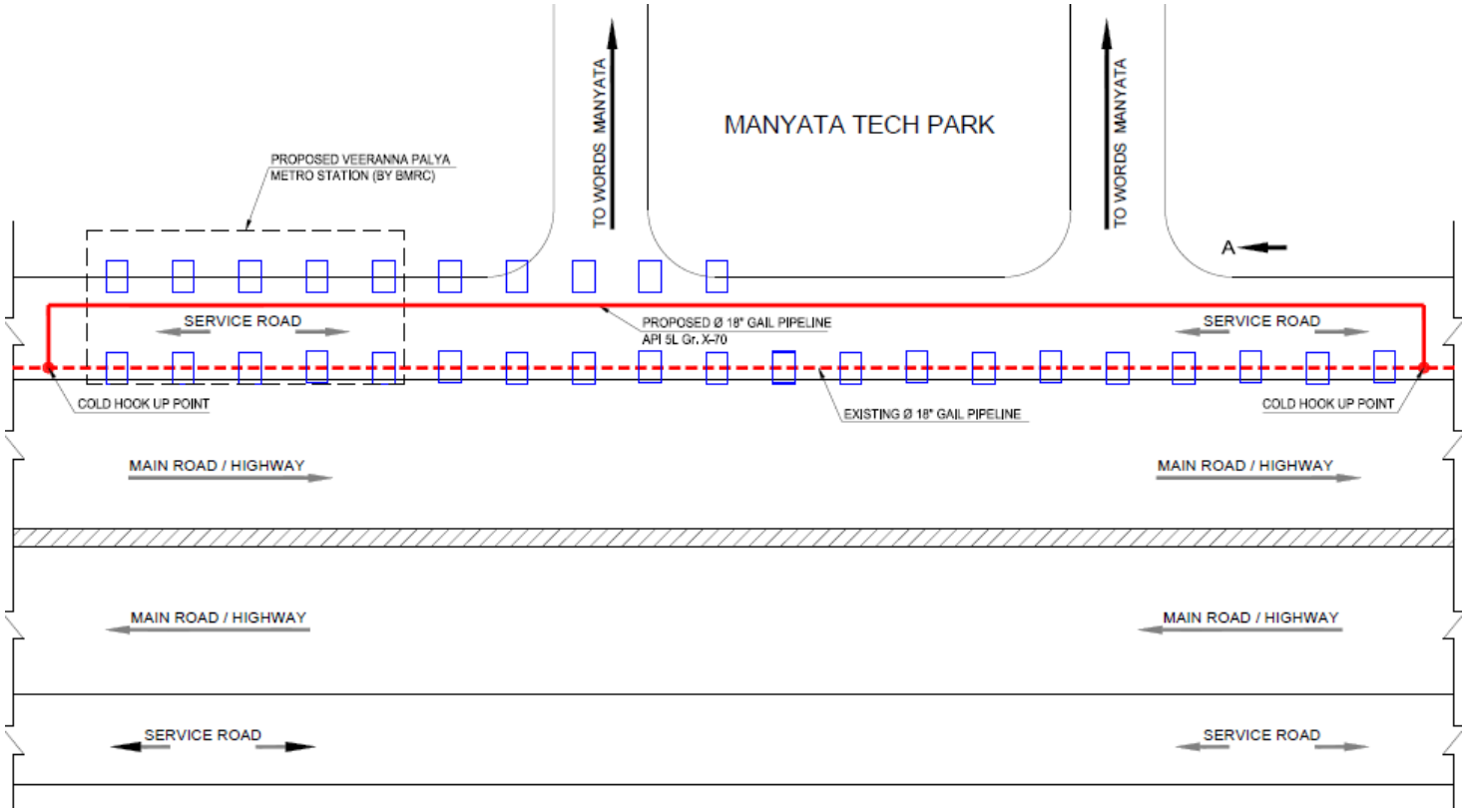
3. SCOPE OF WORK

The scope consists of dismantling existing underground 18" DBPL pipeline of GAIL's to facilitate proposed Metro pillar construction in that route and Laying of rerouted section Ch. 39.40 to 40.20 KM –Manyata Tech Park, Bangalore city.

This document shall be read in conjunction with Scope of Work Document No: 1015-47-PP-SOW-2001, specifications, standards, drawings and other documents forming a part of the Tender Document. All works and clauses of this document shall be applicable unless specifically mentioned otherwise.

- Cold cutting of existing pipeline at the hook-up locations for hook-up with new pipeline shall be carried out. Before cold cutting. Entire section from station to station shall be purged with nitrogen to remove hydrocarbon from the pipeline. Arrangement of localized purging with cylinder shall be done during welding to avoid localized hydrocarbon pockets.
- Completion of Hook up shall be planned in a single day of 24 hr shutdown time. Deployment independent welding crews for each Hook up along with NDT, coating and backfilling crew.
- Contractor shall prepare a method statement with drawing for carrying out the hook-up works and submit the same to Company for review and approval. The hook-up work shall be carried out based on the approved methodology, drawings and/or as per site conditions and as per instruction of Engineer-in-Charge. Contractor shall check and ensure the safe working at the existing hook-up locations by using fire screens.
- Providing barricading in Open trench and Tie in/ hook up points

- Arranging hot work permit from company for performing the work in existing Facilities area particularly hook up points. Arranging of adequate firefighting equipment viz. fire brigade, fire extinguisher, shielding from existing facilities, oxygen mask etc. for carrying out the work safely in existing terminals to the satisfaction of Company.



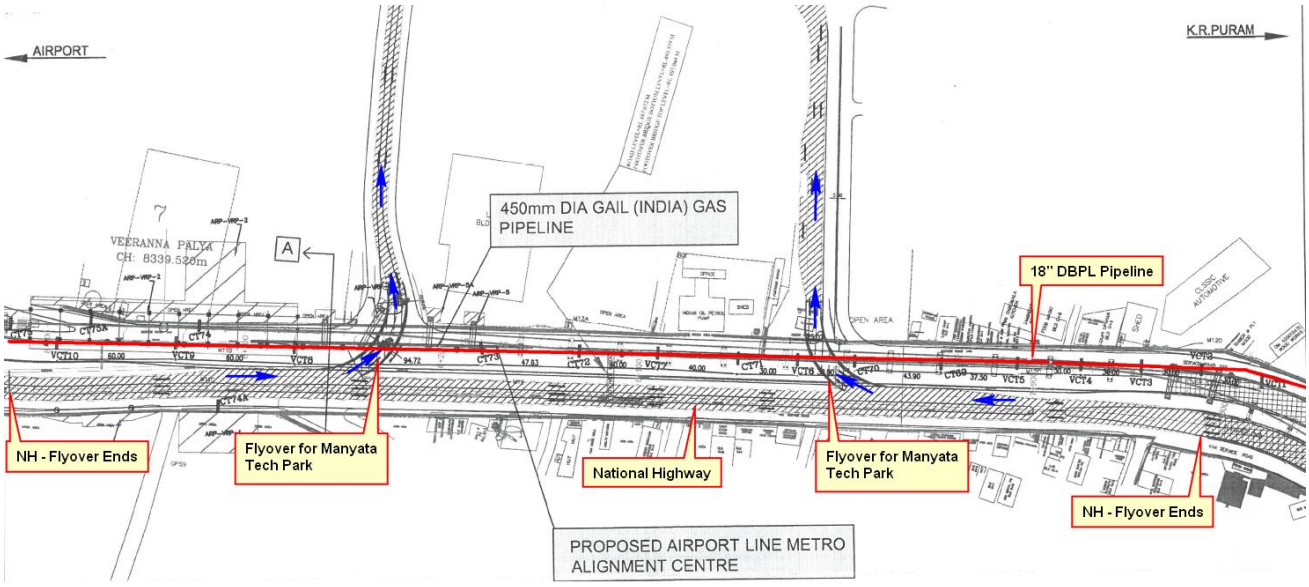
4. HOOKUP & TIE-IN DETAILS

a) Route Description

b)

❖ **Ch. 39.40 to 39.95 KM – Manyata Tech Park, Bangalore city;**

- Existing 18" DBPL GAIL's Natural Gas pipeline is running between the service road and National Highway with a cover depth of 1-m to 1.5-m from Ch. 39.400 Km up to Ch. 39.950 Km. However, 150-m section in front of Manyata Tech-park has been crossed by HDD method with a cover depth of around 6-m.



b) Design Data

Pipeline Design Parameters	
Description	**Value**
Main line	18 "
Products	Natural Gas
Design Pressure (kg/cm^{2}g)	98.0
Operating Pressure (kg/cm^{2}g)	30.0
Max. Design Temperature, Deg. C i. Above ground section ii. Underground section	 -29 to 65.0 -29 to 60.0
Operating temperature, °C	22 – 25
Economic Design Life, years	30
Corrosion Allowance, mm	0

c) Tie-In Basic Information

TABLE-1: PIPELINE TIE-IN SUMMARY FOR REROUTING OF 18" P/L						
Tie-in No.	PIPELINE	From/ To	Size	Material	Isolation	Tie-in Type
TP-103	DBPL	Ch.57.25 KM - KADUBEESANAHALLI UNDER PASS	18"	API 5L Gr. X-70	Shut Down	Welded LR Bend
TP-104	DBPL	Ch.58.25 KM - KADUBEESANAHALLI UNDER PASS	18"	API 5L Gr. X-70	Shut Down	Welded

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT.LTD.

STANDARD SPECIFICATION FOR LONG RADIUS BENDS FOR ONSHORE PIPELINES

VPC-SS-PP-2009

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
00	28.01.2020	MB	MC	AD	SK

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	28.01.2020					
		MB	MC	AD	SK	

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ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
BHN	Brinell hardness number
HAZ	Heat Affected Zone
MSS-SP	Manufacturers Standardization Society - Standard Practice
NB	Nominal Bore
NDT	Non Destructive Testing
OD	Outside Diameter
OLAC	Online Accelerated Cooling
SAW	Submerged Arc Welded
SMYS	Specified Minimum Yield Strength
TMCP	Thermo Mechanical Control Process

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1.0 SCOPE

This specification covers minimum requirements for manufacture, testing and supply of long radius bends, made from carbon steel line pipe, for use in onshore pipeline systems handling hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).

This specification shall be used for fabrication of long radius bends of radii R=6D & R=3D.

2.0 REFERENCE DOCUMENTS

Fabrication, testing and supply of hot induction bends shall comply with the applicable sections of the latest edition (edition enforce at the time of issue of enquiry, unless specified otherwise) of the following codes and standards including their addenda.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.4	:	Pipeline Transportation System for Liquids and Slurries
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B16.25	:	Butt Welding Ends.
B16.49	:	Factory-Made wrought Steel Butt welding Induction Bends for transportation and distribution systems.

AMERICAN PETROLEUM INSTITUTE (API)

Specification 5L	:	Specification for Line Pipe.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370	:	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

MANUFACTURERS STANDARDIZATION SOCIETY (MSS)

SP-75	:	Specification for High Test Wrought Butt Welding Fittings.

OIL INDUSTRY SAFETY DIRECTORATE (OISD)

Std. 141	:	Design and Construction Requirements for Cross Country Hydrocarbon Pipelines.
Std. 214	:	LPG Cross Country Pipeline
Std. 226	:	Natural Gas transmission Pipeline and City Gas Distribution Network

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PURCHASER'S SPECIFICATIONS FOR LINE PIPE

SS-PL-018	:	Standard Specification for Longitudinal Seam Submerged Arc Welded Line Pipe.
SS-PL-042	:	Standard Specification for Seamless Line Pipe
SS-PL-038	:	Standard Specification for HFW Line Pipe

In case of conflict between various requirements of this specification and reference standards mentioned above, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIALS

Bends shall be fabricated from steel line pipe manufactured in accordance with the latest revision of the Company's Specifications referred in Section 2.0 above. The type of pipe to be used for fabrication of bends shall be as indicated in the Purchase Order. Pipes with positive wall thickness tolerances shall be used for fabrication of bends.

The finished product shall be evaluated for mechanical properties and micro structural stability.

Mechanical testing of test bends performed during the bend manufacturing procedure qualification as per Clause 9.0 of this specification shall ensure that, all bends made according to the Company approved bend manufacturing procedure, have the required mechanical properties. Destructive testing of production bend is not required. However, Company reserves the right to require destructive testing whenever production bending parameters or heat treatment parameters deviate from those established in the Company approved bend manufacturing procedure. However, deviations accepted during pipe production with respect to mechanical properties of line pipe shall be applicable for the bends.

4.0 MANUFACTURE

4.1 GENERAL

Material grade, bend size, bend radius and bend angle shall be as indicated in the Purchase Order/MR /Data sheet. The bending radius for bends shall be either six times the specified outside diameter (R=6D) or three times the specified outside diameter (R=3D), as applicable. The specified bend radius shall be measured at the bend neutral axis.

4.2 MANUFACTURING PROCEDURE

4.2.1 BENDING PROCESS

Bends shall be manufactured by high frequency continuous induction heating and forming method. A minimum of four temperature-monitoring probes shall be in continuous operation throughout all operations. The pipe to be bent shall be cleaned to remove any loose mill scale etc. Once the bending operation has commenced no stoppage shall be permitted until the entire bend has been completed. If bending temperature, bending rate,

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cooling medium volume or heat treatment temperature deviates from the Company approved bend manufacturing procedure, then the bend shall be discarded and another bend shall be made in its place. Cost of such discarded pipes shall be borne by the Manufacturer.

Heat treatment shall be carried out for all finished bends, only in case, it is established during bending procedure qualification that heat treatment is required to meet the specification requirements. Post hot bending heat treatment shall be carried out to the same cycle that the original material received for its production in order to bring the metallurgical condition back to its original state and heat treatment procedure shall be such that the mechanical properties and steel microstructure of the finished bends comply with the minimum requirements specified in the applicable line pipe specification referred under clause 2.0. Heat treatment procedure shall be submitted and prior approval of company shall be obtained on heat treatment procedure.

When Thermo mechanically Control Process (TMCP) and online accelerated Cooling (OLAC) steels are used, specific approval of the proposed heat treatment shall be obtained before bending process is employed. Heat treatment shall be carried out for all finished bends in case it is established during bending procedure qualification that heat treatment is required to meet the specification requirements.

Unless otherwise specified differently in the Purchase Order, the bevels at the ends shall be as per the relevant pipe specification.

4.3 INTERNAL TRANSITIONS

Bends shall have internal transitions at the tangent ends machined to suit the mating pipe in accordance with the specified wall thickness and the requirements of ASME B31.8/B 31.4.

4.4 CIRCUMFERENTIAL JOINTS

Bends shall not have any circumferential joints.

4.5 LOCATION OF WELD SEAM

When bending SAW or High Frequency Welded Pipes, the longitudinal seam shall be located in the plane of minimum deformation or neutral axis. Acceptable tolerance on location of the longitudinal weld seam shall be ± 5°.

4.6 WELD END BEVELS

Unless otherwise specified in Purchase Order, the bevels at the weld ends shall be as per ASME B 31.4/ ASME B 31.8. All cut pipe ends shall be bevelled by machining. The excess weld material at the inside of the bend in case of bends made from SAW pipes, shall be removed over a distance of 100 mm at both ends, but shall not result in reduction of bend wall thickness below the minimum specified wall thickness requirement.

4.7 REPAIRS

No repair by welding is allowed on any part of the bends.

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4.8 DEVIATIONS FROM ORIGINAL CONTOUR

Bulges, dents and flat areas shall not appear within 100 mm of each end of the bend. For the remaining part of these deviations from the original contour of the pipe are permitted provided these deviations do not exceed 2% of nominal outside diameter or 6.0 mm whichever is less. The same shall not extend (in any direction) over a distance of more than 25% of nominal outside diameter of the bend. Dents at the pipe weld seam shall not be acceptable irrespective of the size.

4.9 TANGENT LENGTH

All bends shall be provided with a tangent length at both ends. Tangent length shall be minimum 500 mm or equal to pipe outside diameter whichever is more.

In case, the total length of the bend arc (R=6D) including tangents exceeds one pipe length, tangent length shall be restricted to accommodate complete bend within one pipe length. In no case, tangent length shall be less than 250 mm.

4.10 TOLERANCES

The dimensions of bends shall be controlled to make sure that they are manufactured according to the tolerances indicated below, in addition to the requirements of MSS-SP-75. However, the ends of finished pipe bend shall meet the dimensional tolerances of the relevant pipe specification referred in Clause 2.0.

Following tolerances shall be applicable for Bend Angle and Bend Radius:

- Weld Seam : ± 5°.
- Bend Angle : ± 0.5° from the specified angle.
- Bend Radius : ± 1% of Bending Radius. of bending nominal radius (radius as indicated in Clause 4.1 above
- Wall Thickness : As per (A) below.
- Out of Roundness : As per (B) below.
- Off Plane : As per (C) below.

A. WALL THICKNESS

The Manufacturer shall measure the wall thickness of the pipe before bending along both the inside and outside radii of the bend between and including the start and stop points of the bend arc angle, at intervals approximately equal to pipe diameter or 300 mm whichever is less. The wall thickness shall be measured ultrasonically after bending at the same locations as measured before bending. In addition, the wall thickness of the tangents shall also be measured. These measurements shall be taken at four equally spaced locations around the pipe circumference. The measured wall thickness shall be at least equal to:

t_{min} = 0.95 (ta - Δ t).

ta = Actual wall thickness before bending.

Δ t = 0.35 mm for ta < 10 mm.

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= 0.5 mm for ta ≥ 10 mm.

Maximum percentage thinning allowed 10% & 18% for 6D and 3D bends respectively.

When the pipes are free issue (or thickness of pipes is specified in MR) the thickness of finished bend shall comply with the requirement of 4.10 or as specified in data sheet whichever is higher. When pipes for manufacturing LR bends are to be procured by manufacturer and thickness of finished LR bends is specified in the MR, thickness specified of the bends shall be the minimum thickness achieved after bending with tolerance as (-) 0.0. Manufacturer shall procure pipes to achieve t_{min} of LR bends. Higher value of t_{min} shall be selected among as described in 4.10 above & as specified in data sheet.

B. **Out of roundness tolerance on the body and ends of the bend shall be as follows:**

Body

Measurements of the outside diameter shall be taken in the plane of the bend at locations where wrinkles are present (OD_{max}.) and at locations where wrinkles are not present (OD_{min}). Out of roundness shall be considered acceptable, if the value of ((OD_{max}-OD_{min})/OD_{nom}.) does not exceed 2.0%.

The measurements shall be made over the circumference of the bend either at distances approximately equal to pipe diameter or 300 mm whichever is less. Minimum three measurements shall be taken for each bend.

Ends

Out-of-roundness over a length of 100 mm from the end shall comply with the requirements of relevant company specification referred in Clause 2.0.

In case multiple bends are to be manufactured from single pipe, out of roundness tolerances applicable on pipe body shall be acceptable as end tolerances for bend ends fabricated from original body of line pipe.

C. **OFF PLANE**

Off-Plane of bends shall not exceed (θ /90) x 10 mm, where θ is the bend angle in degree or the tolerance limit specified in MSS-SP-75, whichever is less. The measurement shall be in accordance with MSS-SP-75.

D. **Squareness**

Bevel and squareness of bend ends shall comply with the requirements of relevant company specification referred in Clause 2.0.

5.0 INSPECTION AND TESTS

5.1 GENERAL

The manufacturer shall perform all inspection and tests as per the requirements of this specification and MSS-SP-75 prior to shipment, at his Works. Such inspection and tests shall be as a minimum, but not limited to, the following:

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- Verify that the unfinished product arriving at Manufacturer's shop is in full compliance with the pipe specification as referred in Clause 2.0 of this specification.
- Visual Inspection.
- Dimensional and tolerances check as per MSS-SP-75 and requirements of Clause 4.0 of this specification.
- Check heat treatment, if carried out, as required and maintain its records.
- Temperature against time recorder charts for each induction heating.
- The non-destructive inspection on the finished bend shall be carried out as given below:
    - All seam welds of bends manufactured from SAW pipes shall be 100% radiographed and seam welds of bends manufactured from HEW pipe shall be 100% ultrasonically tested. The acceptance criteria shall be same as given in applicable pipe specification referred under clause 2.0 of this specification.
    - The full circumference of both ends of each bend after bevelling shall be ultrasonically tested for laminations over a length of 100 mm and acceptance limits shall be as per pipe specification as referred in Clause 2.0 of this specification.
    - The finished bends shall be magnetic particle inspected on the outside and inside radii to include the area encompassed 30 degrees either side of the line passing through the plane of the bend. Acceptance criteria shall be as per ASME Sec. VIII Appendix 6.
- A check shall be performed on each bend by passing a gauging pig consisting of two discs having a diameter equal to 95% of the inside diameter of the pipe, connected rigidly together at a distance equal to 500 mm. Details of the gauging pig, including its dimensions shall be approved by Company.
- When Specified in requisition for quotation, all bends shall be subjected to hydrostatic testing at a pressure capable of generating a hoop stress in pipe equal to 95% of Specified Minimum Yield Strength of pipe. Test pressure shall be maintained for a min. of 20 sec.

5.2 Company's Inspector reserves the right to perform stage wise inspection and witness tests on all bends as indicated in Clause 5.1 at Manufacturer's works, prior to shipment.

Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection, to the Company's Inspector. Inspection and tests performed or witnessed by Company's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests. Under no circumstances any action of the Company's Inspector shall relieve the Manufacturer of his responsibility for the material and quality of the bends.

As a minimum the following stages will be subject to witness/hold/review by the Purchaser’s Inspector:

- Bend Manufacturing Procedure Qualification.
- Heat Treatment.

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- Destructive Testing of Test Bends.
- Inspection of Radiographs and Other NDT Results.
- Material Certification Checks.
- Full Dimensional Checks.
- Pre-release Inspection.

Where inspection or testing is to be performed by certified testing laboratories, the Manufacturer shall submit their proposed testing laboratory for approval.

The final inspection, before issue of a release note for the Induction Bends, shall include material certificates, test certificates, surface treatment, dimensional conformity, heat treatment, tagging and packing conformity.

6.0 TEST CERTIFICATES

Manufacturer shall submit the following Certificates:

- Test certificates of chemical analysis, mechanical tests, heat treatment, NDT, dimensional inspection and hydrotest carried out on pipe used for fabrication of bend.

  These test certificates are not required when pipe is supplied as free issue by the Company.

- Certificates of non-destructive test/examination carried out on bends.

- Records of heat treatment, if carried out for bends.

- Certified reports of dimensional tolerance of bends.

- Certificates of all other tests as required in this specification.

The Certificates shall be valid only when signed by Company's Inspector. Only those bends which have been certified by Company's Inspector shall be dispatched from Manufacturer's works.

7.0 MARKING, PACKING & SHIPMENT

Packing, shipping and handling of all materials to be in accordance with the instructions in the RFQ and as per following:

- All bends shall be marked as per MSS SP-75.

- All loose and foreign material i.e. rust, grease, etc. shall be removed from inside and outside of the bends prior to packing.

- A coat of antirust paint shall be applied on the bends for protection during transit and storage. Type of paint shall be as agreed upon with the Company.

- Both ends of all bends shall be suitably protected to avoid any damage during transit by means of metallic or high impact plastic bevel protectors.

- Bends shall be packed / crated or bundled for transportation or shipping to the agreed destination.

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Package of bends shall be marked with following:

- Purchaser's Name.
- Order Number.
- Package Number.
- Size (Inches), Wall Thickness (mm)
- Bend Radius (mm).
- Manufacturer's Name and Place of Manufacture.
- Destination of dispatch.
- Any Additionally marking / shipping marks specified in Purchase order/MR.

In addition, each bend shall be paint stencilled with the same information in 25 mm (1 Inch) or larger letters on the inside surface within 150 mm (6 Inch) of each end.

8.0 DOCUMENTATION

Documentation to be submitted by Manufacturer to Company is summarized below. Number of Copies (Hard copies / soft copies etc.) shall be as indicated in CONTRACT document.

8.1 All documents shall be in English language.

8.2 At the time of bidding, bidder shall submit the following documents:

- Reference list of previous supplies of bends of similar specifications.
- Brief description of manufacturing including heat treatment and quality control facilities of the Manufacturer's Works.
- Brief description of manufacturing and quality control facilities of the Manufacturer's works.

8.3 Within two weeks of placement of order, the Manufacturer shall submit bend manufacturing procedure including manufacturing, inspection, testing procedures, quality control manual and quality plans.

The Bend Manufacturing Procedure shall detail the following, as a minimum:

- Sequence of operation
- Induction forming process including bending temperature, temperature control, bending rate, cooling rate and cooling procedure;
- Temperature measurement and calibration
- Post bend heat treatment procedure including temperature and time.
- Dimensional control procedure
- Pipe material used for bend manufacture

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- NDT procedures
- Quality Control and Quality Plans

Upon successful completion of the bend manufacturing procedure qualification as per Clause 9.0 of this specification, Manufacturer shall submit the qualified procedure to Company for approval. Regular production of bends shall commence only after the bend manufacturing procedure has been qualified and approved by Company.

Once the approval has been given by Company any change in material and method of manufacture and quality control shall be notified to Company whose approval in writing of all such changes shall be obtained before the bends are manufactured.

8.4 Within two weeks from the approval date, Manufacturer shall submit to Company the approved drawings, documents and specifications as listed in Clause 8.3 above.

8.5 Prior to shipment, the Manufacturer shall submit test certificates as listed in Clause 6.0 of this specification.

9.0 BEND MANUFACTURING PROCEDURE QUALIFICATION

9.1 Prior to start of production bending, Manufacturer shall demonstrate the suitability of the proposed manufacturing procedures for producing pipe bends including the post-bending heat cycle, that meet the requirements of this specification, by mechanically testing additional bend(s) (test bends). The bending procedure shall be qualified in the presence of Company Representative.

9.2 Test bends shall be made by using the pipe specified in Clause 2.0 of this specification. One test bend is required per 'heat lot' where a heat lot is deemed to include all bends of the same diameter, wall thickness, mill heat number and bend forming parameters such as, bending temperature, bending rate, cooling medium volume & heat treatment temperature (excluding bend angle). In case, line pipes are free issued from multiple heat lots, heat lot having maximum numbers of pipes shall be considered for fabrication of test bend. The test bend shall be bent to an angle of 90°.

9.3 Inspection and Testing of Bends

9.3.1 All finished test bends shall meet the requirement of dimensional tolerances, inspection and non-destructive testing requirements specified in Clause 4.0 and 5.0 of this specification.

9.3.2 In addition, all finished test bends shall be subjected to following mechanical testing to confirm that the bends manufactured meet all mechanical property requirements of Company line pipe specifications referred in Section 2.0 of this specification. Test procedure and acceptance criteria shall be in accordance with the Company line pipe specification referred in Section 2.0 of this specification. The test specimen shall be taken from the bent portion of the bend only.

a. Tensile Test

One tensile test shall be conducted on the base material of finished test bend, to establish yield strength, ultimate tensile strength and elongation. The specimen

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shall be taken longitudinal or transverse to the axis as specified in the relevant pipe specification. In case of bends of 450 mm (18") NB and larger, the specimen shall be taken at inside radius and one at outside radius of the bend.

b. All Weld Tensile Test

In case of bends fabricated from SAW pipes, an all weld tensile test shall be conducted to establish yield strength, ultimate tensile strength and elongation of weld material on bend.

c. **Guided Bend Test/Reverse Bend Test**

For bends manufactured from SAW pipes one face and one root guided bend test shall be performed. For bends manufactured from HFW pipes, reverse bend test shall be carried out. Test method and acceptance criteria shall be same as given in applicable pipe specification referred under clause 2.0 of this specification.

d. Hardness Test

Hardness testing shall be performed "through thickness" on a test ring removed from the middle of the bend. Four specimens shall be prepared one from each quadrant. In case of bends fabricated from SAW/HFW pipes, one specimen shall the have longitudinal weld seam in the middle. Hardness shall be checked for base metal, weld metal and HAZ. In addition, hardness test shall be performed at spots where dents, bulges or wrinkles have been formed on the bends.

e. Fracture Toughness Test

Charpy-V-notch test temperature shall be the same as specified in the relevant pipe specifications referred in Clause 2.0. Three base material specimens shall be taken longitudinal or transverse to the axis as specified in the relevant pipe specification. In case of bends fabricated from SAW and HFW pipes, three transverse weld material specimens shall be taken with weld in the middle. In case of bends of 450 mm (18") NB and larger, the base material specimens shall be taken at the outside radius of the bend. If multiple thicknesses are involved, testing shall be done on bend with maximum thickness.

f. Hydrostatic test

Bends shall be hydrostatically tested to test pressure that shall result in hoop stress Corresponding to 95% of SMYS of pipe material. Test pressure shall be calculated for minimum allowable thickness. Test pressure shall be held for a minimum period of twenty (20) seconds.

Should test bends fail to comply with the above requirements, the bend manufacturing procedure shall be disqualified. The Manufacturer shall revise the manufacturing procedure and re-qualify the same at his own cost and time.

Upon completion of the successful procedure qualification, manufacturer shall provide a written bending procedure for each test bend. The submitted procedure shall indicate in addition to the details as per Clause 8.3, tolerances on various controlling parameters.

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INSPECTION AND TEST PLAN – LR BENDS FOR ONSHORE PIPELINES

0	05.06.2017	ISSUED AS STANDARD	GS	ADE	AD
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ABBREVIATIONS

CE	Carbon Equivalent	NPSH	Net Positive Suction Head
DFT	Dry Film Thickness	PO	Purchase Order
DPT	Dye Penetrant Testing	PESO	Petroleum Explosive Safety Organization
DHT	De-hydrogen Heat Treatment	PQR	Procedure Qualification Record
ERTL	Electronics Regional Test Laboratory	PR	Purchase Requisition
FCRI	Fluid Control Research Institute	PMI	Positive Material Identification
HT	Heat Treatment	RT	Radiography Testing
HIC	Hydrogen Induced Cracking	SSCC	Sulphide Stress Corrosion Cracking
ITP	Inspection and Test Plan	TC	Test Certificate
IP	Ingress Protection	TPI or TPIA	Third Party Inspection Agency
IHT	Intermediate Heat Treatment	UT	Ultrasonic Testing
IC	Inspection Certificate	VDR	Vendor Data Requirement
IGC	Inter Granular Corrosion	WPS	Welding Procedure Specification
MRT	Mechanical Run Test	WPQ	Welders Performance Qualification
NDT	Non Destructive Testing	MPT / MT	Magnetic Particle Testing

1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of LR Bends.

2.0 REFERENCE DOCUMENTS:

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

3.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	STAGE/ ACTIVITY	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION		
					SUB SUPPLIER	SUPPLIER	TPIA
1.0	**Procedure**						
1.1	Hydro Test , NDT, Bend Manufacturing, Heat treatment and Other Procedures	Documented Procedures	100%	Procedure Documents	~	H	R
2.0	**Material Inspection**						
2.1	Raw Material Inspection	Chemical, mechanical properties, method of manufacturing, Heat Treatment Condition, etc.	100%	Mill Test Certificates	H	R	R
3.0	**In-Process Inspection**						

3.1	Material Identification	Heat No/Marking verification, Grade etc. Positive thickness , Diameter, etc.	100%	Mill TC & Pipe Receiving Report	-	H	R
3.2	Bend Manufacturing Procedure Qualification	Bend forming parameters and all the testing as per purchase specification	100%	Test Reports	-	H	H
3.3	Induction Bending (Production bends)	Bending temp Bending rate Power input As per qualified procedure of test bend	100%	Inspection Report	-	H	-
3.4	Heat Treatment (If Applicable	Time / temp record	100%	HT Graph	-	H	R
4.0	**Final Inspection**						
4.1	NDT-RT,UT & MPT as applicable	Defects	100%	Films / test reports	-	H	R
4.2	Hydrostatic tests	Soundness / Leak check	100%	Test Reports	-	H	RW

4.3	Final visual and dimension	Visual and Dimension	100%	Inspection Report	-	H	RW
4.4	Gauging Pig Passing	Verification of ID / Profile	100%	Inspection Report	-	H	RW
4.5	Mechanical Testing as applicable	Destructive Tests	100%	Testing Report	-	H	H
5.0	**Documentation & IC**						
5.1	Documentation & Inspection Certificate(IC)	Review of Stage Inspection Reports / Test Reports & Issue of IC	100%	Manufacturer TC & IC	-	H	H
5.2	Final documents as applicable	Verification & compilation of inspection & test records for submission to customer	100%	Final dossier	-	H	H

Legend:

H - Hold (Do not proceed without approval),

P - Perform,

RW - Random Witness (As specified or 10% [min.1 no. of each size and type of Bulk item]),

R - Review,

W - Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable):

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be Applicable (unless otherwise agreed upon).

2. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in /Job Specification /Approved Documents.

PROJECT:	DEVELOPMENT OF NEW SV STATION ON 6” SPUR LINE AND SV63 AS TOT STATION ON 12" MAIN LPG PIPE LINE	
CLIENT:	GAIL (INDIA) LIMITED	
CONSULTANT:	VCS QUALITY SERVICES PVT. LTD.	

LIST OF RECOMMENDED THIRD PARTY INSPECTION AGENCY (TPIA)

SL. NO	NAME OF TPI	ADDRESS	PHONE NO	FAX NO
1	Tata Projects Ltd.	22,Sarvodaya Society,Nizampura,Baroda-390002	0265-2392863	0265-2785952
2	Bax counsel Insepection Bureau Pvt. Ltd.	303, Madhava,Bandra Kurla Complex, Bandra(E),Mumbai-400051	022-26591526,022-26590236	022-26591526
3	Germanischer Lloyd	4th Floor, Dakshna Building, Sec-11, Plot NO.2, CBD Belapur, Navi Mumbai 400 614	022-4078 1000	022-4024 2935
4	ABS Industrial Verification Ltd., Mumbai	404,Mayuresh Chambers,Sector-11,CBD Belapur(E),Navi Mumbai-400614	022-27578780 /1 /2	022-27578784 / 5
5	Certification Engineers International Ltd.	EIL Bhavan,5th floor,1,Bhikaji Camma Place,New Delhi-110066	011-26167539,26102121	011-26101419
6	Dalal Mott MacDonald	501, Sakar -II, Ellisbridge,Ahemedabad-380006	079-26575550	079-6575558
7	International Certification Systems	E-7,Chand Society, Juhu Road, Juhu, Mumbai-4000049	022-26245747	022-226248167
8	SGS	SGS India Pvt. Ltd.,SGS House,4B,A.S.Marg,Vikhroli(W),Mumbai-400083	022-25798421 to 28	022-25798431 to 33
9	Intertek Moody	9th Floor, Kanchenjunga Building, 18-Barakhamba Road, New Delhi-110001	011-4713 3900	011-4713 3999
10	TUV SUD South Asia	C-153/1, Okhla Industrial Ara, Phase-1, New Delhi-110020	011-3088 9611/9797	011-3088 9598
11	TUV Rheinland (India) Pvt. Ltd.	F-51, Kailash Complex GF, Veer Savarkar Marg, Vikhroli Park Site, Vikhroli(W), Mumbai-400079	022-4215 5435	022-4215 5434
12	Vincott International India Assessment Service Pvt. Ltd.	C-301, Mangalya Premises Cooperative Soc. Ltd, Off. Marol Maroshi Road, Andheri(E), Mumbai-400959	022-4247 4100	022-4247 4101
13	Meenar Global Consultants	Mr. Nitin Taneja (Project Manager)	M: +91-9711212783 T: +91-129-4072836	Web : www.meenaar.in Email : nitin.taneja@meenaar.in
14	VCS Quality Services Pvt. Ltd.	505, 5th floor, 360 Degree Business Park, Next to R-Mall, L.B.S. Marg, Mulund West, Mumbai 400080	Tel: 91 22 21649720	091 22 21646392

ENERGISING QUALITY

CHECKLIST – TECHNICAL

Bidder confirms following, as a minimum, has been enclosed in the offer.

S.NO.	Requirements	Compiled by Bidder(Tick)
1	Reference List of previous supply of Procured item	☐
2	Filled – up Data Sheets, duly signed and stamped by bidder enclosed.	☐
3	List of recommended commissioning spares and accessories for Procured item.	☐
4	List of recommended spares and accessories for two year normal operation for procured item.	☐
5	Compliance statement duly filled and stamped enclosed.	☐
6	GA & assembly drawings, cross section drawings including part list & material list enclosed.	☐
7	Other technical details & vendor's product catalogues enclosed.	☐

COMPLIANCE STATEMENT

S.No	Requirement	Bidder's Confirmation
1	Bidder confirms that all materials proposed by the bidder are same/ superior to those specified in specification/ data sheets enclosed.	
2	Bidder confirms that the offer is in total compliance with the Technical requirements of the Material Requisition. Bidder confirms that deviation expressed or implied anywhere else in the offer shall not be considered valid.	
3	Bidder confirms that all spares and accessories required for two years of normal operation have been quoted separately.	
4	Bidder confirms that prices for start-up/commissioning spares and accessories have been included in the quoted items.	
5	Bidder confirms that in the event of securing order for the requisitioned item(s), good for manufacturing drawings of ordered item(s) shall have complete details with dimensions, part list and material list including back-up calculations in the first submission, failing which the vendor shall be solely responsible for any likely delay in delivery of item(s).	

Bidder's Signature with Stamp

DEVIATION/ EXCEPTION/ CLARIFICATION SHEET

Sr. No.	Contractor's Inquiry Reference	Contractor's Requirement	Proposed Deviation by Supplier, with Technical Justification	Cost Impact, if any	Contractor's Conclusions

NOTES

1- Bidder confirms that apart of from the deviations/exceptions/clarifications listed above, the bid is in full compliance with Inquiry requisition.
2- Bidder shall submit this sheet duly filled up and signed by him along with his bid. In case there is no deviation, then also supplier shall submit this sheet along with his bid indicating NIL deviation.

(Contractor's Name and Signature with Seal)

REV	DATE	DESCRIPTION	PREP	CHK	APPR
0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD

INFORMATION/ DOCUMENTS / DRAWINGS TO BE SUBMITTED BY SUCCESSFUL BIDDER

Successful Bidder shall submit four copies unless noted otherwise, each of the following:

1. Inspection & test reports for all mandatory tests as per the applicable code as well as test reports for any supplementary tests, in nicely bound volumes.

2. Filled in Quality Assurance Plan (QAP) for Purchaser's/ Consultant's approval. These QAPs shall be submitted in two copies within 15 days from LOI/ FOI.

3. Detailed completion schedule activity wise (Bar Chart), within one week of placement of order.

Note : All drawings, instructions, catalogues, etc., shall be in English language and all dimensions shall be metric units.

0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

INSTRUCTION TO BIDDERS

1. Bidder to note that no correspondence shall be entered into or entertained after the bid submission.
2. Bidder shall furnish quotation only in case he can supply material strictly as per this Material Requisition and specification/data sheet forming part of Material Requisition.
3. If the offer contains any technical deviations or clarifications or stipulates any technical specifications (even if in line with MR requirements) and does not include complete scope & technical / performance data required to be submitted with the offer, the offer shall be liable for rejection.
4. Bidder must submit all documents as listed in checklist with his offer.
5. Supplier must note that stage wise inspection for complete fabrication, testing including the raw material inspected to be carried out.
6. Vendors for bought out items to be restricted to the approved vendor list attached with bid document. Approval of additional vendor if required, for all critical bought out items shall be obtained by the supplier from the purchaser before placement of order. Credentials/PTR of the additional vendor proposed to be submitted by supplier for review and approval of Purchaser/ Purchaser's representative

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REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

LIST OF SPARES

S.No.	Part No.	Description	Quantity(Minimum)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

0	25.05.2017	ISSUED AS STANDARD	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

REFERENCE LIST

S. No.	Project	Year of Supply	Client, Address and Contact No.	Email	Size and Rating / thk	Service

Bidder's Signature with stamp

ENERGISING QUALITY	**VENDOR DRAWINGS DOCUMENT SCHEDULE**	**VCS-SD-VS-001**

VENDOR DRAWINGS

DOCUMENT SCHEDULE

ENERGISING QUALITY	**Vendor Drawing/ Document Submission Schedule**						Status: Date:	
Client	Project			Vendor Name				
Item Description	PR No.			Address				
	FOA No.							
	Date of LOA							
	PO No.			Contact Person:			Fax:	
VCS Department			Contact Person (VCS)		Phone:		Email:	
S. No.	Equipment Number	Drg./Doc. Nomenclature	Vendor Drg./ Doc. Number	Vendor Drg./Doc. Title	Category Review (R) / Records	Scheduled date of 1st submission (Rev.0)	Form Electronic / Print	Remarks

0	25.05.2017	ISSUED AS STANDARDS	AS	GS	AD
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHK**	**APPR**

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR
PIPELINE CONSTRUCTION (ONSHORE)

VPC – SS – PP - 2001

00	28.01.2020	MB	MC	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

UNCONTROLLED COPY	:	If printed
CONTROLLED COPY	:	If in soft and signed

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	28.01.2020					
		MB	AK	AD	SK	

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ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
API	American Petroleum Institute
BS	British Standards
ISO	International Organization for Standardization
MSS-SP	Manufacturers Standardization Society - Standard Practice
NACE	National Association of Corrosion Engineers
OISD	Oil Industry Safety Directorate
SSPC	Steel Structures Painting Council

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1. SCOPE

1.1 This specification covers the minimum requirements for the various activities to be carried out by Contractor for or about the construction of cross-country onshore pipelines and associated facilities.

1.2 This specification shall be read in conjunction with scope of work and requirements indicated in specifications and documents included in the contract between Company and Contractor.

1.3 Contractor shall take full responsibility for the stability, suitability and safety of all operations and methods involved in the work.

1.4 The Contractor shall be deemed to have visited, inspected and examined the work area(s) and its surroundings and to have satisfied himself with the form and nature thereof, including sub-surface conditions, hydrological and climatic conditions, accessibility to the work area(s), the extent and nature of the work and materials and equipment necessary for the completion of the work.

1.5 The Contractor shall be deemed to have obtained all necessary information and provided for all risks, contingencies and all other circumstances, which may influence the work.

1.6 Contractor, as part of his Scope of work, shall investigate and establish any new development which may have taken place since the topographical survey was carried out by the Company during feasibility stage and shall submit detailed documentation to support any proposed realignment of the surveyed pipeline route resulting from the actual conditions encountered during his investigations or as required by the relevant Local Authorities. Any realignment of the surveyed pipeline route shall be subject to Company approval prior to implementation.

1.7 Requirements related to pipeline construction including, but not limited to, clearing and grading of Right-of-Use (ROU), staking of the pipeline route, handling, hauling, stringing of pipes along ROU, storing of all materials, trenching, cold field bending of pipes, line-up, welding, lowering, backfilling, tie-in, installation of associated facilities and pipeline appurtenances, testing, clean-up and restoration, maintenance during defect liability period, etc. are addressed in this specification.

2. REFERENCE CODE & STANDARDS

Reference code and Standards latest version has been followed for specification, In case of conflict between the requirement of this reference codes, standards and specification mention below, the more stringent requirement shall apply unless otherwise agreed by Company.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

31.4	:	Pipeline Transportation System for Liquid Hydrocarbons and Other Liquids.
B 31.8	:	Gas Transmission and Distribution Piping Systems.
B 16.5	:	Pipe Flanges and Flanged Fittings.

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B 16.9 : Factory made Wrought Butt Welding Fittings.

B 31.3 : Process Piping.

AMERICAN PETROLEUM INSTITUTE (API)

5L 1 : Recommended practice for rail road transportation line pipe.

1104 : Welding of Pipeline and related Facilities.

1105 : Bulletin on construction Practices for oil and related facilities.

1109 : Marking Liquid Petroleum Pipeline facilities.

1110 : Recommended Practice for Pressure Testing of Petroleum Pipeline.

1102 : Steel Pipelines Crossing Railroads and High way.

BRITISH STANDARDS (BS)

8010 Part 2 : Pipeline on Land Design, Construction and Installation.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

Part 192 : Transportation of natural gas by Pipeline (US Department of Title 49 transportation–Pipeline Safety standards).

Part 195 : Transportation of liquid by Pipeline (US Department of Transportation–Pipeline safety standards).

OIL INDUSTRY SAFETY DIRECTORATE (OISD)

141 : Design and Construction requirements for cross-Country Hydrocarbon Pipelines.

226 : Natural Gas Transmission Pipelines and City Gas Distribution Networks.

214 : Cross-Country LPG Pipeline.

3. GENERAL REQUIREMENT

3.1. Contractor shall, with due care and diligence, execute the work in compliance with all laws, by laws, ordinances, regulations etc. of the land and provide all services and labor, inclusive of supervision thereof, all materials, excluding the materials indicated as "Company Supplied Materials" in the contract, equipment, appliances or other things of whatsoever nature required for the execution of the work, whether of a temporary or permanent in nature.

3.2. In case, the Company will get the surveys and soil investigations carried out along pipeline route. The details of the surveys, soil investigations and other data collected by the Company shall be presented in the drawings and documents enclosed with the Contract for the information of the Contractor. The Contractor shall be deemed to have reviewed and satisfied himself with regard to the details provided in the Contract. Contractor shall not be

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entitled for any compensation in terms of time or cost in case of any variation in actual site conditions from the data furnished in the Contract.

3.3. Where in the Contractor's opinion the survey and investigation data are not found to be sufficient in detail, it shall be the responsibility of the Contractor to assess, requirement of any additional surveys and/ or soil investigations or any other data collection that may be deemed necessary for proper execution of the works. The Contractor shall be responsible for carrying out all such surveys and collect additional data/ information at no extra cost to Company.

3.4. Details of the permissions/ clearances obtained by the Company from agencies/ authorities having jurisdiction in the area where the work is to be performed are indicated in the documents enclosed with the Contract for the information of the Contractor. It shall be the responsibility of the Contractor to comply with all the conditions and requirements issued by the agencies/ authorities. In case any other permit/ authorization is required to be obtained from the relevant authorities for performance of the work, the same shall be obtained by the Contractor.

3.5. Compliance with the requirements of this specification or the Company's approval of any aspect of any operations covered by this specification shall in no way relieve the Contractor of his ultimate responsibility for the satisfactory completion of the work authorized under this Contract.

3.6. The Contractor shall provide full access to the Company Representative for monitoring of all work areas during all phases of work.

3.7. The Contractor shall provide and maintain all lights, guards, fencing, watchmen, etc., when and where necessary or required by Company or by any duly constituted authority and/ or by the authorities having jurisdiction thereof for the protection of the work and properties or for the safety and the convenience of public and/ or others.

3.8. The Contractor shall take full responsibility for the suitability and safety of all operations and methods involved in the work.

For the purpose of this specification the following definitions apply:

- Words 'Shall' and 'Must' where used indicate that a provision is mandatory.
- Words 'Should' and 'Will' where used indicate that a provision is not mandatory but is recommended as good practice.
- 'May' used as a verb to indicate that a provision.

3.9. WORKING SPREAD LIMITATIONS

Contractor shall, in general, observe the following maximum distances between the working mainline spread:

Between ROU grading, clearing and backfilling	:	25 Kms
Between backfilling and final clean-up	:	10 Kms

4. ROUTE SURVEY & MARKING

4.1 Having been granted the accessibility of the route the contractor shall inspect and analysis the entire pipeline route within the designated corridor including Major crossing, Terminal/

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Despatch Station and Terminal/ Receipt Station and if any spur lines to other pipeline/ station before commencement of construction.

4.2 These inspection reports shall state the condition of the item potentially affected by construction and record the mutual approval of all parties concerned

4.3 Every 500 meters along the pipeline route contractor shall establish reference points. 25 meters offset from pipeline centerline the reference points shall be positioned.

4.4 In areas where it is difficult to follow the centerline when staked at 100 m intervals, the stakes shall be set at 50 m intervals or less to ensure unobstructed visibility.

5. RIGHT–OF–USE (ROU)

Company shall make available the ROU acquired for the works covered in the Contract to the Contractor. The Contractor shall carry out the construction activities within the ROU acquired by Company. In case any additional land is required for carrying out the works, it shall be the responsibility of the Contractor to make arrangement for all such additional land at no extra cost to Company.

5.1 STAKINGS

Company has surveyed and marked the centreline of the pipeline route with stone pillars at every 250 meters and also provided pillars at all turning points. In addition, Company also has established survey bench marks along the route. However, it is possible that some of the pillars may have been removed or shifted since their installation. The Contractor shall locate and/ or re-establish benchmarks, turning points and intermediate points by field survey prior to commencement of grading and clearing.

The Contractor shall stake markers in the centreline of the pipeline at a distance of maximum 100 m for straight line sections and maximum 10 m for horizontal bends.

The width of the pipeline ROU acquired by Company and the location of the pipeline centreline within the ROU is shown on the Alignment Sheets. The Contractor shall stake ROU boundary line, so as to prepare the strip for laying the pipeline. Two ROU markers shall be staked at every 100 m, one on either side of the surveyed centerline, for this purpose by the Contractor.

In addition, the Contractor shall also install distinct markers for special points such as obstacle crossing, change of wall thickness along with chainage and contract limits.

Chainage markers shall be installed at every 250 meter.

Any deviation from the approved alignment shall be executed by Contractor after seeking Company approval in writing prior to clearing operations.

5.2 PUBLIC CONVENIENCE AND SAFETY

The Contractor shall give due consideration to the interests of property owners and tenants wherever involved, adhere to all ROU restrictions and permits, and exert all reasonable efforts to maintain the goodwill of the tenants and Land Owners for the benefit of the Company.

The Contractor shall provide temporary approaches to and from crossings of public roads, private roads and entrances that may be opened for construction, and maintain them in a safe condition.

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Warning signs shall be erected on both sides of highway/ road crossing. The signs shall state that the pipeline ROU is a private work area and that unauthorized entry is prohibited.

5.3 FENCING

5.3.1 Prior to clearing and grading of the Right-of-Use or stringing of pipe, Contractor shall open fences on or crossing the construction Right-of-Use and install temporary gate. Before such fences are cut and opened, Contractor shall notify the land owner or tenant, and where practicable, the opening of the fences shall be in accordance with the wishes of said owner and tenant. In all cases where Contractor removes fences to obtain work room, Contractor shall provide and install temporary fencing, and on completion of construction shall restore such fencing to its original condition.

5.3.2 Contractor shall install temporary fencing on either side of ROU where in Company's opinion, it is considered essential to ensure safety and non-interference, especially in areas like grazing lands, villages etc.

5.3.3 Fencing shall be removable type wherever necessary, to permit crossing of traffic. The type of fencing must be suitable for the situation in accordance with user. The pole distance shall not be greater than 6m. The minimum height of the fencing shall be 1.2 m above grade. Fencing can consist of one or more rows of smooth wire and/ or of barbed wire.

5.3.4 Fencing shall be continuously maintained and the thorough-ways inspected to be shut during the execution of the work.

5.4 CARE OF SERVICES AND PROPERTY

5.4.1 When ingress and egress of equipment interferes with existing services, the necessary arrangements shall be made to preserve the continuous use of the existing services during construction of the pipeline.

5.4.2 Temporary culverts shall be installed in all drainage ditches, creeks, and other drainage courses where blockage might result in damage to property. All temporary culverts shall be removed when no longer required. Continuity of water supplies for both domestic and agricultural purposes shall be maintained.

5.4.3 In the event of damage to a facility, the Owner of the facility concerned shall be immediately informed and the facility repaired as necessary (where permitted by the Owner) to allow for its proper function until such time as permanent repairs can be made.

5.5 RESTRICTED WIDTH OF ROU

In certain areas restricted width of ROU shall be available and it shall be Contractor's responsibility to arrange its equipment etc. in such a manner as not to cause any hindrance to the movement of manpower or machinery and at the same time not to cause any damage to other's property.

5.6 ACTIVITIES IN FLOODED FIELDS

Where the pipeline is constructed across agricultural land where regular flooding is necessary, such as rice paddocks. Contractor shall ensure that the water supply and

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access to land on either side of the ROU is maintained, and that the landowner's farming activities are not restrained in any way.

5.7 DUST CONTROL

Adequate dust control measures shall be adopted, including water sprinkling, to ensure that dust does not affect the work or the health and safety of personnel working and travelling on the ROU, adjacent landowners or tenants, animals, crops or pastures.

6. CLEARING, GRADING AND BACKFILLING OF ROU

6.1.1 ROU shall be cleared of all trees, brush, hedges or other obstacles lying within the width of ROU that may hinder the construction of pipeline.

6.1.2 Before clearing operations are started, the Contractor shall familiarize itself with all special provisions included in the ROU secured by the Company and the Contractor shall comply with these provisions.

6.1.3 Wherever the pipeline ROU runs across, through or alongside farm yards, built-up areas, groves, plantations, forests, horticultural spreads, gardens, plantations or grass-fields, ditches, dikes, roads, paths, railways or any other area with restrictions, the Contractor shall grade only the width of the ROU necessary for digging the pipeline trench and constructing the Contractor shall carry out the work in such a way that damage resulting from the pipeline construction is kept to a minimum.

6.1.4 Permission for felling of "Scheduled Trees" as per applicable tree felling Acts shall be obtained by the Contractor prior to felling of the trees.

6.1.5 All stumps shall be grubbed on a continuous strip, with a width equal to trench top width plus two meters on either side centered on the pipeline centreline. In addition, all stumps shall be grubbed from areas of the construction. Outside of these areas to be graded, the stumps may either be grubbed or cut off to ground level. Any stump cut off must be left in a condition suitable for rubber-tyred pipeline equipment movement. Whenever stumps are grubbed and a hole is left in the ground, the Contractor shall back-fill the hole-and compact it to prevent water from gathering in it and making a big hole.

6.1.6 The ROU shall be graded to establish the working platform as required for efficient pipeline construction. The Contractor shall grade the pipeline ROU as required for installation of the pipeline and for providing access to the pipeline during construction.

6.1.7 The Contractor shall grade sharp points or low points to allow the pipe to be bent and laid within the limits set forth in this specifications and alignment sheets with regards to the minimum elastic curvature permitted. All grading shall be done as is necessary to minimize the necessity of sag and over bends.

6.1.8 Temporary or permanent deposit of any kind of material resulting from clearing and grading shall not be permitted in the approach to roads, railways, streams, ditches, drainage ditches and any other position which may hinder the passage and/ or the natural water drainage.

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6.1.9 The ROU clearing and grading operations, however, shall in no case involve embankment/ structures of any type without prior approval of the authorities having jurisdiction over the same.

6.1.10 In the case of natural or artificial deposits of loose soil, sand, heaps of earth or other fill materials, these shall be removed till stable natural ground level is reached so as to ensure the construction of the pipeline ditch in stable ground.

6.1.11 No filling of the ground over the pipeline centreline to achieve the minimum depth of cover shall be permitted. In locations where the ground is filled for access or other reason, the natural surface profile shall be surveyed to ensure that compliance with the minimum cover requirements can be demonstrated.

6.1.12 Grading of the ROU shall be kept to a minimum in order to preserve as much of rootstock as possible.

6.1.13 Cleared materials shall be stockpiled and preserved for use during restoration and final clean up. In no case shall it be left to interfere with the grading and laying operations.

6.1.14 Entire clearing and grading operations shall comply with Environment Management Plan.

6.2 GRADING IN STEEP AND ROCKY AREAS

6.2.1 In the case of ROU clearing and grading on the hillside or in steep slope areas, barriers or other arrangements shall be provided to prevent the removed materials from rolling downhill. Slope of side hill faces shall be stabilized to prevent landslides.

6.2.2 Grading operations in rocky terrain should normally be carried out by drilling, wedging, mechanical excavators or manually. In certain areas where solid rock cannot be removed until loosened by blasting, in order to make an adequate working space along the pipeline, blasting may have to be resorted to. Contractor shall identify such areas and take prior approval of concerned authorities before resorting to any blasting operations.

6.3 PROVISION OF DETOURS

6.3.1 Contractor shall do all necessary grading and bridging at road, water and other crossings and at other locations where needed, to permit the passage of its men and equipment. It is understood that the Contractor has recognized such restrictive features of the Right-of-Use and shall provide the necessary detours and execute the works without any extra cost to Company. Public travel shall not be inconvenienced nor shall it be wholly obstructed at any point.

6.3.2 In rough or steep terrain, Contractor may have to grade access roads and temporary bypass roads for its own use. Where such access roads do not fall on the Right-of-Use; Contractor shall obtain necessary written permission from land owners and tenants and be responsible for all damages caused by the construction and use of such roads, and at no extra cost to Company.

6.3.3 Contractor at his own cost shall furnish and maintain watchman detours, lanterns, traffic lights, barricades, signs, wherever necessary to fully protect the public.

6.3.4 Contractor shall be responsible for moving its equipment and men across or around watercourses. This may require the construction of temporary bridges or culverts.

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Temporary bridging required for Right-of-Use crossing water courses shall be constructed in consultation with concerned Authorities. Contractor shall ensure that such temporary works shall not interfere with normal water flow, avoid overflows, keep the existing morphology unchanged and shall not unduly damage the banks of water courses. No public ditches or drains shall be filled or bridged for passage of equipment until Contractor has secured written approval of the Authorities having jurisdiction over the same. Contractor shall furnish Company a copy of such approval.

6.4 OFF RIGHT-OF-USE DAMAGES

Contractor shall confine all its operations within limits of the Right-of-Use. Any-damage to property outside ROU shall be restored or settled to the Contractor's account.

Contractor shall promptly settle all off Right-of-Use damage claims. Should Contractor fail to do so, Company shall give written notice to Contractor that if Contractor does not settle such claims within seven days after such notice, Company shall have the authority to settle claims from the account of Contractor.

6.5 DISPOSAL OF DEBRIS

All grubbed stumps, timber, bush, undergrowth and roots cut or removed from the ROU, blasted rocks and boulders shall be disposed of in a manner and method satisfactory to Company, Land Owner and/ or tenant, and Government Authorities having jurisdiction and as soon as practical after the initial removal.

6.6 CONSERVATION OF TOP SOIL

6.6.1 In cultivable lands and other areas specifically designated by the Company representative , top 300mm of the aerable soil, excavated shall, be stockpiled separately; for; replacing in original position. Removed topsoil shall be stockpiled in a location that will minimize any loss due to erosion or mixing with other material.

6.6.2 Any topsoil lost due to erosion or mixing with other material shall be replaced with imported topsoil that is compatible with the area subject to approval by Company representative.

7. HANDLING, HAULING, AND STRINGING OF STRINGING OF LINE PIPES AND STORAGE OF OTHER MATERIAL

7.1 GENERAL

The Contractor shall exercise utmost care in handling line pipe and other materials. Contractor shall be fully responsible for all materials and their identification until such time that the pipes and other materials are installed in permanent installation. Contractor shall be fully responsible for arranging and paying for temporary storage areas for the pipeline materials, however, method of storage shall be approved by Company.

Contractor shall reimburse the Company for the cost of replacement of all Company supplied materials damaged during the period in which such materials are in the custody of the Contractor. It shall be Contractor's responsibility to unpack any packing’s for the materials supplied by Company.

Pipe bevel protectors shall always be kept in position during all handling, transportation and stringing operations and shall be removed only prior to fit-up for welding. After

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fabrication and welding, the Contractor shall arrange to return all such bevel protectors at Company's designated storage yard and as instructed by Company.

7.2 "TAKING-OVER" OF LINE PIPES

In case Company supplies line pipes to the Contractor as 'Free Issue Material', the Contractor shall receive and 'take over' against requisition, line pipes from the Company's designated place(s) of delivery as defined in the Contract. The Contractor shall, in the presence of Company Representative, visually inspect the entire surface of the bare pipes and coating of the coated pipes at the time of taking delivery and record all damages and exact length of pipes received.

In the case of coated pipes, the Contractor at his option may carry out holiday detection at a prescribed set voltage and record any holidays detected at the time of 'taking over', in the presence of Company Representative. However, if the Contractor proposes to perform only visual inspection, then repair of all holidays found at the time of laying the pipeline shall be carried out by the Contractor at no extra cost to Company as per relevant Specification.

The Contractor at his option may also carry out gauging of the pipes and record any dents detected at the time of 'taking over', in the presence of Company Representative. However, if the Contractor proposes to perform only visual inspection, then repair of all dents found at the time of laying the pipeline shall be carried out by the Contractor at no extra cost to Company. Repair of all damage occurring after taking over delivery of material shall be contractor's cost.

7.3 HANDLING OF LINE PIPES

7.3.1. BARE PIPES

Contractor shall unload, load, stockpile and transport the bare pipes using suitable means and in a manner to avoid denting, flattening, or other damages to pipes. Pipe shall not be allowed to drop or strike objects, which will damage the pipe but shall be lifted or lowered from one level to another by suitable equipment. Lifting hooks when used shall be equipped with a plate curved to fit the curvature of the pipe. In loading pipe on trucks each length shall be lowered to position without dropping and each succeeding length shall rest on special supports on the truck and shall be separated from the adjacent pipes. After loading, suitable chains and padding shall be used to tie the load securely to each bolster. Pipe, when stock piled, shall be placed on suitable skid to keep it clear of the ground and flood water. Care shall be exercised in handling or stock-piling pipes in order to avoid distortion, flattening, denting or other damages. The Contractor shall provide all necessary timber or other materials required for the stock-piling. While stacking, the number of allowable layers of bare pipes shall be calculated as per API RP 5L1 and shall be agreed with Company. The stacks must be properly secured against sliding and shall consist of pipes of the same diameter and wall thickness. Adjacent stacks of pipes having different dimensional characteristics shall be clearly separated.

Pipes which are damaged at the time of delivery or `taking-over' (when line pipe is supplied by Company), particularly those which are dented, buckled, or otherwise permanently deformed, must be stacked separately and may be transported to the sites only when these defects have been repaired or eliminated.

7.3.2. CORROSION COATED PIPES

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The Contractor shall load, unload, transport and stockpile the coated pipes using approved suitable means and in a manner to avoid damage to the pipe and coating. Contractor shall submit to Company a complete procedure indicating the manner and arrangement used for handling and stacking of coated pipes for Company approval prior to commencement of handling operations.

Use of vacuum lifting equipment's is preferred. Hooks may also be used for handling the pipes provided they have sufficient width and depth to fit the inside of the pipe and covered with soft material like rubber, Teflon or equivalent, so as not to cause damages to bevel or pipe ends. During hoisting cables/ wire roes shall have sufficient inclination compared to pipe axis so that they do not come into contact with external coating.

Coated pipes may be handled by means of slings and belts of proper width (minimum 60 mm) made of non-metallic/ non-abrasive materials. In this case, pipes to be stacked shall be separated row by row to avoid damages by rubbing the coated surface in the process of taking off the slings. Use of round sectional slings is prohibited.

During handling, suitable handling equipment's with proper length of booms shall be used. Forklifts may be used provided that the arms of the forklifts are covered by suitable pads preferably rubber. Before lifting operations, it is essential to ensure that the pipe surface is free from foreign materials with sharp edges. Belts/ slings when used shall be cleaned to remove hard materials such as stone, gravel etc. Coated pipes shall not be bumped against any other pipe or any other objects. Rolling, skidding or dragging shall be strictly forbidden.

Coated pipes at all times shall be stacked completely clear from the ground so that the bottom row of pipes remains free from any surface water. The pipes shall be stacked at a slope so that driving rain does not collect inside the pipe.

The coated pipes may be stacked by placing them on ridges of sand free from stones and covered with a plastic film or on wooden supports provided with suitable cover. This cover can, for example, consist of dry, germ free straw with a plastic film, otherwise foam rubber may be used. The supports shall be spaced in such a manner as to avoid permanent bending of the pipes, particularly in case of small diameter pipes with low wall thickness. The pipes shall be stacked so that the uncoated bevelled ends are in line at one end, thus making differences in lengths clearly noticeable.

Stacks shall consist of limited number of layers so that the pressure exercised by the pipes own weight does not cause damages to the coating. Each pipe section shall be separated by means of spacers suitably spaced for this purpose. Stacks shall be suitably secured against falling down and shall consist of pipe sections having the same diameter and wall thickness. The weld bead of pipes shall be positioned in such a manner so as not to touch the adjacent pipes.

Coated Pipes stacked in open storage yards/ dump yards shall be suitably covered on top to decrease direct exposure to sunlight. The ends of the pipes during handling and stacking shall always be protected with bevel protectors.

The trailers/ rail wagons shall be equipped with adequate pipe supports having as many round hollow beds as the number of pipes to be placed on the bottom of the trailer bed. Supports shall be provided for at least 10% of the pipe length. These supports shall be lined with a rubber protection and shall be spaced in a manner as to support equal load from the pipes. The rubber protection shall be free from all nails and staples where pipes are in contact. The

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second layer and all subsequent layers shall be separated from each other with adequate number of separating layers of protective material such as straw in plastic covers or mineral wool strips or equivalent, to avoid direct touch between the coated pipes.

All stanchions of trailers/ rail wagons used for transportation shall be covered by non-abrasive material like rubber belts or equivalent. Care shall be exercised to properly cover the top of the stanchions and convex portions such as reinforcement of the truck/ rail wagon body, rivets etc. to prevent damage to the coated surface.

7.4 TEMPORARY STOCKPILES

The Contractor at his own cost shall arrange for the land required for temporary stockpile of pipes, whenever the pipes are to be stockpiled prior to stringing. Pipes shall be stacked minimum 300 mm clear off the ground so that the bottom ROU of pipes remain free from any surface water. The pipes shall be stacked at a slope so that rain does not collect inside the pipe.

The coated pipes may be stacked by placing them on ridges of sand free from stones and covered with a plastic film or on wooden supports provided with suitable cover. This cover can, for example, consist of dry, germ free straw covered with a sheet of plastic sheet or foam rubber. The supports spacing shall be such that prevents permanent bending of the pipes.

Stacks shall consist of limited number of layers so that the pressure exercised by the pipes own weight does not cause damages to the pipe as well as coating. Each pipe section shall be separated. The Contractor shall submit calculations for the number of tiers of pipes during stacking for approval by Company Representative. API RP 5L1 may be used as guidelines.

By means of spacers suitably spaced for the purpose .Stacks shall be suitably secured against falling down and shall consist of pipe sections having the same diameter and wall thickness. Where applicable, the weld bead of pipes shall be positioned in such a manner so as not to touch the adjacent pipes.

The pipes shall be stacked in such a manner that the uncoated beveled ends are in line at one end, thus making differences in lengths clearly noticeable at the other end.

At such time as the temporary stockpile site is no longer needed, the site shall be cleaned up and the property restored to the satisfaction of the landowner and the clean-up as per of this Specification. The Contractor shall obtain letter from Land Owners clearly stating that the land has been returned and handed over to the Land Owners to their entire satisfaction.

7.5 STRINGING OF LINE PIPE ALONG ROU

7.5.1 Pipes shall be unloaded from the stringing trucks and lowered to the ground by means of side boom, Hydra Crane or swinging crane or other suitable equipment using lifting devices as per this specification. Pipe shall not be rolled, dragged or dropped from the stringing truck.

7.5.2 Stringing of pipe shall be carried out only in day light and after clearing and grading operations have been completed. Pipe shall not be strung on the ROU in rocky areas, where blasting may be required, until all blasting is complete and the area cleared of all debris. If pipe has already been strung in an area where blasting is subsequently found to be required, all previously strung pipe shall be removed to a safe area at Contractor's cost and time and protected from damage.

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7.5.3 The stringing of the pipe on the ROU shall be done in such a manner as to cause the least interference with the normal use of the land crossed and to avoid damage to or interference with the pipes. The sequence of pipes must be interrupted at suitable intervals, spaced to coincide with passages, roads, railroads, water-bodies and at other places if requested by Land Owner or tenants to permit use of the land. Care shall be taken to provide safe working space between trench edge and the pipe.

7.5.4 Strung pipe shall be supported clear off the ground (minimum 300 mm) and in a manner that will not damage the pipe or coating. Pipe shall be strung on approved soft earth / sand filling bags & wedge.

7.5.5 Special precautions are to be taken and extreme care exercised where stringing operations are carried out in the vicinity of overhead power lines, including possible earthing of individual pipe joints.

7.5.6 The Contractor shall adequately anchor the pipe on steep slopes and where the ROU condition dictates, to prevent the pipe from sliding or rolling from skids.

7.5.7 It shall be the responsibility of the Contractor to ensure that pipe is strung in accordance with the approved drawings for the proper placement of pipe by size, thickness, grade and other specifications. Any additional handling of pipes resulting from failure to, comply with these requirements shall be at the Contractor's expense.

7.5.8 In case line pipe supply is by different Manufacturers, the, Contractor shall string all line pipe of one Manufacturer before commencing the stringing of the line pipe of another Manufacturer.

7.5.9 When parallel pipelines are being constructed, bumping against and contact with the strung sections of pipe shall be avoided, whether the stringing of the pipes for the individual lines is carried out separately or simultaneously.

7.6 REPAIR OF DAMAGED PIPES

After the pipe has been strung on the Right-of-Use, it shall be inspected by the Contractor and the Company and all defective pipe ends repaired. Defective pipes shall be repaired or rejected as the Company may direct as per the requirements of this Specification.

7.7 MATERIALS OTHER THAN LINE PIPE

7.7.1 Contractor shall receive and take over against requisition all Company supplied materials from Company's designated place(s) of delivery as defined in the contract. Contractor shall perform visual inspection and defects, if any noted, shall be recorded separately. The Contractor shall be entitled to extra compensation for repair and rectification of such defects at the rates set forth in the "contract". Contractor shall take permission from Company before start of such repair.

7.7.2 The Contractor shall perform the necessary loading, unloading, hauling from points designated by the Company and storing, if necessary, of all materials. The Contractor shall exercise care in handling, hauling, storing and distribution of materials in order to avoid damage and deterioration of these materials and prevent their theft or loss.

7.7.3 Materials excluding line pipe shall be stored in sheltered storage. Such materials shall. not be strung on the Right-of-Use but shall be transported in covered conveyances for use only at

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the time of installation.

7.7.4 Contractor shall ensure that all valves and whenever applicable, other materials are fitted with suitable end covers of the type approved by Company. Materials with worked surfaces such as flanges, pipe fittings etc. must be stacked and handled so as to avoid contact with the ground or with substances that could damage them.

7.7.5 The Manufacturer's instructions regarding temperature and procedure for storing materials, which are subject to alteration of the original properties and characteristics due to unsuitable storage, must be strictly complied with and, if required, an adequate heat conditioning shall be provided for these materials.

7.7.6 When material is supplied in containers and packages, it must not be thrown or dropped, nor handled using hooks which could damage the container or the materials, either during loading/ unloading or during successive handling, until their final use.

7.7.7 Coating materials, which are susceptible of deteriorating or suffering from damages especially due to humidity, exposure to high thermal excursions or other adverse weather conditions shall be suitably stored and protected. These materials shall be kept permanently in store, supported above the ground in a dry place protected against the weather and transported for use only at the time and in the quantities necessary for immediate application. Deteriorated materials shall not be used and replaced with no extra cost to Company.

8. TRENCHING

8.1 LOCATION

8.1.1 Contractor shall excavate and maintain the pipeline trench on the staked centerline of the pipeline taking into account the curves of the pipeline.

8.1.2 In case of common ROU, the centerline of the trench shall be established from the location of existing pipeline. In case of independent ROU, the centerline of the trench shall be established from the edge of ROU.

8.2 TRENCH EXCAVATION

8.2.1 Trenching shall include all excavation, whether by trenching machine, back-hoe, power shovel, by hand, by blasting or by other methods which may be necessary to prepare a trench for the pipe with the minimum cover between top of pipe and immediate ground level as set forth in this specification.

8.2.2 Contractor shall, by any method approved by Company, dig the pipeline trench on the cleared and graded Right-of-Use.

8.2.3 In cultivable land and other areas specifically designated by the Company, top 300mm of the arable soil on the pipeline trench top width shall be excavated and stored separately, to be replaced in original position, after backfilling and compacting rest of the trench.

8.2.4 Suitable crossings shall be provided and maintained over the open ROU, where necessary, to permit general public, property owners or his tenants to cross or move stock or equipment from one side of the trench to the other.

8.2.5 Care shall be exercised to see that fresh soil recovered from trenching operation, intended

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to be used for backfilling over the laid pipe in the trench, is not mixed with loose debris or foreign material. The excavated material shall never be deposited over or against the strung pipe.

8.2.6 In steep slope areas or on the hillside, before commencing the works, proper barriers or other protection shall be provided to prevent the removed materials from rolling downhill.

8.2.7 On slopes wherever there is danger of landslide, the pipeline trench shall be maintained open only for the time strictly necessary. Moreover, the Company may require manual excavation of trench, local route detouring and limiting the period of execution of the works. The Contractor shall make adequate arrangements for safe working of the personnel involved in manual excavation of trench.

8.2.8 In certain sloppy sections, before the trench cuts through the water table, proper drainage shall be ensured both near the ditch and the Right-of-Use in order to guarantee soil stability.

8.2.9 All sewers, drain ditches and other natural waterways involved in the execution of the works shall be maintained open and functional. The same applies to canals, irrigation canals, and pipelines and buried facilities crossed by the ditch for which temporary pipelines shall be laid, if required, and proper temporary installations provided.

8.2.10 All sewers drain ditches and other natural waterways involved in the execution of the works shall be maintained open and functional.

8.3 NORMAL COVER AND TRENCH DIMENSIONS

The trench shall be excavated to a minimum depth sufficient to provide the minimum cover as specified below. The dimensions in the table below shall govern except as noted herein or as shown on the job standards or detailed construction document/ drawings or as required by authorities having jurisdiction, whichever is stringent.

Location		Minimum Cover in (Mtr)	
		Gas Pipeline	Liquid Pipeline
1	Residential Area, Industrial, Commercial Area	1	1.2
2	Minor water crossing/ steam/ drain nala/ canals	1.5	
3	River crossing for which scour depth is defined (below scour)	1.5	
4	River crossing (Bank width < 50m) (below lowest bed)	1.5	
5	River crossing (Bank width > 50m) (below lowest bed)	2.5 (for normal soil) 1.5(for Rocky strata)	
6	Water crossing by HDD(below lowest bed level/ below scour as applicable)	2.5	
7	Uncased/ Cased Road Crossing/ Station approach	1.2	

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8	Rocky Terrain	1
9	Cased Railway Crossing	1.7
10	Marshy land and creek area	1.5
11	Area under influence of tides	1.5
12	Drainage, ditches at road/ railway crossing	1.2

Note

- Minimum depth of cover shall be measured from the top of pipe corrosion/ concrete weight coating (as applicable) to the top of undisturbed surface of the soil or top of graded working strip or top of road or top of rail whichever is lower.
- Fill material in working strip shall not be considered to add to the depth of cover. However, surface of fill material placed to fill hollows may be used to determine the depth of cover subject to prior approval by Company.
- In case the Pipeline is located within 15 mtr from any dwelling unit, the cover shall be increase by 300mm over and above that specified.

8.4 EXTRA DEPTH AND CLEARANCE

8.4.1 At points where the contour of the earth may require extra depth to fit the minimum radius of the bend as specified or to eliminate unnecessary bending of the pipe or where a deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage ditches, and the like and in transition between normal trench and deep trench, the Contractor shall excavate such additional depth as may be necessary.

8.4.2 The Contractor shall excavate to additional depth where the pipeline approaches and crosses other pipelines, sewers, drain pipes, water mains, telephone conduits and other underground structures, so that the pipeline may be laid with at least 500 mm free clearance from the obstacle or as specified in the standards, or greater as may be required by authorities having jurisdiction over it.

8.4.3 In those areas where trench to be padded with select soil such as rocky areas, seismic zone crossings, station approaches etc. the trench shall be made deeper, to accommodate specified thickness of bedding and/ or padding, than otherwise required to maintain specified cover. Thickness of bedding and/ or padding required shall be as specified in the Contract drawings and documents.

8.5 TRENCHING AT CROSSING

Before excavating the trench across thoroughfare such as roads, tracks, and wherever public access to be normally expected, approval of the crossing shall' be obtained by the Contractor from the concerned authorities. Temporary diversions to permit the traffic shall be provided.

8.6 TRENCHING WITHIN OR ADJACENT TO OTHER UTILITIES

8.6.1 At locations, where pipeline is to be installed within the ROU or the body of a road, canal,

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dyke or other locations under jurisdiction of government/ public bodies, the Contractor shall perform such work, according to the requirement of concerned Authorities. When it becomes necessary, the Contractor shall resort to manual digging, well point drain, erection of sheet piling or any other special construction method in these areas without any extra cost to Company. The facilities damaged during trenching shall be restored; to their original condition to the satisfaction of concerned authority.

8.6.2 In locations, where the pipeline has to be laid more or less parallel to an existing service such as pipeline, cable and/ or other utilities within the ROU, the Contractor shall carryout Trenching as per the requirements of the owners/ authorities of that service. At such locations; the Contractor shall perform the work in such a way that even under the worst weather and flooding conditions, the existing pipeline/ utilities remain stable.

8.7 ENCROACHMENTS AND WORKING NEAR OTHER UTILITIES

Contractor shall be liable for any damage occurring to, or resulting from damage to other pipelines, underground structures/ utilities, as laid down in clause of this specification.

8.8 PROVISIONS FOR NEGATIVE BUOYANCY TO THE PIPE

8.8.1 Contractor shall check if up-floating of Pipeline is present in open trench and then shall take appropriate measures to prevent up-floating such as applying soil dams and dewatering of trench or temporary filling of water into the line (in exceptional cases).

8.8.2 In the case of water on the ditch bottom when the pipeline is being laid, the ditch shall be drained to the extent and for the time required to make a visual inspection of the ditch bottom. After this inspection, the presence of water will be allowed provided its level does not cause sliding of the ditch sides and pipe floating before backfilling when no concrete weighing is provided.

8.8.3 The water pumped out of the ditch shall be discharged into a natural water course.

8.8.4 Whenever up-floating of the pipeline after backfilling is to be reckoned with, anti-buoyancy measures shall be provided by Contractor with Company's approval for such areas of construction, using one or a combination of the following methods.

- Weighing by applying a continuous concrete coating around the pipe.
- Weighing by -installing gravel filled Geotextile bags.
- Installing of soil Bund over the pipeline in trench during lowering.
- Deeper burial of pipeline.
- Provision of select backfill material.

The above provisions shall be in accordance with the relevant specifications and/ or job standards/ drawings.

Contractor shall indicate the option(s) selected to Company for review and approval along with calculations, wherever applicable.

8.9 CUTTING AND REMOVAL OF PAVING

8.9.1 Whenever permitted by Authorities and/ or Company representative to open cut a trench in a paved road crossing or where the line is routed within the road pavement, the Contractor

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shall remove the paving in accordance with the restrictions and requirements of the Authorities having jurisdiction thereof or as directed by Company Representative. After laying the pipeline, in paved area, the trench shall be backfilled immediately to restore the area temporarily. Throughout the period of execution of work in such areas, the Contractor shall provide and use warning signs, traffic lights or lanterns, barricades, fencing, watchman, etc. as required by the local authorities having jurisdiction and/ or Company Representative.

8.9.2 For all roads, paths, walkways etc. which are open-cut, the Contractor shall provide temporary diversions properly constructed to allow the passage of normal traffic with the minimum of inconvenience and interruptions.

8.9.3 The paving shall be restored to its original condition after the pipeline is installed to the entire satisfaction of concerned authorities.

8.10 GRADES, BENDS AND FINISH OF TRENCH

8.10.1 The trench is to be well made concerned authorities to provide a firm, uniform and continuous support for the pipe. Bends shall be made in the pipe at significant changes in grade of the trench. Company reserves the right to set the grade of the trench and locates the bends if so desired, in which case Contractor shall excavate, at no extra cost, the trench and bend the pipe to such a grade. Company desires reduce to a minimum the required number of cold field bends to lay the pipe to conform to the general contour of the ground and maintain a normal cover. This can be accomplished by cutting the trench slightly deeper at the crest of ridges and by gradually deepening the trench in approaches to crossings. Such trenching work shall be done by Contractor at no extra cost to the Company.

8.10.2 Company intends that there will be a minimum of hand grading of the trench bottom. However, to achieve this, Contractor will have to dig as square a bottom of the trench as possible with the equipment. This in part can be obtained by adjusting and adopting the crumbing shoe and digging teeth of the trenching machines and by use of a drag behind the trenching machines or manually dressing-up the same. Contractor shall do such hand work in the trench as is necessary to free the bottom of the trench from loose rock and hard clay and to trim protruding roots from the bottom and side walls of the trench.

8.11 PADDING

8.11.1 In all cases where rock or gravel or murrum/ hard soil is encountered in the bottom of the trench, Company trench padding shall be provided. The thickness padding shall be at least 200 mm or more throughout the trench so that thickness of compacted. Padding shall not be less than 150mm. In those areas, trench shall be suitable excavated to keep min cover as required. Company will decide the extent of trench padding required.

8.11.2 Acceptable padding shall be placed under the pipeline before its installation, and around after installation to establish at both sides and on top of the pipe a permanent layer of padding. The thickness of compacted padding on top of pipe corrosion coating shall be at least 150mm.

8.11.3 Padding materials that are approved by Company shall be graded soil/ sand and/ or other soft materials containing no gravel, rock, or lumps of hard soil. Sand used for padding

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shall- pass through sieve size ASTM C33 No. 16.

8.11.4 When specified in the Contractor, rock shield may be used in place of or in addition to sand padding as indicated above. Such rock shield shall be in accordance with the specification issued for the purpose and shall be subject to Company approval.

8.11.5 Padding shall also be required at other locations where select backfill is specified in the drawings and documents such as seismic zone crossings, station approaches, etc. Type of padding soil and thickness of padding in such areas shall be as specified in drawings and documents.

8.12 TRENCH PROTECTION

8.12.1 The trench shall be maintained in good condition till such time the pipeline is laid. When required, lumber, sheet-piling jacks or other materials that may be necessary to shore the trench, in order to prevent caving, shall be provided and removed by the Contractor.

8.12.2 The Contractor shall dewater the trench, if necessary, using well point system or other suitable systems, or do what else might be required to excavate the trench, install the pipe in it and backfill the trench as per approved procedure with no extra cost to company.

9. BLASTING

9.1 GENERAL

9.1.1 Contractor shall be responsible for carryout of trenching in rocky areas by controlled blasting and removal of scattered rock and debris caused by the blasting from the Right-of-Use and/ or adjacent property, as part of his work. All necessary precautions shall be taken to prevent stones from falling outside the ROU and in cultivated areas and to avoid any damage to the installations and properties existing nearby. Blasting and removal of debris shall be carried out prior to stringing the pipes.

9.1.2 The Contractor shall acquaint himself and comply with all the applicable local laws and regulations concerning storing, handling and the use of explosives. All such laws, regulations and rules etc., as enforced from time to time shall be binding upon the Contractor. National/ Local Laws and Regulations shall take precedence over this specification in the event of conflict. The requirements stated herein, however, in no way relieve the Contractor of his responsibility of carrying out safe blasting operations and the Contractor shall be solely responsible for damages and claims thereof.

9.1.3 Every possible precaution shall be taken to prevent injuries and damages to persons and properties during blasting operations. The Contractor shall be responsible for removal of scattered rock and debris caused by the blasting from the ROU and/ or adjacent property.

9.1.4 The use of explosives requires an approval from the Chief Inspector of' Explosives and/ or his authorized Inspector. It shall be the responsibility of the Contractor to obtain all such permits 'and observe all requirements regarding the safe storage handling and use of explosives.

9.1.5 Blasting and removal of debris shall be carried out prior to stringing the pipes.

9.1.6 Company reserves the right to refuse blasting where possible danger exists to property, existing utilities or other structures. In such locations other methods of extracting rock shall

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be proposed by Contractor and shall be approved by Company.

9.2 BLASTING CLOSE TO EXISTING SERVICES

Contractor shall prepare a detailed blasting procedure incorporating the following:

- Loading of explosives.
- Drilling of new holes and extending existing holes.
- Handling of explosives at site.
- Tamping explosives into holes.
- Machines, tools and cables required.
- Initiation of blasting.
- Safety of personnel.
- Vibration control.
- Blast pattern and shot size establishment.
- Misfires.
- Emergency procedures following approval by the Company representative, the procedures shall be closely followed by the Contractor and shall not be changed without prior approval of Company Representative.

10. PIPE BEND/ BENDING

10.1 GENERAL

10.1.1 The Contractor shall preferably provide for changes of vertical and horizontal alignment by making elastic bends. Cold field bends may be provided, at the Contractor's option for change of direction and slope.

10.1.2 In general, elastic bends or one or more cold field bends will permit construction of most of the direction changes required, however where in the judgment of Company, due to site conditions, even cold field bends cannot be accommodated, the Company may allow use of hot induction bends.

10.1.3 Use of miter bends for change in direction and slope is not permitted.

10.2 ELASTIC BENDS

The minimum allowable radius for elastic bends for corrosion coated as well as concrete coated buried pipeline shall be as indicated in relevant job standards document drawings elastic bend shall be continuously supported over its full length. A radius smaller than permitted in elastic bending shall require a cold field bend.

10.3 COLD FIELD BENDS

10.3.1 The radius of cold field bends shall not be less than 40 times the pipe specified diameter for pipe diameters 18inch and above and shall not be less than 30 times the pipe specified diameter for pipe diameter less than 18 inch.

10.3.2 Contractor shall use a pipe bending machine of adequate capacity and employ recognized and accepted methods of bending of coated pipe in accordance with good pipeline construction practice. However, bending machines shall be capable of making bends without wrinkles,

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buckles, stretching and with minimum damage to the coating.

10.3.3 Contractor shall, before the start of the work, submit and demonstrate to Company a bending procedure, which shall conform to the recommendations of the manufacturer of the bending machine. The procedure shall include amongst other steps-lengths, maximum degree per pull and method and accuracy of measurement during pulling of the bend. The bending procedure and the equipment used shall be subject to Company's approval.

10.3.4 Pipes with longitudinal welds shall be bent in such a way that the weld lies in the plane passing through the neutral axis of the bend, which shall be installed positioning the longitudinal weld in the upper quadrants. If horizontal deviations are to be achieved by joining more adjacent bends, the bending of the pipe lengths shall be made by positioning the longitudinal welds alternatively 70mm above and below the plane passing through the neutral axis in-such a way that the bends are welded with the longitudinal welds displaced by about 150mm and situated in the upper quadrants. In case of vertical bends formed, from a number of pipe lengths, the longitudinal welds shall be positioned on the plane passing through the neutral axis of the bend to the right and left alternatively.

10.3.5 The pads, dies and rolls of the bending equipment shall have relatively soft surfaces to avoid damage to the pipe coating. Where applicable, fully retaining bending shoes shall be used. Roller type bending machines are preferred.

10.3.6 The ends of each bent length shall be straight and not involved anyway in the bending. The length of the straight section shall permit easy joining. In no event shall the end of the bend be closer than 1.5m from the end of a pipe or within one meter of a girth weld.

10.3.7 The ovalization caused on each pipe by bending shall be less than 2.5% of the specified diameter at any point. Ovalization is defined as the reduction or increase in the internal diameter, of the pipe compared with the nominal internal diameter. A check shall be performed on all bends in the presence of Company Representative by passing a gauge consisting of two metallic discs with a diameter equal to 95% of the nominal internal diameter of the pipe connected rigidly together at a distance equal to 300mm.

10.3.8 The wall thickness of finished bends, taking into account wall thinning at the outer radius, should not be less than the design thickness. An indication of wall thinning as a percentage is given by the following empirical formula.

$$\text{Wall thinning} = \frac{50}{n+1}$$

10.3.9 Where 'n' is the inner bend radius divided by pipe diameter. Pipes with measured wall thickness greater than the nominal wall thickness (i.e. with +ve tolerance) shall normally be used for making cold field bends.

10.3.10 Cold bend pipes on site shall have the corrosion coating carefully checked with the aid of a holiday detector for cracks in the coating down to the pipe wall. It must also be checked whether the coating has disbonded from the pipe wall during bending by beating with a wooden mallet along the outer radius. Any defects or disbonding of the coating caused during bending (also forced ridges in the coating) shall be repaired at the Contractor's expense in accordance with Company approved procedures.

10.3.11 When pipelines are laid in parallel, the horizontal bends shall be concentric.

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10.4 MITER AND UNSATISFACTORY BENDS

All bends showing buckling, wrinkles, cracks or other visible defects or which are in any way in disagreement, in whole or in part, with this specification shall be rejected.

No miter bends shall be permitted in the construction of the pipe line. Contractor shall cut out and remove any bend or bends, which do not meet the specifications and shall replace the same with bends complying with specification at no additional cost to the Company. In the event the contract provides for supply of line pipe by Company, the pipes required for replacement will be furnished by Company, but the cost of replacement of such pipes shall be borne by Contractor.

Cutting of cold field bends for any purpose are not permitted.

10.5 HOT INDUCTION BENDS

Use of Hot Induction bends is as indicated in alignment sheets, crossing drawings and station drawings. Cutting of factory made bends for any purpose is not permitted.

11. LINEING UP AND WELDING

11.1 PIPE CLEANING

Prior to aligning and welding of pipes, each length of pipe shall be thoroughly examined internally and externally to make sure that it is free from visual defects, damage, severe corrosion, dirt, animals or any other foreign objects. Each length of the pipe shall be adequately swabbed, either by use of canvas belt disc of proper diameter, or by compressed air blowing or by other methods approved by Company Representative. Directions of Company Representative shall be followed in case of damaged/ corroded pipes. Each length of pipe shall be pulled through just before being welded.

11.2 REPAIR OF PIPE DEFECTS

It is Contractor's responsibility to repair all internal and/ or external defects.

11.2.1 Acceptability of defects in the pipe detected during inspection at the work site shall be determined in accordance with latest edition of Company's own material specification or code ASME B31.8/ B31.4 whichever is more stringent.

11.2.2 The maximum permissible depth of dents in pipes shall be as per applicable line pipe specification issued by Company.

11.2.3 Dents, which contain a stress concentrator such as scratch, gauge, arc burn or groove, and dents located at the longitudinal, spiral or circumferential weld shall be removed by cutting out the damaged portion of pipe as a cylinder.

11.2.4 Repair on line pipe shall be executed as specified in Company's material specification or Code ASME B 31.8/ B 31.4, whichever is more stringent. A record of all repairs shall be maintained by Contractor. This record, provided with the pipe identification number shall be submitted to the Company.

11.2.5 If due to cutting or repairs, the pipe identification number is removed, it shall be reprinted immediately by Contractor in the presence of Company. In the event, the Contractor provides for supply of line pipe by Company, Contractor shall be charged for any pipe

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length due to loss of identification number. No pipe without identification number shall be transported and/ or welded into the pipeline.

11.2.6 Repair of damaged pipe ends by hammering and/ or heating is not allowed. If the dented area is minor and at least 200mm away from the pipe end, and the steel is not stretched, severed, or split in the Company's opinion, the pipe may be straightened with a proper jack.

11.3 PIPE HANDLING AND SKID SPACING

11.3.1 When lifting pipe, care must be taken not to kink or overstress it. Pipe slings approved by Company Representative shall be used. The Contractor shall submit the method of skidding and skid spacing to Company Representative for approval. A strip of soft material shall be placed in between skid and pipe to protect the external coating from damage.

11.3.2 Skids shall be used to raise the pipe sufficiently to accommodate welding and wrapping of joints. Skids shall be at least 1.20 meter long and of sufficient height to maintain pipe bottom at least 500 mm above ground. Width of skids in contact with the pipe shall be 200 mm and 150 mm for pipe with outside diameter (OD) ≥ 324 mm and OD < 324 mm respectively.

11.3.3 Crosses shall be installed at frequent intervals, at least every 10th support with greater number required at bends and undulating ground.

11.4 WELDING

11.4.1 All rust and foreign matters shall be removed from the beveled ends by power operated brush. This shall be affected inside & outside and for a minimum distance of 25 mm from edge of bevel. The bevel shall be thoroughly inspected at this stage. Should laminations, spilt ends or manufacturing defects in the pipe observed, the length of the pipe containing such defects shall be removed from the line in accordance with relevant specification.

11.4.2 The Contractor shall cover the open end of the pipe string during welding to prevent draft. The ends of the pipe string shall be located so that water, mud and debris cannot enter the pipe.

11.5 NIGHT CAPS

11.5.1 At the end of each day's working or every time when joining and welding operations are interrupted, the open ends on the welded strings of pipes shall be capped with mechanical metal cap or plug, approved by Company Representative , so as to prevent the entry of dirt or any foreign matter into the pipeline. These covers shall be removed just before resuming welding operations. Night caps shall also be fixed to the welding completed pipeline section which shall be removed only during Tie-in welding. Whenever the welded strings of pipes are left to be tied in later and at road, railroad, river, marshy crossings, etc, night caps shall be welded to the ends of the pipe. Work at these locations, the end caps shall be cut as a cylinder bevel ends prepared. Cut shall be made at least 25 mm from the end.

12. LOWERING-IN

12.1 TRENCH CLEANING

Lowering can start after removal from ditch bottom of all off cuts, pipe supports, stones, roots, debris, stakes, rock projections below underside of pipe and any other rigid materials which could lead to perforation or tearing of the coating. Sand padding, graded soil and/ or

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other materials containing no gravel, rock shall be provided as required in accordance with clause 8.12 of this specification in such a way to get an even surface for pipe laying.

12.2 LOWERING-IN

12.2.1 Lowering shall follow as soon as possible, after completion of the joint coating of the pipe string, after the trench bottom is prepared and levels checked for proper fit and cover.

12.2.2 Before lowering in, visual inspection and holiday detection using a full circle holiday detector shall be carried out for the pipe coating as well as joint coating and all repairs carried out as per relevant Specification. All points on the pipeline where the coating has been in contact with either the skids or with the lifting equipment during lowering shall be carefully inspected for damages, dents or other defects and shall be completely repaired.

12.2.3 The Pipeline section which is made ready for lowering shall be checked for debris and if necessary cleaned from inside using Pig with dry compressed air to remove debris.

12.2.4 The pipeline shall be lifted and lowered into trench using suitable equipment having flat belts of nonabrasive material. Care shall be exercised while removing the flat belts from around the coated pipe after it has been lowered into the trench to avoid any damage to coating. Lowering-in utilizing standard pipe cradles shall be permitted if the Contractor demonstrates that pipe coating is not damaged. No sling shall be put around field joint coating.

12.2.5 Laying shall be carried out under safe conditions so as to avoid stresses and temporary deformations of the equipment's, which may cause damage to the pipeline itself and to the coating. In case of localized points where the right-of-use is restricted to the minimum necessary for the transit of mechanical equipment, the laying shall be carried out using other suitable means. The pipe shall be placed on the floor of the excavation, without jerking, falling, impact or other similar stresses. In particular, care must be taken that the deformation caused during the raising of the pipe from the supports, does not exceed the values for the minimum allowable radius of elastic curvature, so as to keep the stresses on the steel and on the coating within safe limits. The portion of the pipeline between trench and bank shall be supported by as many side-booms as required and approved by Company for holding the line in gentle S-curve maintaining minimum elastic bend radius -as specified in job standard. Lowering in and back-filling shall preferably be carried out at the highest ambient temperature.

12.2.6 Lowering-in shall preferably be carried out at the highest ambient temperature. Where water is present, no lowering is permitted until the ditch is drained to the extent and for the time necessary to make visual inspection possible of the bed. Following such inspection, the presence of water will be permitted, provided that it is not so high as to cause cave-in of the walls of the trench or floating of the pipeline before backfilling when anti-buoyancy measures are not provided for the pipe. Where water in the trench cannot be practically removed, the lowering-in of the pipeline shall be permitted only after ensuring pipe negative buoyancy is sufficiently increased by continuous concrete weight coating or by placement of gravel filled non degradable fabric bags as per requirements of the Contract and approved by Company representative . In any case, pipe shall not be lowered into a trench containing water until the longitudinal profile of the trench bottom has been fully surveyed by Contractor and approved by Company representative.

12.2.7 Contractor shall take precautions immediately after lowering in to prevent the movement of the pipe in trench.

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12.2.8 Contractor shall close the two ends of the lowered section with night caps against ingress of water/ mud or any foreign material in the section.

12.2.9 When parallel pipelines are lowered into same trench, the minimum distances between the pipelines indicated in the approved drawings shall be maintained. Once the first pipeline has been positioned, it shall in no way be disturbed while lowering of the subsequent pipelines. At every seven meters along the trench sand/ earth filled bags shall be placed between the parallel pipelines so as to ensure maintenance of the minimum stipulated distance between the parallel lines.

12.2.10 Subsequent to lowering a pipe section, level of the trench bottom and level by the side of the trench shall be taken at those locations where levels were taken prior to lowering. Cover shall be ascertained based on the level difference. If the cover is not as per the requirements of this specification, the pipe section shall be removed from the trench and the trench rectified, so that the cover is as per the requirements of this specification is met.

12.3 OVERHEAD SECTIONS AND SECTIONS IN TUNNEL

12.3.1 The following works shall be completed before proceeding with the assembly and laying of overhead pipeline.

- Construction of the pipe support structures.
- Paints and/ or coating of the pipe work, as indicated in the engineering specification.

12.3.2 The erection of the supports shall be carried out taking care that the elevation and alignment is in accordance with the drawings.

In the case of metal work supports, pre-fabrication and/ or assembly shall take into account the maximum allowed free span and the supports shall not interfere with the pipeline welds.

12.3.3 In case roller supports are used, the rollers shall be lubricated, and then checked for smooth rotation and, in case of seizure, the defect shall be repaired or roller shall be replaced. In the case of overhead section where the pipeline is slanting, the alignment of the end supports shall be made after placing the pipeline in position. Before installation of the pipe section, all the rollers shall be perfectly centered acting on the seat of the supports plates.

The above alignment operations shall be carried out before connecting the overhead section with the end of the buried section.

12.3.4 Lifting, moving and laying of the pipeline shall be carried out in accordance with the provisions of clause.

An insulation sheet shall be installed to isolate the pipe from the support or support from the earth. The sheet shall be hard polyethylene at least 5mm thick. It shall extend at least to 1 cm outside the saddles or clamps.

12.3.5 Moving supports, if any, shall be centered on their support and allow for a movement of at least 300mm in both directions.

12.3.6 A comprehensive report/ method statement on the laying operation to be used shall be submitted to the Company well in advance for approval. The report as a minimum shall include, but not limited to the following:

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- Method of installation by lifting (as a preferred method).
- Pulling method and related calculations, whenever lifting method cannot be used.
- Pulling device and its characteristics including available pull force and FOS/ margin available w.r.t. calculated pulling load.
- Method of anchoring the pulling device.
- Characteristics of the pulling rope.
- Braking device, if any.
- Pipeline assembly system.

13. BACKFILLING

13.1 Backfilling shall not be done until the pipe and appurtenances have the proper fit and the pipe is following the trench profile at the required depth that will provide the required cover and has a bed which is free of extraneous material and which allows the pipe to rest smoothly and evenly. Contractors shall take Company's approval before start of backfilling. If any backfilling is done without Company's approval, Company will have the right to require removal of the backfill for examination, and the cost of such uncovering and refilling shall be borne by Contractor. Backfilling of trench in water courses shall be carried out as per the relevant specifications issued for the purpose.

13.2 Backfilling shall be carried out immediately after the pipeline has been laid in the trench, inspected and approved by the Company Representative, so as to provide a natural anchorage for the pipeline, thus avoiding long exposure of coating to sliding down of trench side's, damage of coating and pipe movement in the trench. If immediate back filling is not possible, a covering of at least 200mm of earth, free of rock and hard lumps shall be placed over and around the pipe and coating. On no account the top soil from the ROU be used for this purpose. In general, the trench shall be dry during backfilling. Deviations thereof must have prior approval of the Company.

13.3 The backfill material shall contain no extraneous material and/ or hard lumps of soil, which could damage the pipe and/ or coating or leave voids in the backfield trench.

13.4 After the initial backfill has been placed into the trench to a level slightly above the surrounding ground, Contractor shall compact the backfill material. The surplus material shall be neatly crowned directly over the trench and the adjacent excavated areas on both sides of the trench, to such a height, which will, in Company's opinion, provide adequately for future settlement of the trench backfill. The crown shall be high enough to prevent the formation of a depression in the soil when backfill has settled into its permanent position. Should depression occur after backfill, Contractor shall be responsible for remedial work at no extra cost to Company. Surplus material, including rock, left from this operation shall be disposed of to the satisfaction of land owner or authority having jurisdiction at no extra cost to the Company.

13.5 Rock, gravel, lumps of hard, soil or like materials shall not be backfield directly onto the pipe unless padding and/ or rock-shield has been provided as per the specification. Where rock, gravel, lumps of hard soil or like materials are encountered at the time of trench excavation, sufficient earth, sand or select backfill materials shall be placed around and over the pipe to form a protective cushion extending at least to a compacted height of 150mm above the top of the pipe.

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13.6 Select backfill materials for padding that are acceptable to Company shall be soil, sand, clay or other material containing no gravel, rock or lumps of hard soil. All these works shall be carried out by Contractor at no extra cost to Company.

13.7 When the trench has been dug through driveways or roads, all backfills shall be executed with sand or a suitable material as approved by Company Representative and shall be thoroughly compacted. In certain cases, special compaction methods, such as moistening or ramming of the backfill in layers may be required by any public or private authority having jurisdiction over a road, street or driveway. Authorities may also require the top section of trench of such paved areas to be backfill with crushed rock or some other purchased material and surface repaved. The Contractor shall comply with said requirements at no extra cost to Company. Backfilling and compaction of trenches crossing public thoroughfares shall be carefully and expeditiously carried out so as to reduce to a minimum the time during which the public thoroughfare is out of service.

13.8 Trenches excavated in dikes which are the property of railways or which are parts of main roads shall be graded and backfield in their original profile and condition. If necessary, new and/ or special backfill materials shall be supplied and worked-up. The materials required may include gravel, special stabilization materials or stabilized mixtures. Moreover, special processing and/ or compacting methods shall require the approval of Company and/ or competent authorities.

13.9 Stone-pitching/ cement lining of Dyke walls if dismantled during excavation shall be restored to its original condition after backfilling and compaction to the entire satisfaction of Company and concerned Authorities.

13.10 The trench in irrigated and paddy fields shall be backfield to within 300mm of the top, then rammed and further backfield until the trench is completely- backfield. Surplus material remaining after the operation shall be spread over the ROU.

13.11 At the end of each day's work, backfilling shall not be more than 500 meters behind the head end of lowered-in pipe, which has been padded and approved. for backfill. The backfill shall be maintained by Contractor against washouts and spreading etc., until the completion and final acceptance of the work by Company.

13.12 The Contractor shall furnish materials and install breakers in the trench in steep areas (slope generally 10% and more) for the purpose of preventing erosion of the back fill. The type of breakers installed shall be as per applicable Contract drawings. Sacks filled with sand mixed with cement in the ratio of 6:1 shall be placed to act as a trench barrier. Such works shall be at no extra cost to Company. The Contractor shall pay attention to the direction of backfilling in such steep areas. Barrier consisting of two rows of sacks across the trench built on a staggered basis to provide maximum stability, and keyed into the trench wall may be used in gently sloping locations. The top of trench barriers shall be 200 mm - 300 mm below ground level. Trench barriers shall be bedded onto undisturbed ground. No voids shall be left in the trench barrier wall including between the wall and the pipe.

13.13 In addition to trench barriers when potential to backfill wash out exist due to water flow, shallow surface ditches shall be dug as necessary to channel water diverted by the trench barrier away from the pipe trench and into normal drainage followed before laying of the line. In no case, the water is to be drained via the trench or via channels other than those followed before the line was laid.

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13.14 Stabilization of backfill shall be carried out by the Contractor in sandy areas and other such places, as directed by the Company representative. The Contractor shall carry out the stabilization to have a consolidated cover over the pipeline at no extra cost to Company.

13.15 The backfill shall be stabilized preferably with 150 mm layer of marl, mattresses of gatch other than straw or other stable materials. The width of stabilization shall be at least 3.0 meters on either side of the pipeline, plus one meter for every 10 meters height of sand dune (where the line passes through the dune areas).

13.16 Contractor shall leave the pipe uncovered at certain locations to allow Company to survey the top of the pipe and the level of the pipeline in the backfield trench. Within 48 hours after backfilling, Company shall have carried out such survey and informed Contractor of any realigning, if required. Thereafter Contractor shall compact the backfill.

13.17 Temporary markers shall be installed during backfilling and the survey as per specification to locate the pipeline axis. These markers shall then be replaced with permanent pipeline markers.

13.18 Backfilling shall be preferably carried out at the highest ambient temperature.

13.19 In certain areas like U/G pipeline crossings, overhead power cable crossings etc, special care tobe taken by putting concrete slab/ plastic grating before backfilling. Size and thickness of concrete slab/ plastic grating shall comply applicable job standard and approved by Company.

14. TIE-IN

14.1 The unconnected sections of the pipeline at various locations have to be tied in after the sections are coated, lowered and backfield. The sections to be connected shall have at the ends, sections of over lapping, uncovered pipe of sufficient length to absorb, without inducing excessive stresses in the steel, small displacements necessary for perfect alignment and connection of the ends.

14.2 Tie-in shall preferably be carried out at ambient temperatures corresponding to the average operating temperature in the case of a pipeline conveying fluids at normal temperatures and at the maximum ambient temperature in the case where the pipeline is carrying fluids at high temperature.

14.3 Contractor shall carry out tie-in-welding (including necessary cutting, bevelling, grinding of pipe weld seams and line-up etc.) cleaning, priming, coating and backfilling for the tie-in portion as per relevant specifications. Contractor shall also excavate the required bell-holes for the welding. Bell holes made to facilitate welding shall provide adequate clearance to enable the welders to exercise normal welding ability and skill. All tie-in welds shall be radiographically examined.

14.4 The tie-in should be done in such a way as to leave a minimum of strain in the pipe. If necessary, with respect to the trench, realigning of the pipe shall be done to eliminate force or strain in the pipe by the Contractor at no extra cost to Company.

14.5 If a pup end cannot be avoided for tie-in, the minimum length that shall be added is 1.0 meter and two or more such pups shall not be welded together. All cut-off lengths greater than 1.0 meter shall be moved ahead in order to be welded into the pipeline at a suitable location. Tie-in with two or more pups may be used provided that they each have minimum

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length of 1.0 meter and are separated by an entire length of pipe. In no case more than three (3) welds shall be permitted on a 10 meter length of pipeline.

14.6 In connecting pipes, special items, fittings and equipment where different wall thicknesses are to be welded, Contractor shall follow the procedures indicated in ASME B3l.8/ ASME B31.4, as applicable. The required tapering shall be done by Contractor at no extra cost to Company.

14.7 For tie-in of adjacent sections of pipeline already pressure tested, the pup used for tie-in shall be of single length or off-cuts of pipe, which have already been hydrostatically tested. Contractor shall take care that sufficient number of pretested pipes with different wall. Thicknesses are readily available.

15. SPECIAL INSTALLATIONS ON THE PIPELINE

15.1 GENERAL

15.1.1 In addition to constructing the pipeline, Contractor shall also install certain other auxiliary facilities and appurtenances.

15.1.2 Contractor shall do all work necessary at each of the installations to provide facilities, which are complete in all respects and ready for operations.

15.1.3 Without limiting the generality thereof, the work required to complete the installations shall, where applicable, include all site surveys, site preparation, filling, grading, fencing, foundations, installation of block valves, side valves, pipe work, pipe supports, pressure gauges, mechanical facilities, civil work, painting, installation of all electrical equipment's, motors, cables, conduit, wiring and fixtures and hooking up of same; installation of all instruments, piping, valves and fittings; mounting of all instruments and making all piping and electronic connections, etc.

15.1.4 On completion, all elements of each entire installation shall be checked out and tested for full and correct operation in the presence of, and to the satisfaction of Company. All work shall be carried out strictly in accordance with the appropriate codes, the approved drawings, and this and other related specifications.

15.1.5 Contractor shall fabricate all piping and install valves and fittings as required by the detailed engineering fabrication drawings prepared by him and approved by Company. Piping fabrication drawings shall be prepared by Contractor based on AFC drawings and approved by Company Representative at site.

15.1.6 Stainless steel lines will he "swaged" using permanent fittings installed with a hydraulic device.

15.2 MAINLINE VALVES STATIONS (MLV'S)

15.2.1 The Contractor shall install Mainline Valve assemblies as shown in the approved for construction drawings issued for the purpose and requirements of this specification. The Contractor shall completely assemble, test and make the MLV assembly including all related instruments etc. fully functional prior to installation in the pipeline.

15.2.2 The valve stem shall be installed in the vertical position. Valves with flow arrows shall be installed according to the normal flow in the pipeline. During welding the valve shall be in

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open position. Care shall be taken to avoid entry of sand particles etc. to valve body, seals etc. during assembly and installation.

15.2.3 Valve shall be installed in the pipeline in horizontal position only unless indicated otherwise in approved drawings. Installation shall be done in such a way that there is no strain in the welded joint while the pipeline at upstream and downstream side is straight.

15.2.4 The equipment and tools used for lifting and handling shall never be driven through hand wheel, valve stem, flange joints and other parts, which may cause damage / misalignment.

15.2.5 Entire MLV assembly, after fabrication, shall be tested hydrostatically ex-situ as per applicable specifications to a test pressure equal to 1.25/ 1.4 times the design pressure as applicable. As applicable all weld joints and piping components shall be inspected for leakage. Leakages if any shall be repaired and assembly retested.

15.2.6 Suitable reinforced concrete foundation(s) as per approved for construction drawings shall be constructed on which the valve assembly shall be firmly installed.

15.2.7 The Contractor shall carry out necessary excavation; cutting, bevelling and welding of the tie-ins required for the installation of such assembly. The final tie-in shall not be made until the valve is fixed in position.

15.2.8 The civil and structural work shall be carried out in accordance with the relevant specifications issued for the purpose and in accordance with the approved drawings, and as directed by Company representative. The work shall as a minimum include clearing, grading, filling, fencing, foundations, supports, etc. as required.

15.3 SCRAPER LAUNCHER AND RECEIVER FACILITIES AT STATIONS

15.3.1 Scraper launcher and receiver facilities at stations including the associated piping shall be fabricated and installed as per the approved for construction drawings. The Contractor shall completely assemble, test and make the scraper facilities including connected piping and all related instruments etc. fully functional prior to hook-up with the pipeline.

15.3.2 The Contractor shall maintain elevations shown on the approved drawings and carry out any pipe work adjustments, necessary for this purpose. Field cuts shall be square and accurate and field welds shall not be performed under stress of pipe ends.

15.3.3 The painting for the scraper stations shall be carried out as per relevant Specifications for Painting. The underground sections shall be coated with 3 Layer Polyethylene coating up to at least 300 mm above grade.

15.3.4 Entire scraper facilities including the associated piping, after fabrication, shall be tested hydrostatically to a test pressure equal to 1.25/ 1.4 times the design pressure as applicable. All weld joints and piping components shall be inspected for leakage. Leakages if any shall be repaired and assembly retested. Test pressure shall be maintained for minimum four (4) hours.

15.3.5 The Civil and structural works for the scraper stations shall be carried out as per the relevant specifications, in accordance With the approved for construction drawings. The work as a minimum shall include site survey, site preparation, clearing, grading, filling, fencing, foundations, etc. as required.

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15.4 INSULATING JOINTS (IJS)

15.4.1 Pipeline insulating joints shall be installed in accordance with and at the locations specified in approved for construction drawings.

15.4.2 Pipe abutting insulating joints shall be aligned so that the joint is not subject to loads that induce bending or torsional moments in the joint during installation. During welding of in-line insulating joint, propagation of heat shall be avoided. To achieve this, the joint shall be kept cool by means of rags continuously wetted.

15.4.3 Insulating joints shall be electrically tested by the contractor prior to welding into the pipeline .The electrical conductance test shall be carried out using a Megger. Measurement of the insulation resistance across the joint shall be approx. one Mega Ohm. The test shall be repeated after installation and welding of the joint into the pipeline to verify that the insulating joint assembly is not damaged.

15.5 DIMENSIONAL TOLERANCES

These tolerances apply to inline items and corrections for other lines. These tolerances can be exceeded on items such as vents, drains, dummy supports, field supports, temperature and pressure connections, where the deviation will not affect another spool.

A. General dimensions such as face to face, face or end to end, face or end to center, and center to center: ± 3mm.

B. Inclination of flange face from true in any direction: 4mm per meter.

C. Displacement of branch connection from indicated location:± 1.6mm. When multiple branches are involved, the displacement of the branches shall not exceed 3mm from a common point.

15.6 FLANGED CONNECTIONS

Contractor shall ensure that prior to final bolting, all flange faces are parallel and centered, according to standard practice. Contractor shall not use bolting forces as a means for attaining alignment. A gasket of required size and quality shall be installed between the flanges at each joint.

Bolts shall be tightened in diagonal sequence and shall be centered with equal amounts of thread visible on both sides. Bolts shall be uniformly tightened to produce a leak-proof joint. Bolts that yield during-tightening shall be removed and discarded. It is mandatory that a torque wrench is used for bolt tightening.

15.7 THREADED CONNECTIONS

Damaged threads shall be cut from the end of a run and the pipe shall be rethreaded. Contractor shall properly align all threaded joints. Pipe entering unions shall be true to centerline so the union will not be forced during make-up. The threaded pipe shall not project through fittings to cause interference with valves or other operating mechanisms.
Except for the threaded connections of instruments, which will require periodic testing and maintenance, all threaded joints shall be seal welded. The latter joints shall be made up without pipe joint compound and with a minimum of oil from the thread cutter. Seal welds should taper into the pipe with as little discontinuity as possible, and should cover all threads. All seal welds shall be tested with DP, MP testing.

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15.8 WELDED CONNECTIONS

Where the ends of the piping components being welded have an internal surface misalignment exceeding 1.6mm, the wall of the component extending internally shall be trimmed by machining so that the adjoining internal surfaces will be approximately flush. All welding shall be performed in accordance relevant specification.

15.9 PAINTING

All exposed surfaces like piping, valves, structures, and miscellaneous appurtenances shall be painted in accordance with the specifications issued for this purpose.

15.10 COATING OF BURIED INSTALLATIONS, ETC.

All buried valves, insulating joints, flow tees, bends, other in-line fittings and appurtenances shall be coated with 100% solid high build epoxy (minimum 500 micron THK) or any other equivalent suitable Company approved coating at no extra cost to Company. For buried pipes and LR bends, heat shrink sleeves relevant specification for Field Joint Coating shall be used .Contractor shall submit to Company a report regarding the method of application and the materials used along with all test certificates. Only after obtaining written approval from the Company, Contractor shall commence the work of coating.

15.11 CIVIL WORK

Civil work shall be performed in accordance with Specifications issued for the purpose.

16. THIRD PARTY FACILITIES

16.1 GENERAL

The proposed pipeline may be required to be constructed in or adjacent to easements established by others to carry services including overhead electric transmission cables, buried fiber optic transmission cables, telephone and power cabbies gas, water and other pipelines, etc. Though the Company has endeavored to identify and locate such services known to cross or closely run parallel to the pipeline, it is possible that some such services may not have been fully delineated during the surveys and/ or changes to the services identified have occurred since the Company's surveys. The Contractor shall be responsible for delineating and protecting all such services while executing the works.

Where the works covered under the Contract parallels or crosses an existing service, the requirements of the Authorities having jurisdiction over such a service related to protection of the service from damage during the construction activities shall be identified and complied with by the Contractor.

16.2 LOCATION AND PROTECTION OF BURIED SERVICES

The Contractor shall undertake an investigation to confirm the location of services identified by the Company, and to establish the location of any other services that may interfere with the pipeline construction.

Buried services when located shall be identified by hand excavation, and each service identified shall be marked with a stake and red flag. For all such services, location (UTM co-ordinates), angle of intersection, offset distance, size, depth of cover, etc. shall be recorded by the Contractor.

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Temporary under-pinning or any other type of supports and other protective measures necessary to keep the interfering structure/ utility intact shall be provided by the Contractor at his own cost and shall be of such design as to ensure stability and safety against their possible failure.

Despite all precautions, should any damage to any structure/ utility occur, the owner/ authority shall be contacted by the Contractor and repair shall forthwith be carried out by the Contractor at his expense under the direction of Company representative and the concerned owner/ authority If the Contractor fails to repair in reasonable time, Company reserves the right to have the repair executed at the cost of the Contractor.

16.3 PROTECTION AGAINST INDUCED VOLTAGE HAZARDS

Where the work covered under the Contract parallels or is in close proximity to overhead high voltage power transmission lines, potentially dangerous voltages may be induced in the pipeline and in the working environment posing danger to personnel working on the pipeline. NACE Standard RP0177 shall be followed to the extent applicable during construction for safety purposes. The Contractor shall undertake following precautions in this regard.

i. Personnel performing work within the area influenced by the high voltage system must wear electrically insulated footwear (e.g. rubber knee-boots) and insulating rubber or plastic gloves so that metal parts of the pipeline can be touched.

ii. During thunderstorms or whenever discharges are observed on insulators, all personnel must leave the area of the high voltage line and pipeline.

iii. Vehicles and equipment must be earth-connected. This should be effected by connecting an uninsulated cable or chain of adequate length to the underside of the vehicles/ equipment.

iv. To prevent electrical voltage in a non-buried section of the pipeline from rising to dangerous levels, the length of the pipeline sections that have been welded together before lowering must not exceed the length at which the maximum admissible voltage may be induced. This length may be calculated using an appropriate calculation method.

v. The weld between pipeline section yet to be lowered and section already buried must be at least 50 m from the nearest point of pylon base of a high voltage transmission line.

16.4 ADDITIONAL REQUIREMENTS WHEN WORKING AT LESS THAN 50 M FROM THE CENTRE OF THE HIGH VOLTAGE SYSTEM

When working at a distance less than 50 m from the center of a High Voltage system, following requirements shall be complied with.

i. The work must not be started until agreement has been reached with the authorities, who control the high voltage system, with regard to the safety measures to be adopted.

ii. Measures must be taken to prevent excavators and hoisting equipment from approaching high voltage lines within the following distances.

Voltage level	Radial distance
0- 50 kV	3 m
> 50 - 200 kV	5 m

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> 200 - 380 kV 8 m

Measures to be taken in this regard may be as follows:

- Special selection of equipment, or limiting or blocking certain directions of movement, or limiting the operational area, thereby making it definitely impossible for any work to be done at a distance from the high voltage line of less than accepted minimum.
- In case the measures recommended above are not feasible, installation of clearly visible markers with no passage beyond this point' painted bright red and white must be done to prevent any work being done inside the danger area.

In the event that a vehicle, crane etc. should accidentally come into contact with a live line / conductor of a high voltage system or flash-over of electrical charge occurs, the driver must not get down from his vehicle because this will pose a serious threat to his life. The vehicle or crane must break the contact without any help from outside. The driver must not leave his vehicle until he has managed to leave the dangerous area, or alternatively, when the Electricity Authorities have given notice that the cable(s) have been put out of circuit. In case a serious fire starts in the vehicle, he is permitted to jump from the vehicle, clearing it as far as possible, while the jump should be possible at a dry sport.

17. MARKER

The Contractor shall fabricate and installed all types of pipeline markers along pipeline route. Number and type of pipeline markers shall be as per As-built survey/ alignment sheet & reference specification and as directed by the authorities having jurisdiction. The Contractor shall install all types of markers in accordance with Specification for Markers and approved for construction drawings.

18. FINAL CLEAN-UP OF THE CONSTRUCTION RIGHT-OF-USE (ROU)

18.1 Contractor shall restore the ROU and all sites used. for the construction of pipelines, water crossings and other structures in accordance with Company's instructions, and deliver them to the satisfaction of Company.

18.2 SURPLUS MATERIALS

For Company supplied materials, after completion of work, the Contractor shall return all surplus materials at Company's designated areas.

The reconciliation of surplus free issue line pipes shall be as per the requirement of commercial condition of contract.

18.3 DISPOSAL

18.3.1 All surplus and defective materials supplied by Contractor and all trash refuse and spoiled materials shall be collected and disposed off by Contractor.

18.3.2 The ROU shall be cleared of all rubbish, broken skids, empty cans, card board, sacks, stumps, trash, and leftover construction material. All burnable matter shall be burned, but only after obtaining appropriate permits for such burning. If burning is not allowed, Contractor shall haul the clean-up material to an approved dumping area. All scrap metal and unburnable material shall be disposed of, in an appropriate manner, but never be buried in the ROU.

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18.3.3 Surplus soil can only be removed from the Owner's plot after authorization by Company.

18.3.4 All dumping fees connected with the disposal of materials shall be to the account of Contractor.

18.3.5 All loose stones and rock exposed by the construction operations and scattered over the ROU or adjacent grounds shall be removed by Contractor and be transported to a location considered suitable by the land-owner and/ or tenant, or by authorities have jurisdiction, for satisfactory disposal. For stones, gravel or other hard material, which may be buried in the trench the provisions of the specifications shall apply with the understanding that the use of the land by the land-owner and/ or tenant will not be interfered with.

18.4 TEMPORARY STRUCTURES

All auxiliary structures such as bridges, culverts, sheet piling, posts, signs, etc., which were erected or installed by Contractor as temporary measure, shall be removed. However, it may be necessary to remove the fence of ROU during the maintenance period.

18.5 REPAIR OF DAMAGES

18.5.1 Damages to roads, bridges, and private property shall be repaired by Contractor. All fences and other structures, which are damaged during construction, shall be restored to original.

18.5.2 Slopes, water course sides or banks which have been partially or totally demolished during the execution of the works shall be properly consolidated and restored (without waiting for their natural consolidation and setting) complying to requirement of the concern authorities. The bed of water-courses shall be restored to the original level. The banks and any excavated areas shall be restored to the original levels and contours. The banks shall also be stabilized.

18.5.3 All boundary stones, which have been moved or removed during the work, must be reset in their original location to the satisfaction of the landowner concerned.

18.5.4 On completion of clean-up, the ROU shall be restored to such stable and usable condition as may be reasonably consistent with the condition of the ROU prior to laying the pipeline. The Company shall be completely indemnified and held harmless by Contractor from any and against all claims, demands, losses, expenses etc. that may arise in this behalf or the Company may anyway suffer or sustain, relative to, arising out of, or in connection with same. The Company may require from the Contractor signed releases from landowners regarding satisfactory indemnification and restoration of their lands.

18.5.5 Special precautions shall be taken near steep slopes prone to erosions and landslides. All necessary steps shall be taken to ensure the rapid growth of grass by providing wicker barriers and by regulating the drainage of surface waters.

18.5.6 All cadastral or geodetic markers, which may have been removed during the execution of the work, shall be restored in their exact position.

18.5.7 Ditches for which no instructions for their restoration have been issued, or restoration cannot be done due to absence of banks, shall be restored as instructed by Company. The bed of ditches crossed by the pipeline shall be cleaned over the full width of the ROU, also outside the ROU if necessary. This restoration might contain but is not limited to the supply and installation of proper materials for backfill and protection, the sodding or other precautions to prevent erosion or guarantee the stability. All work has to be done after deliberation and

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acceptance of the authorities and Company. Other field drains have to be restored over full width of ROU and if necessary also outside the ROU by hand and/ or special equipment as soon as possible.

18.5.8 Any subsidence, cave-ins, wash-outs, which have been caused during the pipeline construction and maintenance, caused by whatever reason within the edge of ditches and open drains, shall be repaired by Contractor immediately or at first notice given by Company.

18.5.9 After the clean-up, the ROU of pastures has to remain fenced considered suitable by the tenant and to be removed during the maintenance period. When agricultural and other traffic (requested by tenant) have to cross the ROU the cross-over have to be fenced with the same material as the ROU. If necessary, special materials have to be used to allow traffic on the cross-over. Fencing of the right-of-use as specified shall not be removed until Contractor has obtained written permission by Company. In general this has to be done during the maintenance period.

18.5.10 All openings in or damage to the fences or enclosures shall. be repaired by installing new fencing of a quality, which shall be at least equal to the parts damaged or removed. Provisional gates shall be removed and replaced with new fencing. All repairs to fences and enclosures shall be carried out by Contractor to the complete satisfaction of Company, landowner and/ or tenant.

18.5.11 If, in the opinion of Company, the sod in pasture land has been damaged by vehicles, and wheel tracks are visible, the ROU shall be tilled with a disc-harrow or rotary cultivator several times. The damaged sod shall be firmly cut up and thoroughly mixed through the top-soil. In general, the ROU has also to be ripped. After this procedure no closed-in layers must be found and sufficiently loose top-soil 25 to 30 cm thick must be present. The whole procedure must be approved by Company. Subsequently, the entire ROU, which is part of pasture land, shall be prepared for seeding and fertilized by Contractor according to the instructions of Company.

18.5.12 In crop fields the tillage shall consist of passing over the land several times with a disc harrow, cultivating with a spading machine, or plow, to a depth of approx. 20 cm. In general the ROU has also to be ripped. After this cultivation process no closed-in layers must be found any more in the ROU. The equipment used and methods adopted shall require the approval of Company. Ripping has to be done with rippers with a distance of 50cm between the ripper blades. The type to be used shall be approved by Company.

18.5.13 Adequate numbers of saplings of any plant/ tree uprooted or cut during construction shall be planted along the route as per the direction of the Company and in accordance with the requirement of Authorities. The cost of sapling and its plantation shall be to Contractor's account.

The ROU and the backfilled trench in particular has to be finished in such a way that after settlement of the soil the fields are at their original level.

If during the maintenance period certain parts of the ROU are lower than the original level, Company can order Contractor to bring these parts to the original level.

In cases where heavy damage has occurred to the structure of the subsoil as a result of adverse circumstances, Company reserves the right to order Contractor to carry out special restoration work. Said special work can include:

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- Spading with dragline (depth 30-80cm);
- Spading with dragline (depth 80-100cm);
- Fertilizing;
- Cover with sand.

If during clean-up operations soil. Shortages become apparent outside the trench,. Contractor shall supplement said soil shortage using suitable materials, approved by Company.

If site and/ or climatic conditions should render this necessary, Company shall have the right to order Contractor to suspend certain parts of the work related to the clean-up and postpone it to a later date.

18.6 SOIL SURPLUS

18.6.1 If on site, as a result of the work and after careful backfilling and compacting, a sub-soil surplus exists, this shall be worked tip by grading and compacting below the sub-soil top layer and as a rule this shall be done in the same plot of land. It shall not be permitted to remove the surplus from the plot concerned, unless it concerns rejected soil, which has to be removed. Working up surplus soil or removal of rejected soil shall be considered to pertain to the work.

18.6.2 To work a soil surplus into the ground, Contractor shall remove an additional strip of top soil beside the trench. Next, the upper layer of sub-soil shall also be removed. Both soil types shall be stored separately across a. width depending on the size of the soil, surplus. The soil surplus shall then be distributed across the trench thus widened, after which it shall be graded and compacted and subsequently the top layer of sub-soil and the top-soil shall be replaced in the correct order, in accordance with the Specifications.

18.6.3 In case Company has given prior permission for mixed excavation of the sub-soil as well as in cases where Company deems mixed excavation permissible, the above provision of separate storage of the upper layer of sub- soil shall not apply to the working up to the soil surplus.

18.6.4 In cases where the soil surplus can be worked up in others plots where soil shortages have arisen due to the work, this shall only be done after prior permission by land-owner, land user and Company.

18.7 SOIL SHORTAGES

18.7.1 If due to unforeseen circumstances during backfilling and compacting there should not be enough soil to fill the trench properly, or to install the crown height as stipulated, Contractor shall supply the necessary backfill material.

18.7.2 Soil shortages shall be supplemented and applied before the top-soil is replaced.

18.7.3 The soil to be supplied shall be worked up in those locations and into those layers where a soil shortage has been established. The quality of the supplemented soil shall be equal to that of the shortage.

19. MAINTENANCE DURING DEFECTS LIABILITY PERIOD

Defects Liability Period as defined as period of liability in the Contract.

Company reserves the right to carry out instrumented pigging survey of the completed

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pipeline.

Contractor shall be responsible for making good with all possible speed at his expense any defect in or damage to any portion of the work which may appear or occur during the Defects Liability Period and which arises either:

a) From any defective material (other than supplied by Company), workmanship or design, (other than a design made, furnished or specified by Company and for which Contractor has disclaimed responsibility in writing), or

b) From any act or omission of Contractor done or omitted during the said period.

If such defect shall appear or damage occur, Company shall forthwith inform Contractor thereof stating in writing the nature of the defect or damage.

If any such defect or damage be not remedied within a reasonable time, Company may proceed to execute the work at Contractor's risk and expense provided that he does so in a reasonable manner. Such defect or damage can be, but is not limited to:

- Clean-up of ROU, including water courses.
- Sagging or sinking of site level or pipe supports.
- Sliding of ditch banks.
- Repair of fencing or removal of construction fencing.
- Repaving of pavements, repair of pavements and repair of Roads.
- Repair of coating, painting.
- Realigning markers, signs.
- Leak/ burst of pipe, leaking of flanges, washouts
- Short-circuit in casings

Construction defects such as dents, ovality, welding offsets/ defects, etc. detected during intelligent pigging survey, etc.

Company reserves the right to have the required Computerized Potential Logging Test executed during the Defects Liability Period and whenever weather conditions are more favorable for this job. The work shall (at or as soon as practicable after the expiration of the Defects Liability Period) be delivered to Company in the conditions required by the contractor, fair wear and tear excepted, to the satisfaction of Company. Contractor shall finish the work, if any outstanding, at the date of completion as soon as possible after such date and shall execute all such work.

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
FIELD JOINT COATING

VPC – SS – PP - 2012

00	28.01.2020	MB	MC	AD	SK
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

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ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing of Materials
API	American Petroleum Institute
OISD	Oil Industry Safety Directorate

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1.0 SCOPE

This specification covers the minimum requirements of materials, equipment, application and inspection/ testing of the field joint anti-corrosion coating. This specification shall be applicable for buried onshore factory coated pipelines with either three layer polyethylene or fusion bonded epoxy coating by heat shrink wraparound sleeves.

The heat shrink wraparound sleeve shall conform to DIN EN 12068 and the requirements of this specification. Unless modified/ replaced by this specification, all requirements of DIN EN 12068 shall remain fully applicable and be complied with.

This specification shall be read in conjunction with the conditions of all specifications and documents included in the Contract between Company and Contractor. Unless specified otherwise, all sections of this specification shall apply to all specifications referred in this specification.

2.0 REFERENCE DOCUMENTS

The design, materials, fabrication, inspection, testing and supply of heat shrink sleeve shall comply with the latest edition of the following codes and standards.

AMERICAN SOCIETY OF TESTING OF MATERIALS (ASTM)

D – 149	:	Standard Test Methods of Dielectric Breakdown voltage and Dielectric strength of solid electrical insulating materials of commercial frequencies.
D - 257	:	Standard Test Method of D-C Resistance or conductance of insulating material
D – 570	:	Standard Method of Test for Water Absorption of Plastics.

INTERNATIONAL ORGANISATION FOR STANDARDIZATION (ISO)

ISO 8502 – 3	:	Preparation of Steel Substrates before Application of Paints and Related Products – Part 3 – Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure Sensitive Tape Method)
ISO 8503-1	:	Part 1: Specification and definitions for ISO surface profile comparator for the assessment of abrasive blast clean surfaces.
ISO 8503-4	:	Part 4: Methods for calibration of ISO surface profile comparator and for the determination of surface profile – Stylus instrument procedure

OTHER STANDARDS

DIN EN 12068	:	Cathodic Protection – External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection-tapes and shrinkable materials

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SSPC-SP1 : Steel Structure Painting Council

COMPANY STANDARD SPECIFICATIONS

Following Company specifications shall form integral part of this specification and shall be complied with when applicable to the works covered in the contract.

SS-PL-002 Standard Specification for 3-Layer polyethylene coating

In case of conflict between various requirements of this specification and reference standards mentioned above, more stringent requirement shall apply unless otherwise agreed by Purchaser.

3.0 MATERIAL AND EQUIPMENT

3.1 GENERAL REQUIREMENTS

Field joint anti-corrosion coating material shall be e heat shrinkable wraparound sleeve suitable for a maximum operating temperature of (+) 60°C (Tmax) and shall conform to designation EN 12068 - C HT 60 UV. In addition, the field joint anti-corrosion coating shall comply the requirements specified in para 3.2 of this specification.

3.1.1 HEAT SHRINKABLE WRAPAROUND SLEEVES

Heat shrinkable wraparound sleeve shall consist of radiation cross-linked, thermally stabilized, ultraviolet resistant semi-rigid polyolefin backing with a uniform thickness of high shear' strength thermoplastic/ co-polymer hot melt adhesive. The joint coating system shall consist of a solvent free epoxy primer applied to the pipe surface prior to sleeve application.

The total thickness of heat shrinkable wraparound sleeve in the as applied condition shall be as follows:

Pipe Size (Specified Outside Diameter)	Thickness (mm)	
	On Pipe Body (Min.)	On Weld Bead (Min.)
< 4″	1.8	1.4
4″ – 10″	2	1.6
12″ – 18″	2.2	1.8
20″ – 30″	2.5	2.0
≥32"	3.0	2.5

The heat shrink wraparound sleeve shall have the required adhesive properties when applied on various commercial pipe-coating materials. The pre-heat and application temperatures required for the application of the shrink sleeve shall not cause loss of functional properties of the pipe coating.

Heat shrinkable wraparound field joint coating system manufactured by M/s Raychem - Covalence and M/s Canusa are acceptable for the supply of field joint coating materials. The Contractor shall propose the specific grade of field joint coating system meeting the requirements of this specification from these manufacturers. In case the Contractor

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proposes to supply heat shrinkable wraparound sleeve from any other manufacturer, then the Contractor shall propose only those coating systems that have been previously used for pipelines of size same or higher than the size indicated in tender, for a length of 50 km and above in a single project for similar operating conditions.

3.1.2 OTHER REQUIREMENTS

The backing material shall be provided with either dimple or other means to indicate that the desired heat during shrinking in the field is attained.

The heat shrink wraparound sleeve shall be of a size such that a minimum overlap of 50 mm is ensured (after shrinking) on both sides of the yard applied corrosion coating of pipes. The sleeve shall be supplied in pre-cut sizes to suit the pipe diameter and the specified overlap requirement.

In the cases where carrier pipe is installed by direct boring/ jacking, the overlap on the mill, coating for the leading edges of the joints shall be minimum 200 mm. When this extra overlap is achieved by providing an additional patch of heat shrink tape/ wraparound, it shall be applied in such a manner that the square edge of the patch on the joint coating is in the direction opposite to the direction of boring/ jacking.

The pre-heat and application temperatures required for the application of the shrink sleeves shall not result in any damage to the applied mainline coating.

The Contractor shall obtain prior approval from Company regarding the Manufacturer of the field joint coating and the specific grade of the joint coating system proposed. Complete details along with test certificates shall be submitted to Company for this purpose. The said test certificate shall be from an independent DIN recognized/ approved laboratory for all the properties required for the specified EN designation of the field joint coating and the requirements of this specification.

3.2 PROPERTIES OF BACKING

Property of PE backing used as a part of heat shrink wraparound sleeve system shall comply the following:

S No	Property	Test Condition	Unit	Requirement	Test Method
a	Tensile Strength	(+)25°C	N/mm2	12 min.	DIN EN 12068
b	Ultimate Elongation	(+) 25°C	%	250 min.	DIN EN 12068
c	Dielectric withstand	1000 volts/sec	KV	30 min.	ASTM D 149
d	Volume Resistivity	(+) 25°C	Ohm-cm	1015 min.	ASTM D 257
e	Water Absorption	(+)25°C for 24 hrs	%	0.05 max.	ASTM D 570

3.3 INSTALLED FIELD JOINT COATING PROPERTIES

As applied field joint coating system shall comply the requirements of DIN EN 12068, Table 1 and 2 corresponding to designation DIN EN 12068-C HT 60 UV, except as modified below:

- Cathodic Disbondment Resistance at T_{max} i.e 60°C shall be 20 mm when tested as per Annexure K of DIN EN 12068. Test shall be carried out at (+) 60° C.
- Peel Strength shall be as follows:

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Peel Strength		Units	Required for Mech. Resistance Class C (minimum)	Test Method as per DIN EN 12068
Inner to Inner Outer to Inner	@ 23 C	N/mm	1.5	Annexure B
	@T_{max}	N/mm	0.3	
Outer to Outer	23°C	N/mm	1.5	
	@$T_{max.}$	N/mm	0.3	
To Pipe Surface	@ 23°C	N/min	3.5	Annexure C
	@ T**max**	N/mm	0.5	
To Factory Coating	@ 23°C	N/mm	3.5	
	@T_{max}	N/mm	0.5	
Notes				
T max shall be (+) 60 °C.				

3.4 TEST CERTIFICATES

The Contractor shall ensure that the Manufacturer has carried out all quality control tests on each batch of material and test certificates are provided as per the requirements of this specification. These documents shall be furnished to the Company prior to commencement of field joint coating application. Company reserves the right to have the materials tested by an independent laboratory.

3.5 MATERIAL IDENTIFICATION

All materials shall be identified by the batch number. It shall be the responsibility of the Contractor to ensure that the materials supplied are properly packed and marked with the Manufacturer's Name, material designation, batch number, date of manufacture and shelf life.

Random product batch sampling tests shall be performed at site by the Contractor and the results recorded for review by the Company. Tests shall include, but not be limited to, measurement of backing thickness, dimensional compliance and control batch records compliance.

3.6 MATERIAL STORAGE

All materials shall be stored as per the Manufacturer's recommendation. Sleeves shall upon receipt be examined to check their integrity and their compliance to the specification. The sleeves shall be stored, covered, sheltered from sunlight, and away from excessive heat. Sleeves, which for any reason have undergone visible distortion or contamination, shall be segregated and removed immediately from the installation site. Liquid materials shall be stored and handled such that their original properties are retained.

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The material shall not be older than their period of validity at the time of application by the Contractor.

3.7 FACILITIES AND TOOLS FOR FIELD JOINT APPLICATION

The Contractor shall provide and maintain mobile facilities which contain all necessary equipment, tools, tackles, etc. for carrying out the surface preparation and application of field joint coating.

The Contractor shall furnish sufficient number of following equipment and the required spares as a minimum for inspection and testing purposes for each crew:

- Full circle adjustable 25 kV holiday detector with a visible and audible signal system
- Non-destructive type thickness gauge for measuring thickness of as-applied coating
- Contact type temperature recording thermometer
- Roughness profile measuring instrument

4.0 HEAT SHRINK WRAPROUND SLEEVE SYSTEM PRE-QUALIFICATION

The field joint coating system and its application procedure proposed by the Contractor shall be prequalified during the sleeve installation start-up phase. Five joints shall be coated in compliance with the requirements of this specification and then inspected and tested in respect of the following:

- Surface preparation, including cleanliness, roughness profile and dust contamination
- Pre-heat temperature
- Primer thickness
- Visual appearance and void after sleeve installation on the body, area-adjoining weld seam and adjoining factory applied coating. A strip of 50 mm wide X 200 mm long shall be removed for this purpose.
- Holiday testing
- As-applied coating thickness
- Peel strength test at 23°C and 60°C (between sleeve and pipe surface, between sleeve and factory applied coating & between overlap)

Company Representative shall witness the tests and inspection of coating. Regular application of field joint coating commence only after successful completion of the pre-qualification testing.

After successful completion of the pre-qualification testing, the entire field joint coating shall be removed, the pipe surface re-blasted and field joint coating re-applied as per this specification.

5.0 HEAT SHRINK WRAPROUND SLEEVE APPLICATION

5.1 GENERAL

The application procedure shall be in accordance with Manufacturer's instruction and the minimum requirements specified below whichever are most stringent and shall be demonstrated to and approved by Company. Manufacturer's expert shall supervise the application and shall be available at site upon request during qualification of application procedure and during construction at Contractor's Cost.

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5.2 OPERATOR QUALIFICATION

Operators for coating application shall be given necessary instructions and training before start of work, by the Contractor. To verify and qualify the application procedures, all coating applied during the qualification test shall be removed for destructive testing as detailed subsequently in this specification. Contractor shall only utilize those operators who have been approved/ prequalified by the field joint coating manufacturer.

5.3 SURFACE PREPARATION

Oil, grease, salt and other contaminants shall be removed from steel surface by wiping with rags soaked with suitable solvents. Solvent cleaning shall be done in accordance with SSPC-SP1.

5.3.1 BLAST CLEANING

Each field joint shall be blast cleaned using a closed cycle blasting unit or open expendable blasting equipment. With the first equipment type, steel or chilled shot and iron grit shall be used and Garnet material with the second one (in case the authority having jurisdiction have no objection, the contractor may adopt sand blasting instead of garnet material). During blast cleaning the pipe surface temperature shall be simultaneously more than 5°C and more than 3°C above ambient dew point, while the ambient relative humidity shall not be greater than 85%. Prior to surface cleaning the surface shall be completely dry. The surface shall be cleaned to a grade Sa2 ½ in accordance with Swedish Standard SIS 055900 with a roughness profile of 50-70 microns. Surface roughness profile shall be measured using an approved profile comparator in accordance with ISO 8503-1 and shall be calibrated prior to start of work in accordance with ISO 8503-3 or ISO 8503-4. The blast cleanliness shall be checked on every joint and the roughness profile shall be checked 1 in every 10 joints.

Dust, grit or foreign matter shall be removed from the cleaned surface by an industrial vacuum cleaner. The contamination allowed shall be of a rating max 2 as per ISO 8502-3. The frequency of checking for dust contamination shall be 1 every 10 joints.

Blast cleaned field joint shall be coated within 2-4 hours according to the conditions below:

- Relative Humidity (RH) >80% - 2 Hours
- Relative Humidity (RH) 70-80 - 3 Hours
- Relative Humidity (RH) <70% - 4 Hours

Pipes delayed beyond this point or pipes showing any visible rust stain, shall be blast cleaned again.

5.3.2 SURFACE INSPECTION

The field joint surface shall be inspected immediately after blast cleaning and any feature of the steel surface such as weld spatter, scabs, laminations or other imperfections considered injurious to the coating integrity, made visible during blast cleaning shall be reported to the Company Representative and on permission from Company Representative, such defects shall be removed by filing or grinding. Pipes affected in this manner shall be then re-blast cleaned if the defective area is larger than 50 mm in diameter. All steel joint surfaces shall be thoroughly examined before the application of the coating in order to

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ensure the surfaces are free of oil, grease, rust, mud, earth or any other foreign matter. All these substances shall be removed before coating.

5.3.3 PREPARATION OF EDGE OF FACTORY APPLIED COATING

The ends of existing factory applied mainline coating shall be inspected and chamfered. Disbonded portions of the coating shall be removed and then suitably trimmed. Portions where parent coating is removed shall be thoroughly cleaned. The adjacent chamfered areas of the line pipe coating shall also be cleaned and abraded, to expose a clean uniform fresh surface of uncontaminated factory applied coating.

Field joint coating shall be applied on the joints immediately after the completion of cleaning operation.

5.4 PREHEATING

Before placing the wraparound sleeve, the bare steel surface shall be preheated either with a torch moved back and forth over the surface or by induction heating. The minimum pre-heat temperature shall be as recommended by manufacturer and shall be checked by means of contact type temperature-recording thermometer at minimum four (4) locations uniformly spaced around the pipe circumference.

Temperature indicating crayons shall not be used.

Pre-heat temperature shall be checked on every joint. Care shall be taken to ensure that the entire circumference of the pipe is heated evenly. Temperature measuring instruments shall be calibrated immediately before the start of the works and thereafter at intervals recommended by the Manufacturer of the instrument.

5.5 APPLICATION OF PRIMER

Upon pre-heating, the pipe surface shall be applied with two pack epoxy primer of wet film thickness of 150 microns or as per manufacturer's recommendation whichever is higher, to cover the exposed bare metal of the welded field joint and 10 mm minimum on to the adjacent pipe coating if recommended by the manufacturer. The wet film thickness of the primer shall be checked on every joint with a wet film thickness gauge prior to installation of sleeve. Thickness gauge shall be calibrated once in a shift.

5.6 APPLICATION OF HEAT SHRINK SLEEVE

Immediately after application of epoxy primer, the wraparound sleeve shall be entirely wrapped around the pipe within the stipulated time recommended by the Manufacturer. Sleeve shall be positioned such that the closure patch is located on one side of the pipe at 10 or 2 O'clock position, with the edge of the undergoing layer facing upward and an overlap of minimum 50 mm. Gently heat by appropriate torch the backing and the adhesive of the closure and press it firmly into place.

A heat shrinking procedure using heating torch or induction heaters shall be applied to shrink the sleeve in such a manner to start shrinkage of the sleeve beginning from the center of the sleeve and heat circumferentially around the pipe. Continue heating from the center towards one end of the sleeve until recovery is completed. In a similar manner, heat and shrink the remaining side. Shrinking has been completed when the adhesive begins to

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ooze at the sleeve edges all around the circumference and change in the visual indicator other means provided on the backing material, to signify proper shrinkage, shall be complete and uniform.

The complete shrinking of the entire sleeves shall be obtained without undue heating of existing pipe coating and providing due bonding between pipe, sleeve and pipe coating. The installed sleeve shall not be disturbed until the adhesive has solidified.

6.0 INSPECTION AND TESTING

6.1 VISUAL INSPECTION

Visual inspection of the as applied coating shall be carried out on every joint, for the following:

- Mastic extrusion on either ends of the sleeve shall be examined
- There shall be no sign of punctures or pinholes or bend failure. The' external appearance of the sleeve shall be smooth, free of dimples, air entrapment or void formation. All sleeves shall be tested for the presence of voids by knocking on the sleeves. A hollow sound compared to the remainder of the sleeve may indicate the presence of voids under; the sleeve. Such sleeve shall be tested for-adhesion at the discretion of the Company Representative.
- Weld bead profile shall be visible through-the sleeve
- Visual indicator provided on the backing and the closure patch showing desired heat is achieved.

6.2 COATING THICKNESS

Coating thickness shall be checked by non-destructive methods for each field joint. Average thickness of the as-applied coating on pipe body shall be established based on measurements at min. eight locations i.e. four measurements on either side of the girth weld at 3, 6, 9 & 12 O' clock positions. To establish the minimum thickness on the girth weld, four measurements shall be taken on apex on the weld at 3, 6, 9 & 12 O' clock positions. All such measurements shall be recorded. Company representative reserves the right to ask for additional measurements at any location on the field joint coating, whenever doubt arises.

6.3 Holiday Detection

The entire surface of each joint shall be inspected by means of a full circle holiday detector approved by Company, set to a DC voltage applicable as per the requirements of factory applied mainline coating specification of Company. Inspection of the sleeves shall be conducted only after the joint has cooled below 50°C. The holiday detector used shall be checked and calibrated daily with an accurate DC voltmeter. The detector electrode shall be in direct contact with the surface of coating to be inspected.

No field joint shall be covered or lowered in the trench until it has been approved by the Company.

6.4 Peel Strength Testing

6.4.1 One out of every 50 joint coatings or one joint coating out of every day's production, whichever is stringent, shall he tested to establish the peel strength on steel and factory

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applied coating. Contractor shall carry out such testing in the presence of Company Representative.

6.4.2 From each test sleeve selected as above, one or more strips of size 25mm x 200 mm shall be cut perpendicular to the pipe axis and slowly peeled off.

The required peel strength shall meet the requirements of this specification as applicable for (+) 23 °C or (+) 60 °C whichever is feasible. This test shall be conducted between wrapping & metal and mill coating & between layers at Overlap with joint coating (wherever applicable). After removal of strip, the bulk of adhesive shall remain adhered to the pipe showing no bare metal, otherwise, test shall be considered failed. The adhesive layer that remains on the pipe surface shall generally be free of voids resulting from air or gas inclusion. In case the peel strength test at a different temperature than that specified is warranted due to the ambient site conditions, then the peel strength shall comply the recommendation of the manufacturer. Manufacturer shall be asked to furnish peel strength values corresponding to various expected temperatures, prior to start of the works.

6.4.3 If the sleeve does not meet the requirements of clause 6.4.2 the adjacent two sleeves shall also be tested. If the adjacent two sleeves are acceptable the test rate shall be increased to one sleeve every twenty five until Company's Representative is satisfied. The test rate can then be reduced as per clause 6.4.1 at discretion of Company's Representative. If either or both of the adjacent two sleeves do not meet the requirements of clause 6.4.2, the field coating shall be stopped.

6.4.4 Company Representative reserve the right of 100% removal of sleeves if he is not convinced that the requirements of clause 6.4.2 are achieved.

7.0 REPAIRS

7.1 If a field is detected to be unacceptable after testing as per section 6.0 of this specification the Contractor shall, at his own cost:

- Determine the cause of the faulty results of the field coating.
- Mobilize the expert of manufacturer, if required.
- Test to the complete satisfaction of Company, already completed field coatings.
- Stop the field coating works until remedial measures are taken against the causes of such faults, to the entire satisfaction of the Company.

7.2 Contractor shall replace all joint coating found or expected to be unacceptable as per section 6.0 of this specification.

7.3 Contractor shall, at his own cost repair all areas where the coating has been removed for testing by the Company.

7.4 After the coating work on welded joints and repan to the coating have been completed the coating as a whole shall be tested with a spark-tester before lowering or jacking the pipeline.

7.5 Company shall be entitled to check the coating on buried pipelines or parts of pipelines with equipment such as the "Pearson Meter" and the resistance meter or during CP survey. If

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coating defects are established, the Contractor shall be responsible for excavation at such points, repairing the coating, spark testing and backfilling the excavations without extra cost to Company.

8.0 DOCUMENTATION

8.1 PRIOR TO PROCUREMENT

The Contractor shall furnish the following details for qualification of the heat shrink wraparound sleeve Manufacturer and the material, prior to commencement of procurement, for Company approval:

- Comprehensive information as per Section 5.2, DIN EN 12068 along with descriptive technical catalogues
- Test certificates and results of previously conducted tests, for all properties specified in this specification
- Reference list of previous supplies of similar material in the last five years, indicating the project name, pipeline diameter, operating temperature, year of supply, contact person and performance feedback

8.2 PRIOR TO SHIPMENT

- The Contractor shall furnish the following documents, prior to shipment of the materials:
- Test certificates and results as per Manufacturer's quality control procedure for each batch of materials
- Specific application instructions
- Storage and handling instructions
- Recommended peel strength values corresponding to expected site conditions/ ambient temperatures.

8.3 PRIOR TO FIELD APPLICATION

After successful qualification of field joint coating system and its application procedure, the Contractor shall submit a qualification report before commencement of production of field joint coating.

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VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR

HYDROSTATIC TESTING OF ONSHORE PIPELINES

VPC – SS – PP -2014

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ABBREVIATIONS

ASME	:	American Society of Mechanical Engineers
API	:	American Petroleum Institute
OISD	:	Oil Industry Safety Directorate (of India)
SMYS	:	Specified Minimum Yield Strength

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1.0 SCOPE

1.1 This specification covers the minimum requirements of supply and various activities to be performed by Contractor for hydrostatic testing of cross-country steel pipelines transporting hydrocarbons in liquid or gaseous phase under high pressure.

This specification does not cover the requirements of caliper pigging, swabbing/ drying/ pre-commissioning of the tested pipelines.

1.2 This specification shall be read in conjunction with scope of work, specifications, documents, drawings and other requirements indicated in and included in the Contract between the Company and the Contractor. Unless specified otherwise, all sections of this specification shall apply to all specifications referred in this specification

2.0 REFERENCE DOCUMENTS

2.1 The latest edition of following Codes and Standards are referenced in this specification and all provisions of these reference codes and standards shall be applicable.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B 31.4	:	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
ASME B 31.8	:	Gas Transmission and Distribution Piping Systems.
ASME Sec. VIII Div. 1	:	Boiler and Pressure Vessels Code - Rules for Construction of Pressure Vessels.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 1110	:	Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon Dioxide.

OIL INDUSTRY SAFETY DIRECTORATE (OISD)

OISD-STD-141	:	Design and Construction Requirements for Cross Country Hydrocarbon Pipelines
OISD-STD-226	:	Natural gas transmission pipelines and city gas distribution networks

COMPANY STANDARD SPECIFICATION

SS-PL-015	:	Standard Specification for Pipeline Construction (Onshore)

2.2 In case of conflict between the various requirements of this specification and

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reference codes, standards and specifications mentioned above, more stringent requirement shall govern.

3.0 GENERAL REQUIREMENT

3.2 The Contractor shall ensure that the complete pipeline section undergoing hydrostatic test is mechanically complete in all respects, i.e welds have been accepted and the pipeline has been laid and backfilled, all mechanical and civil works completed. Hydrostatic test shall include those sections which have been previously tested viz. Rail/ road crossings, major water crossings including test on banks and in place after installation.

3.3 Hydrostatic test shall be performed on the entire length of the pipeline in accordance with approved Hydrostatic Test procedure and Diagrams clearly indicating the number of test sections and minimum and maximum test pressures in each test sections. The maximum length of each test section shall not exceed 50 Kms.

3.4 For pipeline sections (i.e. River Crossing, Railway Crossing, HDD Crossing, National Highway Crossing, etc.) which in Company's opinion, once installed would require an inordinate amount of effort for repair in case of a leak, a provisional pre-test shall be conducted. However, after installation, such pre-tested sections shall be tested again along with the entire pipeline.

3.5 All works required for hydrostatic testing shall start only after obtaining prior approval from the Company.

4.0 TEST PROCEDURE

The Contractor shall submit a comprehensive hydrostatic test procedure to the Company for approval. The procedure shall also include all temporary materials and equipment to successfully complete hydro testing, but not be limited to the followings:

a) A diagram for the system to be tested, indicating all fittings, vents, valves, temporary connection, relevant elevations and ratings. The diagram shall also indicate injection locations and intake and discharge lines.

b) A diagram indicating the lengths, elevations, and locations of the test sections.

c) Pipeline details of the test section pipe diameter, wall thickness and material

d) Source of water for testing and test water discharge location for each test section

e) Estimated quantity of water for filling and pressurizing

f) Details of chemicals/ inhibitors and the dosage

g) Cleaning, gauging flushing, and filling procedures including type and number of pigs, details of gauging pig.

h) Procedures for Pig Tracking System (which shall be used in case of pig getting

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stuck inside pipeline).

i) Procedures for location and rectification of dents/ buckles/ other deformation, etc.

j) Temperature stabilization procedure.

k) Pressure testing procedure including all calculations and test section isolation details.

l) Procedure for detection, location and rectification of leaks.

m) Safety precautions and procedures.

n) Repair procedures for coating damage at thermocouple locations.

o) Formats to be used for recording the test data.

p) Procedure for dewatering and neutralization of corrosion inhibitor of the pipeline sections(s) after testing.

The Contractor shall not commence hydrostatic testing activities until the testing procedure is approved.

5.0 SAFETY PRECAUTIONS DURING THE HYDROTEST

The Contractor shall take all necessary safety precautions during the hydrotest. As a minimum, the following shall be taken during the hydrostatic test:

a) Provision shall be made for the installation of no-admittance signs to unauthorized personnel from the roads to the R.O.U.

b) Warning signs stating 'PIPELINE UNDER TEST-KEEP OFF" with local language translation shall be placed where the pipeline is uncovered, and particularly where the provisional traps/ test headers and stations are located. Such areas shall be suitably fenced in such a way as to prevent access of unauthorised personnel and no unauthorised personnel shall be closer than 40 m to the testing equipment or pipeline under test. Warning tapes and signboards shall also be placed near the crossings and regular intervals along the route to warn the public around those areas.

c) The test station shall be placed in such a location as to prevent it from being affected by a catastrophic failure in the test head.

d) Once dewatering is over the sectionalizing valves and other valve assemblies tested previously, shall be installed at locations shown in the drawings and in accordance with the procedures contained in the relevant specifications.

e) All thermocouples installed in the pipeline shall be removed and damage corrosion coating shall be repaired using Company approved materials and procedure.

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6.0 TEST PRESSURE AND DURATION

6.1 TEST PRESSURE

Unless otherwise specified in the Contract, the minimum hydrostatic test pressure for different classes shall be as follows:

For pipeline handling hydrocarbon in gaseous phase:

Class 1	:	1.25 times the design pressure as per ASME 31.8
Class 2	:	1.25 times the design pressure as per ASME 31.8
Class 3 and Class 4	:	1.4 times the design pressure as per ASME 31.8

For pipeline handling hydrocarbon in liquid phase:

All Location	:	1.25 times the design pressure for pipeline Handling liquids including Liquefied Petroleum Gas (LPG).

The test pressure shall be generated at the highest point in the section under test. At any point in the test section, hoop-stress due to test pressure and static head shall not exceed 95% of the Specified Minimum Yield Strength (SMYS) of pipe material.

6.2 TEST DURATION

The duration of the hydrostatic test shall be 24 hours after thermal stabilization.

7.0 EQUIPMENT AND INSTRUMENTATION

The Contractor shall provide all necessary equipment and instrumentation for performing the work as stated in cleaning, flushing, filling, stabilizing, testing and dewatering procedures.

7.1 EQUIPMENT

The equipment to be provided shall include, but not be limited to, the following in sufficient numbers along with spares:

a) Pigs for cleaning, gauging, flushing and filling.

- Cleaning pigs with spring loaded steel wire brushes.For internally coated pipes, the pigs shall be provided with nylon/polyurethane brushes.
- Four cup batching pigs
- Two cups/ Four cups pigs fitted with gauge plate
- Gauging pigs fitted with gauge plate.

The Contractor shall provide a sufficient number of pigs, including spares.

b) Fill pumps:

The Contractor shall determine the type and number of fill pumps in order to guarantee the following:

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- Differential head : 20% greater than the maximum required
- Flow rate : Minimum 400 m³/hr; Maximum 1000 m³/hr for 24" and above pipeline.

: Minimum 200 m³/ hr; Maximum 400 m³/ hr up to 18" Pipeline

If a single pump is used, a standby unit must be available.

c) Pressurizing pump:

Variable speed positive displacement pumps equipped with a stroke counter to pressurize the pipeline, capable of generating pressure of 20 bar (g) over and above the required test pressure of the section.

d) Two Positive displacement meters/ Turbine meters to measure the volume of water used for filling the line. These meters shall be provided with a calibration certificate not older than three months.

e) Portable tanks/ Break tanks of sufficient size to provide a continuous supply of water to the pump during filling and pressurizing.

f) Injection facilities to inject chemicals/ inhibitors into the test medium in the required proportions.

g) The temporary test header shall be installed at both ends of section. Proper piping and valving arrangements shall be available to allow launching and receiving of each pig independently

The test heads shall be sized in conformity with ASME specification Section VIII, Division 2 with particular reference to Appendices 4 and 5.

7.2 INSTRUMENTATION

The instrumentation to be provided shall include, but not be limited to, the following in sufficient numbers along with spares:

a) Bourdon pressure gauges of suitable pressure range and accuracy.

b) Dead weight testers with an accuracy of 0.01 bar, measuring with least count of 0.05 bar and provided with a calibration certificate not older than one month.

c) 48 hours recording pressure gauges complete with pressure recording charts duly tested with dead weight tester prior to use. These shall be installed at the test head. The gauge shall having following specification :

Accuracy	:	± 0.1% of the full-scale value
Recording	:	continuous on tape or disk, graph width 100 mm
Feed	:	7.5 °/ hr for disk diagrams, 20 mm/ hr for tape diagrams

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Recording : Range to be such as to record pressure between 50% and 90% of the diagram width

d) Temperature recorders for fill water.

Accuracy : ± 1% of the scale range

Scale -10 °C to +40 °C

ssRecording : continuous on tape or disk, graph width 100 mm

Feed : 7.5 °/ hr for disk diagrams, 20 mm/ hr for tape diagrams

e) Environmental temperature shall be recorded from the beginning of pressurization to the end of the test by means of a recording thermometer featuring the following characteristics:

Accuracy : ± 1% of the scale range

Scale - 0 °C to + 60 °C

Recording : continuous on tape or disk, graph width 100 mm

Feed : 7.5 °/ hr for disk diagrams, 20 mm/ hr for tape diagrams

f) Thermocouples for measuring the pipe wall temperatures, with an accuracy of ±0.2 °C

g) Two laboratory thermometers of range 0 °C to 60 °C and with accuracy of ±0.2 °C to be used in thermo wells.

h) Means to measure the volume of water necessary to drop the line pressure by 0.5 bar (container with scales or graduated cylinder).

i) Injection facilities to inject additives into the test medium in the required proportions.

j) Communications equipment stable for a continuous connection between the beginning and the end of test section and with the inspection team along the line, in accordance with the requirements of local authorities.

k) The temporary scraper traps shall be installed according to the test section fixed in the test procedure manual. Proper piping and valve arrangements shall be available to allow launching and receiving of each pig independently.

The test heads shall be sized in conformity with ASME specification Section VIII, Division 2.

l) Thermocouples for measuring the temperature of the pipe wall shall be installed on the pipeline to be tested at the following locations:

- One (1) thermocouple at about 500 m distance from the pumping head.
- One (1) thermocouple every 2500 m of the pipe. The spacing may be

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increased to maximum 5000 m depending on the terrain and nature of sub soil along the alignment of test section.

- One (1) thermocouple at about 500 m distance from the terminal head

Thermocouples shall be attached on the external surface of the pipe after removal of external coating and shall be adequately protected by padding with minimum 500 mm soil. After successful testing, the thermocouples shall be removed and damaged coating shall be repaired as per applicable coating repair procedure, approved by Company. For soil temperature measurements, the thermocouple shall be buried at pipe centerline depth at a distance of 500 mm from the pipe wall.

m) Digital pressure/ temperature monitoring and chart recording systems can be used in lieu of the components listed above provided that the individual pressure/ temperature sensors included in the system have a level of accuracy and can be field calibrated in a manner similar to those instruments listed above. Instruments shall be portable and rugged in construction with minimum weather proof rating of IP-66. They shall display pressure and temperature readings on the screen and shall have adequate memory for recording the same. The instrument shall have computer interface to export the stored data after completion of test.

8.0 HYDROSTATIC TESTING

8.1 Equipment and/ or parts which need not or must not be subjected to the test pressures or which must not be tested with water, must be disconnected or separated from the pipeline to be tested.

8.2 If the difference of minimum and maximum atmospheric temperature should cause thermal instability on the pipe section directly exposed to atmospheric condition, the test header and above ground pipeline shall be properly protected.

The pipeline test shall exclude long segments of line exposed to atmospheric conditions, viz. aerial lengths on piers, suspension bridges, etc. Such sections shall be tested separately.

8.3 TEST MEDIUM

The test medium shall be soft non-aggressive water supplied by the Contractor. The water to be used shall be filtered, shall not be contaminated and free from sand of silt. Contractor shall submit laboratory test reports of water used for testing. The possible use of sea water shall be subjected to its degree of cleanness, the possibility of obtaining a pre-determined salinity neutralization. The Contractor shall furnish and install all temporary piping, which may be necessary to connect from source of water to its pump and manifolds/ tankages.

The following products are acceptable for corrosion inhibition of the water used for hydro testing:

- REMIDOL 4000 of M/s Chemtreat India Ltd., Navi Mumbai.
- HIBITOL 2000 of M/s Renkal Chemical, Navi Mumbai.
- INDION 175 of M/s Ion Exchange India Ltd., Hyderabad.

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- VISCO 3900 of M/s NALCO EXXON

Indicative dosage for inhibitor is as follows:

- Upto 6 months : 500 mg/l
- Above 6 months : 750 mg/l

However the exact dosage rates shall be as per the hydro test water analysis and manufacturer recommendations.

8.4 INHIBITORS

Contractor shall provide Company approved corrosion inhibitors, oxygen scavengers and bactericides to be added to the test water.

Contractor shall note the following:

- All chemicals for hydro testing shall be procured from approved vendors. Chemicals olders than three months shall not be used.
- Company representative shall inspect the chemical containers and take random samples prior to its use. Contractor shall get the samples tested in an govt nominated Govt./PSU/other competent laboratories.Contractor shall get the samples tested, testing shall be carried out for accelerated % corrosion inhibition efficiency, % SRB and TBC killing efficiency test. Company reserves the right to witness the testing. The test report shall be submitted to Company for approval prior to undertaking hydro testing works.
- Only those chemicals which have passed the above tests shall be used for hydro testing.
- Chemicals shall be injected by dosing pump only and mixing in open tank shall not be allowed.

Inhibitors shall be uniformly mixed with the test water in the dosage recommended by the Manufacturer depending upon the water used and in sufficient concentration to ensure the inhibitor remains active for the duration of the test, and any possible delays to testing.

8.5 CLEANING

The pipeline shall initially be cleaned by running a series of wire brush cleaning pigs propelled by compressed air, to remove all mill scale, rust, sand, etc. from the internal of the pipe section. For these purpose temporary headers for air cleaning shall be attached to the pipeline. The number of pig runs is depending upon the cleaning results and shall be determined by company at site.

8.6 GAUGING

After cleaning the pipeline by using air and acceptance by Company, gauging shall be carried out by using gauging pig. The gauge plate diameter shall be equal to 95% of inside diameter of the heaviest wall pipe in the test section. While computing the Inside Diameter (ID) of heaviest wall pipe, pipe manufacturing tolerances shall not be considered. A 10 mm thick aluminum plate shall be used

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for making gauge plate. Compressed air shall be used to run Gauging pig.

After receipt of gauging pig at the other end, the gauge plate shall be inspected in the presence of Company representative. A deformed, bent or severally nicked plate or damaged pig shall be evidence of gauging pig run failure and the same shall not be acceptable to COMPANY. In such cases, the Contractor shall locate any obstruction and/ or faults such as dents, buckles, flat spots, etc. and rectify the same to the satisfaction of the Company. A written approval shall be obtained from Company regarding successful completion of gauging pig run.

After acceptance of gauging operation, air header shall be cut and removed. Pre-tested test headers loaded with three numbers of four cup batching pigs shall be welded to test section.

The drawing of the test headers shall be submitted along with hydrotest procedure for approval. All fittings and flanges to be used in the test header fabrication shall be at least one ANSI rating higher than the line rating. The headers shall be pretested at line hydrotest pressure for duration of minimum 24 hours. The record shall be kept and shall be part of the final hydro test report.

8.7 FILLING

After acceptance of gauging run, water filling of the testing shall commence. For this purpose, pretested test headers loaded with three numbers of batching pig shall be welded to the test section. Un-inhibited water equal to 10% of the volume of test section shall be filled ahead of the first pig. The first batching pig shall be launched using minimum un-inhibited water equivalent to 1.5 Km of test section. Then the second pig shall be launched using inhibited water till the second pig is received at the other end. The Contractor shall continuously monitor the volume and pressure, the temperature of the fill water during the filling operation. When it has been confirmed that the filling pigs have arrived in the receiving test header, the thermal stabilization and pressurization operations can commence subsequently.

8.8 THERMAL STABILIZATION

After a check has been made to confirm if the pressure has attained minimum 1 bar (g) on the highest section, the thermal stabilization can be started.

Thermal equilibrium between the pipeline and environment shall be checked through the Thermocouples installed on the pipeline and in the soil.

Temperature readings shall be made at 2 hours-intervals. Thermal stabilization shall be considered to have been achieved when a difference not higher than 1 °C is attained between the average values of the last two readings.

Thermal stabilization completion shall be approved by Company.

8.9 PRESSURIZATION

8.9.1 The pressurization shall be performed in the presence of Company at a moderate and constant rate not exceeding 2 bars/ min. One pressure recording gauge shall

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be installed in parallel with the dead weight tester. Volume required to reach the test pressure shall be recorded periodically throughout the pressurization as follows:

- Each 5 bar increments up to 80% of test pressure as recorded by the dead weight tester
- Each 2 bar increments between 80% to 90% of test pressure as recorded by the dead weight tester
- Each 0.5 bar increments between 90% of the test pressure to full test pressure as recorded by the dead weight tester

8.9.2 The pressurization shall be cycled according to the following sequence:

- Pressurize to 50% of test pressure, hold pressure for 1 hour,
- Drop pressure to 10% of test pressure of test section at test head,
- Pressurize to 75% of test pressure, hold pressure for 1 hour
- Drop pressure to 10% of test pressure of test section at the test head
- Pressurize to test pressure.

During the pressurization to each test pressure, two tests shall be carried out for the calculation of air volume in the pipeline under test.

In case, during the hold pressure periods indicated above, a decrease in pressure is observed, the above operations shall not be repeated more than twice, after which the line shall not be considered capable of test, until the Contractor has isolated and eliminated the cause for the lack of water tightness.

8.10 AIR VOLUME CALCULATION.

Two separate consecutive pressures lowering of 0.5 bar shall be carried out after pressurizing to test pressure in order to check the presence of air in the pipeline.

For calculation of air in the pipeline the second pressure lowering shall be used, and the relevant drained water shall be accurately measured (V_1). This amount measured shall be compared to the theoretical amount (Vp) corresponding to the pressure lowering that has been carried out, by using the procedure outlined in clause 9.1 of this specification.

If no air is present in the length under test, then $\frac{V1}{Vp} = 1$

In order that the above ratio is acceptable, it shall not differ by more than 6% (i.e. 1.06). If the air found in the pipeline is within the above established tolerance, then the pressurizing can continue. If the ratio VI / Vp exceeds 1.06, the hydrostatic testing cannot go on and additional pig passages shall be performed to remove the air pockets.

The test shall be repeated as per the above procedure until above estimated tolerances are satisfied. The pressurizing can then continue, to reach the value of the test pressure.

8.11 TESTING

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The section to be pressurized to the test pressure and after the air volume test has given acceptable results. When temperature and pressure has stabilized, the injection pump, pressuring pump shall be disconnected and all connections at the test heads shall be checked for leakage. The test pressure shall be held for a minimum of 24 hours after stabilization. The pressure recorders shall then be started with the charts in a real time orientation for continuous recording throughout the test.

During the testing period the following measurements shall be recorded

- Pressure measurements from dead weight tester: Every hour
- Ambient temperature and the pipe temperature at the thermocouples: Every two hours

All data shall be recorded on appropriate forms attached to the hydrostatic test procedure manual. Care shall be taken that the maximum test pressures are not exceeded. Bleed-off water shall be accurately measured and recorded

8.12 MEASUREMENTS

8.12.1 WATER AMOUNT MEASUREMENT

The quantity of water added to the test section shall be measured during the filling stage through a positive displacement meter (a turbine meter may also be used).

The quantity of water added during pressurization shall be measured during the pressurization stages.

8.12.2 PRESSURE MEASUREMENT

Pressure shall be measured with a dead weight tester that shall permit readings with least count of 0.05 bar. . The pressure shall also be recorded by means of a recording pressure gauge. The recording pressure gauge shall be checked by means of a dead weight tester at the beginning, during and at the end of the hydrostatic test.

Accuracy	:	± 0.1% of the full-scale value
Recording	:	Continuous on tape or disk, graph width 100mm
Feed	:	20mm/h for tape diagrams, 15°/h for disk diagrams
Recording range	:	To be such as to record pressure between 50% and 90% of the diagram width.

8.12.3 TEMPERATURE MEASUREMENT

- Water temperature shall be taken at every 2 hours through the thermocouples that have been installed on the pipe wall along the section.

  In addition, the temperature measurement shall be taken during filling operation, thermal stabilization stage and during the pressure hold period.

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The thermocouples' sensitivity shall enable temperature readings with the accuracy of ±0.1°C.

- Water temperature shall also be measured at the pump delivery through a recording thermometer throughout the filling stage.

  The recording thermometer shall feature the following characteristics:

Accuracy	:	± 1% of the scale range
Scale	:	-10° to +40°C
Recording	:	Continuous on tape or disk, diagram width 100mm
Feed	:	20mm/h for tape diagrams, 15°/h for disk diagram

- Ground temperature shall be taken by measuring pipe temperature at the thermocouples prior to starting the filling operation.
- Ambient temperatures shall be recorded from the beginning of pressurization to the end of the test by means of a recording thermometer.

Accuracy	:	± 1% of the scale range
Scale	:	0° to +60°C
Recording	:	Continuous on tape or disk, diagram width 100mm
Feed	:	20mm/h for tape diagrams, 15°/h for disk diagrams.

9.0 CALCULATIONS

9.1 The theoretical water amount that is necessary for filling the section to be tested shall be obtained from the geometrical volume of the section considering the pipe tolerances.

The theoretical water amount that is necessary for pressurizing the section shall be calculated by means of the following formula:

$$Vp = \left(0.884\frac{r_i}{t} + A\right) X\ 10^{-6}\ X\ (Vt)\ X\ (\Delta P)\ X\ K$$

Where:

Vp = computed water amount required to raise by P the pressure in the section to be tested (m^3)

Vt = geometrical volume of the section (m^3)

ΔP = pressure rise (bar)

r_i = nominal inner radius of the pipe (mm)

t = nominal pipe thickness (mm)

A = Isothermal compressibility value for water at the pressurization temperature in the P range (bar^{-1}) x 10^6(Refer water compressibility factor v/s pressure and temperature charts. For temperature above 30°C the values may be extrapolated.)

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K = A dimensionless coefficient that is equal to a value of 1.02 for longitudinally welded pipe.

9.2 The pressure change due to a water temperature change shall be calculated through the following formula:

$$\Delta P = \frac{B}{0.884\ \frac{ri}{t} + A}\ \Delta T$$

Where:

ΔP = Pressure change resulting from a temperature change (bar)

ΔT = Algebraic difference between water temperature at the beginning of the test and water temperature as measured at the end of the test (°C).

B = Value of the difference between the thermal expansion of water at the pressure and temperature as measured at the end of the test and that of steel ($^{\circ}C^{-1}$ x10^{6}) (Refer Table1)

A = Isothermal compressibility value of water as estimated at the pressure and temperature values obtained at the end of test (Refer Figure 1)

K = A dimensionless coefficient that is equal to a value of 1.02 for longitudinally welded pipe.

ri = nominal inner radius of the pipe (mm)
(In case of the test section having multiple wall thicknesses, "ri" shall correspond to the wall thicknesses, having the maximum total length in the given test section.

t = nominal pipe thickness (mm)

10.0 ACCEPTANCE

10.1 The hydrostatic test shall be considered as positive if pressure has kept a constant value throughout the test duration, except for change due to temperature effects. Such changes shall be evaluated as described under clause 9.2 of this specification.

The pressure change value as a function of temperature change shall be algebraically added to the pressure value as read on the meters. The pressure value thus adjusted shall be compared with the initial value and the test shall be considered as acceptable if the difference is less than or equal to 0.3 bar. In case of doubt the testing period shall be extended by 24 hours.

10.2 If test section fails to maintain the specified test pressure after isolation, Contractor shall determine the location of leakage or failure by suitable means. All leaks and failures within the pipe wall or weld seams shall be repaired by replacement of entire joint or joints in which leakage or failure occurs. In those

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cases where leaks occur in circumferential welds the method of repair shall be determined by the Company. Contractor shall comply with instructions of the Company whether to replace a section of the line pipe that includes the line leak or whether to repair the circumferential weld. This repair should, however, meet the requirements of applicable welding specification enclosed with the Contract. Where failures occur in pipeline field bends, bends shall be replaced with same degree of bends. After completion of repairs, the hydrostatic test shall be repeated in full, as per this specification.

10.3 The cost of repairs or replacements, followed by refilling and depressurizing the line, due to poor workmanship, shall be borne by the Contractor. In the event of leaks or failures resulting from faulty Company furnished materials, Contractor shall be reimbursed as per the provisions of Contract. All work of reinstalling line pipe, to replace failures, shall be done in accordance with the relevant specifications included in the CONTRACT.

10.4 Contractor shall haul and stockpile all damaged and defective pipes to storage location designated by the Company. All cracks and splits resulting from failure shall be coated with an application of grease to preserve the characteristics of failures from corrosion. Joint of failed pipes shall be marked with paint, with a tag indicating failure details, date and location of failure and pressure at which failure occurred. Failed pipes shall have pipe number and heat number clearly marked on the outside surface along with warning sign to prevent re-usage.

11.0 TERMINATION

After the positive result of testing and all the data have been gathered, the test shall be terminated upon written approval given by the Company. The pipeline shall be slowly depressurized at a moderate and constant rate as instructed by Company. Subsequent operations such as installation of sectionalizing valves, caliper pigging, swabbing, pre-commissioning checks, purging/ inertising and commissioning shall be carried out as per the relevant specifications.

11.1 All thermocouples installed in the pipeline shall be removed and damaged coating shall be repaired using Company approved materials and procedure.

11.2 Contractor shall dewater the tested line as per the following requirement after test acceptance.

The dewatering shall be carried out by using four cup pigs and foam pigs driven by compressed air. The detailed dewatering procedure shall be deployed by the Contractor in such a way as to provide adequate control of pigs during dewatering. Pigs and equipment required for dewatering the line shall be furnished by Contractor and shall be approved in advance by the Company. Four cup pigs run shall be made through the line to displace the water. Foam pigs shall then be passed in order to complete the line dewatering. Contractor shall use a number of foam pigs each in different colors/ numbered for this purpose. The line shall be considered dewatered when a negligible amount of water is flushed out by the last foam pig and approval is given by the Company.

11.3 During dewatering, care shall be taken to properly dispose the discharging water

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in order to avoid pollution, damages to fields under cultivation and/ or existing structures and interference with the traffic. Before the start of dewatering and disposal of hydro test water, a procedure for treatment of inhibited water to prevent pollution shall be submitted by Contractor to Company for review and approval.

11.4 Upon completion of the testing and dewatering operation, any provisional traps/ headers for pigs and all other temporary installation relating to the test shall be removed. Subsequently, the individual sections of the line already tested shall be joined in accordance with the requirements of relevant specifications issued for the purpose.

12.0 TEST REPORT

A complete report signed by Contractor and the Company shall be submitted upon completion of the hydrostatic test for each test section.

This report shall contain as a minimum:

- Water test certificate;
- Inhibitor test certificate;
- The cleaning, gauging, flushing, filling and testing procedures used;
- Schematic layout of cleaning, filling and testing facilities;
- Equipment's and Instruments calibration certificate;
- A profile of the pipeline that shows the test sites, all instrument and injection connections;
- Pipe filling logs and records;
- Additive specification, required concentration and additive injection records;
- Pig specifications;
- Pig inspection records including photographs of the damages; records of gauging pig survey and photographs;
- Pressurization and stabilization records;
- Pressure and temperature recording charts with appropriate information inscribed thereon;
- Temperature data along the pipeline;
- Dead weight tester logs and recordings;
- Air volume calculations;
- Pressure change due to temperature change calculations;
- Environmental data;
- Depressurization logs and records;
- Dewatering procedure and schematic layout of relevant facilities; dewatering logs and records;
- Records and photographs of all leaks, if applicable.

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13.0 PRESERVATION OF PIPELINE

When so stated in the CONTRACT, to preserve/ conserve the pipeline for a specified duration, Contractor shall completely fill the pipeline with water, with sufficient quantity of corrosion inhibitors depending upon quality of water and the period of conservation, at a pressure as per relevant specification/ Contract. Contractor shall obtain necessary approval from the Company of the procedure, type and quality and quantity of inhibitors used before commencement of the works.

14.0 PRECAUTIONS DURING THE TEST

In addition to all that has been expressly described in the procedures for carrying out the tests, the following additional requirements shall be complied with:

1. Provision shall be made for the installation of no-admittance signs to unauthorised personnel from the roads to the R.O.U.

2. Signs stating 'PIPE UNDER TEST-KEEP OFF" with local language translation shall be placed where the pipeline is uncovered, and particularly where the provisional traps and stations are located. Such areas shall be suitably fenced in such a way as to prevent access of unauthorised personnel. No unauthorised personnel shall be closer than 40M to the pipeline or equipment under test.

3. Provisional scraper traps shall be installed in compliance with methods and suitable location so that their rupture cannot cause any injuries to the personnel or third parties

4. The test station shall be placed in such a location as to prevent it from being affected by a catastrophic failure in the test head.

5. Once dewatering is over the sectionalising valves and other valve assemblies tested previously, shall be installed at locations shown in the drawings and in accordance with the procedures contained in the relevant specifications. All thermocouples installed in the pipeline shall be removed and damaged corrosion coating shall be repaired using Company approved materials and procedure.

15.0 DOCUMENTATION

PRIOR TO COMMENCEMENT OF HYDROSTATIC TEST

The Contractor shall furnish the Hydrostatic Test Procedure at least six weeks prior to commencement of hydrostatic test operations for the approval of the Company Representative. Hydrostatic test operations shall commence only after obtaining written approval from Company.

Prior to commencement of the testing, copies of certifications, calibrations, etc of any equipment/ instrumentation to be incorporated in the test set-up shall be submitted to the Company Representative.

ON COMPLETION OF HYDROSTATIC TEST

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The Contractor shall furnish the Test Report duly signed by both the Contractor and the Company Representative, immediately upon completion of successful hydrostatic test.

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TABLE 1: DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION

FACTOR ($°C^{-1}$ x10^6)

°C bar	1	2	3	4	5	6	7	8
0.981	-98.62	-79.89	-61.81	-44.34	-27.47	-11.14	4.66	19.98
10	-95.55	-76.94	-58.99	-41.65	-24.89	-8.67	7.02	22.23
20	-92.15	-73.68	-55.86	-38.64	-22.01	-5.92	9.65	24.74
30	-88.74	-70.4	-52.72	-35.63	-19.14	-3.16	12.29	27.26
40	-85.32	-67.12	-49.58	-32.62	-16.24	-0.41	14.93	29.78
50	-81.9	-63.84	-46.43	-29.6	-13.36	2.36	17.57	32.31
60	-78.47	-60.55	-43.27	-26.58	-10.46	5.15	20.23	34.85
70	-75.03	-57.25	-40.1	-23.54	-7.56	7.92	22.89	37.89
80	-71.6	-53.96	-36.94	-20.51	-4.65	10.7	25.55	39.94
90	-68.16	-50.66	-33.77	-17.47	-1.73	13.5	28.23	42.5
100	-64.72	-47.35	-30.6	-14.43	1.18	16.29	30.9	45.05
110	-61.28	-44.05	-27.43	-11.38	4.1	19.08	33.58	47.67
120	-57.84	-40.74	-24.26	-8.34	7.02	21.88	36.26	50.18
130	-54.4	-37.44	-21.08	-5.29	9.95	24.68	38.94	52.75
140	-50.96	-34.13	-17.9	-2.25	12.87	27.49	41.63	55.32
150	-47.53	-30.83	-14.73	0.8	15.79	30.29	44.31	57.89
160	-44.1	-27.53	-11.56	3.85	18.72	33.1	47	60.46
170	-40.67	-24.23	-8.4	6.89	21.64	35.9	49.69	63.04
180	-37.24	-20.94	-5.23	9.94	24.56	38.7	52.37	65.62
190	-33.83	-17.65	-2.06	12.98	27.48	41.51	55.06	68.19
200	-30.42	-14.37	1.09	16.01	30.4	44.3	57.75	70.77
210	-27.02	-11.09	4.25	19.04	33.31	47.1	60.43	73.34
220	-23.63	-7.82	7.4	22.06	36.22	49.9	63.12	75.9
230	-20.24	-4.56	10.54	25.08	39.13	52.69	65.8	78.48
240	-16.87	-1.3	13.67	28.1	42.03	55.48	68.48	81.05
250	-13.5	1.94	16.79	31.11	44.92	58.26	71.15	83.61
260	-10.14	5.17	19.9	34.12	47.81	61.04	73.81	86.81
270	-6.8	8.39	23	37.11	50.69	63.8	76.48	88.73
280	-3.48	11.6	26.11	40.09	53.56	66.57	79.14	91.29
290	-0.17	14.8	29.19	43.07	56.43	69.33	81.78	93.83
300	3.13	17.98	32.27	46.03	59.29	72.08	84.83	96.38

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TABLE 1: DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION

FACTOR ($°C^{-1}$ x10^6)

°C bar	9	10	11	12	13	14	15	
0.981	34.82	49.22	63.2	76.78	89.99	102.83	115.34	
10	36.97	51.26	65.15	78.64	91.75	104.51	116.93	
20	39.36	53.55	67.33	80.71	93.72	106.39	118.71	
30	41.76	55.84	69.51	82.79	95.7	108.26	120.49	
40	44.18	58.14	71.7	84.87	97.68	110.14	122.28	
50	46.6	60.45	73.9	86.96	99.68	112.04	124.07	
60	49.02	62.76	76.1	89.07	102.67	113.93	125.88	
70	51.44	65.08	78.32	91.17	103.68	115.84	127.69	
80	53.88	67.4	80.53	93.29	105.69	117.76	129.5	
90	56.32	69.73	82.75	95.41	107.7	119.67	131.32	
100	58.77	72.07	84.98	97.53	109.73	121.59	1333.15	
110	61.21	74.41	87.22	99.66	111.75	123.52	134.98	
120	63.67	76.74	89.45	101.79	113.79	125.46	136.82	
130	66.12	79.09	91.69	103.93	115.83	127.39	138.67	
140	68.58	81.45	93.93	106.07	117.87	129.34	140.51	
150	71.05	83.8	96.18	108.21	119.9	131.2	142.37	
160	73.51	86.15	98.43	110.36	121.96	133.74	144.22	
170	75.97	88.51	100.68	112.51	124.01	135.19	146.08	
180	78.44	90.87	102.94	114.66	126.06	137.15	147.94	
190	80.91	93.23	105.19	116.82	128.12	139.11	149.81	
200	83.37	95.59	107.45	118.97	130.17	141.07	151.68	
210	85.84	97.95	109.71	121.13	132.24	143.03	153.55	
220	88.3	100.31	111.97	123.29	134.29	144.99	155.42	
230	90.67	102.67	114.23	125.45	136.36	146.96	157.3	
240	93.22	105.03	116.48	127.6	138.42	148.93	159.18	
250	95.69	107.39	118.74	129.76	140.48	150.9	167.05	
260	98.14	109.74	121	131.92	142.54	152.87	162.93	
270	100.6	112.1	123.25	134.08	144.61	154.84	164.81	
280	103.05	114.44	125.5	136.24	146.67	156.84	166.69	
290	105.5	116.79	127.75	138.39	148.73	158.78	168.57	
300	107.94	119.13	130	140.54	150.79	160.75	170.45	

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TABLE 1: DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION

FACTOR ($^{\circ}C^{-1}$ x10^{6})

°C bar	16	17	18	19	20	21	22	23
0.981	127.52	139.41	151	162.3	173.37	184.18	194.75	205.08
10	129.02	140.83	152.36	163.6	174.56	185.3	195.79	206.07
20	130.71	142.42	153.85	165	175.9	186.55	196.96	207.16
30	132.4	144.02	155.35	166.4	177.23	187.8	198.14	208.26
40	134.1	145.62	156.87	167.9	178.58	189.07	199.33	209.37
50	135.8	147.24	158.39	169.3	179.93	190.34	200.52	210.49
60	137.51	148.86	159.92	170.7	181.29	191.62	201.72	211.61
70	139.22	150.49	161.46	172.2	182.66	192.91	202.93	212.74
80	140.95	152.11	163	173.6	184.03	194.2	204.14	213.88
90	142.67	153.75	164.56	175.1	185.41	195.5	205.36	215.03
100	144.42	155.4	166.11	176.6	186.8	196.8	206.59	216.17
110	146.15	157.04	167.66	178.1	188.2	198.12	207.82	217.33
120	147.9	158.7	169.24	179.5	189.59	199.44	209.06	218.49
130	149.65	160.36	170.81	181	191	200.75	210.31	219.66
140	151.4	162.03	172.39	182.5	192.41	202.09	211.56	220.84
150	153.16	163.7	173.98	184	193.82	203.42	212.81	222.02
160	154.93	165.37	175.56	185.5	195.24	204.76	214.08	223.2
170	156.69	167.05	177.15	187	196.66	206.1	215.34	224.39
180	158.47	168.73	178.75	188.5	198.09	207.45	216.61	225.58
190	160.24	170.42	180.35	191.1	199.52	208.8	217.89	226.79
200	162.01	172.1	181.95	191.6	200.97	210.16	219.17	227.99
210	163.8	173.8	183.55	193.1	202.4	211.53	220.46	229.2
220	165.58	175.49	185.16	194.6	203.85	212.89	221.74	230.41
230	167.36	177.19	186.78	196.1	205.3	214.26	223.04	231.63
240	169.16	178.89	188.39	197.7	206.75	215.63	224.32	232.85
250	170.94	180.59	190.01	199.2	208.2	217	225.63	234.08
260	172.73	182.3	191.63	200.8	209.66	218.4	226.93	235.31
270	174.53	184	193.25	202.3	211.12	219.77	228.24	236.54
280	176.32	185.7	194.88	203.8	212.59	221.16	229.55	237.77
290	178.11	187.42	196.5	205.4	214.05	222.54	230.86	239.01
300	179.9	189.13	198.13	206.9	215.51	223.93	232.18	240.26

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TABLE 1: DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION

FACTOR ($°C^{-1}$ x10^6)

°C bar	24	25	26	27	28	29	30	
0.981	215.2	215.14	234.88	244.41	253.79	263	272.03	
10	216.1	225.99	235.66	245.13	254.44	263.59	272.57	
20	217.2	226.94	236.53	245.94	255.18	264.27	273.18	
30	218.2	227.88	237.41	246.75	255.93	264.95	273.8	
40	219.2	228.85	238.3	247.58	256.69	265.64	274.42	
50	220.3	229.82	239.2	248.4	257.45	266.33	275.07	
60	221.3	230.79	240.11	249.24	258.22	267.04	275.7	
70	222.4	231.78	241.02	250.08	258.99	267.75	276.35	
80	223.4	232.77	241.94	250.93	259.78	268.47	277.01	
90	224.5	233.76	242.87	251.79	260.57	269.19	277.66	
100	225.6	234.76	243.79	252.66	261.36	269.92	278.33	
110	226.6	235.78	244.73	253.53	262.17	270.77	279.01	
120	227.7	236.79	245.68	254.4	262.98	271.41	279.69	
130	228.8	237.81	246.63	255.28	263.69	272.16	280.38	
140	229.9	238.84	247.59	256.18	264.62	272.92	281.08	
150	231	239.87	248.55	257.07	265.44	273.69	281.78	
160	232.1	240.91	249.52	257.97	266.28	274.46	282.49	
170	233.3	241.96	250.49	258.88	267.12	275.23	283.2	
180	234.4	243.01	251.47	259.79	267.97	276.01	283.92	
190	235.5	244.06	252.46	260.71	268.82	276.8	284.64	
200	236.6	245.12	253.45	261.63	269.67	277.59	285.37	
210	237.8	246.18	254.45	262.5	270.54	278.39	286.11	
220	238.9	247.26	255.45	263.49	271.4	279.19	286.85	
230	240.1	248.33	256.46	264.43	272.28	280	287.59	
240	241.2	249.41	257.46	265.37	273.16	280.82	288.35	
250	242.4	250.49	258.48	266.31	274.04	281.63	289.11	
260	243.5	251.58	259.49	267.27	274.92	282.46	289.86	
270	244.7	252.66	260.52	268.23	275.82	283.29	290.64	
280	245.8	253.76	261.54	269.18	276.71	284.12	291.4	
290	247	254.86	262.57	270.15	277.61	284.95	292.18	
300	248.2	255.96	263.6	271.11	278.51	285.79	292.95	

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FIGURE – 1

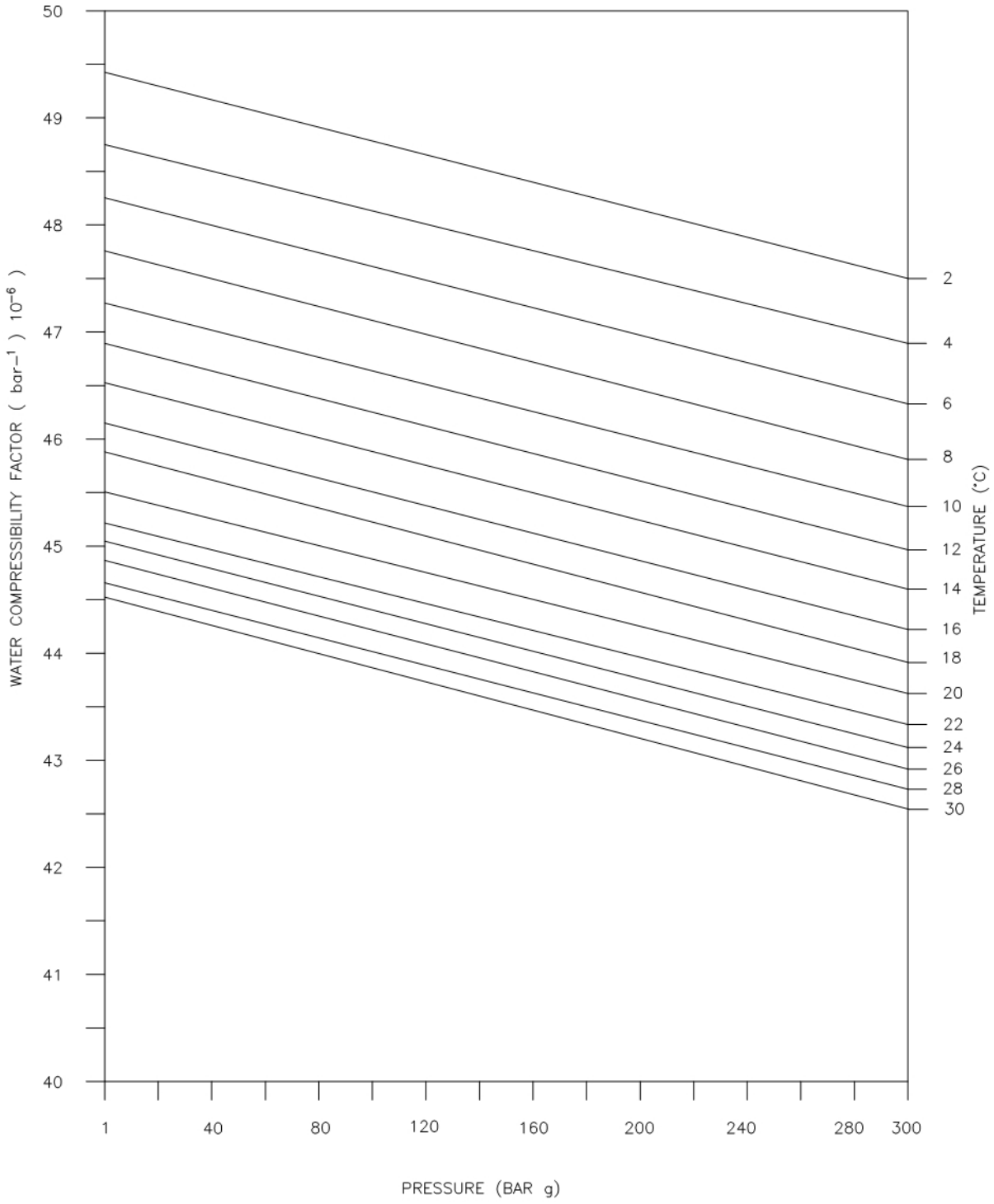


FIG. 1- WATER COMPRESSIBILITY FACTOR v/s PRESSURE AND TEMPERATURE

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

WELDING SPECIFICATION
FOR
ONSHORE PIPELINE
FOR
TRANSPORTATION OF LIQUID

VPC – SS – PP – 2019

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
00	28.01.2020	MB	MC	AD	SK

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ABBREVIATIONS:

ANSI	:	American National Standards Institute
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
BS	:	British Standard
CRT	:	Cathode Ray Tube
CTOD	:	Crack Tip Opening Displacement
GMAW	:	Gas Metal Arc Welding
GTAW	:	Gas Tungsten Arc Welding
HAZ	:	Heat Affected Zone
HV	:	Vickers Hardness
IIW	:	International Institute of Welding
IQI	:	Image Quality Indicator
ISO	:	International Organization for Standardisation
MPI	:	Magnetic Particle Inspection
PQR	:	Procedure Qualification Record
SMAW	:	Shielded Metal Arc Welding
UT	:	Ultrasonic Testing
UTS	:	Ultimate Tensile Strength
WPS	:	Welding Procedure Specification

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1. SCOPE

The requirements stated herein shall be followed for the fabrication of all types of welded joints of carbon steel piping systems connected with the pipeline and related facilities.

The welded pipe joints shall include the following:

a) All line pipe joints of the longitudinal and circumferential butt-welded and socket welded types.

b) Attachments of castings, forgings, flanges and other supports to pipes.

c) Welded manifold headers and other sub-assemblies.

d) Welded branch connections.

e) Joints in welded / fabricated piping components.

f) The attachments of smaller connections for vents drain drips and other instrument tappings.

Any approval granted by the COMPANY shall not relieve the CONTRACTOR of his Responsibilities and guarantees.

2. APPLICABLE CODE AND STANDARDS

All welding work, equipment for welding, heat treatment, other auxiliary functions and the welding personnel shall meet the requirements of the latest editions of the codes, standards and specifications listed below:

a) Code for Gas Transmission and Distribution Piping Systems, ANSI B 31.8

b) Standard for welding of Pipelines and Related Facilities, API 1104

c) Specification for welding Electrodes and Filler Materials ASME Sec. II C

d) Non Destructive examination, ASME Sec. V

3. BASE MATERIAL

In general carbon steel is used in this specification. The details of material specifications are given in the welding Specification Chart attached along with other project data sheets. The CONTRACTOR will arrange and maintain the record of test certificates of all the materials for the reference of the welding engineer.

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4. WELDING CONSUMABLES

a) The CONTRACTOR shall provide at his own expense all the welding consumables necessary for the execution of the job such as electrodes, oxygen, acetylene etc. and these shall bear the approval of the COMPANY.

b) The welding electrodes / filler wires supplied by the CONTRACTOR shall conform to the class specified in the welding specification chart attached along with other project data sheets. The materials shall be of the make approved by the COMPANY.

c) The electrode shall be suitable for the welding process recommended and the base metal used. Physical properties of the welds produced by an electrode recommended for the welding of a particular base metal shall not be lower than the minimum values specified for the base metal unless otherwise specified in the Welding Specification Chart and shall correspond to the physical properties of the class of electrode adopted. The choice of electrode shall be made after conducting the required tests on the electrodes as per relevant standards, and shall be the sole prerogative of the COMPANY.

d) The CONTRACTOR shall submit batch test certificates from each electrode manufacturers giving details of physical and chemical tests carried out by them for each batch of electrodes to be used.

e) Electrode Qualification test records shall be submitted as per the Exhibit-A (attached) in respect of the electrodes tested by the CONTRACTOR for obtaining the approval of the COMPANY.

f) All electrodes shall be purchased in sealed containers and stored properly to prevent deterioration. The electrodes removed from the containers (except cellulosic coated electrodes) shall be kept in the holding ovens, at the temperature recommended by the electrode manufacturer. Ovens shall be used for the low hydrogen electrodes only. Out-of-the oven time of electrodes before they are consumed shall not exceed the limits recommended by the electrode manufacturer. The electrodes shall be handled with care to avoid any damage to the flux covering. Different grades of electrodes shall be stored separately. Cellulosic electrodes used shall however be used as per the specific recommendations of manufacturer.

g) The electrodes used shall be free from rust, oil, grease, earth and other foreign matter, which affect the quality of welding.

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h) **Shielding Gas**

The composition and the purity of shielding gas when required by the welding processes other than shielded metal arc welding, when permitted by the COMPANY shall bear the approval of the COMPANY. Where appropriate, gases or gas mixture of the following quality shall be used.

I. Argon gas complying with BS 4365.

2. Carbon dioxide gas complying with type 1 specified in BS 4105

3. Gas mixtures that have been proved to be satisfactory as a result of procedure approval tests.

When a gas mixture is used, which has specified additions, e.g. 2% O_2, 5% CO_2 the variation of such addition shall not exceed ± 10% of that stated. Moisture content shall correspond to a dew point of -30°C or lower.

5. EQUIPMENT & ACCESSORIES

The CONTRACTOR shall have sufficient number of welding and cutting equipment, auxiliaries and accessories of sufficient capacities to meet the target schedules.

5.1 All the equipment for performing the heat treatment, including transformers, thermocouples, pyro-meters, automatic temperature recorders with suitable calibration arrangements, etc. shall be provided by the CONTRACTOR, at his own expense and these shall bear the approval of the COMPANY. Adequate means of measuring current and voltage shall be available.

5.2 Redoing of any work necessitated by faulty equipment or operation used by the CONTRACTOR will be done at his own expense.

6. WELDING PROCESSES

6.1 Welding of various materials under this specification shall be carried out using Shielded Metal Arc Welding process (SMAW) with the approval of the COMPANY.

6.2 The welding processes to be employed are given in the welding specification chart attached along with other project data sheets. Any deviation desired by the CONTRACTOR shall be obtained through the express consent of the COMPANY.

6.3 Automatic process shall be employed only with the express approval of the COMPANY. The welding procedure adopted and the consumables used shall be specifically approved.

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6.4 A combination of different welding processes or a combination of electrodes of different classes / makes could be employed for a particular joint only after duly qualifying the welding procedures to be adopted and obtaining the approval of the COMPANY.

7. BEVEL CLEANING / BEVEL INSPECTION

The Line Pipe supplied by COMPANY shall have bevel ends as specified in the applicable specification for the Line Pipe attached with the Bid Package. Any modification thereto, if required by the CONTRACTOR due to his special welding technique, shall be carried out by the CONTRACTOR at his own cost. Before welding, all the rust and the foreign matter shall be removed from the bevelled ends by power operated tools. This shall be effected inside and outside and for a minimum distance of 25 mm from the edge of the weld bevel. The bevels shall be thoroughly inspected at this stage. If any of the ends of the pipe joints are damaged to the extent that, in the opinion of the COMPANY, satisfactory weld spacing cannot be obtained and local repair by grinding cannot be successfully done, the damaged ends shall be cut and bevelled to the satisfaction of the COMPANY, with an approved bevelling machine. Manual cutting and weld repairs of bevels is not allowed. Should laminations, split ends or inherent manufacturing defects in the pipe be discovered, the lengths of pipe containing such defects shall be removed from the line to the satisfaction of COMPANY. On pipes, which have been cut back, a zone extending 25 mm back from the new field bevel, shall be ultrasonically tested to the requirement of the line pipe specification to ensure freedom from laminations. The new bevel shall be 100% visual and 100% dye penetrant/MPI tested. A report shall be written for all the testing and records kept.

8. ALIGNMENT AND SPACING

Immediately prior to line-up CONTRACTOR shall inspect the pipe ends inside and outside for damage, dents, laminations etc. Pipe for welding shall be set up, correctly spaced, allowing for the temperature changes during welding. In correct alignment shall in no circumstances be sprung into position. Temporary attachments of any kind shall not be welded to the pipe. Welds joining the sections of the pipeline, valve installation or similar welds classified as tie in welds shall be made in the trench. Otherwise the alignment and welding shall be made alongside the trench with the pipe supported on skids and pack pads or other suitable means approved by COMPANY, at least 500 mm above the ground unless approved by the COMPANY in specific cases.

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Seam orientation of welded pipe shall be selected to ensure that at the circumferential welds, the longitudinal welds shall be staggered in the top 90° of the pipeline, or 250 mm whichever is the lesser. A longitudinal joint shall pass an appurtenance of a structural element at a minimum distance of 50 mm. Should a section of the line containing uncompleted welds fall from the skids, the CONTRACTOR shall immediately inform the COMPANY.

Every effort shall be made to reduce misalignment by the use of the clamp and rotation of the pipes to the best fit. For pipe of same nominal wall thickness the offset shall not exceed 1.6 mm. The offset may be checked from outside using dial gauges. Any branch connection sleeve, etc. shall be at least 150 mm from any other weld. The welds for fittings shall be so located that the toe of the weld shall not come within 50 mm of any other weld. Cold dressing is permissible only in cases of slight misalignment and may only be carried out with a bronze headed hammer. Hot dressing shall not be permitted. When welding pipes of different wall thickness (as directed by COMPANY) a special transition piece shall be used. This shall have a minimum of 1:4 taper. The welds shall be subject to both ultrasonic and radiographic inspection.

The root gap shall be accurately checked and shall conform to the qualified welding procedure. The use of internal Line-up Clamps is mandatory for pipe diameters 10" and above. However, in some cases (tie-in welds, flanges, fittings, diameter of pipe 10" etc.) where it is impossible to use internal clamps, an external line-up clamp may be used.

The internal line-up clamp shall not be released before the entire first pass has been completed.

When an external line-up clamp is used, all the spaces between the bars or at least 60% of the first pass shall be welded before the clamp is released and the pipe remaining adequately supported on each side of the joint.

Segments thus welded shall be equally spaced around the circumference of the pipe. Slag, etc. shall be cleaned off and the ends of the segments shall be prepared by grinding, so as to ensure continuity of the weld bead.

9. WEATHER CONDITIONS

The parts being welded and the welding personnel shall be adequately protected from rain and strong winds. In the absence of such a protection no welding shall be carried out. The completed welds shall be suitably protected in case of bad weather conditions

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10. WELDING

10.1 Root Pass

a) The root pass shall be made with the electrodes/filler wires recommended in the welding specification chart attached along with the other project data sheets. The size of the electrodes used shall be as per the approved welding procedure.

b) Position or roll welding may be permitted. Separate procedures shall be submitted and qualified for uphill, downhill, vertical down and roll welding. The vertical up method of welding shall be used for the root pass of the tie-ins, special crossings, fittings and special parts, fillet welds, repairs and when an external line up clamp is used. The downhill welding may be used for the root run welding of tie-ins and special crossings when (a) the edges are machined or have equivalent preparation (b) line up clamps are used and the fit up is geometrically and mechanically similar to one of the ordinary line welding without misalignment or unevenness.

c) The root pass of butt joints shall be executed properly so as to achieve full penetration with complete fusion of the root edges. Weld projection inside the pipe shall not exceed 3 mm wherever not specified by the applicable code.

d) Any deviations desired from the recommended welding technique and electrodes indicated in the welding specification chart shall be adopted only after obtaining express approval of the COMPANY.

e) Welding shall be continuous and uninterrupted during a pass.

f) On completion of each run, craters, welding irregularities, slag etc., shall be removed by grinding and chiseling.

g) While the welding is in progress care shall be taken to avoid any kind of movement of the components, shocks, vibration and stresses to prevent occurrence of weld cracks.

h) Fillet welds shall be made by shielded metal arc welding process irrespective of the thickness and class of piping. Electrode size shall not exceed 3.25 mm diameter for the socket joints. At least two passes shall be made on the socket weld joints.

i) Peening shall not be used.

10.2 Joint Completion

In case of manual welding, the first pass shall be carried out by a minimum of two welders, working simultaneously and so placed as to cause minimum distortion of the pipe.

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The number of welders and the allowable welding sequences shall be as those laid down in the qualified welding procedure specification. Once the deposit of the first pass has been started, it must be completed as rapidly as possible, reducing interruptions to the minimum. The welding and wire speed shall be approximately same as that established in the qualified welding procedure specification.

The pipe shall always be adequately supported and must not be bumped or shaken during welding. The clamp shall be removed, as indicated in clause 8.0 above. Before starting the second pass, the first pass shall be cleaned and flattened with rotating grinders.

The interruption between completion of the first pass and starting the second pass shall be as stated in the procedure specification, normally not exceeding four minutes.

For crack prevention a top and bottom reinforcement of at least one electrode shall be applied before lowering the pipe on the skid.

The welding speed selected shall enable production of a bead which is sufficiently thick and which shows no under cutting.

The time lapse between the second and the third pass shall be as stated in the procedure specification, normally not exceeding five minutes. After completion of the third or following passes, welding operations may be suspended, so allowing the joint to cool down, provided that the thickness of the weld metal deposited is equal to at least 50% of the pipe thickness. Upon restarting, depending on the materials, wall thickness and welding process, a preheating of at least 100°C shall be applied. Subsequent passes up to weld completion shall be protected to avoid rapid cooling, if meteorological conditions so dictate. Cleaning between the passes shall be done carefully so as to reduce the possibility of inclusions.

The electrode starting and finishing points shall be staggered from pass to pass. Arc-strikes outside the bevel on the pipe surface are not permitted. Arc-strike or arc-burn on the pipe surface outside the weld, which are caused accidentally by electrical arcs between the electrode, electrode holder, welding cable or welding cable round and the pipe shall be removed by grinding in accordance with a procedure approved by the COMPANY and the repair checked by ultrasonic, radiographic, magnetic particle or dye penetrant tests which the COMPANY feels necessary. The pipe wall thickness after grinding shall not be less than the minimum thickness limit permitted for the pipe. Repair of arc strikes by welding is prohibited.

The completed weld shall be carefully brushed and cleaned and shall appear free from spatters, scales, etc.

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These requirements apply not only to completed welds but also to the bare strip at least so wide as to allow full skid examination at both ends of the pipe to allow a good ultrasonic inspection when it is required.

11. HEAT TREATMENT

11.1 Preheating

a) Preheating requirements for the various materials shall be as per the welding specification chart attached along with other project data sheets.

b) Preheating shall be performed using resistance or induction heating methods. Pre-heating for tie-in welds, repair welds or welds at point spreads may be done using a propane gas burner ring with prior approval from VCS/owner. The contractor may be asked to demonstrate the effectiveness of the arrangement.

c) Preheating shall extend uniformly to at least three times the thickness of the joint, but not less than 50 mm, on both sides of the weld.

d) Preheating temperature shall be maintained over the whole length of the joint during welding. Temperature indicating crayons or other temperature indicating devices shall be provided by the CONTRACTOR to check the temperature.

11.2 Post Weld Heat Treatment

a) Post weld heat treatment, wherever required for joints between pipes and fittings, pipe body and supports shall be carried out by the CONTRACTOR at his expense as per the relevant specifications, applicable standards and the instructions of the COMPANY.

b) The heat treatment of welded joints shall be carried out as per the requirements laid down in ANSI B31.8 and other special requirements mentioned in welding Specification chart.

c) The CONTRACTOR shall submit for the approval of the COMPANY, well before Carrying out actual heat treatments the details of the post weld heat treatment Procedure, as per Exhibit 'B' attached, that he proposes to adopt for each of the Materials/assembly/part involved.

d) Post weld heat treatment shall be done in a furnace or by using an electric resistance or induction heating equipment, as decided by the COMPANY.

e) While carrying out local post weld heat treatment, technique of application of heat must ensure uniform temperature attainment at all points of the portion being heat- treated. Care shall be taken to ensure that width of heated band over which specified post weld heat treatment temperature is attained is at least as that specified in the relevant applicable standards/codes.

f) The width of the heated band centered on the weld shall at least be equal to the width of weld plus 2" (50 mm). The temperature gradient shall be such that the length of the material on each side of the weld, at a temperature exceeding half

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the heat treatment temperature, is at least 2.5 rt where r is the bore radius and t is the pipe thickness at the weld.

g) Throughout the cycle of heat treatment, the portion outside the heat band shall be suitably wrapped under insulation so as to avoid any harmful temperature gradient at the exposed surface of pipe. For this purpose temperature at the exposed surface of the pipe shall not be allowed to exceed 400°C.

h) The temperature attained by the portion under heat treatment shall be recorded by means of thermocouple pyrometers. Adequate number of thermocouples shall be attached to the pipe directly at equally spaced locations along the periphery of the pipe joint. The minimum number of thermocouples attached per joint shall be 2 up to 10" dia and 3 for 12" dia and above. However, the COMPANY can increase the required minimum number of thermocouples to be attached if found necessary.

i) Automatic temperature recorders, which have been suitably calibrated, shall be employed. The calibration chart of each recorder shall be submitted to the COMPANY prior to starting the heat treatment operation and its approval shall be obtained.

j) Immediately on completion of the heat treatment, the post weld heat treatment charts/records along with the hardness test results on the weld joints (whenever required as per the welding specification chart) shall be submitted to COMPANY for its approval.

k) Each joint shall bear an identification number, which shall be maintained in the piping sketch to be prepared by the CONTRACTOR. The joint identification number shall appear on the corresponding post weld heat treatment charts. The same identification numbers shall also be followed for identification of corresponding radiographic films. The chart containing the identification number and the piping sketch shall be submitted to the COMPANY in suitable folders.

l) Vickers hardness/Brinel hardness of the heat affected zone as well as of the weld metal, after heat treatment shall be measured using a suitable hardness tester and shall not exceed the maximum hardness specified in the welding specification chart. The weld joint shall be subjected to reheat treatment, when hardness measured exceeds the specified limit, at the CONTRACTOR'S own expense.

m) The CONTRACTOR shall arrange for the hardness testing and shall maintain the records of all the joints tested. These records shall be checked by the plant COMPANY'S inspector.

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12. INSPECTION & TESTING

12.1 General

a) The COMPANY'S Inspector shall have free access to all the concerned areas, where the actual work is being performed. The CONTRACTOR shall also afford the COMPANY'S inspector all means and facilities necessary to carry out inspection.

b) The COMPANY is entitled to depute its own inspector to the shop or field where prefabrication and erection of pipelines are being done, with (but not limited to) the following objectives:

i) To check the conformance to relevant standards and suitability of various Welding equipment and the welding performance.

ii) To supervise the welding procedure qualification.

iii) To supervise the welders' performance qualification.

iv) To check whether shop/field welding being executed is in conformity with the relevant specifications and codes of practice followed in pipe construction.

c) CONTRACTOR shall intimate sufficiently in advance the commencement of the Qualification tests, welding works and acceptance tests, to enable the COMPANY'S inspector to be present to supervise them.

12.2 Welding Procedure Qualification

a) Welding procedure qualification shall be carried out in accordance with the relevant requirements of API 1104 latest edition or other applicable codes and other job requirements by the CONTRACTOR at his expense. The CONTRACTOR shall submit the welding procedure specifications in format as per Exhibit-C (attached) immediately after the receipt of the order.

b) COMPANY'S inspector will review, check and approve the welding procedure submitted and shall release the procedure for procedure qualification tests. The. procedure qualification test shall be carried out by the CONTRACTOR under field conditions at his own expense. A complete set of the test results in format as per Exhibit-C (attached) shall be submitted to the COMPANY'S Inspector for approval immediately after completing the procedure qualification test and at least 2 weeks before the commencement of actual work. Standard tests as specified in the code shall be carried out in all cases. In addition to these tests, other tests like radiography, macro/micro examination, hardness tests, dye penetrant examination, charpy v-notch etc. shall be carried out on the specimens. It shall be the responsibility of the CONTRACTOR to carry out all the

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tests required to the satisfaction of the COMPANY'S Inspector. The destructive testing of welded joints shall be as per Annexure - 1.

12.3 Welder's Qualification

a) Welders shall be qualified in accordance with the API 1104 and other applicable specifications by the CONTRACTOR at his expense. The butt weld test pieces of the qualification test shall meet the radiographic test requirements specified in Clause 12.5 and Annexure-3 of this specification. The COMPANY'S inspector shall witness the test and certify the qualification of each welder separately. Only those welders who have been approved by the COMPANY'S inspector shall be employed for welding. CONTRACTOR shall submit the welder qualification test reports in the standard format as shown in Exhibit - D and obtain express approval, before commencement of the work. It shall be the responsibility of CONTRACTOR to carry out qualification tests of welders.

b) The welders shall always have in their possession the identification card as shown in Exhibit-E and shall produce it on demand by the COMPANY'S Inspector. It shall be the responsibility of the CONTRACTOR to issue the identity cards after the COMPANY has duly certified it.

c) No welder shall be permitted to work without the possession of identity card.

d) If a welder is found to perform a type of welding or in a position for which he is not qualified, he shall be debarred from doing any further work. All welds performed by an unqualified welder shall be cut and redone by a qualified welder at the expense of the CONTRACTOR.

12.4 Visual Inspection

COMPANY shall carry out inspection of all welds as per the latest editions of the applicable codes and specifications. All finished welds shall be visually inspected for parallel and axial alignment of the work, excessive reinforcement, concavity, shrinkage, cracks, under-cuts, dimensions, surface porosity and other surface defects. Undercutting adjacent to the completed weld shall not exceed the limits specified in the applicable standard and code.

12.5 Non Destructive Examination

The non-destructive examination shall mainly consist of examination using x-ray radiography as detailed in Annexure - 3.

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Radiographic examination of one hundred percent (100%) girth welds will be required by the COMPANY. Welds shall meet the standards of acceptability as set forth in API 1104 and as well as the requirements laid in subsequent paragraphs.

The CONTRACTOR shall make all the arrangements for the radiographic examination of work covered by the specification at his expense.

The COMPANY will review all the radiographs of welds and inform the CONTRACTOR regarding unacceptable welds. The decision of the COMPANY shall be final and binding in this regard.

All the requirements mentioned in the specification shall be arranged and executed by the CONTRACTOR through his own resources. In addition, ultrasonic inspection is required in the following cases as per Annexure - 2 of this Specification.

a) On the first 100 welded joints corresponding to each automatic (GTAW/GMAW) welding procedure used.

b) When 20 mm or more are cut from the pipe end as supplied, the ends shall be ultrasonically inspected for an additional length of 20 mm to assure no laminations exist.

c) When welds are repaired.

d) When in the opinion of COMPANY, ultrasonic inspection is required to confirm or clarify defects indicated by radiography.

e) When automatic procedure is used at least 10 cm on each weld shall be ultrasonically inspected at COMPANY's discretion.

f) Welding of transition piece of pipe.

In addition, ultrasonic inspection may be required for certain critical welds of the pipeline (i.e. tie-ins, welding of valves, flanges) randomly selected at COMPANY's discretion. All fillet and groove welds other than those radiographed shall be subjected to dye penetrant/ MP inspection. The non-destructive test system used for inspecting welds must by approved by the COMPANY.

12.5.1 Acceptance Criteria

Weld quality as judged on the basis of the acceptability criteria mentioned below:

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i) Any weld, which as a result of radiographic and/or ultrasonic examination in the opinion of COMPANY exhibits imperfections greater than the limits, stated in API 1104 latest edition or as superseded in this article shall be considered defective and shall so be marked with an identification point marker.

ii) In addition to the API 1104 requirements, the welds containing cracks including crater cracks regardless of size or location are unacceptable.

Lack of fusion and lack of root penetration may be permitted only up to a maximum individual length of t, where t is nominal pipe wall thickness. Cumulative length of the defect shall not exceed 25 mm in any 300 mm length of weld. For welds less than 300 mm length, the aggregate length shall not exceed 8 percent of the weld length. Defects situated in line and separated by less than the length of the shortest defect shall be considered as one defect. However, no Lack of fusion or lack of root penetration is permitted at any intersections of welds.

Suitable records shall be maintained by the CONTRACTOR as desired by the COMPANY on the day to day work done on welding radiography, ultrasonic testing. The CONTRACTOR shall present the records to the COMPANY on day-to-day basis and whenever demanded, for approval.

12.6 Destructive Testing

The COMPANY has the authority to order the cutting of up to 0.1 % of the total number of welds completed for subjecting to destructive tests at no extra cost to COMPANY. The destructive testing of weld joints shall be made as per Annexure - 1.

In addition, welds already cut out for defects for any reason may also be subjected to destructive testing. The sampling and the re-execution of welds shall be carried out by the CONTRACTOR at his own expense. If the results are unsatisfactory, welding operations shall be suspended and may not be restarted until the causes have been identified and the CONTRACTOR has adopted measures, which guarantee acceptable results. If it is necessary in the COMPANY's opinion the procedure shall be requalified. The weld joint represented by unsatisfactory welds shall stand rejected unless investigation proves otherwise.

13. REPAIRS OF WELDS

13.1 With the prior permission of COMPANY welds, which do not comply with the standards of acceptability, shall be repaired or the joint cut out and re-welded.

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A separate welding procedure specification sheet shall be formulated and qualified by CONTRACTOR for repair welds simulating the proposed repair to be carried out. Separate procedures are required to be qualified for (a) through thickness repair (b) external repair and (c) internal repair. Welders shall be qualified in advance for repairs. The root pass, for repairs opening the root, shall be replaced by the vertical uphill technique. The procedure shall be proven by satisfactory procedure test to API-1104 including the special requirements of the specification, and shall also be subjected to metallographic examination, hardness surveys and Charpy tests to determine the effects of repair welding on the associated structure.

Root sealing or single pass repair deposit shall not be allowed. Internal root defects shall be ground thoroughly and welded with a minimum of two passes. However, while grinding for repairs, care shall be taken to ensure that no grinding marks are made on the pipe surface anywhere.

The repair shall be subjected, as a minimum requirement to the same testing and inspection requirements as the original weld. After the repair of the circumferential weld, re-radiography of the full joint shall be carried out. 100% ultrasonic test shall be done at the repaired area externally. Any repaired area that is wide, irregular or rough shall be rejected and a full cut out shall be done.

Repairs are limited to a maximum of 30% of the weld length. Not more than two repairs are permitted on the same location. All repairs shall be carried out the day after initial radiography or earlier. A full report of all repairs made shall be submitted every day to the COMPANY.

13.2 Weld Rejected by Accumulation of Defects

Where a weld is rejected by the accumulation of defect clause, as defined by API-1104 and this specification, repairs within these limitations are permitted. Defects in the filling and capping passes shall be repaired preferentially.

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ANNEXURE-I

1.0 DESTRUCTIVE TESTING OF WELDED JOINT - BUTT WELDS

1.1 Preparation

Having passed the visual and the non-destructive inspection, the test weld shall be subjected to mechanical test.

After satisfactory completion of all visual and non-destructive testing the procedure test weld shall be set-aside for a period not less than 24 hours. No further work on the test weld and no cutting of test specimens from the weld shall be performed until a period of at least 24 hours has expired.

Weld specimens shall be taken from the positions indicated in fig.1 & 1A of this specification from areas as free from defects as possible; for this reason it is necessary to take the previous non-destructive tests into account. The minimum number of tests to be carried out is given in Table - 1 of this specification.

The test shall be carried out at laboratories approved by the COMPANY. The specimens shall be prepared in accordance with the figures given in the paragraphs that refer to the individual test.

1.2 Tensile Strength

Specimens shall be taken from the position indicated in fig.1 & 1A of this specification. Two ISO type specimens and two API-type specimens shall be taken.
The ISO test specimens are shown in fig.2 of this specification.

1.2.1 Method

The test shall be carried out in accordance with ISO 375

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TABLE 1

PIPE SIZE, OUTSIDE DIAMETER INCHES	NUMBER OF SPECIMENS									
	TENSILE API	TENSILE ISO	NICK BREAK	ROOT BEND	FACE BEND	SIDE BEND	MACRO	HARDNESS	IMPACT	TOTAL
	WALL THICKNESS ½ INCH (12.7 mm) AND UNDER									
UNDER 2	0	0	2	2	0	0	0	0	0	4
2 TO 4½ INCLUDING	0	0	2	2	0	0	0	0	0	4
OVER 4½ LESS THAN 12¾	2	0	2	2	2	0	2	2	12	24
12¾ AND OVER	2	2	4	4	4	0	2	2	24	44
	WALL THICKNESS OVER ½INCH (12.7 mm)									
4½AND SMALLER	0	2	0	0	0	2	0	0	0	4
OVER 4½ LESS THAN 12¾	2	0	2	2	2	0	2	2	12	24
12¾ AND OVER	2	2	4	0	0	8	2	2	24	44

1.3 Nick-Break Test

1.3.1 Preparation

Specification for nick-break test with notches thus worked can break in the base metal, instead of in the fusion zone; therefore an alternative test piece may be used after authorization by the COMPANY with a notch cut in the reinforcement of outside weld bead to a maximum depth of 1.5mm, measured from the surface of the weld bead.

1.4 Macroscopic Inspection

104.1 Preparation

Specimens shall be taken from the positions indicated in Fig. 1 of this specification and shall be prepared in accordance with ASTM E2 and E3.

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The width of the macro section has to be at least three times the width of the weld. The section is to be prepared by grinding and polishing and etched to clearly reveal the weld metal and heat affected zone.

104.2 Method

Specimens shall be carefully examined under the microscope, with a magnification of at least 25 times (25:1). The COMPANY may ask for a macrograph with 5 times (5:1) magnification, for DOCUMENTATION purposes.

104.3 Requirements

Under macroscopic examination, the welded joints shall show good penetration and fusion, without any defect exceeding the limits stated in the evaluation criteria of the nick bream test

1.5 Hardness Test

1.5.1 Preparation

The prepared macro section is to be used for hardness testing using the vickers method with 10 kg load indentations are to be made along traverses each approximately 1 mm below the surface at both side of the weld.

In the weld metal a minimum of 6 indentations equally spaced along the traverses are to be made. The HAZ indentations are to be made along the traverses for approximately 0.5 mm each into unaffected material, and starting as close to the fusion line as possible.

One indentation at each side of the weld along each traverse has to be made on parent metal. Reference is made to Fig. 3 of this specification. The indentations are to be made in the adjacent region as well as on the opposite side of the macro section along the specified traverses.

1.5.2 Method

The test shall be carried out in accordance with recommendation ISO R81, Vickers hardness, using a laboratory type machine controlled as pre-recommendation ISO R146 and using a diamond pyramid penetrator set at 2.37 rad (136") with a load of 10 kg.

1.5.3 Requirements

Hardness value shall not exceed the limit specified in welding specification chart. In case of a single reading strictly (+ 10HV) higher than the specified limit, further indentations shall be made to check if the high value was an isolated case.

All the hardness values contained from the heat-affected zone shall not exceed 100 HV with respect to the average hardness of the values

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obtained for the base metal. If these additional tests give hardness within the specification limit the slightly higher value may be accepted.

1.6 Charpy V-Notch Impact Test

1.6.1 Specimens shall be taken from the position indicated in Fig. 1 of this specification. The test specimens will be prepared in accordance with ISO R 148. Charpy V-Notch specimens shall have dimensions as given in Fig. 4 of the specification. Three test specimens shall be taken from each sample and they shall be cut and worked so that their length is transversal and perpendicular to the weld bead with the notch position as shown in Fig. 4 of this specification. The notch shall be perpendicular to the roller surface. The test specimen width shall depend upon the pipe wall nominal thickness as per the following table:

Nominal wall thickness (mm)	Test specimen width (mm)
Over 12	10
Over 9.5 and up to 12	7.5
From 7 up to 9.5	5
Less than 7	2.5

1.6.2 Test Method

The test shall be carried out as indicated in ISO R 148 "Beam Impact Test V-Notch".

Test pieces shall be immersed in a thermostatic bath and maintained at the test temperature for at least 15 minutes. They shall then be placed in the testing machine and broken within 5 seconds of their removal from the bath. The test temperature shall be as mentioned in welding specification chart.

1.6.3 Requirements (Note 1)

The impact energy shall be:

Test specimen (mm)	Average of three specimen (Note 2) Joule (Min.)	Minimum single value (Note 1) Joules
10.0	27.0	22.0
7.5	21.5	17.5
5.0	18.5	15.0
2.5	10.0	8.0

Note:

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(1) These values are specified for resistance to brittle fracture only. Where additional requirements are specified in project data sheet (Ex. pipeline materials with arrest properties i.e. a higher upper shelf charpy V energy for resistance against propagating ductile fractures) the same shall be followed.

(2) Only one value is permitted to be lower than average value up to the value specified.

1.7 Bend Test Requirements

The Bend test Specimens shall be made and tested as per the requirements of API 1104 Nineteenth Edition, September 1999. However, the dimensions of the Jig for guided bend test in Fig. 9 shall be modified as specified below:

Radius of the Plunger 'A' = 2t

Radius of the die. 'B' = 3t + 1.6 mm

Width of the die. 'C' = 50.8

The acceptance criteria shall however be as per para 5.6.4.3 and 5.6.5.3 of API 1104 latest edition.

Note: t = thickness of specimen

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ANNEXURE-2

1.0 ULTRASONIC INSPECTION

In addition the radiographic inspection, ultrasonic inspection is required as per conditions listed in paragraph 12.5 of this specification. This section concerns manual ultrasonic inspection. However ultrasonic inspection by automatic equipment may be used if approved by the COMPANY.

1.1 General:

The CONTRACTOR who carries out the ultrasonic inspections shall have sufficient no. of qualified personnel, equipment and instruments at his disposal to be able to effect the tests without hindering or delaying the pipeline assembly operations.

The CONTRACTOR appointed to carry out ultrasonic inspections shall supply all the instruments necessary for their execution on site.

1.2 Specification for Ultrasonic Testing Procedure Qualification

Before work begins, the CONTRACTOR shall present a specification describing the proposed U.T. procedure qualification.

This specification shall state, all the parameters described in API 1104 and the following information:

a) Type of U.T. Equipment used;

b) Type and dimensions of transducers

c) Frequency range

d) Details for calibration

e) Coupling medium

f) Inspection technique

g) Record details

h) Reference to the welding procedure where it is intended to adopt the specification

i) Temperature range of the joints to be inspected.

1.3 Qualification of Ultrasonic Inspection Procedure

The ultrasonic inspection procedure shall be approved by the COMPANY. Before inspection begins, the COMPANY may require the qualification test of the ultrasonic inspection procedure. This specification test consists in testing (under normal operating conditions) some CONTRACTOR welds made according to the same production procedure, where there are typical defects the test intends to detect.

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This test shall be conducted in the presence of the COMPANY.

1.4 Test Procedure

Circumferential welds shall be inspected from both sides using angle probes.

The surface with which the probe comes into contact shall be free of metal spatter, dirt, iron oxide, and scales of any type; therefore it shall be necessary to clean a strip at least 50 mm wide on both sides of the weld with steel-wire brushes and anyhow the cleaned strip must be at least wide enough to allow one and a half skip examination.

If, during the test, echoes of doubtful origin appear, it shall be necessary to inspect a convenient area on the pipe surface, close to the weld, with a straight beam transducer in order to check whether any manufacturing defects are present which could have interfered with the ultrasonic beam.

By way of an example, the equipment shall include but not be limited to the following:

a) Ultrasonic equipment and coupling medium

b) Sample sections for calibration of instruments

c) Equipment for cleaning of surface to be examined

d) Rules calibrated in centimeters for exact location of the position of defects.

The characteristics of the above listed instruments and equipment shall guarantee:

a) That the required standards of the inspection procedure, as previously established an approved by the COMPANY, are satisfied.

b) Continuous operation

All the instruments and equipment shall be approved by the COMPANY before being used. The COMPANY has the authority to reject any item that is considered unsuitable. The decision of the COMPANY is final. The CONTRACTOR appointed to carry out ultrasonic inspections shall also ensure the operational efficiency and maintenance of the instruments and equipment, and shall immediately substitute any item rejected by the COMPANY.

All the instruments and equipment necessary for carrying out ultrasonic inspection on site shall satisfy the requirements laid down by the public boards of institutions that regulate 'safety at work'.

1.5 Ultrasonic Instruments

The ultrasonic instrument:

a) Shall be pulse echo type, able to generate, receive and display, on the screen a Cathode Ray Tube (CRT), pulse at frequencies between 1 and 6

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MHz. The useful part of the CRT screen shall be at least 70mm wide and at least 50mm high shall have variable amplification, with steps of 1 or 2 dB over a range of a least 60 dB.

b) the regulation control shall be accurate to within ±1 dB and this accuracy shall be certified by the instrument manufacturer.

c) may be powered by a battery or an electric generator. In the first case, the autonomy of operation (endurance) of the instrument shall be sufficient to carry on working without frequent interruptions, and the instrument shall be equipped with an automatic switch which switches if off when the battery runs down; in the second case, there must be a voltage stabilising device with a tolerance of ±2 Volts.

1.6 Probes

The probes used shall have dimensions, frequencies, and a refraction angle suited to the type of steel, the diameter, and the thickness of the pipeline and to the joint design.

1.7 Reference Sample Pieces

The efficiency of the equipment used, the effective refraction angle of the probe, and the beam output point, shall be checked using a V_1 and V_2 sample block, IIW type or the calibration block ASTM E-428.

For manual ultrasonic testing and automated ultrasonic testing the reference sample pieces shall be as described in API 1104, Nineteenth Edition, para 11.4.5.

1.8 Calibration

The calibration, qualification of the testing procedure shall be done as provided in API 1104.

1.9 Regulation of Amplification during Production Testing

Scanning sensitivity shall be as provided in API 1104 para 11.4.7.2 & 11.4.7.3.

1.10 Qualification of Ultrasonic Testing Operators

Before the inspection begins or during the same inspection, the COMPANY may require a qualification test for the ultrasonic equipment operators.

The operators shall be fully qualified as per a recognized standard (ASME Sec V or equivalent) and they shall have as minimum level II as described in para 11.4.3,API 1104,Ninteenth Edition. The operators shall be able to:

a) calibrate the equipment;

b) perform an operational test under production conditions;

c) interpret the screen picture;

d) evaluate the size and location of reflectors

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e) interpret the type of defects detected

The COMPANY has the option of checking the ability of personnel employed for ultrasonic testing by means of qualification tests.

1.11 Evaluation of Indications given by Ultrasonic Tests

Each time that echoes from the weld bead appear during production testing, the instrument amplification shall be altered to coincide with the reference amplifications and the probe shall be moved until maximum response is obtained, paying attention all the time to the probe-tube coupling.

If, under these conditions, the height of the defect echo is equal to or greater than that of the reference echo, the defect shall be evaluated according to clause 12.5 of this specification. If the defect has also been detected by the radiographic and/or visual examination, the dimensions shall be judged according to the type of examination which detects the greater defect. Returns that are less than 50% of the reference echo will not be considered. If returns are above 50% but lower than 100% of the reference echo, and if the operator has good reasons to suspect that the returns are caused by unfavorably oriented cracks, he shall inform the COMPANY. Moreover, when there is a defect to be repaired, such defect shall be removed for a length corresponding to the one where no more return echo is given.

1.12 Other Equipment

The use of rules calibrated in centimeters, attached if possible to the probe, for the precise location of the position of welding defects, is recommended. Defect location is effected by measuring the projection distance between the probe output and the reflecting surface.

The operators carrying out the tests shall have, besides the probing instrument, tools for cleaning the pipe surface (files, brushes, etc.) as well as the coupling liquid or paste appropriate for the temperature of the section to be examined.

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ANNEXURE-3

RADIOGRAPHY

1.0 SCOPE

This annexure covers the radiographic inspection of all types of welded joints of the main pipeline.

The welded joints shall include the following:

i) Full girth welds on the mainline construction including double jointing of pipe, if adopted.

ii) Welds for installation of block valves, insulating joints and other appurtenances and tie-ins.

iii) Welds at scraper launching and receiving barrels.

iv) Terminal Piping

2.0 APPLICABLE STANDARDS

This specification shall apply in conjunction with the following (all latest editions):

i) API 1104, Standard for welding Pipelines and Related Facilities

ii) ANSI B 31.8, Code for Gas Transmission and Distribution Piping Systems.

iii) ANSI B 31.4, Code for Transportation System for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia and Alcohols.

iv) ASTM E 94, Recommended practice for Radiographic Testing

v) ASTM E 142, Standard Method for Controlling Quality of Radiographic Testing

vi) The American Society for Nondestructive Testing. Recommended Practice no. SNT-TC-1A Supplement A.

3.0 PROCEDURE

3.1 The radiographic examination procedure to be adopted shall be submitted by the CONTRACTOR as per Exhibit-F.

3.2 The procedure of radiographic examination shall be qualified to the entire satisfaction of COMP ANY prior to use. It shall include but not be limited to the following requirements:

i) Lead foil intensifying screens, at the rear of the film shall be used for all exposures.

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ii) Type 2 and 3 films as per ASTM E-94 shall be used.

iii) A densitometer shall be used to determine film density. The transmitted film density shall be between 2.0 and 3.5 throughout the weld. The unexposed base density of the film shall not exceed 0.30.

iv) Radiographic identification system and documentation for radiographic interpretation reports and their recording system.

3.3 The CONTRACTOR shall qualify each procedure in the presence of the COMPANY prior to use.

3.4 The procedure of radiographic examination shall produce radiographs of sufficient density, clarity and contrast so that defects in the weld or in the pipe adjacent to the weld are clearly discernible.

3.5 One Check shot of the full joint on main line welds shall be taken per 100 circumferential welds or one per day of the production whichever is more for cross checking the correctness of the radiographs of weld joints executed by the contractors. For taking check shots on completed/accepted sections, contractor has to separately mobilize either internal crawler/external X-ray unit, as appropriate.

3.6 All the girth welds of mainline shall be subjected to 100% radiographic examination. The CONTRACTOR shall furnish all the radiographs to the COMPANY, immediately after processing them, together with the corresponding interpretation reports on approved format. The details of the radiographs along with the joint identification number shall be duly entered in a register and signed by the CONTRACTOR and submitted to the COMPANY for approval.

3.7 When the radiation source and the film are both on the outside of the weld and located diametrically opposite each other, the maximum acceptable length of film for each exposure shall not exceed the values given. The minimum film overlap, in such cases, shall be 40mm. The ellipse exposure technique may be used on nominal pipe sizes of 2 inch and smaller provided that the source of film distance used is a minimum of 12 inch.

3.8 Three copies of each acceptable radiographic procedure (as per Exhibit-F) and three copies of radiographic qualification records shall be supplied to COMPANY. One set of the qualifying radiographs on the job shall be kept by the CONTRACTOR's authorized representative to be used as a standard for the quality of production radiographic during the job. The other two sets shall be retained by COMPANY for its permanent record.

3.9 Three copies of the exposure charts relating to material thickness, kilo voltage, source of film distance and exposure time shall also be made available to COMPANY by the CONTRACTOR.

3.10 The CONTRACTOR shall, on a daily basis, record for each radiograph (1) radiograph's number, (2) approximate chainage of weld location, (3) whether or not the welds meet the specified acceptance standards and (4) the nature and approximate location of unacceptable defects observed. It must be possible to

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relate back to a particular butt weld and welder on piping drawing and pipeline alignment drawing.

3.11 Each day's production of processed radiographs shall be properly packaged separately, identified by at least the (1) date, (2) radiographic unit, (3) job locations, (4) starting and ending progress survey stations and (5) shall include original and three copies of the daily radiographic record. The package shall be submitted to the COMPANY daily when possible, but in no event later than noon of the following day.

3.12 The CONTRACTOR shall provide all the necessary facilities at site, such as a dark room with controlled temperature, film viewer etc. to enable the COMPANY to examine the radiographs.

3.13 The CONTRACTOR, if found necessary, may modify the procedure of radiographic examination suiting to the local conditions prevailing. This shall, however, be subject to the approval of the Company.

3.14 COMPANY shall have free access to all the CONTRACTOR's work facilities in the field.

3.15 Any approval granted by the COMPANY shall not relieve the CONTRACTOR of his responsibilities and guarantees.

4.0 RADIATION SOURCE

4.1 Radiographic examination shall be carried out using X-radiations; radiographic examination by Gamma rays using slow speed films may be allowed, at the discretion of the COMPANY, in case of inaccessible joints. Radiography by Gamma ray for tie-in-joints shall be acceptable provided D4 AGFA film or equivalent is used and the required sensitivity obtained.

4.2 Whenever possible, pipeline welds will be inspected by placing the radiation source inside the pipe. on the pipeline axis. with a radiation of 6.28 red. (360).

If it is impossible to place the radiation source inside the pipe, the weld will be inspected with the source on the outside. An overlap of at least 40 mm at the ends of each film shall be required to ensure that the first and last location increment numbers are common to successive films and to establish that no part of a weld has been omitted.

5.0 LEVEL OF QUALITY

The quality level of Radiographic sensitivity required for radiographic inspection shall be at least equivalent to the values in Figure-5.

6.0 PENETRAMETERS

The Image Quality Indicator (abreviation:IQI) shall be used for the qualification of the welding procedure and during normal line production. Radiographic sensitivity shall be measured with the wire image quality indicator (Penetrameter). The Penetrameter shall be selected according to DIN-54109 or ISO-1027. For radiographs made with the source on the outside, a Penetrameter shall be placed on

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each side of the film with the smaller wire of the Penetrameter turned towards the end of the film itself. When a complete weld is radiographed in a single exposure using a source inside the piping, four pentrameters approximately equally spaced around the circumference shall be used. During the procedure qualification, IQI shall be placed both on the source side and on the film side.The sensitivity obtained with IQI on the source side shall not be less than the values shown in Fig. 5 of this specification.

The sensitivity limit may be considered to have been reached when the outline of the IQI, its identification number and the wire of the required diameter show up clearly on the radiograph.

The COMPANY may authorize use of types of IQI other than those planned, provided that they conform with recognized standards and only if the CONTRACTOR is able to demonstrate that the minimum sensitivity level required is obtained. For this demonstration, a test shall be carried out comparing the IQI specified and the CONTRACTOR's to show up the identification number and other details of the proposed IQI, which must be visible in the test radiograph.

7.0 FILM IDENTIFICATION MARKERS

All films shall be clearly identified by lead numbers, letters, and/or markers. The image of the markers shall appear on the films, without interfering with the interpretation. These markers positions shall also be marked on the part to be radiographed and shall be maintained during radiography.

8.0 PROTECTION AND CARE OF FILM

8.1 All unexposed films shall be protected and stored properly as per the requirements of API 1104 standard and ASTM E.94.

8.2 The exposed and unexposed film shall be protected from heat, light, dust and moisture. Sufficient shielding shall be supplied to prevent exposure of film to damaging radiation prior to and following the use of the film for radiographic exposure.

9.0 RE-RADIOGRAPHY

9.1 The weld joints shall be re-radiographed in case of unsatisfactory quality of the radiographs, at the expense of the CONTRACTOR.

9.2 All the repaired weld joints shall be re-radiographed at no extra cost to the COMPANY in the same manner as that followed for the original welds. In addition, the repaired weld areas shall be identified with the original identification number plus the letter R to indicate the repair.

9.3 When evaluating repair film, radiographers shall compare each section (exposure) of the weld with the original film to assure repair was correctly marked and original defect removed.

9.4 The COMPANY will review prior to any repair of welds, all the radiographs of welds that contain, according to the CONTRACTOR's interpretation,

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unacceptable defects. The final disposition of all unacceptable welds shall be decided by the COMPANY.

10.0 QUALIFICATION OF RADIOGRAPHERS

10.1 Pipeline radiographers shall be qualified in accordance with the requirement of API 1104 and to the full satisfaction of COMPANY.

10.2 Certification of all the radiographers, qualified as per 10.1 above, shall be furnished by the CONTRACTOR to the COMPANY before a radiographer will be permitted to perform production radiography. The certificate record shall include:

i) Background and Experience Record

ii) Training Course Record

iii) Technical Examination Record

iv) Doctor's report on radiographer's Jacque 0-1 acquity eye test

v) Date of qualification

10.3 The radiographers shall be required to qualify with each radiographic procedure they use, prior to performing the work assigned to him in accordance with the specification.

11.0 PRESERVATION ON OF RADIOGRAPHS

11.1 The radiographs shall be processed to allow storage of films without any discoloration for at least three years. All the radiographs shall be presented in suitable folders for preservation along with necessary documentation.

11.2 All radiographs shall become property of the COMPANY.

12.0 EQUIPMENT AND ACCESSORIES

12.1 CONTRACTOR shall make necessary arrangements at his own expense, for providing the radiographic equipment, radiographic films and all the accessories for carrying out the radiographic examination for satisfactory and timely completion of the job.

12.2 For carrying out the mainline radiographic examination the CONTRACTOR shall be equipped with suitable mobile/stationary type dark rooms.
These shall have all the required facilities for film processing. Film viewer used shall be equipped with the film illuminator that has a light source of sufficient intensity and suitably controlled to allow viewing film densities up to 4.0 without damaging the film.

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13.0 RADIATION PROTECTION

13.1 CONTRACTOR shall be responsible for the protection and personnel monitoring of every man with or near radiation sources.

13.2 The protection and monitoring shall comply with local regulations.

13.3 In view of visual hazards in the handling of Radioactive source of material, CONTRACTOR shall be solely responsible for complying with all rules and regulations set forth by Atomic Energy Commission or any other Government agencies of India in this regard and COMPANY shall not be responsible and shall be kept indemnified by the CONTRACTOR for default (s) of whatever nature by the CONTRACTOR. Safety equipment as considered adequate by the COMPANY for all necessary personnel shall be made available for use and maintained for immediate and proper use by the CONTRACTOR.

14.0 DISPLAY OF SAFETY INSTRUCTIONS

The safety provisions shall be brought to the notice of all concerned by display on a notice board at prominent place at the work spot. The person responsible for the "Safety" shall be named by the CONTRACTOR.

15.0 ENFORCEMENT OF SAFETY REGULATIONS

To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangement made by the CONTRACTOR shall be open to inspection by COMPANY or its representatives.

16.0 FIRST AID AND INDUSTRIAL INJURIES

16.1 CONTRACTOR shall maintain first aid facilities for its employees and those of sub-Contractors.

16.2 CONTRACTOR shall make outside arrangements for ambulance service and for treatment of industrial injuries. Names of those providing these services shall be furnished to COMPANY prior to start of work and their telephone no. Shall be posted prominently in CONTRACTOR'S field office.

16.3 All critical industrial injuries shall be reported promptly to the COMPANY and a copy of CONTRACTOR's report covering each personal injury requiring the attention of physician shall be furnished to the COMPANY.

17.0 NO EXEMPTION

Notwithstanding the above there is nothing in these to exempt the CONTRACTOR from the operation of any other act or rules in force.

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EXHIBIT- A

Sheet 1 of 3

ELECTRODE QUALIFICATION TEST RECORD

A. Tested at (Site name) Date:

Manufacturer's Narne :

Brand Name :

Batch Number & Size tested :

Classification & Code :

Intended for welding in position: :

In combination with (if any) :

Code of Reference (used for testing) :

Special Requirements (if any) :

B. All-weld Tensile Test :

Base Material used :

Pre-heat temperature :

Post weld heat treatment details: :

Visual examination :

Radiographic examination results :

Tensile test results :

Identification No.	U.T.S.	Yield Point	Elongation	Remarks
1.				
2.				

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C. Impact Test Results

Test Temperature : Notch in :

Type of Specimens (Charpy) : Size of Specimens:

EXHIBIT- A

Sheet 2 of 3

Specimen No.	Impact Value	Average
1		
2		
3		
4		
5		

D. Chemical Analysis Results

Electrode Size Result :

Batch No. :

%C	%S	%P	%Si	%Mn	%Cr	%Ni	%Mo	Other

E. Fillet Weld Test Results :

Welding Positions :

Base Materials :

Size of electrode used :

Visual Inspection Results :

1)

2)

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3)

Macro Test Results :

Fracture Test Results :

Remarks :

F. Other Test Results

1. Transverse tensile test :

In combination with :

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EXHIBIT- A

Sheet 3 of 3

Base material used :

Position of welding :

Preheat temperature :

Post weld heat treatment :

Radiography :

Identification No. U.T.S. Fracture in Remarks

2. Guided Bend Test :

Position	Identification No.	Root, Face or Side Bend	Remark
	1		
	2		
	3		
	4		
	5		

G. Any other tests :

H. Conclusions :

….....	.....	.....
PREPARED BY (CONTRACTOR)	**REVIEWED BY (CONTRACTOR)**	**APPROVED BY (VCS/OWNER)**

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EXHIBIT- B

Sheet 1 of 1

STRESS RELIEF HEAT TREATMENT PROCEDURE SPECIFICATION

Name of the Heat-treater :
Name of the Project : Specification Reference No.

1. General Detail:
   Name of the Equipment:
   Name of the Assembly/Part:
   Drawing No:
   Material:

2. Furnace Details
   Type of Heating : Gas/Oil/Elect.
   Res/ induction Type of Heating
   Capacity (Size) :
   Maximum Temp. (C) :
   Method of temp. Measurement
   Atmosphere Control :

3. Heat Treatment Cycle Details :
   Charging Temp. C
   Rate of heating, C/Hr.
   Soaking Temp. C
   Soaking Time, hrs.
   Rate of Cooling, C/Hr.
   Mode of Cooling

4. Other Details, if any :

Notes:

The following documents shall be furnished along with the specifications:
i) Material test certificates
ii) Assembly/Part Drawing.

.....	.....	.....
PREPARED BY CONTRACTOR)	**REVIEWED BY (CONTRACTOR)**	**APPROVED BY (VCS/OWNER)**

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EXHIBIT- C

Sheet 1 of 3

Example of record form for welding procedure qualification test

Project / Contract		Contractor		
Pipe and fitting material				
Process				
Outside Diameter				
Pipe				
Thickness				
Joint design (Sketch attached)				

	Make and type of Filler metal	Diameter	Current	Voltage
Root				
Second run				
Other runs				
Other Characteristics	electrical	a.c/d.c	Electrode	negative / Positive

Shielding gas	
Type of mixture	
Flow	
Shielding flux	
Position	

Direction of welding	:	
Root	:	Vertical up*/ Vertical down
Second run	:	Vertical up*/ Vertical down
Other runs	:	Vertical up*/ Vertical down

Number of welders	:
Root	
Second run	
Other runs	

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EXHIBIT- C

Sheet 2 of 3

Time lapse between commencements of second Run and commencement of other runs	
Minimum number of runs before joint allowed to cool	
Maximum time between commencement and Completion of weld	
Type of line-up clamp	
Removal of clamp after run	
Lowering off after run	
Cleaning	
Preheating	
Minimum temperature C	Ambient
Temperature C	
Type of heater to be used	
Interposes temperature	
Minimum C	
Maximum C	Maximum C
Post weld heat treatment	
Speed of travel	
Test Results	
State acceptable 'non-acceptable (with Reasons) or give numerical results	
Non-destructive tests	
Visual	
Radiograph	

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EXHIBIT- C

Sheet 3 of 3

Destructive tests	1	2	3	4
Transverse tensile				
Tensile strength (with units)				
Fracture location				
Test temperature				
Macro-examination				
fillet weld fracture				
Hardness survey				
Type				
Hardness range :				
Parent metal				
Heat affected zone				
weld				
Charpy V-notch impact tests				
Specimen location and size				
Notch location				
Test temperature				
Results (with units)				

Additional test (s) and results. e.g. chemical analysis, micro-examination, CTOD tests, Bend Tests, Nick Break test.

The statements in this record are correct. The test joints were prepared, welded and tested in accordance with the requirements of specification.

Contractor	Inspector
Position	Witnessed by
Date	Date

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EXHIBIT- D

Sheet 1 of 1

Example of record form for welder qualification test

Welder test certificate	Test no	
Project/Contract	Date	
Contractor	Inspector	
Welder's name		
Address		
Pipe material		
Pipe thickness		
Pipe outside diameter		
Welding process	Root	
	Fill and Cap	
Electrode / wire		
Root	Current	Voltage
Second run	Current	Voltage
Fill and cap	Current	Voltage
Direction of travel	Root : Vertical up*/Vertical down	
	Fill and cap : Vertical up*/Vertical down	
Reason for failure		
Visual		
Non-destructive testing		
Butt joint		
Fillet weld		
'Number of attempts		
Comments		
Accepted date/Time		

Signed by Contractor

Signed by Inspector

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*Delete as necessary

EXHIBIT- E

Welder's Identification Card

Name	:	
Identification	:	Photograph
Date of Testing	:	
Valid till	:	
Approval of Welding	:	
Welding Position	:	
Material	:	
Diameter	:	
Diameter range approved	:	
Wall thickness	:	
Thickness range approved	:	
Type of welding consumables	:	

Approved by: Employers' Signature with seal

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EXHIBIT- F

Sheet 1 of 1

Radiographic Procedure for Pipe Welding

1. Location
2. Date of Testing
3. Name of Supervised Contractor
4. Material
5. Dia & Thickness
6. Type of weld joint
7. Radiation Source (X-ray, iridium)
8. Type of equipment (External/Internal)
9. Intensifying screens and material
10. Filter type and placement mask, Diaphragm Lead screen etc. adjacent to radiation source or specimen,
11. Exposure Geometry (Source focal spot size, object to film distance, radiation angle with respect to weld and film).
12. Limit of film coverage
13. Film type and make
14. Exposure Conditions (ma, KV, time)
15. Processing (time temperature for development stop bath or rinse, fixation, washing, drying etc.)
16. Density
17. Sensitivity
18. Type of penetrameter
19. Essential wire to be seen on source side:
20. Essential wire accepted for film side viewing:

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Approval of the COMPANY

Signature of CONTRACTOR with seal

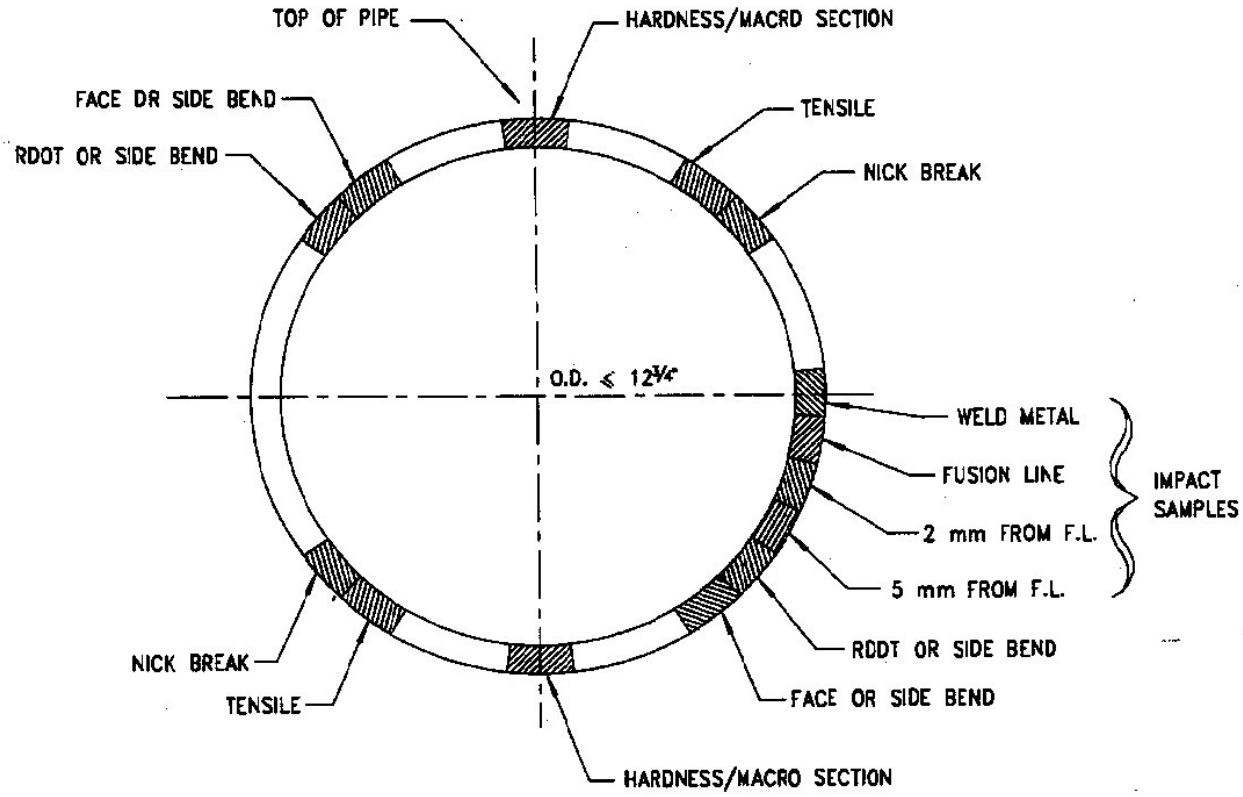


FIGURE 1.

LOCATION OF SPECIMENS FOR WELD PROCEDURE QUALIFICATION FOR PIPE DIA. < 12 ¾"

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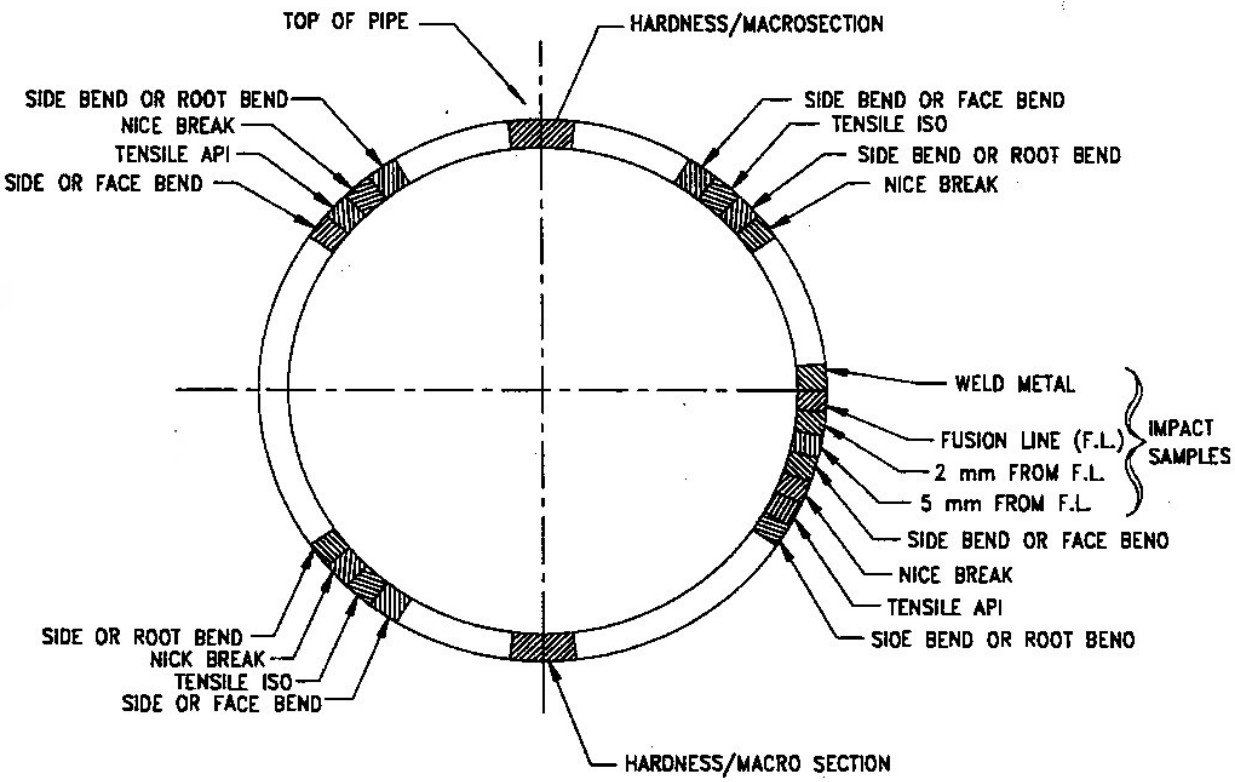


FIGURE 1A.

LOCATION OF SPECIMENS FOR WELD PROCEDURE QUALIFICATION FOR PIPE DIA. > 12 ¾

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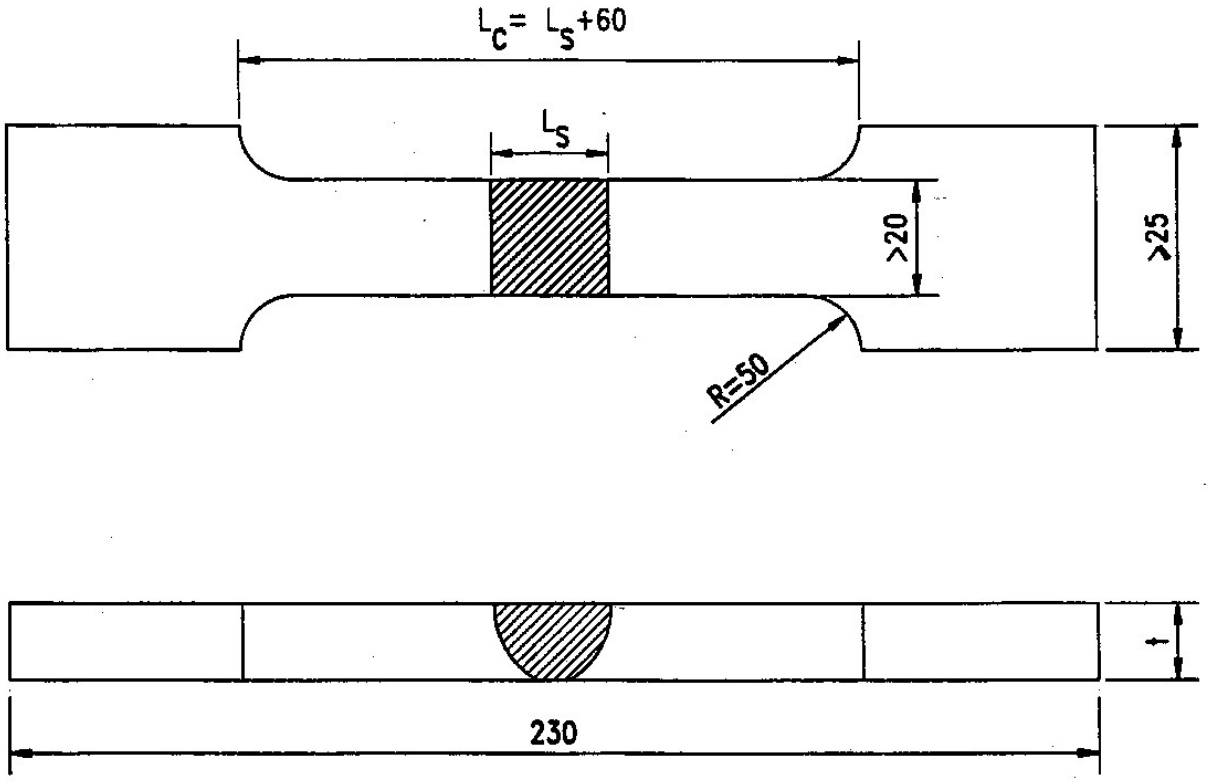


FIGURE 2. ISO TENSILE TEST SPECIMEN

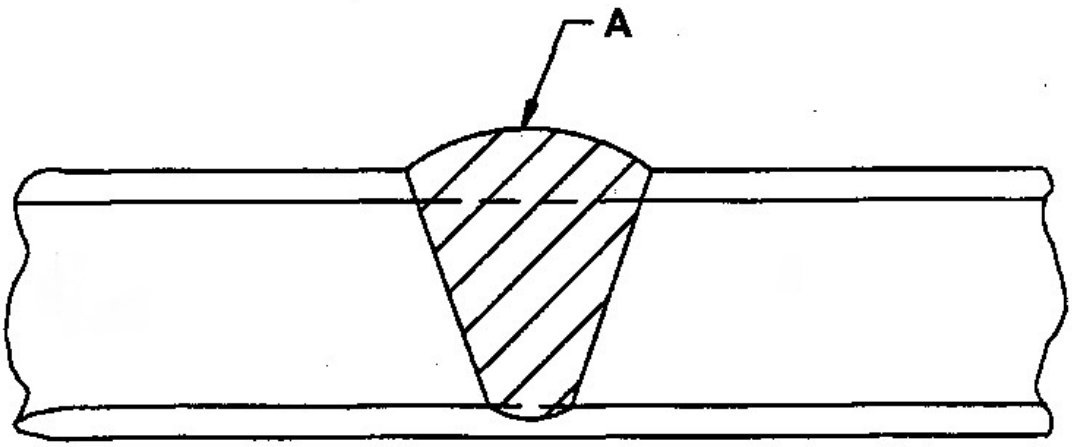
LEGEND

t = PIPE WALL THICKNESS

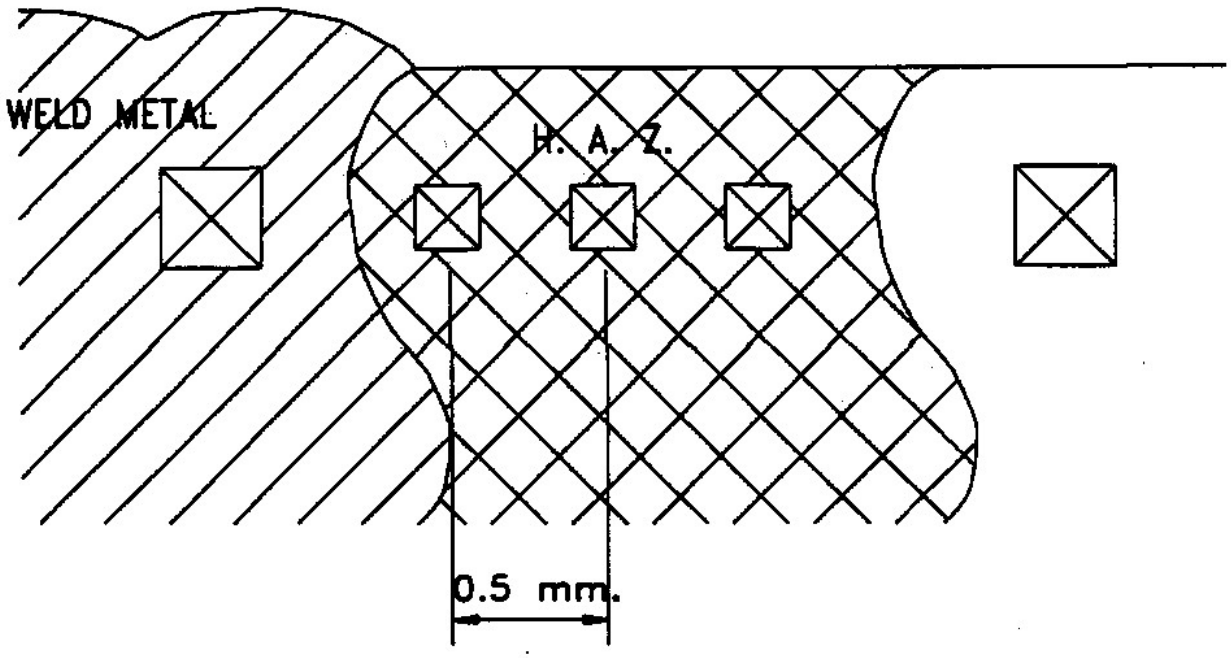
LS = WELD WIDTH AFTER LEVELLING

LC = LENGTH OF PARALLEL EDGES

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HARDNESS TESTING – BUTT WELDS



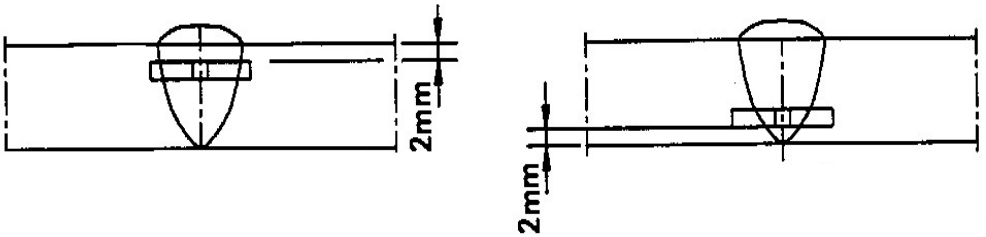
DETAIL - A

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FIGURE 3. HARDNESS TESTING OF WELD JOINTS – SCHEMATIC

NOTCH POSITIONS

CENTER OF WELD



FUSION LINE(F.L.)



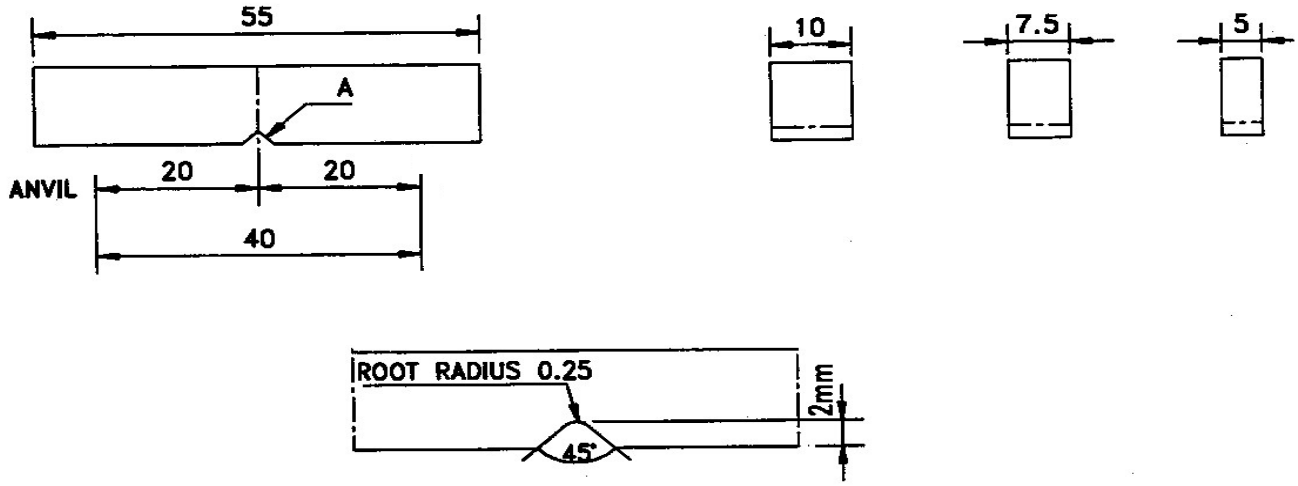
2mm FROM F.L.



5mm FROM F.L.

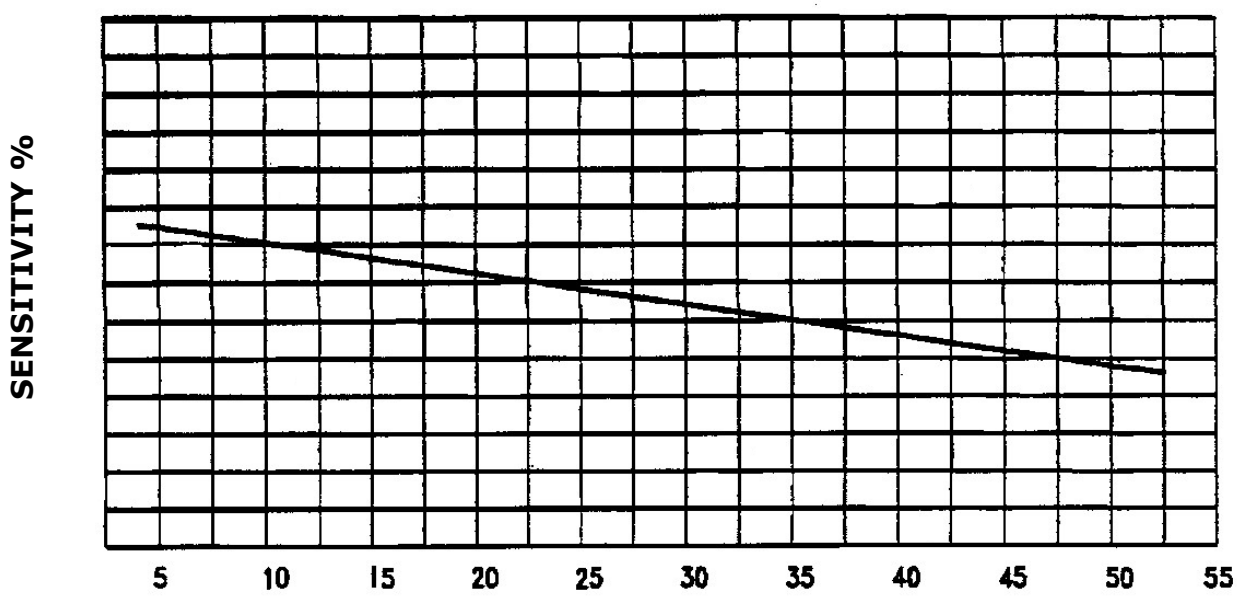


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DETAIL- A

FIGURE 4. CHARPY V – NOTCH TEST SPECIMEN



PIPE WALL MATERIAL THICKNESS, mm

NOTE:-

FOR PRODUCTION RADIOGRAPHY, SENSITIVITY REDINGS BASED ON FILM ON SIDE PENTRAMETERS ARE TO BE JUDGED AS PER RESULT FROM THE PROCEDURE QUALIFICATION WITH PENTRAMETERS PLACED ON THE SOURE SIDE.

Figure 5

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
WARNING MAT

VPC – SS – PP -2020

00	**28.01.2020**	**MB**	**MC**	**AD**	**SK**
Rev. No	**Date**	**Prepared By**	**Checked By**	**Approved By**	**Authorized By**

UNCONTROLLED COPY	**:**	**If printed**
CONTROLLED COPY	**:**	**If in soft and signed**

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ABBREVIATIONS:

ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing of Materials
API	American Petroleum Institute
OISD	Oil Industry Safety Directorate

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5.0 QUALITY ASSURANCE (QA) 7
6.0 DEFECT LIABILITY 7
7.0 RECOMMENDED MANUFACTURER FOR RAW MATERIAL 7

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1.0 SCOPE

This specification covers the minimum requirements for the various activities to be performed by for the procurement of Warning Mat.

Warning Mats shall be laid in the ground above the gas main line in order to indicate their presence.

This specification shall be read in conjunction with the condition of all specifications and documents include in the contract between company and contractor.

2.0 REFERENCE CODES, STANDARDS AND SPECIFICATIONS

The latest edition of following Codes and Standards are referenced in this specification and all provisions of these reference codes and standards shall be applicable.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B31.4	:	Pipeline Transportation system for liquid Hydrocarbon & other liquids.
B 31.8	:	Gas Transmission and Distribution Piping Systems.

AMERICAN PETROLEUM INSTITUTE (API)

1102	:	Pipeline Crossing Railroads and Highways
1109	:	Marking Liquid Petroleum Pipeline Facilities
1104	:	Welding of Pipelines and Related Facilities

OIL INDUSTRY SAFETY DIRECTORATE (OISD)

STD-141	:	Design and Construction Requirements for Cross Country Hydrocarbon Pipelines.
STD-226	:	Natural gas Transmission Pipelines and city gas distribution network.

US DOT PIPE LINE SAFETY STANDARD

Part 192, Title 49	:	Transportation of Natural and other Gases by Pipe Line
Part 195	:	Transportation of Liquid by Pipe Line

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3.0 FEATURES

3.1 MATERIAL

Warning Tape, Type 1 as per EN 12613 shall be used for the present project.

The material grade of Warning Mat shall be Virgin Low density polyethylene (PE) material with warning sticker / stamp. The material shall be having the density between 0.913 to 0.923 g/cc at 27 deg. Celsius as per IS 2508.

The tape shall be uniform in colour, texture and finish and shall be free from holes and foreign materials.

Rodent repellent chemicals to be added to the plastic master batch for protection against rodents.

The material and colour, if used, for printing shall have no detrimental effects on the environment.

3.2 MECHANICAL PROPERTIES

Mechanical properties of the Warning Mat (Type I) shall be in accordance with the code EN 12613.

Minimum tensile withstand load in longitudinal direction shall not be less than 200 N. The test piece shall not exhibit a reduction of more than 20% of its width after removal of the specified load.

3.3 COLOUR

The Warning Mat shall be of bright golden yellow colour. This colour must not take any alteration in the course of time.

3.4 DIMENSIONS

Warning Mat shall have following dimensions:

Width	300 ± 2 mm
Thickness	1.0 mm (Minimum)

Negative tolerance on the thickness is not allowed.

3.5 MARKING

3.5.1 The warning mat shall be marked at intervals not exceeding 1 meter. Marking on the mat shall be approved by owner. The marking shall be legible and durable. The warning mat must be printed with "Caution: High Pressure Gas Pipeline Below" in both English and Hindi, Chainage marking along with owner's logo and owner's 24 Hours Emergency Number ----------, ---------- at a frequency of every meter. In addition, name or trademark of the manufacturer, year of manufacture and reference of code of manufacture of warning mat shall be included in the marking.

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3.5.2 Vendor shall submit proposed Artwork to be marked on the Warning Mat for approval from Owner / Owner's representative before start of production.

3.6 TESTS

All the tests and test procedures for Warning Mats shall be as per EN 12613 or as per required National/ International standards mentioned in EN 12613. In addition, all requirements pertaining to statutory requirements, if any, as specified from time to time shall be complied.

The required tests are briefed as below:

Colouring

Three separate tests shall be carried out in accordance with:

- As per normative annexure B of EN 12613, using 20% ammonium sulphide.
- As per EN ISO 175, using 10% nitric acid & 20% sodium carbonate solution.

The tests shall be repeated for each colour (if any).

There shall be no discolouration or change of the initial colour of the warning tape after the tests.

Tensile Withstand Strength

The test sample shall be selected as per mentioned in EN 12613. The test samples shall be preconditioned for not less than 12 h at 23±2 oC. Static loads shall be carried out to the samples over a period of 10 s.

After the test, the test piece shall withstand without starting to separate at weak points (if any) for not less than 5 minutes. Also it should no exhibit a reduction of more than 20% of its width after removal of specified load.

The minimum tensile withstand load for the warning mat in the longitudinal direction shall be not less than 200 N.

Visual Warning Characteristics

The test shall be carried out in accordance with normative annexure A of EN 12613.

Permanence of Printing

The test shall be performed as per CL. 9.3 of IEC 60898:1995.

The test is made by rubbing the marking by hand for 15 sec with a piece of cotton soaked with water and again for 15 sec with a piece of cotton soaked with aliphatic solvent hexane with a content of aromatics of max. 0.1% by volume, a kauributanol value of 29, an initial boiling point value of approx. 65oC, a dry point of approx. 69oC and a density of approx. 0.68 gm/cm3.

After the test, the marking shall be easily legible.

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Test of laying Characteristics

The test is for the assessment of transverse rigidity of the warning mats.

The test shall be performed as per EN 12613.

Warning Mat Virginity Test

Differential Scanning Calorimeter (DSC) Scan test along with the temperature of melting (Tm) shall be performed for the Warning Mat and its raw polymer i.e. virgin low density polyethylene (LDPE).

The Differential Scanning Calorimeter (DSC) Scan curve of the Warning Mat obtained from its DSC Scan test along with its Temperature of Melting (Tm) shall then be compared with the DSC Scan curve and the Temperature of Melting (Tm) of its raw polymer (i.e. virgin LDPE).

To ensure the virginity of the Warning mat, the DSC Scan curve and Tm of the Warning Mat (finished product manufactured from the raw polymer) shall match on overlapping with its corresponding raw polymer's DSC Scan curve and Tm.

4.0 PACKING

The warning mat shall be delivered in rolls of minimum 50 meters. Packing size to be mentioned to ensure uniformity in delivery conditions of the materials being procured. Packaging of the Warning Mat shall be such that there won't be any deterioration due to Ultraviolet (UV) effect during transportation and storage of the Warning Taps prior to use.

5.0 QUALITY ASSURANCE (QA)

Manufacturer shall prepare detailed Inspection Test Procedure (ITP) and submit for the approval from Owner / Owner's representative.

6.0 DEFECT LIABILITY

Defect liability period shall be as per the commercial volume I of II.

7.0 RECOMMENDED MANUFACTURER FOR RAW MATERIAL

1. INEOS
2. BOREALIS
3. TOTAL PETROCHEMICALS
4. DOW
5. BASELL
6. RELIANCE
7. GAIL
8. HALDIA

However any other reputed national or international Manufacturer may also be consider for supply of Raw material with approval of Owner / Owner's representative.

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
HEALTH, SAFETY & ENVIRONMENT

VPC – SS – PP - 2021

00	28.01.2020	MB	MC	AD	SK
Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By

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Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
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ABBREVIATIONS:

TPIA	THIRD PARTY INSPECTION AGENCY
QA	Quality Assurance
QC	Quality Control
LOI	Letter of Indent
QAP	Quality Assurance Procedure
ISS	International Standard Space
UPS	Uninterruptible Power Supply

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1.0 SCOPE

This specification establishes the Health, safety and Environment (HSE) aspects to be complied with by the contractor during construction at site.

2.0 REFERENCES

This document should be read in conjunction with following.

- General Condition of Contract (GCC)
- Special Condition of Contract (SCC)
- Job Specifications
- Relevant IS codes
- Reporting Formats

3.0 RESPONSIBILITY & ORGANISATION

Safety activities at site shall be under control of contractor's RCM. He shall be responsible for implementation of HSE provisions. The nominated or designated safety engineer/ officer shall assist and perform day to day HSE work as per his advice.

4.0 GENERAL REQUIREMENT

4.1 The contractor should follow HSE policy of owner as applicable to construction site.

4.2 The contractor shall deploy a full time HSE engineer / officer to coordinate the site.

The HSE officer shall be duly qualified in Industrial Health & Safety management with an experience of 4 -5 years.

4.3 The contractor shall ensure that HSE requirements are clearly understood & faithfully implemented at all level, at each site.

4.4 The contractor shall organize safety awareness programs regularly.

4.5 The contractor shall ensure his participation in the every HSE meeting called by owner/owner representative.

4.6 The contractor's shall conduct daily tool box talk.

4.7 The contractor shall submit Monthly HSE reports (Form attached in ANNEXURES).

4.8 The contractor shall provide all help and support to the injured person got injury at site during construction work and arrange compensation as per insurance policy / Act.

4.9 The contractor shall adhere consistently to all provisions of HSE. In case of non-compliance or continuous failure the owner/ owner representative may impose stoppage of work without any cost time implication to owner. A penalty amount of Rs 1000/- shall be imposed on the contractor for the serious HSE violation.

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4.10 Three times of this penalty may count as a serious violation of contractor in line with HSE. This may affect to new work assignment/award of contractor.

5.0 ACCIDENT, INCIDENT AND NEAR-MISS REPORTING

Accident

Unintended occurrence arising out of and in the course of employment of a person, which results in to injury with or without damage to plant/equipment/materials.

Incident

means an unplanned and uncontrolled event which results in damage to plant or equipment or loss of material without causing any injury to persons, like fire, spill, leak, property damage etc.

Near-miss

An unexpected, unwanted event not causing loss, injury or illness but which under slightly altered conditions can lead to an accident.
can be defined as "Any event which under slightly un favorable circumstances, may have resulted in any of the following:

- Injury, fatal or otherwise or ill health to people
- Loss of property, damage to plant or materials
- Damage to the environment
- A business interruption"

Accident, Incident and Near miss reporting form listed in ANNEXURES

6.0 HSE REQUIREMENTS AT SITE

6.1 Personnel Protective Equipment's

The contractors shall provide sufficient numbers of following personal protective equipment's (PPEs) to workmen and supervisors/engineers to use them properly at work site.
Following five numbers of Personnel protective equipment's are identified as MANDATORY for all.

- Safety Helmet
- Coverall
- Safety shoes/footwear
- Safety Glasses
- Hand Gloves (as per job requirement)

  Other PPEs are depending upon nature of job like

  Arc Welding – Welding face shield

  Grinding – Grinding face shield

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Height work – Full Body harness (above 2 meters)

Ask site supervisor for proper use and selection of protective clothing / equipment for specialized jobs

6.2 Welding

- Ensure that welding machine is in order and approved by site engineer.
- Ensure that welding cables are in order.
- Ensure that welding machine is properly earthed.
- Remove all combustible material from welding area to avoid fire
- Place a fire extinguisher nearby welding premises.
- Ensure welding holder, cable and its lugs in good condition and use only industrial power socket and plugs (3 Pin) to avoid electricity risk.
- Make sure that welding machine is provided with ON/OFF switch and is earthed/grounding.
- Do not over load electrical appliances and cable, Shocked pin etc,
- Ground the work piece separately from the welding return connection only.

6.3 Gas Cutting

- Check the cylinder and its valve or leakage and move out any leaking cylinder immediately.
- Ensure that flash back arresters are installed with torch and NRV (Non-return valve) on the gas cylinders side.
- Ensure cylinders in vertical position (Cylinder trolley) and far away from fall of sparks and hot metal.
- Check the regulator and torches that they are inspected prior to every use.
- Check for leaks around regulators, hoses/fittings & nozzle with soap solution.
- Check the entire hose length if it is cracked or worn out cut that length of hose or replace the hose.
- Check that flash back arrester used for the purpose is of approved make/specification only.
- Place a fire extinguisher nearby welding premises.

6.4 Grinding Operation

- Grinding wheels should be stored in dry place.
- After expiry date, grinding wheel must be condemned, broken in to pieces.
- Power supply cable of adequate current carrying capacity shall be used and it should be in good workable condition without abrasions, cuts or puncture in outer insulation.
- Socket pin provided at supply end and on/off switch in working condition.
- Proper earthing of the body in case of metallic body.
- Wheel guard properly fitted in position.

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- Machine body without any damage like crack etc.
- Moving part (wheel) must be properly fixed to the machine with the help of spanner.
- Grinding wheel must be of suitable size as per the speed of grinding machine.
- Grinding wheel without manufacturer's sticker showing size, speed and expiry date must be condemned.
- Don't use portable grinding machine as bench grinder.
- Don't fit over size wheel than recommended size by machine/wheel manufacturer.
- Don't grind small, unstable object without fixing it in the vice.
- Don't over press the grinding wheel against the job for fast removal of metal.
- Put OFF the main switch, while machine is not in use (tea break etc.)
- Don't chip off grinding/cutting wheel for achieving fast cutting rate.

PPEs:

- Use of helmet, face shield or safety goggles (where face shield is not possible.) and hand gloves.

6.5 Use of Power Tools and Cables

- All electrical equipment and tools used by the contractors and their employees shall be properly checked by contractor's supervisor before use.
- All power tools must have proper guard at all time.
- Leads /cables must be placed so that they do not create a tripping hazard.

6.6 Material Handling and storage

The Contractor will only use crane/Hydra and lifting equipment that has been tested and certified as fit for purpose by 3rd Party. All crane operators and riggers will be adequately trained and certified. The Contractor will keep records of tests and certification of all lifting equipment crane employed on the Works.
Maintenance records shall be routinely inspected by the Contractor and made available for Safety audits.

LIFTING GEAR: Lifting machine, chains, ropes and lifting tackles used at site shall conform to the following:

- All parts shall be good construction, sound material and adequate strength and free from defects.
- Shall be properly maintained, thoroughly examined, load tested by competent person.
- No lifting machine and no chain, rope or lifting tackle shall except for purpose of test be loaded beyond safe working load must be plainly marked on the gear concerned.
- All material must be properly stacked and secured to prevent sliding, falling or collapse.
- Stairs and passage ways must be kept clear at all time.

6.7 Trenches and Excavation

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Before commencing any excavation work the Site in charge will ensure that the proposed works have been adequately assessed and planned to ensure that they are executed safely and without risks to Health and safety. The factors to be assessed and planned will include: -

- The nature and stability of the material being excavated and the need for any support of walls.
- The effect of excavation on nearby area.
- The foreseeable presence of hazardous contaminants.
- The proximity of mobile plant.
- The provision of edge protection (fall prevention of people and materials)
- Access and egress

6.8 Pipe Transportation and lowering

- All drivers shall hold a valid driving license for the class of vehicle.
- Securing of the load shall be according to established and approved methods.
- All overhangs shall be made clearly visible and restricted to acceptable limits.
- Load shall be checked before moving off and after traveling a suitable distance.
- All vehicles used by Contractors shall be in worthy condition and in conformance to the Land Transport requirement.
- Use of certified side booms after 3rd Party inspection.
- Effective communication should be done among all involved personals.
- Signaling shall be done by authorized foreman only.
- Ensure appropriate measures are taken for overhead hazards.
- Persons are not allowed towards trench side / under the boom at the time of lowering.
- Co-ordination of lowering in by a single man only.
- Inspection of equipment before use.
- All personnel should stay clear of moving equipment.
- Use of certified lifting tools and tackles.

6.9 Pressure / Leak Testing

Hydraulic and Pneumatic Test

Access to the test area shall be limited to essential personnel only. before the test commences compliance is required with the following points:

- Persons supervising pressure or leak tests must have sufficient knowledge and experience of testing to fully understand the hazards of the activity and the precaution, which must be taken.
- Effective communication, including formal procedures, must be established between sites whenever the test envelope extends beyond one site, for example, pipelines.
- The area shall be cordoned off (using tape, shields or barriers, etc) at an adequate

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distance from the equipment to be tested, as specified on the Permit to Work

- Warning signs shall be posted at access ways, at other strategic positions, and on the equipment to be tested (including the doors of test workshops or other designated areas
- Pressuring equipment shall be provided with suitably calibrated pressure control / regulator devices.
- Pressuring equipment shall not be left unattended at any time during the test.
- Pressuring equipment shall be isolated from the equipment under test and where practicable disconnected, when the test pressure has been reached.
- Care must be taken to ensure that materials of construction have the required ductility at the test temperature to prevent brittle fracture.
- A safety valve should be fitted to the equipment/system being tested, set to relieve at a pressure that will prevent over pressurization
- Sufficient venting / draining points shall be provided in order to prevent trapping of pressurizing medium behind non-return valves, check valves, between isolation valves, or within dead legs of the pressure envelope
- The equipment/plant to be pressure tested must be subjected to thorough examination prior to testing. It may be necessary to 100% inspect all welds using visual, radiographic or other NDT techniques
- The gas supply must be isolated when test pressure has been achieved
- The pressure envelope must contain sufficient vents, to a safe location.
- De-pressurization after pneumatic testing must be gradual

6.10 Scaffolding and Ladder

- All working platform must be constructed with the specific requirement of job.
- All portable ladders must be in good condition as per the site norms.
- If the working platform is not permanent then safety belt must be used.
- There shall be firm foundation for all scaffoldings. All scaffolding shall be made of sound material.
- Scaffolding material shall be inspected and used, only if found in good condition.
- Provide metal base plate is used under all upright or standard scaffoldings. Correct type of couplers shall be used for all connections.
- Plumb and level scaffoldings as erection proceeds, so that braces will fit without forcing. Fasten all braces securely.
- Working platforms shall be provided with guards. This should consist of top rail, mid rail, and toe board. The toe board shall be of minimum height 100 mm, while the mid rail and top rail shall be at heights of 600 mm and 1200 mm respectively.
- Do not use ladders or makeshift devices on top of scaffoldings to increase the height.

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- Shall be placed at least 75 deg. to the floor.
- Ladder shall extend 3" to 4" above the point of Landing and topmost 3 rungs shall not be used.
- Ladder is checked visually for defects before every use.
- Ladders shall not be used in a horizontal position as runways or scaffoldings.
- Ladders shall not be placed in front of a door that opens toward the ladder unless the door is locked, blocked or guarded.
- Fall arrestor to be used where ever applicable.

6.11 Work Permit Procedure

- For working at more than 10' height the permission must be obtained from site in-charge.
- For doing any Hot work in the fire risk areas the permission must be obtained from site in charge or safety officer.
- For any Excavation work it must be ensured that there are no under group utilities like cables, Water pipeline etc.
- For any work inside confined space, entry permit must be obtained from site engineer.

6.12 Barricades and Warning Signs

- Area where work is being carried out above man height or below 1' ground depth must be barricaded.
- Follow the instruction of all types of warning signs like "NO SMOKING" "NO ENTRY" "DANGER" "Work at height"

6.13 Emergency Plan and Procedures

- All Contractor's employees should be aware of site Emergency control plan
- Periodic drill to train employees for their awareness & information should be followed.

6.14 Road Safety Norms

- For roadside working site to be barricaded as per approved barricading norms Penalty clause for road safety & barricading shall be applicable as per relevant clause of commercial part of tender.
- Only eligible driver can drive required vehicle inside site
- Speed limit norms of site must be followed
- No riding or travelling on the back of open-end vehicle, fork lift or trailers should be done.

6.15 Labour Welfare & Legal Requirement

- All mandatory provisions with regard to safety as prescribed under contract Labour (Abolition & Regulation) Act 1970 and Rules made there under are applicable.
- Workmen compensation insurance and registration under ESI should be maintained.
- Time to time, all rules and regulations suggested by safety committee of site must be

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followed and implemented

ANNEXURE – A

RELEVANT IS-CODES FOR PERSONNEL PROTECTION

IS : 2925 – 1984	:	Industrial Safety Helmets.
IS : 4770 – 1968	:	Rubber gloves for electrical purposes
IS : 6994 – 1973 (Part – I)	:	Industrial Safety Gloves (Leather & Cotton)
IS : 1989 – 1986 (Part – I & III)	:	Leather safety boots and shoes
IS : 3738 – 1975	:	Rubber knee boots
IS : 5557 – 1969	:	Industrial and Safety rubber knee boots
IS : 6519 – 1971	:	Code of practice for selection, care and repair of Safety footwear
IS : 11226 – 1985	:	Leather Safety footwear having direct moulding sole
IS : 5983 – 1978	:	Eye protectors
IS : 9167 – 1979	:	Ear protectors.
IS : 3521 – 1983	:	Industrial Safety belts and harness

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ANNEXURE – B

FORMAT - 1.0

1.0: HEALTHY, SAFETY & ENVIRONMENT (HSE) PLAN

Project: ---------- Contractor: ----------

Date: ---------- Owner: …….

(To be prepared & submitted by each Construction Agency)

Activity Description	Procedure/ W.I./ Guidelines	Code of Conformance	Performing Function			Audit Function
			Performance	Checker	Approver	Customer Review/ Audit Requirements

PREPARED BY REVIEWED APPROVED BY

2.0 MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (1/6)

Project: _____ Contractor : _____

Date: _____ Owner : _____

Inspection By: _____

Note: write 'NC' (Not Concern) wherever any of the items are not applicable

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Sanitary facilities adequate and Clean				
Passageways and Walkways Clear				
General neatness of working areas				
Proper Material Storage				
Wooden Boards properly stacked and nails removed				
Cords, leads out of walk and traffic ways				
Scraps removed from the work site				
Other				
PERSONNEL PROTECTIVE EQUIPMENT				
Goggles: Shields				
Face protection				
Hearing protection				
Safety Shoes provided				
Hand protection				
Respiratory Masks etc.				
Safety Belts				
Safety Helmets				
Other				
EXCAVATIONS / OPENINGS				
Excavation permit				
Excavated earth kept away from edge				
Dewatering pump kept away from edge				
Safe access into excavated area				
Opening properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (2/6)

Item	Yes	No	Remark	Action
Welding Cutting				
Valid not work permit				
Flashback arrester provided for cylinders				
Power cable not crossing the welding cable				
Adequate earthing provided				
No combustible materials kept near welding & cutting works				
Gas cylinder chained upright & kept in trolleys				
Cables and hoses not obstructing				
Screens or shields used				
Flammable materials protected				
Fire extinguisher (s) accessible				
Other				
SCAFFOLDING				
Fully decked platform				
Guard and intermediate rails in place				
Toe boards in place & tied properly				
Adequate shoring				
Adequate access				
Other				
LADDERS				
Extension side rails I'm above				
Top of landing				
Properly secured at top & bottom				
Angle $\pm$ 70° from horizontal				
Other				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (3/6)

Item	Yes	No	Remark	Action
HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaves OK				
Condition of slings, chains, hooks and eyes OK				
Inspection and maintenance logs maintained				
Outriggers used				
Singh/ barricades provided				
Signals observed and understood				
Qualified operators				
Other				
MACHINERY, TOOLS AND EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspections and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Others				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (4/6)

Item	Yes	No	Remark	Action
TEMPORARY FACILITIES				
Emergency instruction posted				
Fire extinguishers provided				
Fire-aid equipment				
Secured against storm damage				
General nemeses				
In accordance with electrical requirements				
Other				
Fire Prevention				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas				
Hydrants clear				
Other				
ELECTRICAL				
Proper wiring &earthing				
ELCB’s provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Proper electrical cable joints				
Light poles secured				
Clear way to power distribution board				
Proper rating of fuses				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (5/6)

Item	Yes	No	Remark	Action
HANDLING AND STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguishers nearby				
Other				
WORKING AT HEIGHT				
Erection plan				
Safety nets				
Safety belts tied properly				
Illumination				
No loose material at height				
No body under working area				
All openings covered				
Other				
ENVIRONMENT				
Chemical and other Effluents properly disposed				
Cleaning liquid of pipes disposed of properly				
Seawater used for hydrotesting disposed off as per agreed proceeding				
Lubricant Waste/ Engine oils properly disposed				
Waster from Canteen office, sanitation etc. disposed properly				
Disposal of surplus earth stripping materials, Oily rags and combustible materials done properly				
Green belt protection.				

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MONTHLY CHECKLIST CUM COMPLIANCE REPORT REGARDING HSE (6/6)

Item	Yes	No	Remark	Action
HEALTH CHECK				
Hygienic conditions at labour camps OL				
Availability of First Aid facilities				
Proper sanitation at site, office and labour camps				
Arrangements of medical facility				
Measures for dealing with illness				
Availability of potable drinking waters for workmen & staff				
Provision of cretches for children				
ERECTION				
Slings/ D'shakle checked				
Signal Man				
Tag line for guiding the load				
Protecting the slings from sharp edges				
No loose materials at height				
Ladder & platform welding inspected				
No one under the suspended load				
Stay rope				
SWL				

Signature of Resident
Engineer with Seal

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Monthly Health, Safety & Environmental (HSE) Report
(To be submitted by each Contractor)

Actual work start date: _____

For the month of: _____

Project: _____

Report No.: _____

Name of the Contractor: _____

Status as on: _____

Name of Work: _____

Name of Safety officer: _____

Item	This Month	Cumulative
Total strength (Staff – Workmen)		
Number of HSE meeting organised at site		
Number of HSE awareness programmes conducted at site		
Whether workmen compensation policy taken	Y/N	
Whether workmen compensation policy valid	Y/N	
Whether workmen registered under ESI Act	Y/N	
Number of Fatal Accident		
Number of Loss Time Accident (Other than Fatal)		
Other accident (non loss time)		
Total No. of accident		
Total man-hours worked		
Man-hour loss due to fire and accident		
Compensation cases raised with insurance		
Compensation cases resolved and paid to workmen		

Remark

Date: _____/_____/_____

Safety Officer/RCM

(Signature and name)

To: OWNER..... 1 COPY

RCM/SITE-IN-CHARGE 1 COPY

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SUPPLEMENTARY ACCIDENT, INCIDENT&NEAR MISS REPORT

Project: _____ Supplementary to Report No.: _____

(Copy enclosed)

Site: _____ Date: _____

Contractor: _____

NAME OF THE INJURED……...
FATHER'S NAME…….
SUB-CONTRACTOR M/S…….
DATE & TIME OF ACCIDENT……
LOCATION……

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT

NATURE OF INJURY / DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICITIM/INJURED

SUGGESTED IMPROVEMENT IN THE WORKING CONDITION IF ANY

LOSS OF MANHOURS AND IMPACT ON SITE WORKS

ANY OTHER COMMENT BY SAFETY OFFICER

Date: _____/_____/_____/ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER 1 COPY

: RCM/SITE-IN-CHARGE 1 COPY

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ACCIDENT REPORT

(To be submitted by Contractor after every accident within 2 hours of accident)

Report No._____
Date: _____

Name of Site: _____
COTRACTOR_____

NAME OF THE INJURED …….
FATHER'S NAME……
SUB-CONTRACTOR M/S……..
DATE & TIME OF ACCIDENT……
LOCATION……

BRIEF DESCRIPTION OF ACCIDENT

CAUSE OF ACCIDENT

NATURE OF INJURY / DAMAGE

MEDICAL AID PROVIDED / ACTIONS TAKEN

INTIMATION TO LOCAL AUTHORITIES

Date: _____/_____/_____/ SIGNATURE OF CONTRACTOR WITH SEAL

To : OWNER 1 COPY
: RCM/SITE-IN-CHARGE 1 COPY

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
PRE-COMMISSIONING
& COMMISSIONING OF PIPELINE SYSTEM

VPC – SS – PP - 2022

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
00	28.01.2020	MB	MC	AD	SK

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ABBREVIATIONS:

NACE	National Association of Corrosion Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing of Materials
BHN	Brinell hardness number
MSS-SP	Manufacturers Standardization Society - Standard Practice
LTCS	Low temperature Carbon Steel AS Alloy Steel

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1.0 SCOPE

The specification covers the minimum technical requirements for testing and commissioning of entire pipeline facilities including Commissioning activities such as pre-commissioning checks, dewatering, swabbing, flushing/blowing, leak testing etc.

2.0 GENERAL

The scope of work for testing & commissioning including Pre – Commissioning actives shall include but not limited to the manpower, machinery & equipments, detailed Procedures, Materials & Consumable, Communications etc. to perform the work satisfactorily.

Contractor shall prepare detailed procedures for piping, dewatering, swabbing, pigging & commissioning of the pipeline, covering all aspects of work for owner's approval.

Contractors shall design & supply all temporary line connections Valves, Instruments, as required during the various operations.

In the event of any details which are not fully addressed, it is warranted by Contractor that work shall be performed in accordance with the specification & the best recognized practices in the onshore pipeline industry.

3.0 RESPONSIBILITY OF CONTRACTOR

The pipeline contractor shall be responsible for all the pre-commissioning and commissioning activities that need to be carried out for the project.

3.1 Pre-commissioning

In order to execute and perform pre-commissioning activities, the pipeline contractor shall be responsible for (but not limited to) the following: -

- Carrying out pre-commissioning checks of the pipeline system including Tap-off Stations/Receipt Stations, Sectionalizing Valve (SV) Stations and their associated facilities under the scope of work to ascertain that the project has been mechanically completed in all respects.
- Checking of field instruments, laying out survey of pipeline, checking of communication system, checking of Electrical, Instrumentation system, controls & interlock etc.
- Dewatering of Pipeline and above ground piping, flushing/air-blowing and leak testing of piping i.e. piping and equipments under their scope of work.
- Supply and supervision of manpower for pre-commissioning.
- Operation of machinery and equipment for pre-commissioning.
- Supply and use of materials/consumables as required for the pre-commissioning activities.
- Erection of all temporary facilities like pig launcher/receiver, line connections, spool pieces, pigs and requisite accessories, valves, instruments, manpower etc. as required during various operations.

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- Preparation of detailed pre-commissioning procedures, activity schedules, bar charts, schemes etc.

  This shall include preparation of detailed procedures for dewatering, electronic geometric pigging / caliper pigging (By other Contractor), idle time preservation (if applicable), removal of idle time preservers (if applicable, flushing/blowing, leak testing and shall address the sequence and methodology describing all operations, data on materials, equipments, instruments, consumables (e.g. Pigs and associated items), communication systems, necessary calculations, detailed time schedule and organization chart.

- All necessary work to perform the job successfully including all modifications that would be required at various stages.

The pipeline contractor shall demonstrate to the Owner / Consultant (for approval) the successful completion of all the above-mentioned activities.

In the event of any detail, which is not fully addressed, the pipeline contractor should warrant that work shall be performed in accordance with the relevant codes, Owner / Consultant's specifications and the best recognized engineering guidelines and practices being followed in the on-shore gas pipeline industry.

3.2 Commissioning

In order to execute and perform commissioning related activities, the pipeline contractor shall be responsible for providing all support/ assistance required for commissioning under the overall guidance and supervision of Owner / Consultant. Contractor shall submit a detailed commissioning procedure for Owner / Consultant approval.

The pipeline contractor shall be also responsible to coordinate with the Composite Contractor(s), who is responsible for commissioning of the cathodic protection of the entire pipeline so that the commissioning process can proceed uninterruptedly in a harmonious manner for the entire project.

Commissioning assistance broadly covers the following activities:

- Commissioning checks including Safety Review prior to start of commissioning activities to achieve 'Ready for commissioning' status for pipeline

- Surveillance of pipeline and attending leaks and operation of SVs and metering station (at Dispatch Station/Tap-Off Station/Receipt Stations, IDS whenever required).

- Supply and supervision of manpower for commissioning. Manning of SV and Tap-Off Station/Receipt Stations for pig tracking, pig receiving and other activities.

- Supply and operation of machinery and equipment for commissioning, if required.

- Supply of Nitrogen and its associated accessories for purging required for carrying out commissioning.

- Supply and use of materials/consumables as required for the commissioning activities.

- Any other assistance required by Owner / Consultant.

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- Erection and supply of all temporary line connections, spool pieces, strainers, valves, instruments, manpower etc. as required during various operations.
- Ensuring all communication facilities is in place and in proper working condition prior to start of commissioning activities of the pipeline system.

- Stabilization and total system operation for 72 hrs. with all instruments controls & interlocks working satisfactorily at normal operating conditions. On completion of this stage one-month operating run period will start.

- All necessary work to perform the job successfully including all modifications that would be required.

In the event of any detail, which is not fully addressed, contractor should warrant that work should be performed in accordance with the relevant codes, Owner's specifications and the best recognized engineering guidelines and practices being followed in the onshore pipeline industry.

3.3 Pre-commissioning Activities

3.3.1 PRE-COMMISSIONING CHECKS

Pre-commissioning checks shall be carried out for the pipeline system to ascertain that the pipeline system has been mechanically completed in all respect. These checks shall cover all the facilities of the main pipeline, including Metering Stations, tap-Off Stations, Receipt Stations, Sectionalizing Valve Stations, as applicable. The pre-commissioning checks shall include the following:

a) System Checks

The entire facilities shall be checked against the latest P&ID's, Engineering and Vendor Drawings/Documents and other design specifications. Any shortcoming observed shall be listed down in the form of punch lists and these should be duly attended or liquidated. The pipeline contractor should check the stations systems from the angle of pre-commissioning and commissioning and spell out any additional requirement of vents/drains, temporary arrangement/modification etc. that may be required during the pre-commissioning and commissioning activities and arrange for the same in consultation with the Owner / Consultant representative.

b) Checking of Field Instrument

All the field instruments like actuated valves, shutdown valves, transmitters, solenoid valves, shut down switches, alarms etc. shall be checked physically and also for their intended application by simulating the actual conditions. It will also include checking of different meters, gauges, action of actuated valves, control valves, shutdown valves etc.

c) Survey of the Pipelines

This shall be performed to confirm that proper fittings/ supports, Cathodic protection system, route markers, warning signs, fencing around SV stations, etc. have been installed along the pipeline.

d) Checking of Communication System

This is to check that there is proper communication with adequate back-up power to ensure uninterrupted communication.

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e) Checking of Electrical Distribution System

This is to ensure safety and also to ensure an uninterrupted power supply during start-up and normal pipeline operation.

f) Checking of Instrument, controls & Interlocks

This is to check that instrument controls and interlocks are functional as per the normal operating conditions.

g) Checking of Utilities

This is to check that utilities like power system, etc. are available prior to start-up.

h) Any other checks as may be considered necessary.

3.3.2 PRE-COMMISSIONING WORKS FOR THE ABOVE GROUND PIPING (DISPATCH STATION, METERING STATIONS, RECEIPT STATIONS ETC. UNDER THE SCOPE OF WORK)

3.3.2.1Dewatering (Hydro Test Water)

- General

  Dewatering of a piping system shall be done subsequent to the hydro-test of the respective piping section. During the dewatering operation, the major quantity (to the maximum extent possible) of hydro-test water shall be removed from the main interconnecting piping work in the stations. A standard blind shall be arranged and provided at the inlet and outlet nozzles of pumps and sump tank to avoid entry of debris/dirt/mud etc., before start-up of pre-commissioning activities.

- Operational Requirements

  The dewatering operation of the piping work in the stations shall consist of physically draining the water content in the piping work by opening low point drains and/or end flanges. If required, air shall be used to push-off water from the pipes. The pipeline contractor shall arrange suitable compressor for such purposes.

- Flushing/Blowing of Aboveground Piping in the Terminal

  Flushing/blowing of the above ground piping with water/air to remove debris/dirt/mud from within the piping has to be performed by the pipeline contractor. Subsequent to water flushing, to ensure complete cleanliness of the piping work, air blowing/cardboard blasting method has to be adopted. All instruments, control valves, orifice plates etc. to be dismantled from the piping work and any gap produced should be bridged with suitable temporary spool. Proper supporting of the piping, during such flushing/blowing activities is to be ensured by the pipeline contractor.

  The pipeline contractor has to make arrangement of clean water/air for these flushing / blowing activities.

  The pipeline contractor should submit a plan/methodology for carrying out such activities detailing out each aspect/step.

- Acceptance Criteria

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The pipeline contractor shall specify when flushing/air blowing is completed to the satisfaction of the Owner/Consultant, and shall obtain approval of the Owner/Consultant before proceeding to the next step.

3.3.2.2Internal Cleaning of Equipment

- General

  Equipments like filters, Corrosion Inhibitor Dosing Tanks, Sump Tanks are to be checked for internal cleanliness and shall be ensured by the pipeline contractor.

- Acceptance Criteria

  The laying contractor has to demonstrate cleanliness of the internals of all equipment to the satisfaction of the Owner/Consultant and obtain approval for final box up of the equipment.

3.3.2.3After dewatering / swabbing is over & all functional checks carried out as specified in pre-commissioning checks, drying of the pipeline is to be closed out with compressed air. The pipeline shall be dried to achieve a content dew point of -80 Deg C.

3.3.2.4Trial Run of Rotating Equipments

The pipeline contractor has to arrange for trial run of the sump pump with water for short duration of time.

The pipeline contractor has to arrange all temporary arrangements required for such trial runs. The pipeline contractor has to submit procedure/method statement regarding how he plans to take such trial runs and take approval of the Owner/Consultant, before actually proceeding for the same. If pump vendor(s) is available for such trial run, the pipeline contractor has to provide all sorts of assistance to the vendor and help the vendor in completing the successful trial run.

3.4 Commissioning Related Activities

3.4.1 Safety Review Prior to Start of Commissioning Activities

A pre-start-up safety review of the cross-country pipeline system shall be arranged by the pipeline contractor, involving all concerned in the commissioning. The Owner/Consultant shall also participate in the pre-start-up safety review. The pipeline contractor shall generate all requisite formats to record the findings of such Safety Review.

3.4.2 Ready for Commissioning

After completion of pre-commissioning activities and Owner approved safety start-up review followed by liquidation of review punch list points, the pipeline contractor shall notify the Owner/Consultant that the pipeline systems in totality are ready in all respects for hydrocarbon-in. 'Ready for commissioning status' shall be jointly assessed by Owner/Consultant, composite work contractor, Pipeline contractor. After such joint assessment, if all the criteria are met, it will then be declared by the Owner that the entire pipeline system has reached a stage of 'Ready for Commissioning'.

It should be noted that if the actual commissioning of the stations is taken up after idle time of sufficient length, then before starting the rotating equipment again, provisioning

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of the rotating equipments has to be done in presence of pump vendor(s). The pipeline contractor has to provide all sorts of assistance during such provisioning activities.

3.4.3 Commissioning and Stabilization

The pipeline contractor shall be responsible for providing all necessary assistance to carry out commissioning activities under the overall guidance and supervision of Owner/Consultant for the entire pipeline system.

Commissioning of pipeline shall be considered completed when the line is charged with product natural gas at operating pressure and the total system operated at normal operating pressure for a minimum period of 72 hrs. with all the instruments, controls & interlock satisfactorily at normal operating conditions. Contractor shall submit a detailed commissioning procedure for owner's approval.

4.0 DOCUMENTATION

The pipeline contractor shall submit the complete description, detailed procedures and time schedule for all of the following activities for approval of the Owner/Consultant.

- Pre-commissioning Checks
- Dewatering
- Swabbing
- Flushing / Blowing
- Low Pressure Leak Test with Air
- Drying
- Idle Time Preservation (if applicable), including Removal of Preservers

All these documents should be prepared covering all aspects of HSE, quality assurance and quality control plans.

The pipeline contractor shall ensure that his documents are related to "as-built" conditions of the pipeline, equipment and structures involved.

Documents shall also contain all safety plans, procedures to be followed while carrying out the activities.

Upon successful completion of the work, the pipeline contractor shall prepare a final report of the work which shall include necessary charts, diagrams, graphs, calculations, recordings, daily logs, measurements, details of the operation etc. Report shall also include all certificates of calibration of instruments required, together with records of calibration performed at site prior to the start of any operation and the approved pre-commissioning and commissioning formats and check sheets.

5.0 SPARES AND CONSUMABLES

The pipeline contractor shall identify and arrange for supply of manpower, spares, tools, tackles and consumables as required for pre-commissioning and commissioning activities.

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6.0 SAFETY

The pipeline contractor shall follow the safety practices during execution of pre-commissioning and commissioning works as detailed in the scope of work. The pipeline contractor shall also maintain and follow all safety practices equivalent or better than those being practiced by the industry during pre-commissioning and commissioning activities. A dedicated safety department from the pipeline contractor's side should be available for the job.

7.0 OTHERS

The pipeline contractor, along with his bid documents, is required to submit the following:

- Execution plan and method statement for pre-commissioning and commissioning activities.
- Past experience of pre-commissioning and commissioning activities carried out for a similar pipeline system / network.

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR

REPAIR OF POLYTHYLENE COATING

VPC – SS – PP -2027

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
00	28.01.2020	MB	MD	AD	SK

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	28.01.2020					
		MB	MD	AD	SK	

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ABBREVIATIONS:

DC	:	Direct Current
EN	:	European Standard
KV	:	Kilo Volt

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1.0 SCOPE

This specification covers the minimum requirements for materials and equipment, application procedure and inspection of repair of damaged Polyethylene coatings on steel pipes. This specification is applicable for repairing damages less than 100mm x 100 mm for pipe sizes less than 10", 150mm x 150mm for pipe sizes between 12" to 28" and 300mm x 300mm for pipe sizes more than 28".

If damaged area of coating of the pipeline is larger than above, heat shrinkable sleeve is recommended.

The repair shall be carried out using repair patch made of radiation cross-linked polyolefin backing, coated on the inside with semi-crystalline thermoplastic adhesive and filler mastic.

The repair patch shall have thermal indicators to ensure correct heat is being applied during application.

2.0 MATERIAL AND EQUIPMENT

2.1 The repair material shall be as under:

a) Repair Patch: radiation cross-linked HDPE (Unexpanded High density polyethylene) with semi-crystalline thermoplastic adhesive.

b) Mastic Filler

c) Melt stick shall be Co-Polymer based and same shall be heat sensitive.

d) Liquid Epoxy Primer (two pack)

2.2 The repair material shall be certified by DIN to meet the requirements of EN12068 Stress Class CHT 80

2.3 The material shall not be older than their period of validity at the time of application by the Contractor. Deteriorated/decomposed materials shall not be used.

2.4 Materials shall be stored in sheltered storages in the manufacturer's original packing away from direct sunlight and in accordance with manufacturer's instructions.

2.5 Contractor shall supply all equipment and manpower required for a skilful application in the field in accordance with the specification.

3.0 APPLICATION PROCEDURE

3.1 The application procedure to be followed for holiday type of damage shall be in accordance with manufacturer's instruction and minimum requirement specified below whichever are the more stringent.

3.1.1 Preparation

Remove coating from damaged area with knife, scraper or power brush. Scrap off the damaged area and adjacent coating to remove oil, grease, rust, dirt and moisture. Pipe surface shall be prepared to SA 2½.

3.1.2 Preheating

Preheat the exposed bare metal surface to approx. 80° C and adjacent pipe coating to approx. 60° C with a torch moved back and forth over the surface. Upon preheating, the

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pipe surface shall be applied with the two pack epoxy primer to ensure a minimum wet film thickness of not less than 200 microns to cover the exposed base metal.

3.1.3 Application of the Filler

Plastic filler shall be cut to size and applied to all exposed metal surface. The mastic shall be heated and smoothed down with a paint scraper to cover all bare metal in a manner such that all entrapped air is removed and mill applied coating thickness of the pipe is restored.

3.1.4 Application of repair tape

A patch shall be cut from the tape in a manner such that it extends 50 mm (2 inch) beyond the damaged area on all sides. The patch shall be positioned over the damaged area and heated until the temperature sensitive paint on the outside of the patch changes colour or dimples on the backing vanish. It shall be smoothed down to confirm with the contour of lap, and shall be freed of any air bubbles or wrinkles.

3.2 For cosmetic type of defects such as minor gouging, tearing, and/or scratches, which do not indicate holiday during holiday inspection, following procedure shall be adopted.

3.2.1 The defective area shall be roughened to remove loose polyethylene coating, oil, grease, dirt, etc.

3.2.2 This shall be followed by application of patch as detailed in clause 3.1.4.

4.0 INSPECTION AND TEST

4.1 A visual inspection shall be carried out for the following:

- Mastic extrusion on ends of the patch shall be examined.
- There shall be no sign of punctures or pinholes or bend failure. The external appearance of the patch shall be smooth, free from dimples, air entrapment or void formation.
- The entire closure patch shall have changed colour uniformly.

4.2 Holiday Inspection

The holiday detector used shall be checked and calibrated daily with an accurate D.C. Voltmeter. The detector electrode shall be in direct contact with the surface of coating to be inspected.

The entire surface of the repaired section shall be inspected by means of a full circle holiday detector approved by Owner set to a D.C. Voltage of at least 25 KV. Inspection of repaired patch shall be conducted only after it has cooled below 50° C.

4.3 Procedure qualification shall be carried out for repair patch. The value for peel strength to pipe surface and to factory coating carried out as per EN 12068 shall be 0.5 N/mm minimum at 60°C.

4.4 All repaired joint shall be approved by the Owner.

5.0 DOCUMENTATION

5.1 Prior to procurement of coating repair materials, Contractor shall furnish four copies of,

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but not limited to, the following for qualification of the Manufacturer and material:

i) Complete descriptive technical catalogs describing the materials offered along with samples of repair coating materials, its properties and installation instruction as applicable specifically to the project.

ii) Test certificate and results of previously conducted tests from independent inspection agency, for properties listed in Para 4.3 of this specification.

iii) Reference list of previous supplies of the similar material indicating the project details such as diameter, quantity, service conditions, year of supply, project name, contact person and feedback on performance.

Once the Company's approval has been given, any change in material or Manufacturer shall be notified to Company, whose approval in writing of all changes shall be obtained before the materials are manufactured.

5.2 Prior to shipment of materials from the Manufacturer's works, Contractor shall furnish six hard copies and an electronic copy of the following:

i) Test certificates for each batch of materials.
ii) Specific installation instruction with pictorial illustrations.
iii) Specific storage and handling instructions.

5.3 All documents shall be in English Language only.

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION

FOR
QUALITY MANAGEMENT SYSTEM

VPC – SS – PP - 2028

Rev. No	Date	Prepared By	Checked By	Approved By	Authorized By
00	28.01.2020	MB	MD	AD	SK

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REVISION RECORD						
Rev.	**Revision Date**	**Prepared by**	**Checked by**	**Approved by**	**Authorized by**	**Revision Description**
00	28.01.2020					
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1.0 SCOPE

This document covers minimum requirement for Quality Management system (QMS) to be met with by the manufacturers, suppliers or service providers (herein after called Contractors) to ensure that only quality products/services are delivered to the purchaser/Owner (herein after called Company).

2.0 GENERAL REQUIREMENT

2.1 The Contractor shall have established and in operation a QMS which fully complies with requirements of ISO 9001 – 2008 or equivalent standard for Quality Management System. The established and in operation QMS shall be such that all quality related activities related to the execution of contract are well planned and controlled systematically to ensure end goal of delivering product/service of required standard of quality.

2.2 The QMS shall be well documented and understood by all, including Sub Contractors/suppliers, concerned with delivery of product/service to the Company.

2.3 The Contractor shall draw a project specific quality plan based on his organization's Quality Manual and standard Quality Plan and same is to be implemented throughout the period of project execution.

2.4 The quality plan thus prepared shall be such that specified and intended requirements of the contract are fully understood by all and duly met with while delivering produce/service.

3.0 QUALITY SYSTEM REQUIREMENT

3.1 DOCUMENTATION REQUIREMENT

3.1.1 Documents to be submitted at the time of bidding.

Following QMS documents shall be submitted by the Contractor intending to bid for project at the time of submitting their bids:

a) Corporate Quality Policy document duly signed by the Corporate Head or any other Authorized representative.

b) Documents in support of successful implementation of Quality Management System (QMS) within the organization of the contractor such as certificate of quality system registration, previous project Quality Plans, Company`s Quality Manual, and Quality Audit reports etc.

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(c) Project Specific Quality Plan demonstrating the proposed method for achieving the Quality Objectives which shall as a minimum conform to ISO 9001:2008 or equivalent.

(d) CVs of the personnel proposed for job execution. Failure to submit the above Quality documents is liable to cause rejection of the bid.

3.1.2 Documents to be submitted after award of contract.

Within two (2) weeks after award of Contract and, in any case prior to commencement of any project related activity, the contractor shall provide, as a minimum, the following documents :

a) Job specific Quality Plan, Procedures, and Work Instructions, job specific Inspection and Test Plans (ITP) and Reporting Formats (Quality Records)

b) Project Specific Organization chart with responsibilities and authorities clearly defined for each specific role for complete organization and organization proposed for job execution.

c) Procedure to calibrate and maintain required measuring and test equipment.

d) Procedure for tracing the root cause for non-conformance and segregation of Non-confirming product/services.

e) Procedure for Management of change.

f) Plan and procedure for periodical internal Quality Audit for duration of contract.

g) Procedure for control of non-confirming products

h) Procedure for documentation control Project Contracted work can commence only after obtaining written approval of above documentation from Company.

In addition, following documentation shall be maintained by the Contractor for submission to Company on demand at any point of time during the execution of the project.

a) Project Quality Manual

b) Reports of internal and external Quality Audits conducted during execution of contract.

c) Corrective Action Report on the project audits observations/non-conformities reported.

Upon completion of Contract, the Contractor shall compile and submit a dossier containing quality records including exceptions/deviations granted by Company, non-conformance records, audit records or any other quality related records applicable to the works covered under contract.

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3.2 FUNCTIONAL REQUIREMENT FOR QUALITY SYSTEM IMPLEMENTATION

3.2.1 Experienced, knowledgeable and qualified personnel shall be deployed for execution of various activities related to work covered under Contract. Contractor shall arrange for adequate infrastructure and suitable work environment to ensure that the specification and quality of the product/services are maintained. Responsibilities and Authorities shall be communicated to all personnel identified for execution of work covered under Contract.

3.2.2 Contractor to ensure that the Authority responsible for job execution has communicated the Contract requirements, including all identified or intended statutory and regulatory requirement, to all concerned in their organization and subcontractor's organization who are to participate in the work execution.

3.2.3 Contractor shall implement, maintain and operate project specific QMS approved by Company.

3.2.4 The Contractor shall do advance quality planning, for all activities involved in delivery Of product/services, which shall cover as minimum:

A) Resource Planning
B) Identification of Product/Service characteristics required to be controlled to ensure quality
C) Identify process characteristics for realization of intended product/service characteristics
D) Identify measurement and test requirement and define acceptance criteria for same.
E) Generation and management of records
F) Any additional procedures required to be developed specific to the Project.

3.2.5 Based on above the Contractor shall prepare and submit, for Company review and approval, a project specific Quality Plan, Inspection and Test Plan and work execution procedures for contracted work scope. The Quality Plan shall address all of the applicable elements of ISO 9001-2008, identify responsible parties, within Contractor`s organization, for the implementation / control of each area, reference the applicable procedures used to control and verify the documents produced for each area of working. Approved Quality Plan, ITP`s and work procedure shall be available at its working place and well understood by concern personals.

3.2.6 During execution of work, Company reserves the right to undertake QMS Audit as deemed necessary to assess the effectiveness of the implementation of Contractor's quality management system.

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3.2.7 Contractor shall validate all processes for production and/or services for which output cannot be verified by monitoring and measurements during execution. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.

3.2.8 Contractor shall establish a system for identification and traceability of product/deliverable throughout product realization.

3.2.9 Contractor shall identify, verify, protect and safeguard Company's property (materials/documents) provided for use or incorporation in to the product/service. If any property is lost, damaged, misused or otherwise found to be unsuitable for use, this shall be reported to Company at the earliest.

3.2.10 Contractor shall establish system to ensure that inspection and testing activities are carried out in a manner that is consistent with the requirements. Measuring equipment shall be calibrated at specified frequency against national or international standards. Where no such standard exits, the basis used for calibration shall be recorded. Calibration certificate shall be available for review by Company on demand.

3.2.11 Contractor shall monitor and measure the characteristics of the product/deliverable to verify that contract requirement has been met. The inspection (stage wise as well as final) by Contractor and Company personnel shall be carried out as per approved ITPs.

3.2.12 Non-conformities (NCs) / deficiencies found by Contractor's inspection /surveillance staff or observed by Company representative shall be duly recorded, including their disposal action and resolved. Effective corrective and preventive action plan shall be implemented by Contractor to prevent recurrence.

3.2.13 Deviation from the approved drawings / specification shall be intimated to Company in advance and specific waiver from Company shall be obtained. Any un-approved deviation shall be treated as non-conformity and a Non Conformance Reports (NCR) shall be raised and processed as per approved procedure.

3.2.14 All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, and handed over to Company as per contract requirement or disposed as per relevant project procedure.

3.2.15 The Contractor shall note that product/service will be considered to have been delivered after complete records have been submitted to the Company and the Company has accepted the same.

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3.3 QUALITY CHECKS AND AUDITS

During approval of QMS document, Company will identify the stage and extent of its involvement during inspection and testing of product. Company may put on 'HOLD' activities that must be reviewed by Company before work proceeds further that could obstruct necessary verification of the submitted activity. For such inspections Company may require work to be held until Company informs whether or not its representative will attend to witness the inspection/testing.

Contractor shall plan and carryout the QMS audit for the job. Quality Audit program shall cover design, procurement, construction management and commissioning, as applicable, including activities carried out by sub-vendors and sub-contractors. This shall be additional to the surveillance audits carried out certification/recertification of QMS of Contractor`s Organization.

The audit program and audit reports shall be submitted to Company for information. Company reserves the right to attend, as a witness, any audit conducted during the execution of the works.

In addition to above, Company and/or independent Third Party Inspection Agency (TPI) engaged for the project may also perform Quality and Technical Compliance Audits. Contractor shall provide assistance and access to its systems and sub-contractor/vendor`s systems, as may be required for the purpose.

Company will not act as an inspector for the work being carried out. This responsibility lies entirely on the Contractor, who must fulfil it at all times, for all work, in accordance with the Company approved QMS. Company's actions will be to audit the compliance of the QMS by the Contractor, by varying degrees of review or involvement on the activities performed by the Contractor.

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ENERGISING QUALITY	**PROJECT NUMBER: 1015**	

BEND THINNING CALCULATION			Client Job Number	BEN-006-4100000327-047-04.02.2019	
			Total Sheets	05	
Document No	1015	47	PP	CAL	2003

GAIL (INDIA) LIMITED

REROUTING / SHIFTING OF 18" PIPELINE AT 2 LOCATIONS IN BANGALORE REGION

BEND THINNING CALCULATION

REV	DATE	DESCRIPTION	PREP	CHKD	APPR
C1	29.03.2020	ISSUED FOR CLIENT REVIEW	AK	MD	AD

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1.0 INTRODUCTION

GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain and its related services. In a rapidly changing scenario, GAIL is spearheading the move to a new era of clean fuel industrialization, creating a quadrilateral of green energy corridors that connect major consumption center in India with major Gas Fields, LNG terminals and other cross border gas sourcing points. GAIL is also expanding its business to become a player in the International Market. M/s. GAIL (India) Limited envisages to strengthen local gas grid network in various parts of India.

VCS Quality Services Private Limited has been appointed as Engineering Consultant by GAIL for "REROUTING / SHIFTING OF 18" PIPELINE AT 2 LOCATIONS IN BANGALORE REGION" due to coinciding with Proposed Metro corridor in Bangalore City.

BEND THINING CALCULATION

P, Design pressure	96.1	barg	9.61	Mpa	9.61	=N/MM2
D, Diameter	457.2	mm				
S, SMYS	484.7	MPA	48.47	Mpa	48.47	=N/MM2
T (temperature Derating Factor)	1					
E, Welding Factor	1					
DF (Design Factor)	0.4					
R,(Bend Radius 5D Or 6D)	6					
Tr, (Calculated thickness based on Hoop Stress)	11.33096	mm				
CA, Corrosion Allowance	0	mm				
THICKESS AFTER ADDING CA	11.33096	mm				
SELECTED MOTHER THK	14.27					
12.5% of Mother thickness	1.78375	note-1				
t, AFTER DEDUCTING 12.5%	12.48625					

Bend Thinning as per BS 8010

S No.	Dia (mm)	t (Mother pipe thickness after Deducting 12.5% mill tolerance)	R (Bend radius 5D or 6D)	n	Bend Thinning %	tb (Thickness After Bending)	Te=tb-CA	tr	Result te ≥ tr
1	457.2	12.48625	6	5.50	7.69	11.53	11.53	11.331	Design is Safe

HOOP STRESS Calculated based on Te	190.603	Mpa or N/mm2
Allowable Hoop stress	193.88	Mpa or N/mm2
SAFE OR UNSAFE	**SAFE**	

Note-1: Mill tolerance will change as per API 5L based on thickness, Size and type of manufacturing of line pipe.

ENERGISING QUALITY	**PROJECT NUMBER : 1015**	

SCOPE OF WORK-CIVIL/STRUCTURAL & ARCHITECTURAL	**CLIENT JOB NO**	BEN-006-4100000327-047-04.02.2019
	TOTAL SHEETS	**4**

DOCUMENT NO	1015	47	CS	SOW	6001

GAIL (INDIA) LIMITED

RE-ROUTING OF 18" PIPELINE IN BANGALORE REGION

SCOPE OF WORK
CIVIL/STRUCTURAL & ARCHITECTURAL

REV	DATE	DESCRIPTION	PREP	CHK	APPR
C1	31.03.2020	ISSUED FOR REVIEW	SKS	MO	RKB/GDS

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1. INTRODUCTION

GAIL (India) Limited, is India's flagship Natural Gas company, integrating all aspects of the Natural Gas value chain and its related services. In a rapidly changing scenario, GAIL is spearheading the move to a new era of clean fuel industrialization, creating a quadrilateral of green energy corridors that connect major consumption center in India with major Gas Fields, LNG terminals and other cross border gas sourcing points. GAIL is also expanding its business to become a player in the International Market. M/s. GAIL (India) Limited envisages to strengthen local gas grid network in various parts of India.

VCS Quality Services Private Limited has been appointed as Engineering Consultant by GAIL for the project "**RE-ROUTING OF 18" PIPELINE IN BANGALORE REGION".**

2. SCOPE OF WORK

The scope of civil / structural and Architectural works under this Contract shall include Residual Engineering, detailing, supply and construction of all relevant civil / structural and Architectural works as per Design Basis, Specifications, standards, Addendums and Drawings enclosed with the bid document.

All detailed engineering drawings shall be issued to the successful bidder.

Major Civil / Structural and Architectural works involved shall include but not be limited to the following:

a. Earthwork and Backfilling in Foundation including dewatering during excavation, if required.

b. In service pipeline safety protection against accidental damage & protection slab for pipeline.

c. Foundation for markers and signages.

d. Breaking and making/restoring good the existing roads; pipe/electrical/instrumentation cable crossings etc.

e. Dismantling of existing masonry, concrete and steel structures, road, footpath, fence & other related civil structures.

f. As built drawings / documents of station.

g. For scope of other Civil Structural works, Pipeline, Instrumentation, Mechanical and Electrical scope of works shall also be referred to.

h. Any other civil and structural works required/directed by Engineer-in-charge for the satisfactory and successful completion of the project shall be included in the lump sum cost and at no extra cost to the owner.

3. SCOPE OF SUPPLY

All materials (consumables/non-consumables) including cement, structural steel and reinforcement bars required to complete the Civil / Structural & Architectural works including Tools & Tackles shall be supplied by the Contractor.

4. LIST OF STANDARDS, SPECIFICATIONS & DRAWINGS

Are attached elsewhere in the Tender.

ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
PLAIN AND REINFORCED CEMENT CONCRETE

VPC-SS-CS-023

Rev. No	Date	Purpose	Prepared By	Checked By	Approved By	Approved By
01	16.10.2019	RE-ISSUED AS STANDARD SPECIFICATION	MA	MO	AD	SK
00	05.07.2017	ISSUED AS STANDARD SPECIFICATION	MA	MO	AD	SK

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ABBREVIATION

m	Metre
mm	Millimetre
m^2	Square metre
m^3	Cubic metre
Kg/m^2	Kilogram per Square Metre
Kg/m^3	Kilogram per Cubic Metre
IS	Indian Standard
BIS	Bureau of Indian Standards
BS	British Standard
PVC	Poly Vinyl Chloride

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1.0 SCOPE

This specification is applicable for Concrete Grade up to M55 and establishes the requirements of materials, mix proportioning, placing, curing, etc. of all types of cast-in-situ and precast concrete used in foundations, underground and over ground structures, floors, pavements etc. Any special requirements as shown or noted on the drawings shall supersede over the provisions of this specifications.

2.0 REFERENCE

Apart from this specification, construction of plain and reinforced concrete works shall be in accordance with the Indian Standard Code of Practice for "Plain and Reinforced Concrete" IS: 456 and other relevant codes mentioned therein.

2.1 For Liquid Retaining Structures relevant Specification shall be applicable.

2.2 For Structural Steel works Specification No. VPC-SS-CS-024 & 026 shall be applicable.

2.3 In case of conflict between the clauses mentioned in this specification and those in the Bureau of Indian Standards (BIS), this specification shall govern.

3.0 MATERIALS

3.1 Materials for concrete viz. cement, Pozzolanas, Fly Ash, Ground Granulated Blast Furnace Slag, sand, coarse aggregate, water, etc. shall be as described in Specification No. VPC-SS-CS-021.

3.2 Materials for all reinforcements, embedment, inserts, water bars etc. shall conform to Specification No. VPC-SS-CS-021.

3.3 Materials suggested to be used as additive to concrete shall conform to Specification No. VPC-SS-CS-021.

4.0 GRADES OF CONCRETE

Characteristic Compressive strength for different grades of concrete shall be as per Table-1.

TABLE – 1

GRADES OF CONCRETE

Grade Designation	Specified Characteristic Compressive Strength of 150 mm cube at 28 days (N/mm^2)
M 15	15
M 20	20
M 25	25
M30	30
M35	35
M 40	40
M 45	45

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M 50 M 55	50 55

Note for Table - 1: The characteristic strength is defined as the strength of material below which not more than five (5) percent of the test results are expected to fall.

5.0 TYPE OF CONCRETE MIX

5.1 Unless otherwise noted on drawings, all lean/plain and reinforced concrete shall be nominal mix and design mix types, respectively.

5.2 NOMINAL MIX CONCRETE

This concrete shall be made (without preliminary tests) by adopting nominal concrete mix with proportions of materials as specified in clause no. 9 of IS: 456.

5.3 DESIGN MIX CONCRETE

The mix shall be designed as per IS: 10262 & SP: 23 to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in Table-1. The target mean strength of concrete mix shall be equal to the characteristic strength plus 1.65 times the standard deviation.

As long as the quality of materials does not change, a mix design done earlier but not prior to one year may be considered adequate for later work. However, in case the quality of materials changes or there is a break in the continuity of construction and the same work is allocated to a new contractor, the Engineer-in-Charge shall ask for a new design mix.

Irrespective of the grade of concrete required to be produced as per characteristic strength criteria, the minimum cement content and maximum free water cement ratio in the design concrete shall be strictly maintained as stipulated in Table 2 for the corresponding grade of concrete.

6.0 CONCRETE MIX PROPORTIONING

Proportioning, as used in this specification, shall mean the process of determining the proportions of the various ingredients to be used to produce concrete of the required workability when fresh/green and strength, durability and surface finish, when hardened. The following information shall be collected prior to design of the concrete mix:

a. Grade designation.

b. Type of cement.

c. Maximum nominal size of aggregate.

d. Minimum cement content.

e. Maximum free water cement ratio

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f. Workability requirements.

g. Exposure condition as per Table 3 & Table 4 of IS: 456

h. Maximum temperature of concrete at the time of placing.

i. Method of Placing.

The Engineer-in-Charge shall verify the strength of the concrete mix, before giving his sanction of its use. However, this does not absolve the Contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work, cube tests show lower strengths than required, the Engineer-in-Charge shall order fresh trial mixes to be made by the Contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into consideration for material reconciliation. Preliminary mix designs shall be established well ahead of start of work.

6.1 MAXIMUM DENSITY

Suitable proportions of sand and the different sizes of coarse aggregates for each grade of concrete shall be selected to give as nearly as practicable the maximum density. This shall be determined by mathematical means, laboratory tests, field trials and suitable changes in aggregate gradation. The contractor shall submit to the Engineer-in-Charge at least three sets of mix design and corresponding test results after varying the mix proportions and / or grading of aggregate so as to establish the maximum density of any particular grade of concrete.

6.2 CONSISTENCY

The concrete shall have a consistency such that it shall be workable in the required position and when properly vibrated it flows around reinforcing steel, all embedded fixtures, etc.

6.3 WORKABILITY

"Workability of Concrete" shall be as per clause no. 7 of IS: 456.

6.4 DURABILITY

For achieving sufficiently durable concrete, strong, dense aggregates, low water-cement ratio and adequate cement content shall always be used. Workability of concrete shall be such that concrete can be completely compacted with the means available. Leak-proof formwork shall be used so as to ensure no loss of cement-slurry during pouring and compaction. Cover to reinforcement shall be uniform and as shown on drawings. Concrete mix design shall always take into account the type of cement, minimum cement content irrespective of the type of cement and maximum free water cement ratio and minimum grade of concrete conforming to the exposure conditions as given in Table-2.

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TABLE-2
MINIMUM CEMENT CONTENT, MAXIMUM FREE WATER CEMENT RATIO AND MINIMUM GRADE OF CONCRETE FOR DIFFERENT EXPOSURE CONDITIONS

Exposure	Plain Concrete			Reinforced Concrete		
	Minimum Cement Content (kg /m^3)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content (kg / m^3)	Maximum Free Water Cement Ratio	Minimum Grade of Concrete
Mild	220	0.6	M 15	300	0.55	M 20
Moderate	240	0.6	M 15	300	0.50	M 25
Severe	250	0.5	M 20	320	0.45	M 30
Very Severe	260	0.45	M 20	340	0.45	M 35
Extreme	280	0.4	M 25	360	0.4	M 40

Note: Cement prescribed in this table is irrespective of grade of Cement and it is inclusive of pozzolanas, Fly Ash, Ground Granulated Blast Furnace Slag may be taken into account in the concrete composition within respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS: 1489 (part-1) and IS: 455 respectively.

Generally, the following types of cement shall be used for Plain and Reinforced concrete works:

a. 33 Grade Ordinary Portland Cement conforming to IS: 269.

b. 43 Grade Ordinary Portland Cement conforming to IS: 8112.

c. Rapid hardening Portland Cement conforming to IS 8041.

d. Portland Slag Cement conforming to IS: 455.

e. Portland Pozzolana Cement (fly ash based) conforming to IS: 1489(Part 1)

f. Portland Pozzolana Cement (calcined clay based) conforming to IS: 1489(Part-2).

g. Sulphate Resisting Portland Cement conforming to IS: 12330

Sulphate Resisting Portland Cement shall be used only for specific requirements depending on environmental and process exposure conditions to which the structures may be subjected to like high sulphate concentrations, processes involving sulphur handling etc.

6.4.1 FREE WATER CEMENT RATIO

Once a mix, including its free water cement ratio, has been determined and approved for use by the Engineer-in- Charge, that free water cement ratio shall be maintained. The Contractor shall determine the water content of the aggregates frequently as the work progresses, and the amount of mixing water shall be adjusted so as to maintain

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the approved free water cement ratio. Maximum free water-cement ratio shall be as per Table-2 for different exposure condition.

The minimum cement content as mentioned in Table-2 shall be adjusted for aggregates other than 20mm nominal maximum size. The minimum cement content in the concrete mix shall be increased by 40kg/m3 and decreased by 30 kg/rn3 for 10mm and 40mm nominal maximum size aggregates respectively.

For maximum cement content refer clause no. 8.2.4.2 of IS: 456.

6.5 LIMITS TO DELETERIOUS CONSTITUENTS

Careful selection of the mix and the constituent materials shall be made to limit the presence of deleterious constituents in concrete. The total acid soluble chloride content calculated from the mix proportion and the measured chloride content of each of the constituents shall not exceed 0.6 kg/m3 at the time of placing of concrete. The total water soluble sulphate content of the concrete mix shall not exceed 4 percent by mass of the cement in the mix.

7.0 BATCHING

Refer clause no. 10.2 of IS: 456.

8.0 CONCRETE MIXING

8.1 The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixer shall be fitted with water measuring devices. The mixing shall be continued until there is a uniform distribution of the material and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be remixed.

Use of Ready Mixed Concrete supplied by Ready Mixed Concrete Plants or from on/off-site batching plants (IS: 4926) shall be preferred for structural concrete.

All records and charts for the batching and mixing operations shall be prepared and maintained by the contractor as per the instructions of Engineer-in-Charge.

8.2 MIXER

8.2.1 Mechanical Mixers shall comply with IS: 1791 and 12119 and shall be maintained in satisfactory operating condition. These shall be used only for producing lean/ plain concrete and/ or nominal mix concrete wherever permitted.

8.2.2 MIXING TIME

Mixing time shall be as indicated in the following table. Excessive mixing requiring additions of water shall not be permitted. Time shall start when all solid materials are poured in the revolving mixer drum, provided that all of the mixing water shall be introduced before one-fourth of the mixing time has elapsed. The Engineer-in-Charge may, however, direct a change in the mixing time, if he considers such a change necessary.

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MINIMUM MIXING TIME FOR MIXERS

Capacity of mixer	Minimum mixing time
2 m^3 or less Above 2 m^3	2 minutes 3 minutes or as recommended by the mixer manufacturer.

8.3 HAND MIXING

Hand mixing of concrete shall not be permitted. However, for non-critical applications namely foundations for crossovers, isolated operating platforms etc., using concrete of maximum grade M20 and located at far away isolated places, this may be permitted by the Engineer-in-charge as a special case. Ten percent (10%) extra cement shall be added to the design proportion. Mixing shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. No extra payment shall be made to the Contractor for mixing by hand or for using extra cement due to hand mixing.

8.4 ADDITIVES

Additive in concrete shall be used only with the prior approval of the Engineer-in-Charge and shall comply with clause no. 5.5 of IS: 456. Any additive used for obtaining proper workability or leak-proofness of concrete or repair/rendering works of concrete due to non-conformance to the specifications, shall not be measured and paid for. All costs relating to such usage shall be borne by the Contractor.

9.0 TRANSPORTATION, PLACING AND COMPACTION

9.1 GENERAL

The entire concrete placing programme including transportation arrangements, deployment of equipment, layout, proposed procedures and methods, shall be submitted to the Engineer-in-Charge 24 hours prior to concreting for approval. No concreting shall be placed until his approval has been received. Approval of the Engineer-in-Charge for pouring concrete shall be taken as 'conveyed', when the concrete pour card is signed by him.

9.1.1 CHUTING

The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall be permitted only on written authorization from the Engineer-in-Charge. In case an inferior quality of concrete is produced by the use of such conveyors, the Engineer-in-Charge may order discontinuance of their use and the substitution of a satisfactory method of placing the concrete. Open troughs and chutes shall be equipped with baffles and be in short lengths to avoid segregation. Chutes shall be designed so that the concrete is, to some extent, remixed at the lower end by passing down through a funnel shaped pipe or drop chute. Alternatively, they shall discharge into a storage hopper from which the concrete shall be transported to the point of placing by wheel barrows or other means. Where drop chutes are used, a sufficient number of these must be provided, so that the concrete discharged from the chute is not required

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to flow laterally more than 1.0 metre. Where a drop chute is swung from the vertical, the bottom two sections must be maintained in a vertical position to avoid segregation. The addition of water at any point in the system of transportation, to facilitate the movement of concrete shall not be permitted. All chutes, troughs and pipes, shall be kept clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run; water used for flushing shall be discharged clear of the structure. Concrete shall not be normally permitted to fall freely from a height of more than 1.5 metre nor to strike the forms at an angle. However, a deviation from this normal practice may be allowed provided proper precaution is taken, while placing concrete into the forms to avoid segregation, to the satisfaction of the Engineer-in-Charge.

9.1.2 VIBRATORS

a. Concrete shall be compacted with mechanical vibrating equipment supplemented, if necessary to obtain consolidation, by hand spreading, rodding and tamping. The vibrators shall be of immersion type with operational frequency ranging between 8,000 to 12,000 vibrations per minute. All vibrators shall comply with IS: 2505. Screed board concrete vibrators or concreting vibrating tables or form vibrators conforming to IS: 2506, 2514 and 4656, respectively, shall be used where specifically required and directed by Engineer-in-Charge.

b. Immersion type vibrators shall be inserted in a vertical position at intervals of about 600mm, depending upon the mix, the equipment used, and experience on work. The vibrators shall be withdrawn slowly. The spacing shall provide some overlapping of the area vibrated at each insertion. In no case shall vibrators be used to transport concrete inside the forms. Over vibration or under vibration shall not be permitted as both are harmful. Hand tamping in some cases may be allowed subject to the approval of the Engineer-in-Charge.

c. In placing concrete in layers which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, bonding and moulding of the concrete between the succeeding batches.

d. The vibrator shall penetrate the layer being placed and also penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

e. Care shall be taken to prevent contact of vibrators against all embedded reinforcing steel or inserts. Vibrators shall not be allowed to come in contact with forms.

f. The use of form vibrators shall not be permitted for compaction of in-situ concrete without specific authorization of the Engineer-in-Charge.

g. The use of surface vibrators of screed board type shall not be permitted for consolidation of concrete under ordinary conditions. However, for thin slabs (of thickness less than 200mm) surface vibration by such vibrators may be permitted, upon approval of the Engineer-in-Charge.

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h. Whenever vibration has to be applied externally, the design of formwork and the disposition of vibrators shall be carefully planned to ensure efficient compaction and to avoid surface blemishes.

9.2 TRANSPORTATION

9.2.1 All concrete shall be conveyed from the mixer to the place of final deposit such as formwork as rapidly as possible using suitable buckets, dumpers, pumps, transit mixers containers or conveyors which shall be mortar leak tight. Care shall be taken to prevent the segregation or loss of the ingredients and maintaining the required workability. For structural concrete produced from Ready Mixed Concrete Plants as per clause no. 8.1, concrete shall be transported from the plants to the sites only by transit mixers.

9.2.2 During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted. All equipment used for transporting and placing of concrete shall be maintained in clean condition. All buckets, hoppers, chutes, dumpers and other equipment shall be thoroughly cleaned after each use.

9.3 PLACING AND COMPACTION

9.3.1 Before placing concrete, all soil surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft or yielding soil shall be removed and replaced, with lean concrete or with selected soils/sand and compacted to the density as directed by Engineer-in-Charge. The surface of absorptive soil (against which concrete is to be placed) shall be moistened thoroughly so that moisture is not drawn from the freshly placed concrete. Similarly, for concrete to be placed on formworks, all chippings, shavings and sawdust etc. shall be removed from the interior of the forms before the concrete is placed.

9.3.2 Concrete shall not be placed until the formwork, the placement of reinforcing steel, embedded parts; pockets etc. have been inspected and approved by the Engineer- in-Charge. Any accumulated water on the surface of the bedding layer shall be removed by suitable means before start of placement. No concrete shall be placed on a water covered surface.

9.3.3 Concrete shall be discharged by vertical drop only and the drop height shall not normally exceed 1.5 metre throughout all stages of delivery until the concrete comes to rest in forms. For continuous concreting operation windows of suitable size shall be kept in the formwork or chutes shall be used to avoid segregation of concrete.

9.3.4 Concrete shall be deposited as near as practicable in its final position to avoid rehandling. Concrete shall be placed in successive horizontal layers. The bucket loads, or other units of deposit, shall be placed progressively along the face of the layer with such over-lap as will facilitate spreading the layer of uniform depth and texture with a minimum of hand shovelling. Any tendency to segregation shall be corrected by shovelling coarse aggregates into mortar rather than mortar on the coarse aggregates. Such a tendency for segregation shall be corrected by redesign of mix, change in process or other means, as directed by the Engineer-in-Charge.

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9.3.5 All struts, stays and braces (serving temporarily to hold the forms in correct shape and alignment pending the placing of concrete at their locations) shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These shall not be buried in the concrete. Concrete shall be thoroughly compacted with vibrators and fully worked around the reinforcement, embedded fixtures and into corners of formwork before setting commences and shall not be subsequently disturbed. Methods of placing shall be such as to preclude segregation and avoid displacement of reinforcement or formwork. The formation of stone-pockets or mortar bondage in corners and against face forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding as directed by the Engineer-in-Charge. Care shall be taken to avoid displacement of reinforcement and embedded inserts or movement of formwork.

9.3.6 Unless otherwise approved, concrete shall be placed in single operation to the full thickness of foundation rafts, slabs, beams and similar members. Concrete shall be placed continuously until completion of the part of the work between approved construction joints or as directed by the Engineer-in-Charge.

9.3.7 The method of placing and compaction employed in any particular section of the work shall be to the entire satisfaction of the Engineer-in-Charge.

9.3.8 During hot weather (atmospheric temperature above 40 degree Celsius) or cold weather (atmospheric temperature less than 5 degree Celsius, the concreting shall be done as per the procedure set out in IS: 7861).

9.3.9 Concrete that has set standing and becomes stiffened shall not be used in the work.

9.4 ITEMS EMBEDDED IN CONCRETE

9.4.1 Concreting shall not be started unless the electrical conduits, pipes, fixtures etc., wherever required, are laid by the concerned agency. The Contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical and such other works as directed by the Engineer-in-Charge.

9.4.2 Before concreting, the Contractor shall provide, fabricate and lay in proper position all metal inserts, anchor bolts, pipes etc. (which are required to be embedded in concrete members) as per relevant drawings and directions of Engineer-in-Charge.

9.4.3 All embedment, inserts etc. shall be fully held and secured in their respective positions by the concerned agencies to the entire satisfaction of Engineer-in-Charge so as to avoid any dislocation or displacement during the concreting operations. The Contractor shall take all possible care during concreting to maintain these embedment/inserts in their exact locations

10.0 CONSTRUCTION JOINTS

10.1.1 Construction joints shall be provided in position as shown or described on the drawings or as directed by the Engineer-in-Charge. Such joints shall be kept to the minimum. These shall be straight and at right angles to the direction of main reinforcement and

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shall be placed at accessible locations to permit cleaning out of laitance, cement slurry and unsound concrete. Construction joints shall comply with IS: 11817

10.1.2 In a column, the joint shall be formed about 100mm to 150mm below the lowest soffit of the beams framing into it. Concrete in a beam and slab shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and located within 1/3 to 1/4 of the span, unless otherwise shown on the drawings.

10.1.3 When stopping the concrete on a vertical plane in slabs and beams, an approved stop board shall be placed with necessary slots for reinforcement bars. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop board. Inclined joints shall not be permitted. Any concrete flowing through the joints of stop board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set and a triangular or trapezoidal groove shall be provided for keying with the new concrete later.

10.1.4 When the work has to be resumed on a surface which has hardened, such surface shall be cleared of any foreign materials and roughened to expose the tips of the coarse aggregate. This may be done by manual chipping of concrete, with a high pressure water jet or by any other appropriate means as per Engineer-in-Charge's directions. It shall then be swept clean and thoroughly washed and wetted before any new concrete is poured. Any set mortar or concrete sticking to the exposed reinforcing rods in and around such joints shall be thoroughly removed. The reinforcements shall be wire brushed and washed just before pouring any cement slurry or mortar. For vertical joints neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing new concrete.

10.1.5 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots; work thereafter shall proceed in normal way.

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11.0 SEPARATION JOINT

11.1 Separation joint shall be obtained by using an approved alkathene sheet stuck on the surface against which concrete shall be placed. Adequate care shall be taken to cause no damage to the sheet.

12.0 EXPANSION JOINTS/ISOLATION JOINT

12.1 Expansion/ isolation joints in structures shall be formed in the positions and to the shapes shown in the relevant drawings. Joints shall be filled with joint filling material as stipulated in the drawings/schedule of rates. Isolation joints shall be provided around all equipment foundations, columns, pedestals, trenches etc. on grade.

13.0 WATER STOPS

PVC water stops as per Specification No. SS-CV-021 for materials shall be accurately cut, fitted and integrally joined as per manufacturer's specifications to provide a continuous, watertight diaphragm at all points.

The water stops shall be located and embedded at expansion/contraction/ construction joints as indicated in the drawings or directed by the Engineer-in-Charge.

Adequate provision shall be made for the support and protection of water stops during the progress of the work. Damaged water stops shall be replaced and/or repaired as directed.

14.0 PROTECTION OF FRESHLY LAID CONCRETE

14.1 Newly placed concrete shall be protected, by approved means, from rain, sun and wind. Concrete placed below the ground level shall be protected from falling earth during and after placing. Surface shall be kept free from contact with such ground or with water draining from such ground during placing of concrete for a period of at least 3 days, unless otherwise directed by the Engineer-in-Charge. The ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage and adequate steps shall be taken to prevent floatation and flooding. Steps shall be taken to protect immature concrete from damage by debris, loading, vibration, abrasion, mixing with deleterious materials that may, in the opinion of the Engineer-in-Charge, impair the strength and/or durability of the concrete.

15.0 CURING

15.1 Concrete shall be cured by keeping it continuously moist wet for the specified period of time to ensure complete hydration of cement and its hardening. Curing shall be started

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after 8 hours of placement of concrete in normal weather, and in hot weather after 4 hours. The water used for curing shall be of the same quality as that used for making of concrete.

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances such as hose, sprinklers etc. A layer of sacking, canvas, hessian, or other approved material, which will hold moisture for long periods and prevent loss of moisture from the concrete, shall be used as covering. Type of covering which would stain, disfigure or damage the concrete, during and after the curing period, shall not be used. Only approved covering shall be used for curing.

Exposed surfaces of concrete shall be maintained continuously in a damp or wet condition for at least the first 7 days after placing of concrete.

The Contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing the concrete in pavements, floors, flat roofs or other level surfaces, the ponding method of curing shall be used. For the first 24 hours after concreting the concrete shall be cured by use of wet sacking, canvas, hessian etc. The minimum water depth of 25mm for ponding shall be maintained. The method of containing the ponded water shall be approved by the Engineer-in-Charge. The ponded areas shall be kept continuously filled with water, and leaks, if any, shall be promptly repaired. Areas cured by ponding method shall be cleared of all debris and foreign materials after curing period is over.

Alternatively, membrane curing may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compounds shall be applied to all exposed surfaces of the concrete by spraying or brushing as soon as possible after the concrete has set. Minimum film thickness of such curing compounds shall be as per the recommendation of the manufacturer so as to obtain an efficiency of 90% as specified by BS-8110. This film of curing compound shall be fully removed from the concrete surface after the curing period specified earlier. Engineer-in-Charge may not allow curing by curing compounds for those surfaces where use of curing compound may be detrimental to application of future finishes over the concrete. Impermeable membranes such as polyethylene sheeting closely covering the concrete surface may also be used.

15.2 For concretes containing Portland Pozzolana cement or Portland slag cement, the curing period as given in clause no. 15.1 shall be doubled. Curing by ponding shall, however, commence after the first 24 hours of concreting.

16.0 FIELD TESTS

16.1 Grading Test

Grading test on fine and coarse aggregates shall be carried out as per IS: 2386 at intervals specified by the Engineer-in-Charge.

The mandatory tests and their frequencies shall be done on sand and stone aggregates as given in Table-3

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TABLE - 3
MANDATORY TESTS ON SAND & STONE AGGREGATES

S.No	MATERIAL	TEST	FIELD/LAB TEST	MIN. QTY. OF MATERIAL/WORK FOR CARRYING OUT THE TEST	FREQUENCY OF TESTING
1.	Sand	(a) Bulking of sand	Field	20 m^3	Every 20 m^3 or part thereof or more frequently as decided by the Engineer-in-Charge
		(b) Silt content	Field	20 m^3	
		(c) Particle size distribution	Field or Lab as decided by the Engineer-in-Charge	40 m^3	1) Every 40 m^3 of fine aggregate/ sand required in RCC works only 2) Every 80 m^3 of fine aggregate/sand required for other items
2.	Stone aggregate	a) Percentage of soft or deleterious materials	General visual inspection, laboratory test where required by the Engineer-in- Charge or as specified	As required by Engineer-in-Charge	For all quantities
		b) Particle size	Field or lab. as required by Engineer-in-Charge	45 m^3	For every 45 m^3 or part thereof as decided by Engineer- in-Charge
		Ten percent value	Laboratory	45 m^3	Initial test and subsequent test as & when required by Engineer-in-Charge

16.2 VEE-BEE TEST/SLUMP TEST OF CONCRETE

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16.2.1 For structural quality concrete (excluding pavements, flooring etc.) at least one Slump Test shall be made for every compressive strength test carried out. More frequent tests shall be made if there is a distinct change in working conditions or if required by the Engineer-in-Charge.

16.2.2 For structural quality concrete for pavements & floorings, measurement of workability shall be by determination of compacting factor. Value of compacting factor of 0.75 to 0.8 shall generally be acceptable.

16.3 STRENGTH TEST OF CONCRETE

16.3.1 Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

16.3.2 In order to get a relatively quicker idea of the quality of concrete, optional tests on beams for modulus of rupture at 72±2 hours or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values shall be arrived at based on actual testing. In all cases, the 28 days compressive strength specified in Table-1 shall alone be the criterion for acceptance or rejection of the concrete.

16.3.3 PROCEDURE

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested, that is the sampling should be spread over the entire period of concreting and cover all mixing units.

16.3.4 FREQUENCY OF SAMPLING

The minimum frequency of sampling of concrete for each grade shall be in accordance with Table-4.

TABLE - 4
FREQUENCY OF CONCRETE SAMPLING

Quantity of concrete in the work in m^3	Number of samples
1-5	1
6-15	2
16-30	3
31-50	4
51 & above	4 plus one additional sample for each additional 50m^3 or part thereof.

At least one sample shall be taken from each shift. Where concrete is produced at continuous production units such as ready mixed concrete plants, frequency of sampling may be agreed upon mutually by Engineer-in-Charge.

16.3.5 TEST SPECIMEN

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Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the formwork or to check the testing error. Additional samples may also be required for testing samples cured by accelerated methods as described in IS: 9013. The specimen shall be tested as described in IS: 516.

16.3.6 IDENTIFICATION MARK ON CONCRETE TEST CUBES:

The following numbering system shall be adopted on each 150mm cube:

First line: ZZ (Alpha code assigned by the Engineer -in-Charge to the

Contractor for a particular contract starting with AA and progressing to AB, AC and so on).

Second line: XXXX (Unique integer in ascending order starting from 1).

Third line: DD-MM-YY (Date of casting of cube).

16.3.7 TEST RESULTS OF SAMPLE

The test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ± 15 percent of the average. If the individual variation is more than ± 15 percent, the test results of the sample shall be considered invalid.

16.3.8 STANDARD DEVIATION

a. Standard deviation based on test results of samples:

i. The total number of test samples required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts shall be made to obtain the 30 samples, as early as possible, when a mix is used for the first time.

ii. For design of mix in the first instance, the value of standard deviation given in Table-8 of IS: 456 may be assumed.

iii. As soon as sufficient results of samples are available, actual calculated standard deviation shall be used and the mix design revised/ updated.

16.3.9 ACCEPTANCE CRITERIA

a. Compressive Strength

The concrete shall be deemed to comply with the strength requirement when both the conditions as given in Table-11 of IS: 456 for that particular grade of concrete are simultaneously met. For working out standard deviation compressive test result of date wise serially logged 30 sample test result will be used.

b. Flexural Strength

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The concrete shall be deemed to comply with flexural strength requirements when both the following conditions are simultaneously met:

i. The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm2.

ii. For non overlapping consecutive compressive test result any one alternate set of four samples shall be used for verification of compliance to clause no 16.1.a of IS 456.

iii. The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm2

c. Quantity of Concrete Represented by Strength Test Results

The quantity of concrete represented by group of four consecutive test results shall include the batches from which first and last samples were taken together with all intervening batches. Acceptance of concrete shall be applicable for serially logged 30 samples. In case serially logged samples are less than 30 then standard deviation of adjoining previous sample sets standard deviation will be used for establishing acceptance criteria as per clause no 16.1.a of IS 456.

For the individual test result requirements given in Table 11 of IS: 456 or in item (ii) of 16.3.9 (b), only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified, the maximum quantity of concrete that four consecutive test results represent shall be limited to 60m3.

d. If the concrete is deemed not to comply pursuant to 16.3.9 (c), the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken (Refer clause no. 17.0 & 18.0).

e. Concrete of each grade shall be assessed separately.

f. Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures and tests to the fullest satisfaction of the Engineer-in-Charge.

17.0 INSPECTION AND TESTING OF STRUCTURES

17.1 INSPECTION

To ensure that the construction complies with the design, an inspection procedure shall be set up by the contractor and duly approved by Engineer-in Charge covering materials used, receipt of materials, their test results, records, workmanship and construction etc.

17.2 Immediately after stripping the formwork, all concrete shall be carefully inspected and any defective work or small defects either removed or made good before concrete has thoroughly hardened.

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17.3 TESTING

In case of doubt regarding the grade or soundness of concrete used, either due to poor workmanship or based on results of cube strength, compressive strength tests of concrete on the basis of clause no. 17.4 and/or load test as per clause no. 17.6 of IS: 456 shall be carried out.

The Engineer-in-Charge shall be the final authority for interpreting the results of all tests and shall decide upon the acceptance or otherwise. The decision of the Engineer-in-Charge shall be final and binding on the contractor. In case the results of the tests are unsatisfactory, the Engineer-in-Charge may instruct the contractor to demolish and reconstruct the structure or part thereof without any extra cost to the Owner.

17.4 MEMBERS OTHER THAN FLEXURAL MEMBERS

Members other than flexural members like columns etc. shall be referred to the designer to investigate the structural adequacy. The decision of the designer shall be final and binding on the contractor.

17.5 NON - DESTRUCTIVE TESTS

Non-destructive tests using Ultrasonic Pulse Velocity and Rebound Hammer methods shall be resorted to for checking the soundness of concrete placed and shall be as per the directions of Engineer-in-Charge. The testing shall be based on IS: 13311, Part-1. However, the Rebound Hammer test (IS: 13311, Part-2) shall only be used in combination with other tests (Destructive or Non-Destructive) for checking the concrete quality.

18.0 FINISHING OF CONCRETE

18.1 On striking the formwork, all surface defects such as bulges, ridges and honey-combing etc. observed shall be brought to the notice of the Engineer-in-Charge. The Engineer-in-Charge may, at his discretion allow rectification by necessary chipping and packing or grouting with concrete or cement mortar. However, if honey-combing or sagging is of such extent as being undesirable, the Engineer-in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these defects, demolishing and reconstructing the structure. However, quantity of cement actually used for this purpose may be considered for reconciliation of materials. All burrs and uneven faces shall be rubbed smooth with the help of carborundum stone.

The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish similar to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the formwork except that honey-combed surface shall be made good as specified above. The top faces of slabs not intended to be covered shall be levelled and floated to a smooth finish to the rises or falls shown on the drawings or as directed. The floating shall not be executed to the extent of bringing excess fine materials to the surface. The top faces of slabs intended to be covered with screed, granolithic or similar finishes, shall be left with a rough finish.

18.2 REPAIR AND REPLACEMENT OF UNSATISFACTORY CONCRETE

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18.2.1 Repair shall be made as soon as possible after the forms are removed and before the concrete becomes too hard with prior permission from the Engineer-in-Charge, in writing. Stone pockets, segregation patches and damaged areas shall be chipped out and the edges undercut slightly to form a key. All loose material shall be washed out before patching. No excess water shall be left in the cavity, but the concrete shall be damp. A good bond between the patch and parent concrete shall be obtained by sprinkling dry cement on the wet surface or by throwing mortar with force on to the wetted concrete, or by brush in a coat of thick cement grout of about 1:1 (1 cement: I sand) just before applying the patching material. Before this has dried, the remainder of the patch shall be filled with mortar or concrete, depending on the extent of the repair.

18.2.2 Cement concrete/mortar used in repair of exposed surfaces shall be made with cement from the same source as that used in concrete and blended with sufficient amount of white Portland cement to produce the same colour as in the adjoining concrete. The proportions of ingredients shall be same as those used in parent concrete. The mortar shall be as dry as possible and well compacted into the cavity. All filling shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the filling has been cured and dried.

18.2.3 For larger repairs to hardened concrete, necessary formwork bearing tightly at the edges of the cavity shall be provided. Concrete shall be chipped out to a depth of at least 100mm and preferably 150mm. Mortar shall be scrubbed into all surfaces with a wire brush before placing the concrete. Damaged reinforcement shall be adequately spliced with new steel so as to maintain the original strength. Additional reinforcement, if required in the patch, shall be provided as per the instructions of Engineer-in-Charge.

18.2.4 In case in the opinion of the Engineer-in-Charge defects in the concrete is excessive or beyond repair, the contractor shall either redo the structure or take other remedial measures as instructed by the Engineer-in-Charge. The decision of the Engineer-in-Charge shall be final and binding to all in this respect.

18.2.5 Approved epoxy formulation for bonding fresh concrete used for repairs with already hardened concrete shall be used by the Contractor if asked by the Engineer-in-Charge. Epoxy shall be applied in strict accordance with instructions of the manufacturer.

18.2.6 All repair works due to non-conformance or non-adherence to specification, if allowed by the Engineer-in-Charge, shall be carried out free of cost to the owner.

18.3 CURING OF PATCHED WORK

Immediately after patching is completed, the patched area shall be covered with an approved non-staining water saturated material which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days.

19.0 CEMENT WASH

If not otherwise provided with protective coating due to architectural and/ or geo-technical requirements, all concrete elements (whether cast-in-situ or precast) exposed

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to atmosphere shall be provided with three coats of cement based waterproof paint as per IS: 5410. Prior to application of the paint, the surface shall be prepared to remove all foreign particles, loose materials, extra deposited concrete lumps, etc. using appropriate mechanical/ manual means.

20.0 FORM WORK

20.1 General

20.1.1 Forms for concrete shall be of plywood conforming to IS: 6461 or steel or as directed by the Engineer-in-Charge and shall give smooth and even surface after removal thereof.

20.1.2 If it is desired by the Engineer-in-Charge, the Contractor shall prepare, before commencement of actual work, design and drawings for formwork and get them approved by the Engineer-in-Charge. For details regarding design, detailing etc., reference may be made to IS: 14687.

20.1.3 Form work and its supports shall maintain their correct position and be to correct shape and profile so that the final concrete structure is within the limits of dimensional tolerances specified below, unless required otherwise, for functional/aesthetic reasons. The decision of the Engineer-in-Charge shall be final and binding in this regard.

a. Deviation from specified dimensions of cross section of columns and beams. -6mm to +12mm

b. Deviation from dimensions of footings (see Note below)

i. Dimensions in plan -12mm to +50mm

ii. Eccentricity 0.02 times the width of the footing in the

1. direction of deviation but not

2. More than 50 mm.

iii. Thickness ±0.05 times the specified thickness.

Note: These tolerances apply to Cast-in-situ concrete dimensions only, not to positioning of vertical reinforcing steel or dowels.

c. Deviation in length (major dimension of single unit)

upto 3m	±6mm
3m to 4.5m	±9mm
4.5m to 6m	±12mm
Additional deviation for every subsequent 6m.	±6mm

d. Deviation in straightness or bow (deviation from specified line) for a single or continuous member) e.g. beam, column or slab edge.

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Upto 3m	6mm
3m to 6m	9mm
6m to 12m	-12mm
Additional for every subsequent 6m.	-6mm

e. Deviation in squareness shall be measured taking the longer of two adjacent sides as the base line.

The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds 6mm. For this purpose, any error due to lack of straightness shall be ignored. Squareness shall be checked with respect to the straight lines that are most nearly parallel with the features being checked. When the nominal angle is other than 90 degree, the included angle between check lines shall be varied accordingly.

f. Deviation in twist shall be within a limit such that any corner shall not be more than the limit given below from the plane containing other three corners:

Upto 600mm wide and upto	6m in length-6m
Over 600mm wide and for any	length -12mm

g. Maximum deviation in flatness from a 1.5m straight edge placed in any position on a nominally plain surface shall not exceed 6mm.

h. The tolerance limits for concrete columns/pedestals shall be same as given in part A of ANNEXURE-A of Specification No. VPC-SS-CS-024.

20.2 FORM REQUIREMENT:

20.2.1 The formwork shall be true, rigid and adequately braced both horizontally as well as diagonally. The forms shall have smooth and even surface and be sufficiently strong to carry, without deformation, the dead weight of the green concrete, working load, wind load and also the side pressure exerted by the green concrete. As far as practical, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used. Projected part of nail shall not be bent or twisted for easy withdrawal.

20.2.2 Where through tie rods are required to be put to hold the formwork and maintain accurate dimension, they shall always be inserted through a precast concrete block (of same mix proportion as is to be used for concreting) with a through hole of bigger diameter. The Precast block shall tightly fit against in inner faces of formwork. The holes left after the withdrawal of tie rods shall be fully grouted with cement-sand mortar of same proportion as that used for concrete. However, use of such precast block shall in no case impair the desired appearance or durability of the structure. No such tie rods shall be used in any liquid retaining or basement structure.

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20.2.3 Tie wires shall be permitted only upon approval of the Engineer-in-Charge and shall be cut off flush with the face of the concrete or counter sunk, filled and finished in the manner specified in clause 18.

20.2.4 Form joints shall not permit any leakage. The formwork shall be strong enough to withstand the effect of vibrations practically without any deflection, bulging, distortion or loosening of its components.

20.2.5 Forms for beams and slabs (span more than 6.0m) shall have camber of 1 in 500 so as to offset the deflection and assume correct shape and line after deposition of concrete. For cantilevers, the camber at free end shall be 1/100th of the projected length. Where architectural considerations and adjunctive work are critical, smaller form cambers shall be adopted as decided by the Engineer-in-Charge.

20.2.6 All vertical wall forms may be designed and constructed for the following minimum pressure. The pressures listed in Table-5 are intended as guide only and the Contractor shall ensure that the formwork is adequately strong and sturdy.

TABLE-5
MINIMUM DESIGN PRESSURE FOR WALL FORMWORK

Rate of pour in meter/hour	Pressure in KN/m^2	
	at 10° (in Celsius)	at 24° (in Celsius)
0.6	36.0	29.0
0.9	40.0	32.0
1.2	44.0	35.0
1.5	46.0	37.0

All horizontal forms shall be designed and constructed to withstand the dead load of the green concrete, reinforcement, equipment, material, embedment and a minimum live load of 2.0 kN/m2.

20.3 INSPECTION OF FORMS

Temporary openings shall be provided at the base of column and wall forms and other places necessary to facilitate cleaning and inspection. Before concrete is placed, all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly cleaned, properly treated and free from foreign material. The complete form work shall be inspected and approved by the Engineer-in-Charge before the reinforcement bars are placed in position. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the work shall be stopped until the defects have been corrected as per the instructions of the Engineer-in-Charge.

20.4 CLEANING AND TREATMENT OF FORMWORK

The surfaces of forms that would come in contact with concrete shall be well treated with approved non- staining form release agents such as soft soap, oil, emulsions etc. Release agents shall be applied so as to provide a thin uniform coating to the forms without coating the reinforcement.

20.5 CHAMFERS AND FILLETS

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All comers and angles shall be formed with 45 degree mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise detailed or specified shall be 25x25mm. For heavier work chamfers or fillets shall be 50x50mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached.

20.6 REUSE OF FORMS

Before reuse, all forms shall be thoroughly scrapped, cleaned, examined and when necessary, repaired and retreated, before resetting. Formwork shall not be reused, if declared unfit or un-serviceable by the Engineer-in-Charge.

20.7 REMOVAL OF FORMS/STRIPPING TIME

In the determination of time for removal of forms, consideration shall be given to the location and character of the structures, the weather and other conditions including the setting and curing of the concrete and material used in the mix.

Forms and their supports shall not be removed without the approval of the Engineer-in-Charge. Forms shall not be released until the concrete has achieved strength of at least twice the stress to which the concrete may be subjected at the time of removal. The formwork shall be removed without shock and methods of form removal likely to cause over stressing or damage to the concrete, shall not be adopted. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.

In normal circumstances when average air temperature exceeds 15 degree Celsius during the period under consideration after pouring of concrete and where ordinary Portland cement is used, forms may generally be removed after expiry of following periods.

a.	Walls, columns and vertical faces of all structural members	16 to 24 hours as may be decided by the Engineer-in-Charge.
b.	Slabs (props left under)	3 days.
c.	Beam Soffits (props left under)	7 days.
d.	Removal of props under slabs:	
	Spanning upto 4.5m.	7 days.
	Spanning over 4.5m.	4 days.
e.	Removal of props under beams and arches:	
	Spanning upto 6m	14 days.
	Spanning over 6m	21 days

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f. Cantilever Construction Formwork shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength (minimum 14 days).

Notes:

1. For other cements, the stripping time recommended for ordinary Portland cement shall be suitably modified as per the instructions of the Engineer- in-Charge.

2. The number of props left under, their sizes, supporting arrangement, and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

3. Where the shape of the element is such that the formwork has re-entrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

4. For rapid hardening cement, 3/7 of the above mentioned periods shall be considered subject to a minimum of 16 hours.

20.8 STAGING/SCAFFOLDING

20.8.1 Staging/Scaffolding shall be properly planned and designed by the Contractor. Use of only steel tubes is permitted for staging/scaffolding. The Contractor shall get it reviewed by Engineer-in-Charge before commencement of work. While designing and during erection of scaffolding/staging, the following measures shall be considered:

a. Sufficient sills or under pinning's in addition to base plates shall be provided particularly where scaffolding are erected on soft grounds.

b. Adjustable bases to compensate for uneven ground shall be used.

c. Proper anchoring of the scaffolding/staging at reasonable intervals shall be provided in each direction with the main structure wherever available.

d. Horizontal braces shall be provided to prevent the scaffolding/staging from rocking.

e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.

f. The scaffolding/staging shall be checked at every stage for plumb line.

g. Wherever the scaffolding/staging is found to be out of plumb line it shall be dismantled and re-erected afresh and effort shall not be made to bring it in line with a physical force.

h. All nuts and bolts shall be properly tightened and care shall be taken that all clamps/couplings are firmly tightened to avoid slippage.

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i. Erection work of a scaffolding/staging under no circumstances shall be left totally to semi-skilled or skilled workmen and shall be carried out under the supervision of a technically qualified civil engineer of the Contractor.

20.8.2 For smaller works or works in remote areas, wooden ballies may be permitted for scaffolding/staging by the Engineer-in-Charge at his sole discretion. The contractor must ensure the safety and suitability of such works as described under clause 20.8.1 above

21.0 EXPOSED/ARCHITECTURAL CONCRETE WORK

21.1 FORM WORK

Other things remaining same as per clause no. 20.0, formwork shall be of high quality. Care shall be taken to arrange the forms so that the joints between forms correspond with the pattern indicated in the drawings. The forms shall be butting with each other in straight lines, the corners of the boards being truly at right angles. The joints between the forms shall cross in the two directions at right angles. The size of forms shall be so selected as to exactly match with the pattern of forms impression on the concrete face indicated in the drawings. Maximum care shall be taken to make the form work watertight. Burnt oil shall not be used for treatment of forms. The Contractor shall be permitted reuse of forms brought new on the work for exposed concrete work as specified below.

Such reuses shall be permitted only if forms are properly cared for, stored, repaired and treated after each use.

a. Plywood Forms 6 Reuses (max.)

b. Steel Forms 10 Reuses (max.)

The Engineer-in-Charge may, at his absolute discretion, order removal of any forms considered unfit for use in the work irrespective of the number of uses specified above.

21.2 FINISHING

Repairing to exposed concrete work shall be avoided. Rendering and plastering shall not be done. Minor repairing, if unavoidable shall be done as specified in clause 18.0 with the written permission of the Engineer-in-Charge.

22.0 REINFORCEMENT

22.1 The Contractor shall develop the bar bending schedule for all RCC structures/ structural parts at no extra cost to the Owner and shall get it reviewed by the Engineer-in-charge. Reinforcement shall be cut and bent to shape as per dimensions shown in the bar bending schedule/drawings.

If protective fusion bonded epoxy coating is required to be applied on reinforcement bars, the same shall be done as per IS: 13620. All repairs to applied protective coating required due to mishandling and/ or bending of reinforcement bars shall also be done as per relevant clauses of IS: 13620.

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22.2 STRAIGHTENING, CUTTING AND BENDING

Procedure for cutting and bending shall be as given in IS: 2502. In case bars are supplied in coils, they shall be smoothly straightened without any kinks.

Cold twisted deformed bars shall be bent cold. Bars larger than 25mm in size (except cold twisted deformed bars) may be bent hot at cherry red heat to a temperature not exceeding 850° Celsius as per the instructions of the Engineer-in-Charge. The bars shall be allowed to cool gradually without quenching.

Bars shall be bent in a slow and regular movement to avoid fractures. Bars which develops cracks or splits after bending shall be rejected. A second bending of reinforcement bars shall be avoided but when reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care should be taken to ensure that at no time is radius of the bend less than 4 times bar diameter for plain mild steel or 6 times bar diameter for high strength deformed bars. Care shall also be taken when bending back bars to ensure that concrete around the bars is not damaged. All bars shall be properly tagged for easy identification.

22.3 PLACING AND FIXING

All reinforcement shall be cleaned to ensure freedom from loose mill scale, loose rust, oil, form releasing agents, grease or any other harmful material before placing them in position. Reinforcement shall not be surrounded by concrete unless it is free from all such materials. Rough handling and dropping of reinforcement from a height shall be avoided.

All reinforcement shall be fixed in the correct position and shall be properly supported to ensure that displacement will not occur when the concrete is placed and compacted.

The uncoated reinforcement bars shall be tied at every intersection by two strands of 16 SWG black soft annealed binding wire. The Epoxy coated reinforcement bars shall be tied with 2 strands of PVC coated GI 18 SWG wire at every intersection. Crossing bars shall not be tack welded for assembly of reinforcement. The reinforcement bars shall be kept in position by using the following methods:

a. In case of beam and slab construction, precast cover blocks (having the same sand contents as the concrete which shall be placed) of size 40 x 40 mm and thickness equal to the specified covers shall be placed firmly in between the bars and forms so as to secure and maintain the specified covers over the reinforcement.

   When reinforcement bars are placed in two or more layers in beams, the vertical distance between the horizontal bars shall be maintained by introducing spacer bars at 1 to 1.2m centre to centre.

b. In case of thick rafts & pile caps having two or multilayer’s of reinforcement, the vertical distance between the horizontal bars shall be maintained by introducing suitable chairs, spacers, etc.

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c. In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them. The templates shall be removed after the concreting has been done below it.

d. Exposed portions of reinforcement bars shall not be subjected to impact or rough handling and workmen will not be permitted to climb on extending bars until the concrete has attained sufficient strength so that no movement of the bars in the concrete is possible.

22.4 SPECIAL REQUIREMENTS FOR HANDLING, STACKING, PLACING OF EPOXY COATED REINFORCING BARS.

Epoxy coated reinforcing bars shall be carefully handled and it shall be ensured that these do not rub on any hard surface or against another epoxy coated/uncoated reinforcing bar whether during conveying/transportation, stacking or placing.

During transportation and while stacking the epoxy coated reinforcing bars shall be placed on wooden planks not spaced farther than 600mm. When placed in stacks the epoxy coated reinforcing bars shall be neatly tied in bundles using PVC binding material.

The cut ends of bars shall be touched up with special touch up material of specifications as provided by the coating agency. After cutting of the bar the application of touch up material shall be completed within four hours.

While bending the bars the pins of work bench(s) shall be provided with a PVC or plastic sleeve. Each bending operation on epoxy coated reinforcing bar shall be completed in time not less than 90 seconds.

Epoxy coated reinforcing steel bar shall not be directly exposed to sun rays or rain, and shall be protected with opaque polyethylene sheets or similar means as approved by the Engineer in Charge.

While doing concreting the workmen or machinery shall not rest or move on the epoxy coated reinforcing bars. Wooden planks shall suitably be placed to create proper gang-way.

22.5 SPLICING/OVERLAPPING

Only bars of full length shall be used as shown in the drawings. But where this cannot be done, overlapping of bars shall be done as directed by the Engineer-in-Charge. Where practicable, the overlapping bars shall not touch each other, but these shall be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be tied with two strands of 16 SWG black soft annealed binding wire for uncoated bars and with PVC coated GI 18 SWG wire for Epoxy coated bars. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

22.6 WELDED JOINTS

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Welding of reinforcing bars shall not be permitted without the written permission of the Engineer-in- Charge. If Fusion Bonded Epoxy coated bars are used, welding of reinforcing bars shall generally not be permitted. However, if permitted, the joint shall be coated with epoxy as per BS: 7295. Where welding of uncoated reinforcing bars is permitted, it shall be in accordance with the recommendations of IS: 2751 and IS: 9417. Welded joints shall be located at suitable staggered positions. Tests shall be made as directed by the Engineer-in-Charge to prove that the joints are of the full strength of the bars. Maximum one welded joint shall be allowed per bar.

22.7 MECHANICAL CONNECTIONS

The mechanical splices in reinforcement by means of couplers, clamps etc. shall be used (as per manufacturer's specifications) with the written approval of the Engineer-in-Charge. However, tests shall be made as directed by Engineer-in-Charge to prove that such connections are of the full strength of the bars on trial joints. Mechanical connections for Fusion Bonded Epoxy coated bars shall not be used.

22.8 TOLERANCES ON PLACING OF REINFORCEMENT

Unless otherwise directed by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:

a. For effective depth 200mm or less ± 10mm

b. For effective depth more than 200mm ± 15mm

22.9 SUBSTITUTION

When indicated diameter of reinforcement bar is not available, the Contractor shall use other diameter of reinforcement bars on written approval of the Engineer-in-Charge.

22.10 TOLERANCE TO COVER

The actual concrete cover shall not deviate from the required nominal cover by -0 mm to +10 mm measured over the steel reinforcement including links.

23.0 PRECAST CONCRETE

23.1 Specifications contained in clauses above regarding concrete, formwork and reinforcement shall apply in addition to the clauses given as under. The Contractor shall get the precasting bed approved by the Engineer-in-Charge.

23.2 Necessary lifting hooks of suitable (but not less than 12mm dia) diameter M.S. rounds shall be provided for handling, as indicated in drawings or as directed by the Engineer-in-Charge.

23.3 Unless otherwise specified, the exposed surfaces of precast members shall be integrally finished smooth. For precast slabs or planks, the top surface shall be finished with 1:3

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(1 cement: 3 sand) cement mortar. Surface used as walkways shall be given a non-skid finish.

23.4 The precast concrete units shall be marked clearly on top surface with the letter "T" for identification of surfaces at the time of erection and shall be stored properly until required for erection. The precast units shall be handled and erected by methods approved by the Engineer-in-Charge to protect them from damage.

23.5 Precast concrete elements shall not be removed from the casting bed until the concrete has developed its characteristic compressive strength based on cube test results.

23.6 The units shall be suitably handled, transported, stored and placed taking all necessary safety precautions to avoid development of undue stresses caused by vibrations, impact or lateral forces. During shipment and while in storage, the units shall be placed on suitable blocks to provide clearance from bed/ground.

23.7 The Contractor shall take all necessary precautions for safe handling during the course of erection. The Contractor shall replace at his own expense all such units which are damaged during the course of erection. Cement used for a damaged/rejected precast elements shall not be taken into account for material reconciliation.

23.8 The inspection for precast concrete units during casting shall be same as applicable to normal concrete works. However, additional inspection checks shall be made during and after erection of units to ensure its suitability for the required service as a structural member. These checks shall include inspection to detect chipping, cracks, warpages in the precast units etc due to improper handling and storage, improper jointing (if required) of the precast unit with the structure and improper finishing.

23.9 Fabricated precast concrete units containing defects originating due to use of improper materials or workmanship, excessive repair and not conforming to design drawings shall be rejected. Such rejected units shall not be taken into account for material reconciliation or payment.

24.0 CONTINUOUS CONCRETING

24.1 Where called out on the drawings, continuous concreting shall be done in a single operation as per the requirements of IS: 456 and IS: 2974. It shall be ensured that clause 8.3 of these specifications is not violated in case of continuous concreting. Sufficient "Windows" shall be left in the formwork for pouring & compaction of concrete and inspection. These windows shall be fixed tight once the level of concrete reaches their levels.

25.0 CONCRETING UNDER SPECIAL CONDITIONS

25.1 Work in extreme weather conditions during hot or cold weather, the concreting shall be done as per procedure set out in IS: 7861(Part 1) or IS: 7861 (Part2).

25.2 UNDER WATER CONCRETING.

Concreting shall be as per clause no. 14.2 of IS: 456.

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26.0 PAYMENT

This clause shall apply to item rate tenders only.

26.1 PLAIN AND REINFORCED CONCRETE

26.1.1 Payment for plain and reinforced cement concrete (cast- in-situ) shall be made on cubic metre basis of the volume of the actual finished work done or as per approved construction drawings, whichever is less and shall be inclusive of providing pockets, openings, recesses of all sizes, chamfers, fillets, grooves, separation/ expansion/ isolation/ construction/ movement joints, cement wash, curing by normal moist curing or using curing compound etc. as directed by Engineer-in-Charge etc. The rates shall be deemed to include complete cost of getting the respective mix designs approved, making and testing concrete cubes and carrying out other tests including tests of various ingredients, as per specifications and as directed by Engineer-in-Charge. Payment shall, however, be separately made for tests on concrete cubes done by accelerated methods of curing as defined in IS: 9013.

26.1.2 No separate payment shall be made for any additive/ admixture used by the contractor for accelerating or retarding the strength of concrete or for achieving specified workability/water tightness. The rate quoted shall be deemed to be inclusive of all costs related to any such additive/ admixture.

26.1.3 The rate shall however be exclusive of reinforcement, metal inserts, pipe sleeves, formwork, water stops and any filler material in expansion/isolation joints.

26.1.4 Where the strength of concrete mix as indicated by tests, lies in between the strengths of any two grades given in Table-1 and it is accepted by the Owner/Engineer-in-Charge, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength shows higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the Contractor be entitled for any extra payment on such account. The concrete giving lower strength than specified may be accepted at reduced rates after satisfying the safety of the structure by checking it with tests as specified or rejected entirely at the discretion of the Engineer-in- Charge. The rejected concrete shall be dismantled at no extra cost to the owner and no payment or extension of time shall be granted for the concrete so rejected and the formwork and reinforcement used for the same. Cost of any material supplied by the Owner free of cost shall be recovered from the Contractor at double the prevailing market rate. In case the concrete of lower strength can be improved by carrying out some strengthening measures entirely at the discretion of the Engineer-in-Charge, then the said measures including all related tests shall be carried out by Contractor at his own cost. If the Contractor is able to make up the strength to the required grade by such improvement measures to the entire satisfaction of Engineer-in-Charge, payment shall be made for the grade achieved. However, if the strength of concrete is not made up to the strength of required grade, payment shall be made only for the lower strength if such concrete is accepted by the Engineer-in-Charge.

26.1.5 Deductions for openings, pockets etc. shall be as specified in relevant Indian Standard Codes.

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26.1.6 Payment under continuous concreting item in the schedule of rates shall be made only where the total quantity of concrete between two consecutive construction joints specifically called-out on the drawings exceeds 250 cubic metres. For any foundation/structure involving concrete quantity upto 250 cubic metres between two consecutive construction joints shown on drawings, the concrete shall not be measured or paid for under this category (i.e. continuous concreting), although the same is required to be constructed in single pour. The rate quoted against this item shall be inclusive of all extra costs incurred by the Contractor for arranging continuous pouring of concrete and others as specified complete.

26.2 FORM WORK

Unless otherwise specified, payment for form work shall be on square metre basis of the actual area in contact with the concrete cast. The rates shall be inclusive of keeping the formwork for the full period as specified in the above clauses and removing the same after the period is over. No extra payment shall be made for providing scaffolding/staging/access/stairways/ladders etc.

The rates shall be inclusive of any provision to be made or kept in the formwork for providing dowels, inserts etc.

Superior quality formwork for exposed/architectural concrete work shall be measured and paid separately under the relevant item in the schedule of rates.

26.3 REINFORCEMENT

26.3.1 Payment for plain round mild steel reinforcement bars and high strength deformed steel bars shall be on the basis of weight of bare steel irrespective of any coating applied in metric tons. The weight of the bar shall be derived from the sizes and corresponding unit weights given in handbook of Bureau of Indian Standards. Standard hook lengths, chairs, spacer bars and authorized laps only shall be included in the weight calculated. Binding wire shall not be weighed nor otherwise measured. Measurements for weight shall not include cutting allowance etc.

26.3.2 Rate quoted for uncoated reinforcement shall include cost of supplying, decoiling, straightening, cleaning, cutting, bending, placing, binding, welding, if required, and providing necessary cover blocks of concrete.

26.3.3 Rate quoted for Fusion Bonded Epoxy Coated bars shall also include, apart from those mentioned in clause no. 26.3.2, cost of coating of the bars, all necessary tools and tackles and any repairs required due to damage to coating as per IS: 13620.

26.3.4 Payment for mechanical threaded couplers shall be made on number basis (each). The rate shall include supply of complete assembly, fixing, testing etc. all complete.

26.4 WATER STOPS/WATER BARS & EXPANSION/ISOLATION JOINTS

26.4.1 Payment for PVC water bars shall be made on running metre (RM) basis of the water stops provided in position. Rate shall include supplying cutting, fixing, jointing by vulcanising or any other approved method, wastage, etc. complete.

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26.4.2 Payment for filler materials in Expansion/Isolation joints shall be made on running metre basis of the joint provided. For boards provided at expansion/isolation joints, the measurement shall be made on square metre basis. Rate shall be inclusive of supply, cutting, fixing, jointing, wastage etc. complete.

26.5 PRE-CAST CONCRETE

26.5.1 Payment for precast concrete members shall be made on cubic metre basis of the volume of the finished member. The rate quoted shall include cost of formwork, preparation of casting yard, finishing as specified, curing, handling, fixing in position, breaking masonry and/or concrete surfaces and making good the same etc. Reinforcement shall be paid separately under relevant items. Lifting hooks shall be paid on the same basis as reinforcement. Metal inserts shall be paid as per relevant clauses of Specification No. VPC-SS-CS-026 (Miscellaneous Steel Works).

26.5.2 The quoted rate shall be inclusive of providing pockets, openings, recesses of all sizes, chamfers, fillets grooves, holes, cement wash, curing (hot, cold or by using curing compounds). The rate shall be deemed to include complete cost of taking and testing concrete cubes and carrying out other tests including tests of various ingredients as per specification and as directed by the Engineer-in-Charge.

26.5.3 The rate shall however be exclusive of reinforcement, metal inserts, pipe sleeves. Where the strength of concrete mix as indicated by tests, lies in between the strengths of any two grades given in clause 3.0 and it is accepted by the Owner/Engineer-in-Charge, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength shows higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the Contractor be entitled for any extra payment on such account. The concrete giving lower strength than specified may be accepted at reduced rates after satisfying the safety of the structure by checking it with tests as specified or rejected entirely at the discretion of the Engineer-in- Charge. The rejected concrete shall be dismantled at no extra cost to the owner and no payment or extension of time shall be granted for the concrete so rejected and the formwork and reinforcement used for the same. In case the concrete of lower strength can be improved by carrying out some strengthening measures entirely at the discretion of the Engineer-in-Charge, then the said measures shall be carried out by Contractor at his own cost. If the Contractor is able to make up the strength to the required grade by such improvement measures to the entire satisfaction of Engineer-in-Charge, payment shall be made for the grade achieved. However, if the strength of concrete is not made up to the strength of required grade, payment shall be made only for the lower strength if accepted by the Engineer-in-Charge.

26.6 CEMENT WASH

26.6.1 No payment shall be made for cement wash separately and is deemed to be covered in clause no. 26.1.1 & 26.5.2.

26.7 CONTINUOUS CONCRETING

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Payment shall be made as per clause no. 26.1 of this specification. The rate shall be deemed to be inclusive of all extra cost related to labor, shuttering, staging and making all other arrangements for such continuous casting e.g. provisions for adequate movement and storage spaces, special gangways, scaffolding, additional construction equipments, adequate lighting and supervision while the work continues round the clock etc. The rate shall also be inclusive of all costs related to concreting in any thickness, shape and position and at any height or depth so as to avoid any cold joint between specified construction joints.

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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
INSPECTION & TEST PLAN (ITP)
CIVIL / STRUCTURAL &
ARCHITECTURAL WORKS

VPC-SS-CS-100

Rev. No	Date	Purpose	Prepared By	Checked By	Approved By	Approved By
01	16.10.2019	RE-ISSUED AS STANDARD SPECIFICATION	MA	MO	AD	SK
00	05.07.2017	ISSUED AS STANDARD SPECIFICATION	MA	MO	AD	SK

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ABBREVIATION

AFC	Approved For Construction
BM	Bench Mark
CI	Cast Iron
CPT	Cone Penetration Test
GI	Galvanized Iron
IRC	Indian Road Congress
JB	Junction Box
MS	Mild Sreel
MT	Magnetic Particle Testing
NDT	Non Destructive Testing
PCC	Palin Cement Concrete
PQR	Procedure Qualification Record
PT	Penetration Testing
PVC	Poly Vinyl Chloride
PWHT	Post Weld Heat Treatment
RCC	Reinforced Cement Concrete
RF	Reinforcement
SPT	Standard Penetration Test
U/G	Under Ground
WBM	Water Bound Macadam
WPS	Welding Procedure Specification

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GENERAL NOTE

The enclosed ITPs are indicative and shall be followed for developing the job specific ITP's for the works to be performed by the contractor. The provisions indicated for stage wise inspection by VCS/Owner (For specific activities) are the minimum and the Engineer-In-Charge may decide to increase Hold Points/ Witness Points while approving the job specific ITP's. Activities for which ITP's are not provided in this specification contractor to develop and get the same approved by VCS/Owner before start of the work. In general role of VCS has been specified in the document. The role of owner to be specified during preparation of site specific ITPs

Contractor to submit job specific reporting formats with the aid of enclosed sample reporting formats and job procedures for the jobs for which ITP's are attached and submit to VCS/Owner for approval, before commencement of the activity. If the contractor has to deviate from the given ITP for a valid reason, he shall obtain prior written approval of VCS/Owner. Contractor to carry out 100% examination of all activities.

LEGEND

HP: Hold Point;

A point which requires witnessing/inspection/verification and acceptance by Owner/VCS before any further processing is permitted.

The Contractor shall not process the activity/item beyond a Hold Point without written approval by Owner/VCS except where prior written permission for further processing is available.

W: Witness Point;

An activity which requires witnessing/inspection/verification by Owner/VCS when the activity is performed.
After proper notification has been provided (notification modalities and period shall be finalized before hand), the Contractor is not obliged to hold further processing if Owner/VCS is not available to witness the activity or does not provide comments before the date notified. In such cases, basis of acceptance shall be review of Contractor generated report/document as per relevant technical specification.

Rw: Review of Contractor's documentation.

S: Surveillance Inspection by Owner/ VCS.

Monitoring or making observations to verify whether or not material/items or services conform to specified requirements. Surveillance activities may include audit, inspections, witness of testing, Review of quality documentation & records, personnel qualifications, etc.

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WC: 100% Supervision and Examination by Contractor.

Responsibility for execution of the inspection/testing is with the Contractor; Owner/VCS only verifies examination or testing done by the Contractor at important stages

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ITP NO: 101

LAND & TOPOGRAPHICAL SURVEY

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Boundary markings and submission of drgs./sketches	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	W
3.	Block levels, contour plans, establishing Permanent bench marks with ref. to Survey of India B.Ms. by check levels and submission of relevant drgs. & records	WC	S
4.	Protection of control points, permanent bench marks and regular rechecking	WC	S
5.	Submission of Master plan showing monuments, structures exposed rocks, weirs, water works, ponds, underground services if crossing that area, etc.	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO: 102

SOIL INVESTIGATION

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Positioning of test location	WC	S
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	W
3.	Boring & sampling	WC	S
4.	In-situ testing (SPT, CPT, Plate load test, Soil Resistivity, Block vibration test, etc.)	WC	S
5.	Lab testing (as applicable)	WC	W/ Rw
6.	Monitoring of water level	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO: 103

SITE GRADING

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Clearing and stripping of soil including disposal of unsuitable material	WC	S	-
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP
	b) Field calibration, if any	WC	S	-
3.	Taking and plotting of initial levels at specified intervals for cutting as well as filling areas	WC	S*	S*
4.	Classification (Levels of strata) and testing of filling soil for suitability including preparation of Lead Charts to filling/disposal areas.	WC	S	-
5.	Proper warning of explosions, misfires and storage of explosive materials (As applicable).	WC	-	S
6.	Breaking up of clods, lumps, etc. at the time of filling and compaction.	WC	S	-
7.	Identification and suitability of borrow areas for filling soil/murrum including verification of payments for royalty, etc.	WC	Rw	-
8.	Compaction test for earth filling in specified layers including finished areas.	WC	Rw	-
9.	Verification of final finished grade levels.	WC	S*	S*
10.	Computation of Earth works.	WC	Rw*	Rw*
11.	Record of tree cuttings, stacking of blasted rocks and other quarry materials including handing over to Owner	WC	S	S
12.	Preparation of "As built drawings	WC	Rw	Rw
13.	Removal of Surplus earth/excavated material and levelling in disposal areas.	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT A: All fillings
CAT B: All cuttings.

* In case quantum of earthwork is required to be certified by VCS then HP.

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ITP NO: 104

EXCAVATION

SL. NO.	ACTIVITY	CONTRACTOR	VCS		
			CAT A	CAT B	CAT C
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP	RW
	b) Field calibration, if any	WC	W	S	-
2.	Layout checking	WC	S	-	-
3.	Taking initial levels	WC	S	-	-
4.	Slopes of excavation, benching, overburden, shoring & strutting (in case of deep excavation)	WC	S	S	-
5.	Check for sub-soil water, dewatering requirements as per specifications.	WC	S	S	S
6.	Bottom level of excavation and compaction	WC	S	S	S
7.	Stacking of different type of soils separately	WC	S	-	-
8.	List of obstacles encountered (cables, pipes, conduits, etc)	WC	S	S	-
9.	Barricading of excavated pits for safety & protection from rain	WC	S	S	S
	FOR HARD ROCK				
1	Obtaining license from district authorities for undertaking blasting operations	WC	Rw	Rw	Rw
2	Storing of explosive materials as per explosive rules	WC	S	S	S
3	Prominent display of red flags around the area to be blasted	WC	S	S	S
4	Check the dimensions of bore holes	WC	S	S	S
5	Stacking of hard rock for useable/non useable including handing over to owner	WC	S	S	S
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A : Equipment foundations, Plant buildings, etc.
CAT B : Non Plant buildings, pipe culverts, bridges, etc.

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CAT C : Boundary walls, wing walls, manholes, drains, etc.

ITP NO: 105

BACK FILLING

SL. NO.	ACTIVITY	CONTRACTOR	VCS		
			CAT A	CAT B	CAT C
1.	Selection of materials/selected earth	WC	W	S	S
2.	Check for treatment of soil, if any	WC	S	S	-
3.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP	HP
	b) Field calibration, if any	WC	W	S	-
4.	Filling in specified layers, consolidating, watering.	WC	S	-	-
5.	Compaction tests for layers	WC	W	S	Rw
6.	Filling to required levels	WC	S	-	-
	INSPECTION & TEST DOCUMENTS				
	Review Test and Inspection Documents	WC	Rw	Rw	Rw

CAT A: Equipment foundations, Plant buildings, etc.
CAT B: Non Plant buildings, pipe racks, pipe culverts, bridges, etc.
CAT C: Boundary walls, wing walls, manholes, drains, etc.

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ITP NO :106

UNDERGROUND PIPING (RCC/ CI)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Checking of material	WC	NOTE 1	NOTE 1
2.	Adequate slope, benching in excavation for safety purposes (if required)	WC	S	
3.	Layout, line & level	WC	S	-
4.	Laying & jointing, grouting at manholes/chambers	WC	S	-
5.	Check for supports/ firm bed/ sub soil water level	WC	S	-
6.	Testing for leakages by blocking pipe ends	WC	W	W
7.	Hydro-testing and other tests, Removal of blockages, Cleaning & flushing of system	WC	W	W
8.	Backfilling in layers	WC	Rw	Rw
9.	Check for MS rungs in proper position, inlet/outlet pipe levels in manholes	WC	S	S
10.	Preparation of “As-built drawings”	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Plant Buildings, etc.
CAT B: Non Plant Buildings, Admn. Buildings, Gate House, Security/Guard Rooms etc.

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ITP NO:107

WBM ROADS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	RW
	b) Field calibration, if any	WC	S	-
2.	Layout checking including Road crossings and taking initial levels	WC	S	S
3.	Approval of source & checking/testing of materials (wherever required)	WC	NOTE 1	NOTE 1
4.	Filling (if any), compaction, providing cambers in sub-base including levels	WC	S	S
5.	Spreading metal to required thickness, line & levels, dry rolling including spreading of screening material	WC	-	-
6.	Check for camber and levels over metalling	WC	S	S
7.	Spreading murrum/ sand, watering and rolling	WC	S	-
8.	Checking thickness after each layer and rectification thereof (if any)	WC	S	S
9.	Checking quantity of aggregate by excavation of trial pits as per IRC Code	WC	W	S
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE : 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Roads subjected to heavy loading, connected to main highway, main plant roads
CAT B: Balance Roads

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ITP NO:108

BLACK TOPPING (PREMIX CARPETING) & BITUMINOUS MACADAM (BM)

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Approval of source of materials	WC	Note 1
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP
	b) Field calibration, if any	WC	S
3.	Surface preparation & check for camber/level	WC	S
4.	Checking/ testing of material wherever required	WC	W
5.	Tack coat application	WC	-
6.	Laying of Premix carpeting/ BM including rolling	WC	S
7.	Application of Seal coat	WC	-
8.	Check for camber and levels	WC	S
9.	Check for bitumen temperature and consumption	WC	S
10.	Thickness check of Premix carpet/ BM	WC	S
11.	Removal of surplus earth	WC	-
12.	Berm preparation	WC	-
13.	Final Inspection	WC	W
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE : 1) For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:109

MICRO GRADING

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW
	b) Field calibration, if any	WC	-
2.	Taking initial levels	WC	S
3.	Clearing/ Removal of extra soil, debris, etc. from site by transportation	WC	-
4.	Taking final levels	WC	S
5.	Verification of gradient of ground	WC	-
6.	Finishing of ground surface by hand compactor/ Roller (As applicable)	WC	S
7.	Final inspection	WC	W
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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ITP NO:110

PLAIN CEMENT CONCRETE

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW	RW
	b) Field calibration, if any	WC	S	Rw
2.	Checking of layout and materials, compaction of sub –grade	WC	S	-
3.	Mix proportion	WC	S	-
4.	Check for shuttering, dewatering if any.	WC	-	-
5.	Concreting with proper compaction	WC	-	-
6.	Checking of top level of PCC	WC	Rw	-
7.	Curing	WC	-	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

CAT A : for filled-up area
CAT B : for cutting area

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ITP NO:111

REINFORCED CEMENT CONCRETE (SUBSTRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1	Approval of source of materials	WC	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	HP
	b) Field calibration, if any	WC	Rw	Rw
3.	Checking of layout & condition of PCC/ levelling course	WC	S	-
4.	Incoming material checking	WC	NOTE 1	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP
6.	Check for line & level of shuttering including its condition, quality and rigidity.	WC	S	-
7.	Check for sub-soil water & dewatering arrangement, if any	WC	S	-
8.	Reinforcement & covers to reinforcement	WC	S	S
9.	Inserts, Anchor bolts and pipe sleeves, pockets, dowels, etc.	WC	S	S
10.	Pour Card	WC	W	Rw
11.	Check for obstacles encountered (Electrical conduits, pipe lines, etc.)	WC	S	-
12.	Concreting, testing, compaction & finishing	WC	S	Rw
13.	Casting of cubes	WC	S	S
14.	Curing	WC	S	-
15.	Testing of cubes	WC	W	W
16.	Removal of shuttering	WC	-	-
17.	Check for water tightness, rendering, if any	WC	S	S
18.	Preparation of As-built drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and equipment foundations etc
CAT B:non-plant buildings, pipe sleepers, manhole, catch pit and balance works.

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ITP NO:112

REINFORCED CEMENT CONCRETE (SUPER STRUCTURE)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CATB	CAT C
1	Approval of source of materials	WC	HP	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipment	WC	HP	HP
	b) Field calibration, if any	WC	Rw	Rw
3.	Checking of layout	WC	S	-
4.	Incoming material inspection	WC	Note 1	Note 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP
6.	Check for line & level of shuttering and scaffolding/ vertical bracing including hoisting arrangements.	WC	S	-
7.	Reinforcement & covers to reinforcement	WC	S	S
8.	Inserts, bolts, pipe sleeves, MS rungs, concealed electrical conduits, fan hooks, dowels, etc. including welding if any	WC	S	-
9.	Pockets/ openings	WC	S	-
10.	Expansion joints, if any	WC	S	-
11.	Check for water stops, slopes, stoppers, if any	WC	S	-
12.	Pour Card	WC	W	Rw
13.	Concreting, testing, compaction & finishing	WC	S	S
14.	Casting of cubes	WC	S	S
15.	Curing	WC	S	-
16.	Testing of cubes	WC	W	W
17.	Removal of formwork/ staging	WC	-	-
18.	Verification of dimensions viz AFC drawings and tolerances	WC	S	S
19.	Check for water tightness, rendering, if any	WC	S	-
20.	Preparation of As built drawings.	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and super structure of equipment Foundations, etc
CAT B: non-plant buildings, pipe sleepers, manhole, catch pit and balance work.

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ITP NO:113

RCC PAVEMENT/FLOORING

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Approval of source of materials	WC	Rw
2.	a) Availability of valid calibration certificates of instruments/ testing equipments	WC	HP
	b) Field calibration, if any	WC	S
3.	Layout checking/ excavation of all new foundations	WC	-
4.	Incoming material inspection	WC	NOTE 1
5.	Design of mix &establishment of strength at site by trial mix	WC	HP
6.	Check for proper back filling/compaction/ completion of sub - Structure works	WC	S
7.	Check for edges of shuttering, alternate panels	WC	-
8.	Check for slopes, thickness of flooring	WC	S
9.	Shuttering, reinforcement (as applicable)	WC	-
10.	Check for expansion joints/ Construction joints	WC	S
11.	Check for concealed pipe embedment, earthing, if any	WC	-
12.	Check for dividing strips, as applicable	WC	S
13.	Concreting, finishing, etc	WC	S
14.	Checking for line, levels, slopes, joints, thickness of flooring viz. AFC drawings	WC	S
15.	Curing	WC	S
16.	Grinding & polishing, as applicable	WC	S
17.	Testing of concrete cubes (as applicable)	WC	W
18.	Preparation of “As Built Drawings”	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:114

BRICK MASONARY

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	RW	RW
	b) Field calibration, if any	WC	Rw	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Cleaning of surface	WC	-	-
4.	Wetting/soaking of bricks	WC	S	S
5.	Cement mortar proportion	WC	S	S
6.	Staging & scaffolding	WC	-	-
7.	Hacking of adjacent concrete surface	WC	S	S
8.	Check for bond/closers, thickness of joints	WC	S	-
9.	Line, level & plumb	WC	S	S
10.	Raking out joints, keys in brick work, if any	WC	S	S
11.	Check for placement of Reinforcement bars in case of partition brick work	WC	S	S
12.	Embedment of fixtures	WC	S	S
13.	Curing	WC	-	-
14.	Preparation of 'As Built' Drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A : Load bearing walls
CAT B : Balance works

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ITP NO:115

STRUCTURAL STEEL WORKS

S. NO	ACTIVITY	CONTRA-CTOR	VCS	
			CAT B	CAT C
A	PRE – FABRICATION ACTIVITIES			
1.	a) Availability of valid calibration certificates of instruments/ testing equipment's	WC	HP	RW
	b) Field calibration, if any	WC	S	Rw
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Welding Filler material approval/ qualification			
	a) Manufacturing test certificates/ documents	WC	Rw	Rw
	b) Testing, if any	WC	W	W
4.	Approval of WPS/ PQR	WC	HP	HP
5.	Welders performance qualification	WC	W	Rw
6.	Layout checking	WC	-	-
7.	Welding equipment and accessories	WC	-	-
8.	Preparation and approval of Fabrication drawings	WC	Rw	-
B	FABRICATION ACTIVITIES			
1.	Materials as per design drawing	WC	Rw	Rw
2.	Check straightness and non-warping of members	WC	S	-
3.	Dimensional and fit-up checks including provision of slopes for deflection wherever required	WC	S	-
4.	Visual check for welding	WC	S	-
5.	Grinding including surface preparation for painting and application of primer	WC	S	Rw
6.	Checking paint as per specs, shelf-life, etc.	WC	S	-
7.	Application of specified paint, painting thickness, etc.	WC	S	-
C	FIELD ERECTION ACTIVITIES			
1.	Lifting arrangements including test certificates of lifting tackles	WC	S	Rw
2.	Correctness of location	WC	-	-
3.	Orientation of bracing, lugs	WC	-	-
4.	Alignment & levels	WC	-	-
5.	Field welding (if any)	WC	S	-
6.	Grouting	WC	S	-
7.	Finishing coat of paint, thickness of paint etc.	WC	S	S
8.	Preparation of As-built drawings	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Steel structures pertaining to Pipe racks, and equipment's, etc.
CAT B: Steel structures of plant buildings and non-plant buildings, pipe sleepers, manhole, catch pit, walkways, platforms at grade levels, etc.

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ITP NO: 116

PILING WORKS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Approval of source of materials	WC	Rw	Rw
2.	Layout and ground level	WC	S	-
3.	Incoming material inspection	WC	Note 1	Note 1
4.	Design of mix &establishment of strength at site by trial mix	WC	HP	HP
5.	Driving of piles & check for set point	WC	S	-
6.	Check for depth of bore and lowering of cage measuring	WC	-	-
7.	Pour Card	WC	HP	Rw
8.	Concreting, testing	WC	S	S
9.	Casting of cubes/Testing	WC	S/W	S
10.	Check for cut off level of concreting & quantity of concrete poured	WC	-	-
11.	Lifting of casing pipe	WC	S	-
12.	Pile load tests (lateral/vertical/cyclic/pull out)	WC	Rw	Rw
13.	Submission of pile load test report	WC	Rw	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Pipe racks, plant buildings and other equipment foundations etc.

CAT B: Non-plant buildings, Pipe sleepers, Manhole, Catch pit, etc.

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ITP NO:117

ANTI-TERMITE TREATMENT

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Incoming material inspection & spraying devices including personal protective equipment's like facemask, gloves, shoes, etc.	WC	HP & Note 1
2.	Preparation of surface for taking dosage of emulsion by ramming of each layer of soil by roding the earth at specified intervals	WC	-
3.	Backfilling and compaction in specified layers along with application of emulsifier along the sides of masonry & RCC structures	WC	S
4.	Compaction of top surface for taking dosage of emulsifier by roding the earth at specified intervals for the entire floor area before concreting	WC	-
5.	Check for consumption of emulsifier utilized	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:118

PLASTERING

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Check for completeness of all hidden jobs like piping, conduiting, etc.	WC	-	-
2..	Check for grading of sand, Mix proportion	WC	S	S
3.	Sample preparation for finish and its approval	WC	W	S
4.	Neeru application on plaster (as applicable)	WC	S	-
5.	Hacking and cleaning the surface, removing loose particles, wetting the surface	WC	-	-
6.	Checking of plaster thickness, plumb & even surface	WC	S	-
7.	Check for grooves, openings, rounding off the corners, hollowness in plaster	WC	-	-
8.	Curing	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	

CAT A: Area requiring special finish (e.g. pebble dash finish etc.)
CAT B: Balance works.

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ITP NO:119

DOORS, WINDOWS AND VENTILATORS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Check for sections & dimensions	WC	S	-
3.	Line, level & plumb	WC	-	-
4.	Section joinery details	WC	Rw	-
5	Grouting with lugs/ dash fasteners	WC	-	
6	Check for fixtures & fittings	WC	S	S
7	Check for thickness & type of glazing	WC	-	-
8	Check for rubber gasket, anodizing (as applicable)	WC	-	-
9	Brand/ shade of paints, no. of coats including surface preparation	WC	S	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: plant buildings
CAT B: Balance works

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ITP NO:120

PAINTING (BUILDING WORKS)

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Completion of surface preparation	WC	-	-
2.	Incoming material inspection	WC	Note 1	Note 1
3.	Confirmation of colour, shade & brand	HP	-	-
4.	Check for number of coats and thickness	WC	S	-
5.	Curing, if any	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: plant buildings
CAT B: Balance works

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ITP NO:121

SANITARY FITTINGS

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	Note 1	Note 1
2.	Checking of sample (as applicable)	WC	S	-
3.	Check completeness of finishing works w.r.t. line, level & position	WC	S	-
4.	Check proper fixing of the sanitary fittings to give aesthetic appeal	WC	S	-
5.	Check for leakage	WC	S	Rw
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

CAT A: Main plant buildings
CAT B: Balance works

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ITP NO:122

WATER PROOFING (ROOF)

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Surface preparation for screeding/ water proof plastering	WC	W
2.	Mix proportion, thickness of screeding/ plastering & slope towards rain water pipes	WC	S
3.	Formation of groove at specified height on parapet wall	WC	-
4.	Incoming material inspection, no. of coats, application procedure and consumption.	WC	S/Note 1
5.	Termination of material in groove on vertical plane	WC	S
6.	Check for hollowness, bubbles in water proofing, if any	WC	S
7.	Conducting a sample of water proofing test by flooding the area for specified interval (as applicable)	WC	S
8.	Cleaning of surface	WC	-
9.	Submission of Guarantee in the requisite Performa	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:123

FALSE FLOORING AND FALSE CEILING

SL. NO.	ACTIVITY	CONTRACTOR	VCS
	FALSE FLOORING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Cleaning base floor	WC	-
4.	Painting base floor with Polyurethane based paint (as specified)	WC	S
5.	Proper line, level & layout	WC	S
	FALSE CVCSING		
1.	Manufacturers Test Certificate	WC	Rw
2.	Incoming material inspection	WC	Note 1
3.	Surface preparation of panel boards	WC	-
4.	Proper line, level & cut-outs	WC	S
5.	Painting of panel boards	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:124

UNDER DECK INSULATION

SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Incoming material checking including density	WC	Note 1
2.	Checking of adhesive, fasteners for anchorage	WC	S
3.	Fixing of scaffolding, ladders, platforms	WC	S
4.	Fixing of under-deck insulation with adhesive	WC	-
5.	Fixing of dash fasteners at defined spacing	WC	-
6.	Finishing	WC	S
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001

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ITP NO:125

ROOFING ACCESSORIES

SL. NO.	ACTIVITY	CONTRACTOR	VCS	
			CAT A	CAT B
1.	Incoming material inspection	WC	HP/Note 1	HP/Note 1
2.	Check for mitring, overhang, laps, etc.	WC	S	-
3.	Slopes line, level of sheets, barge boards, ridges & gutters, overhang of sheets	WC	S	-
4.	Bolting by drilling only, length of bolts, nos., anodizing and type of washers	WC	S	-
5.	Check for slopes of rain gutters, down take pipes, north lighting curves/ supports for gutters	WC	S	-
6.	Check for leakage/ passing of light	WC	S	-
	INSPECTION & TEST DOCUMENTS			
	Review Test and Inspection Documents	WC	Rw	Rw

NOTE: 1 For incoming material inspection please refer VCS Standard Specification No: SS-EA -001
2) Fixing arrangement need to be reviewed with respect to contract specifications.

CAT A: Important structures (e.g. Compressor House, Warehouse and Pump House etc.)
CAT B: Balance works.

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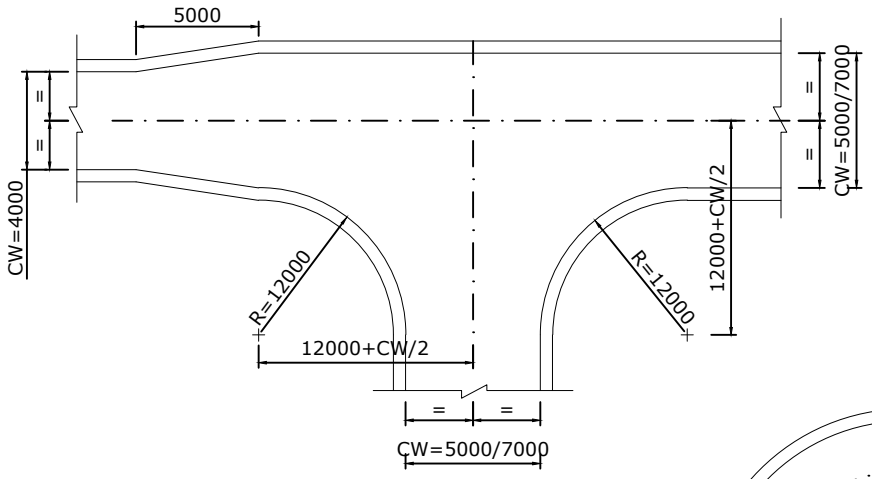
ITP NO:126

LIGHTING WORKS (NON PLANT BUILDINGS)

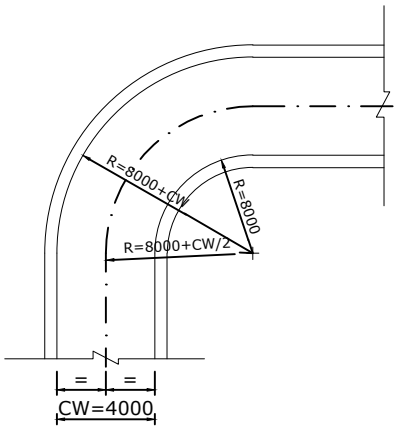
SL. NO.	ACTIVITY	CONTRACTOR	VCS
1.	Prepare detailed conduit layout diagram as per the approved electrical drawing	WC	W
2.	Provide /PVC/GI sleeves in columns/beams at identified locations to facilitate laying of conduit on later date.	WC	S
3.	Ensure conduit & accessories material is inspected at site before using	WC	W
4.	Ensure that the conduit is laid in line with execution drawings & provide pull-wires as per requirement.	WC	S
5.	Check correctness of drop/JB locations	WC	S
6.	Check threaded joints are proper	WC	S
7.	Ensure all JB/Fan box are properly stuffed with jute	WC	S
8.	Ensure conduits are properly tied to reinforcement bars to prevent floating during concrete	WC	S
9.	Ensure proper supporting of conduit lengths wherever required	WC	S
10.	Ensure adequate chasing depth for conduit portion coming inside brick walls	WC	S
11.	Check workmanship towards joints and presence of any foreign material inside the conduits	WC	S
12.	Ensure wiring material is inspected at site before use	WC	W
13.	Ensure correctness of lighting wire size and no. of wires as per the drawing in each conduit portion	WC	S
14.	Preparation of "As Built" drgs.	WC	Rw
	INSPECTION & TEST DOCUMENTS		
	Review Test and Inspection Documents	WC	Rw

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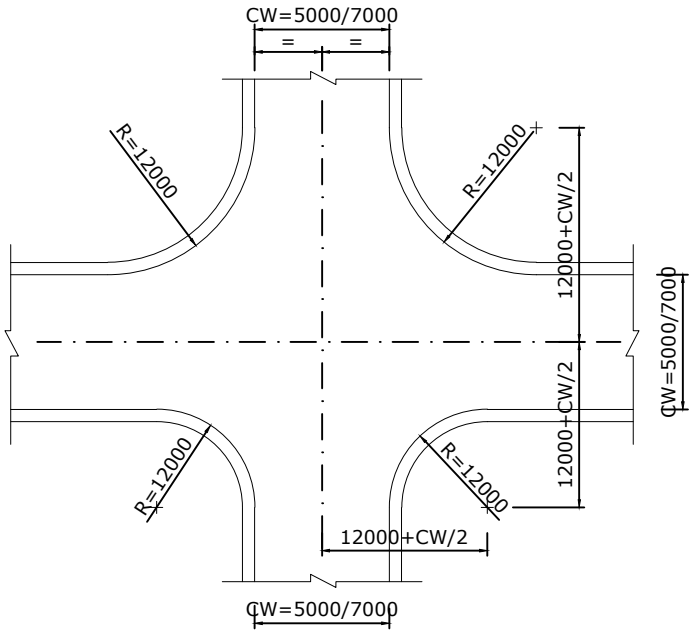
M/s. VCS PROJECT CONSULTANT PVT. LTD.	STANDARD FOR DETAIL OF ROAD CURVES AND CROSSINGS	DRAWING NO. VPC-STD-CS-001
		SHEET NO. 1 OF 1



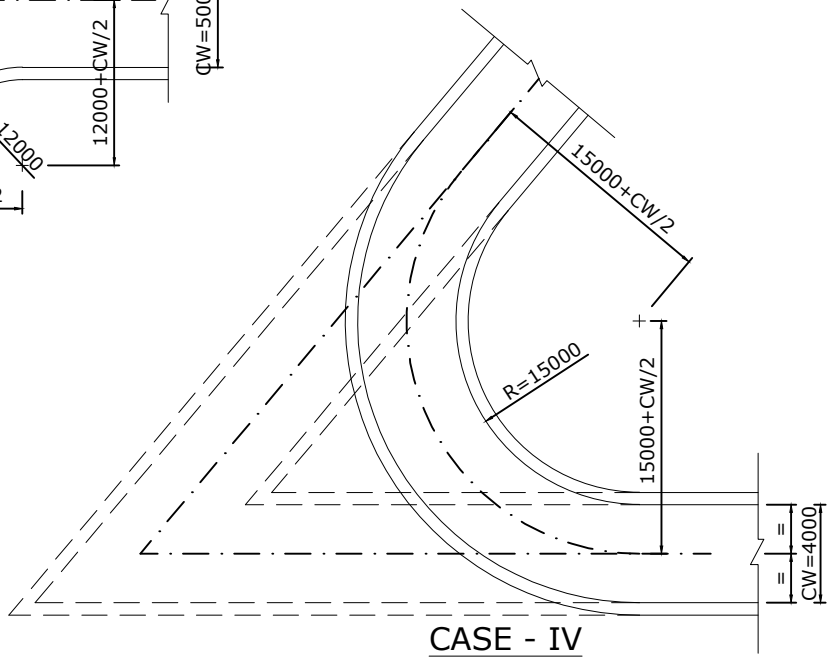
CASE - I



CASE - III



CASE - II



CASE - IV

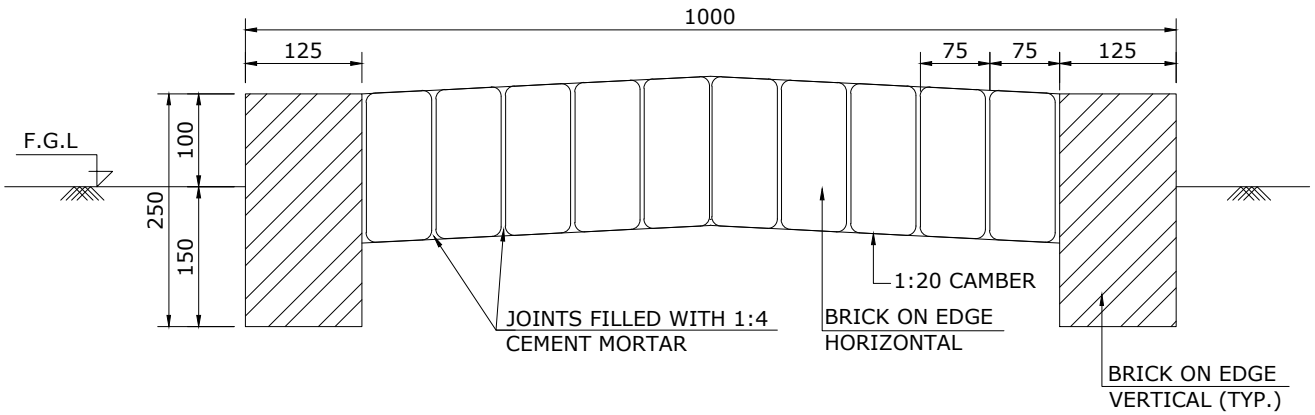
NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE MENTIONED.
2. MINIMUM RADIUS OF CURVES FOR ROADS WITH CW=4.0m
3. MINIMUM RADIUS OF CURVES FOR ROADS WITH CW>4.0m SHALL BE 12m.
4. RADIUS OF CURVES FOR APPROACH ROADS TO BUILDINGS AND OTHERS AREAS MAY BE REDUCED AS PER SERVICES REQUIRMENTS.
5. FOR ROAD CURVES WITH ACUTE ANGLE TURNING. THE MINIMUM RADIUS SHALL BE 15m AND ANGLE NOT LESS THAN 50°.
6. RADIUS OF CURVES AND CROSSING WHEN DIFFERENT FROM THOSE GIVEN IN THIS STANDARD TO MEET ANY SPECIAL REQUIRMENT SHALL BE SO MARKED IN THE AREA DRAWINGS.

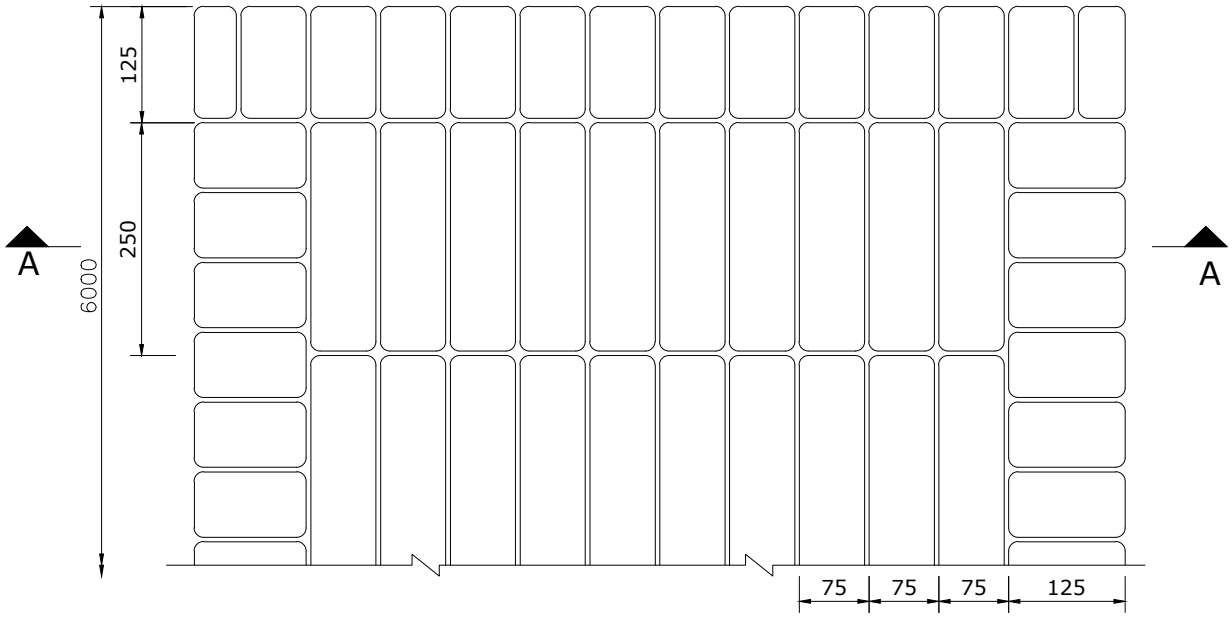
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	17.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

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M/s. VCS PROJECT CONSULTANT PVT.LTD.	BRICK FOOTPATH	DRAWING NO.
		VPC-STD-CV-017
		SHEET NO. 1 OF 1



SECTION A-A



PLAN

NOTES:-

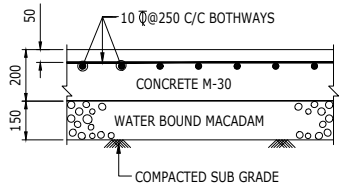
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. AFTER EVERY 6000 LENGTH OF FOOTPATH A BREAK OF 100 mm WIDTH SHALL BE LEFT UNPAVED TO ALLOW THE SURFACE DRAINAGE.

LEGEND:-

F.G.L = FINISH GRADE LEVEL

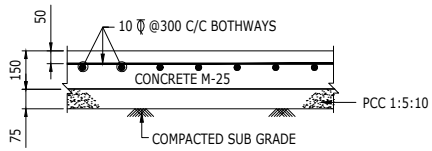
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	17.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

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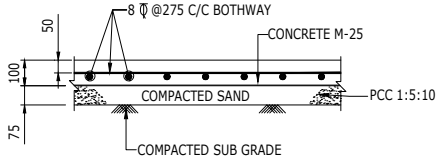
TYPE - I

(FOR VEHICULAR MOVEMENT AREA)



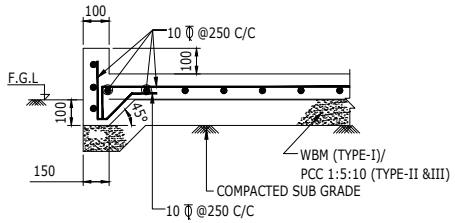
TYPE - II

(FOR UNIT PAVEMENT)



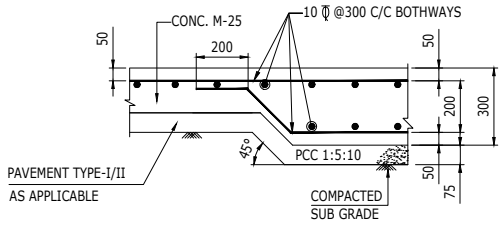
TYPE - III

(FOR OFFSITE PUMP STATION)



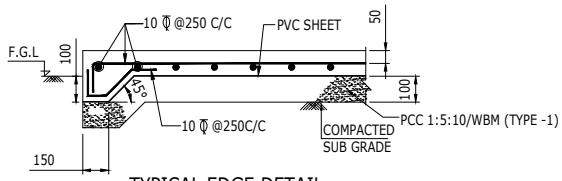
TYPICAL EDGE DETAIL

(WITH KERB WALL)



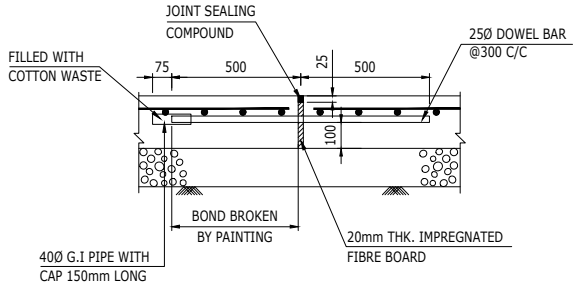
X-SECTION OF THICKENED PAVEMENT

(SEE NOTE 14)



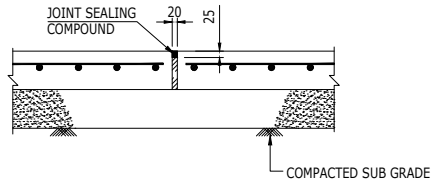
TYPICAL EDGE DETAIL

(WITHOUT KERB WALL)



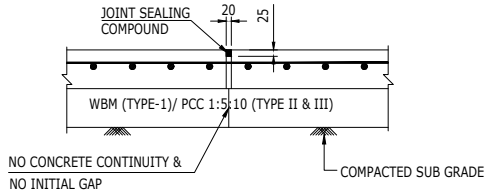
DETAIL OF EXPANSION JOINT

(FOR TYPE -I PAVEMENT)



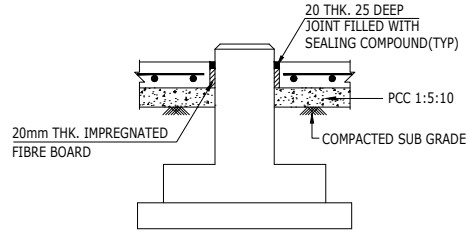
DETAIL OF EXPANSION JOINT

(FOR TYPE -II & III PAVEMENT)



DETAIL OF CONSTRUCTION JOINT

(SEE NOTE 13)



TYPICAL DETAIL OF JOINT SEALING
AROUND FOUNDATION

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. CONCRETE SHALL BE CONFIRM TO IS:456.
3. ϕ DENOTED HIGH YIELD DEFORMED BARS OF GRADE Fe415 CONFIRMING TO IS:1786. UNLESS OTHERWISE SPECIFIED.
4. JOINT SEALING COMPOUND IN PAVING AND AROUND EQUIPMENT FOUNDATIONS SHALL CONFIRM TO IS:1834 TYPE-B.
5. EXPANSION AND SEALING JOINT FILLER MATERIAL SHALL BE FILLERS OF BITUMEN PREFORMED FIBRES IMPREGNATED FIBRE, CONFIRMING TO IS:1838, PART-1.
6. CONCRETE PAVING SHALL BE SLOPED STEEPEST TO 1:100 UNLESS OTHERWISE SHOWN IN DETAIL ENGINEERING DRAWING. SLOPE OF THE SUB GRADE SHALL BE PREPARED TO MATCH WITH SLOPE OF PAVEMENT.
7. SUB GRADE BELOW PAVEMENT SHALL BE THOROUGHLY COMPACTED TO 95% OF LAB DRY DENSITY AS PER IS:2720, PART VIII.
8. CAST IN SITU CONCRETE FOR PAVEMENT SHALL BE LAID IN ALTERNATE PANELS OF SIZES AS DEFINED IN THIS STANDARD DRAWING HOWEVER, THE PANEL SIZE SHALL BE ADJUSTED AROUND COLUMNS & FOUNDATION
9. EXPANSION JOINTS SHALL BE SPACED AT 14.0M (MAX.)FOR TYPE-I PAVEMENT & 13M C/C (MAX.)FOR TYPE-II PAVEMENTS.
10. EXPANSION JOINTS SHALL BE SPACED AT 15 M C/C & CONSTRUCTION JOINS SHALL BE SPACED AT 7.5M C/C (MAXIMUM) FOR TYPE-III PAVEMENTS.
11. THIS STANDARD NOT VALID FOR CAUSTIC HANDLING AREAS.
12. LIMITATION OF SINGLE AXLE LOAD ON RCC PAVEMENT:
    FOR TYPE-I PAVEMENT : MAX. UPTO 12.0 TONNE
    FOR TYPE-II PAVEMENT : MAX. UPTO 6.0 TONNE
    (FOR SMALL VEHICLES LIKE FORK LIFT)
    (FOR TYPE III PAVEMENT: NO IS LOAD EXPECTED)
13. CONSTRUCTION JOINTS MAY BE PROVIDED IN CASE PANEL SIZE IS LESS THAN THE REQUIRMENT OF EXPANSION SUIT SITE REQUIREMENTS.
14. FOR PIPE SUPPORT DETAILS COMING IN THICKENED PAVEMENT AREA REFER RELEVENT PIPING GAD / PIPING STANDARDS.

GEOTECHNICAL RECOMMENDATION SHALL BE FOLLOWED FOR SUBGRADE TREATMENT FOR PAVEMENTS IN BLACK COTTON SOIL AREAS/JOB SPECIFIC REQUIREMENT

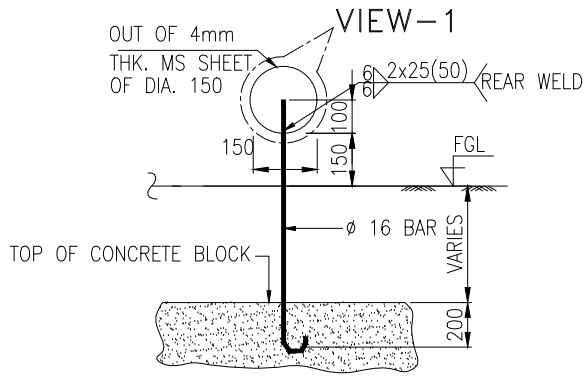
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	26.03.18	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

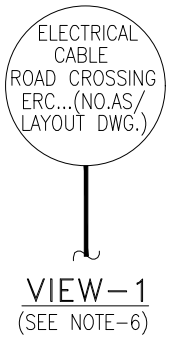
RCC PAVEMENT DETAILS

M/s. VCS PROJECT CONSULTANT PVT. LTD.	STANDARD NO.	SHEET	REV.
	VPC-STD-CS-018	1 OF 1	1

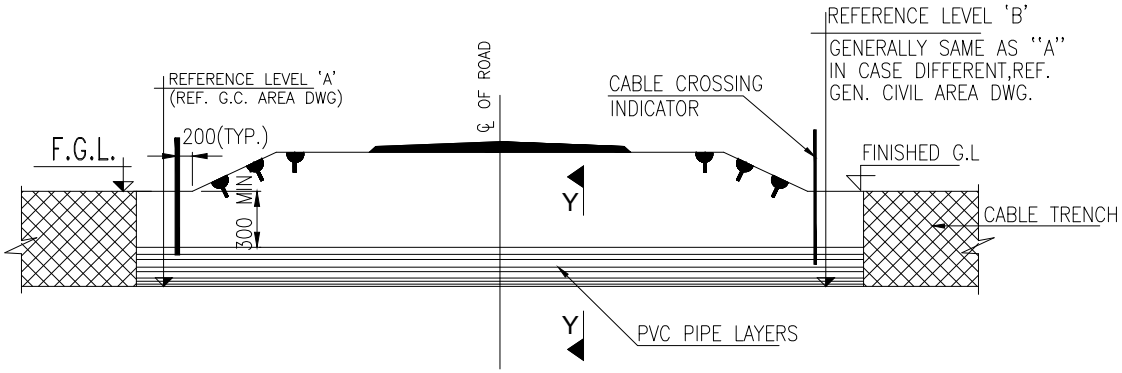
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M/s. VCS PROJECT CONSULTANT PVT.LTD.	CABLE CROSSING UNDER ROAD (P.V.C. PIPES)	DRAWING NO.
		VPC–STD–CS–021
		SHEET NO. 1 OF 1

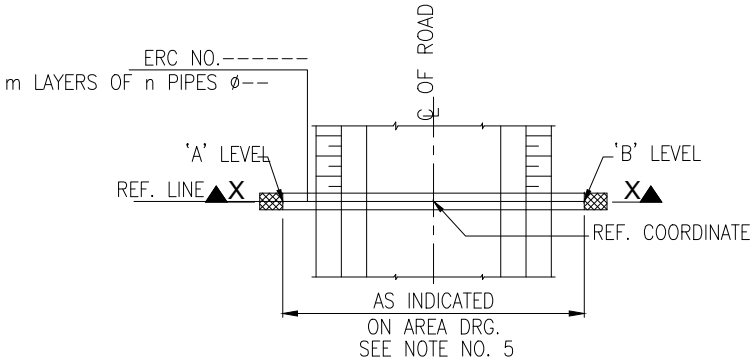




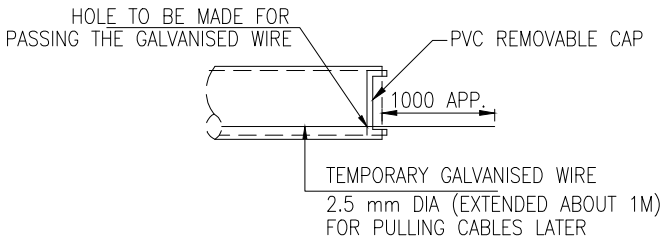
DETAIL OF CABLE CROSSING INDICATOR



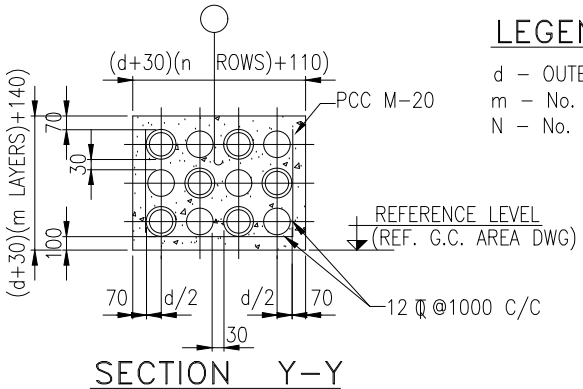
SECTION X–X
(APPLICABLE FOR ERC & IRC)



PLAN
(REPRESENTATION ON AREA DRG.)



SLEEVE END PLUGGING DETAIL



SECTION Y–Y

LEGEND:–

d – OUTER DIA OF PIPE
m – No. OF LAYERS
N – No. OF ROWS

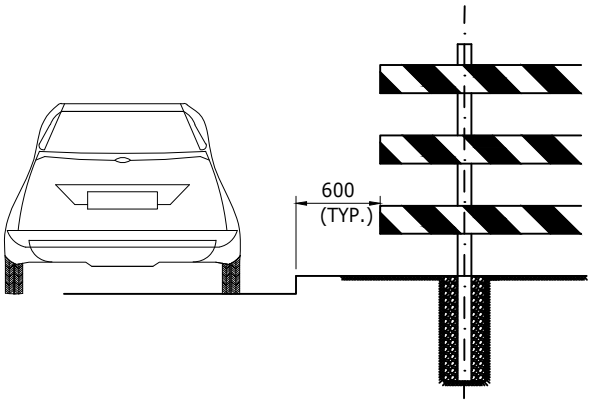
NOTES:–

1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.
2. CONDUIT MATERIAL P.V.C. PIPE OF NOM. OUT SIDE PIPE DIA.ø110, ø160 OR ø210 AS PER LAYOUT PLAN
3. PIPES SHALL CONFIRM TO IS: 4985 CLASS–I AND EMBEDDED IN PLAIN CEMENT CONCRETE.
4. BACK FILLING WITH ROAD MATERIAL SHALL BE DONE IN 150 MM THK. LAYER WELL WATERED AND COMPACTED AS PER ROAD SPECIFICATION.
5. INCASE CABLE CROSSING IS REQUIRED TO CROSS THE OPEN DITCHES ON EITHER SIDE THE LENGTH & THE LEVEL OF CABLE CROSSING SHALL BE DECIDED CLEARING THE SERVICE ALONG ROAD SIDE.
6. CABLE CROSSING INDICATOR MADE OF 4mm THK. MILD STEEL PLATE AS PER IS:2062, ENAMEL PAINTED IN JADE GREEN BACKGROUND ON BOTH SIDES WITH WHITE LETTERING.
7. THE SHAPE OF PVC REMOVABLE TYPE CAP AS SHOWN IS INDICATIVE.

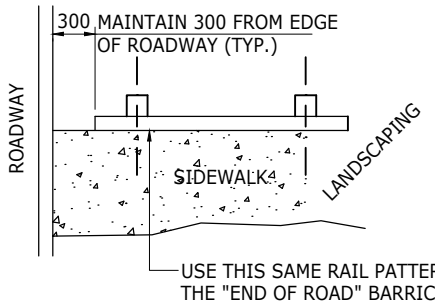
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	17.10.19	RE-ISSUED AS STANDARD				
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

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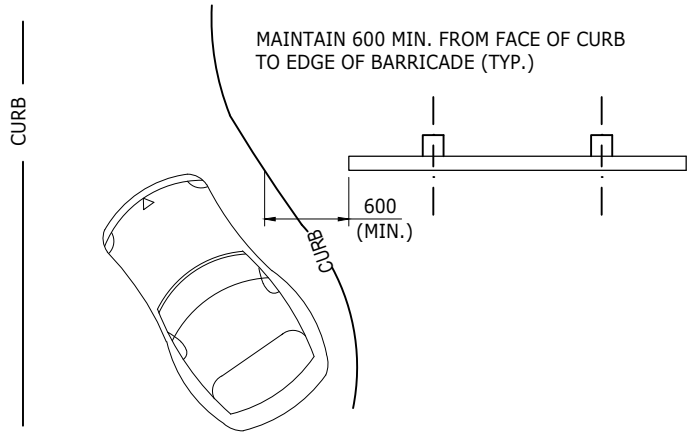
M/s. VCS PROJECT CONSULTANT PVT.LTD.	STANDARD **FOR BARRICADES**	DRAWING NO. VPC-STD-CS-022
		SHEET NO. 1 OF 1



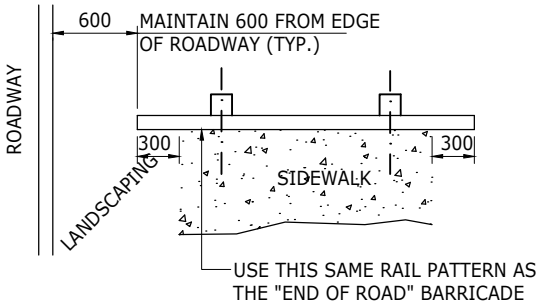
TYPICAL NARROWING OF DRIVING AREA BARRICADE (USW DIMENSIONS BELOW)
ORIENT DIAGOINAL BARS TO CHANNEL TRAFIC AS SHOWN



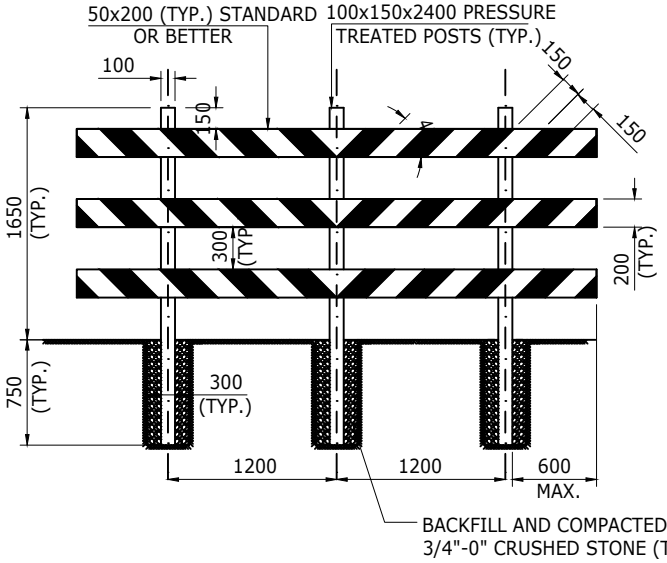
END OF SIDEWALK ('TYPE B')



NARROWING OF DRIVING AREA

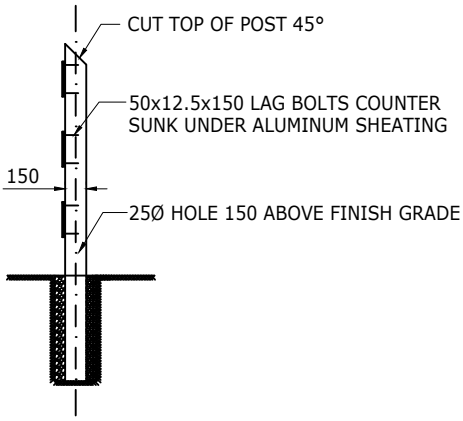


END OF SIDEWALK ('TYPE A')



END OF ROAD BARRICADE

(TYPICAL DIMENSIONS AND LAYOUT)



SECTION

NOTES:-

ALL WOOD SHALL BE PAINTED WHITE.

ALTERNATING RED & WHITE HIGH INTENSITY PRISMATIC 0.80. ALUMINUM SHEATING SHALL BE SCREWED TO THE HORIZONTAL RAILS

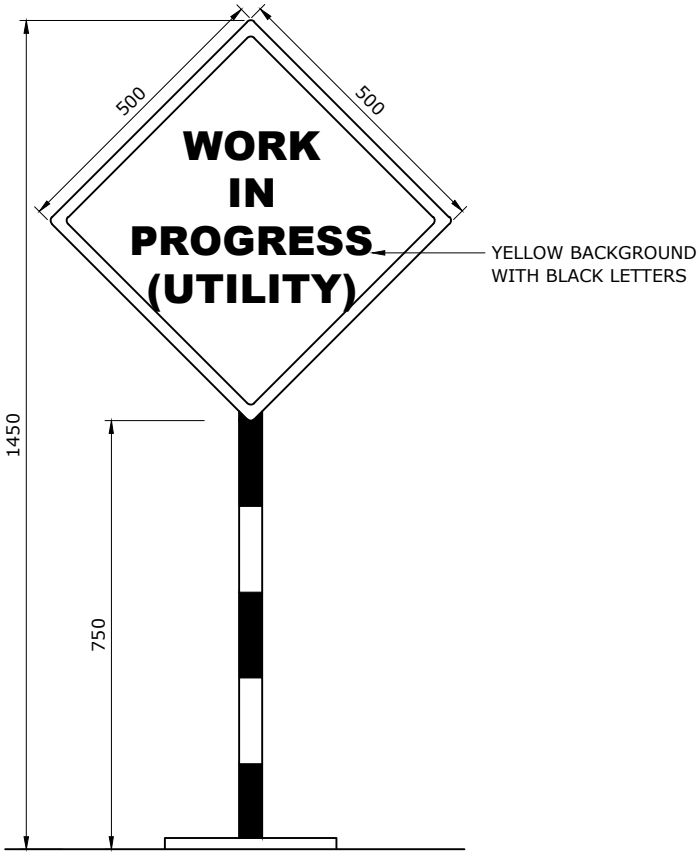
ALL FASTENERS TO BE STAINLESS STEEL OR RUST PROOF HEAVT GALVANIZED

FOR STREET BARRICADES HORIZONTAL RAIL LENGTH SHALL EQUAL THE DISTANCE BETWEEN THE FACE OF CURB PLUS 600. (EG. 1000 CURB 1600 RAILS).

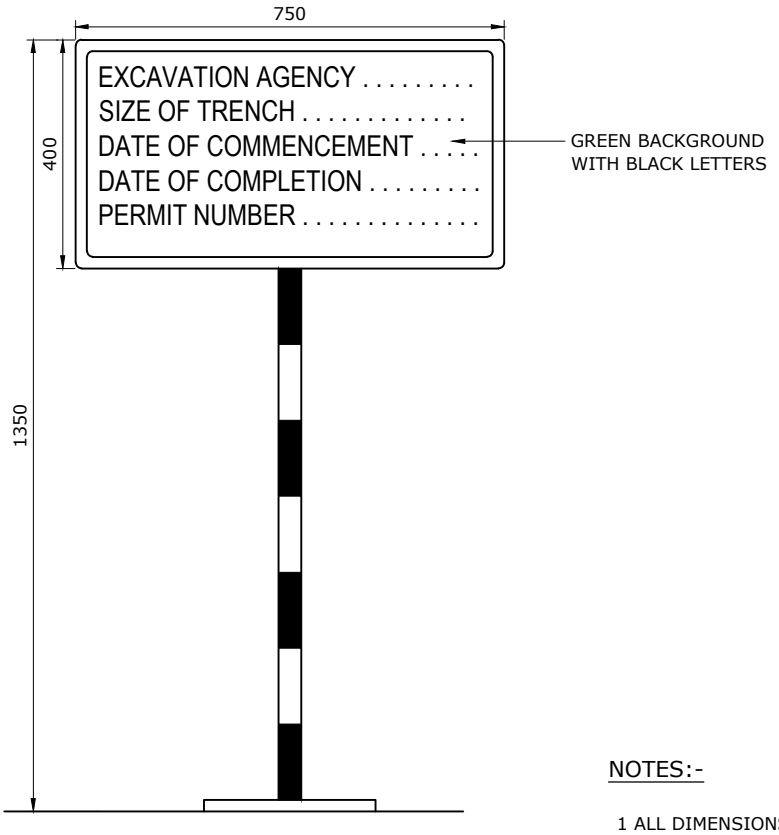
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	17.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

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M/s. VCS PROJECT CONSULTANT PVT.LTD.	STANDARD FOR **SAFE SIGNING**	DRAWING NO.
		VPC-STD-CS-023
		SHEET NO. 1 OF 1



CAUTION BOARD



INFORMATION BOARD

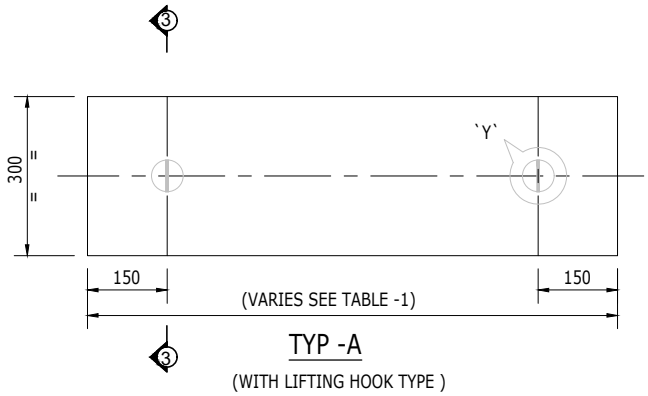
NOTES:-

1 ALL DIMENSIONS ARE IN MILLIMETERS.

REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	17.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

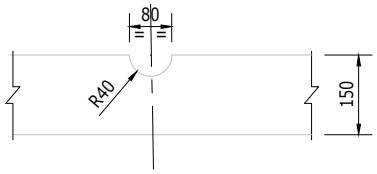
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VCS PROJECT CONSULTANT PVT. LTD.	STANDARD PRECAST R.C.C SLAB FOR LOW COVER PIPELINE	DRAWING NO. VPC-STD-CS-056
		SHEET NO. 1 OF 1



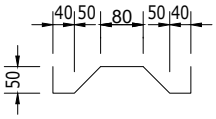
TYP -A

(WITH LIFTING HOOK TYPE)

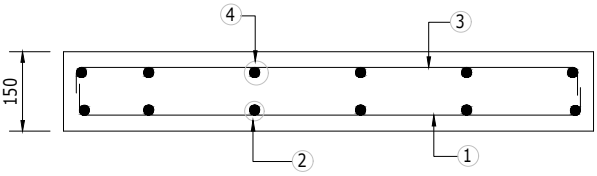


DETAIL- `Y`

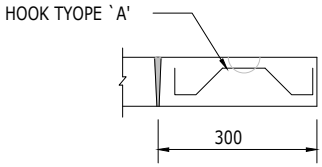
(TYP.)



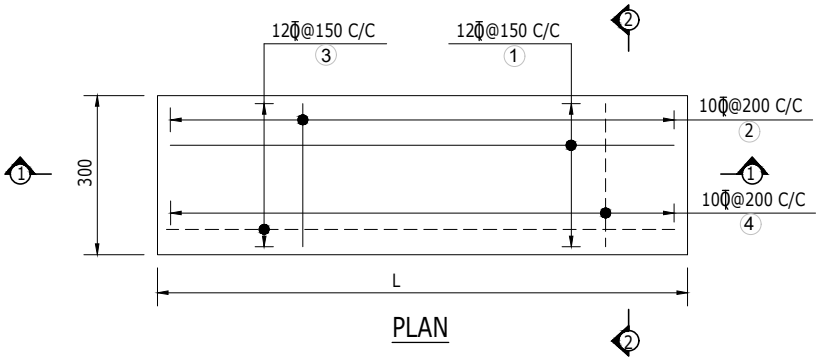
HOOK TYOPE `A'



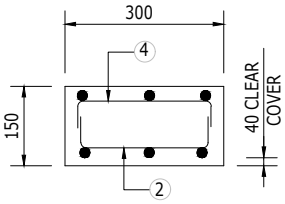
SECTION 1-1



SECTION 3-3



PLAN



SECTION 2-2

NOTES:-

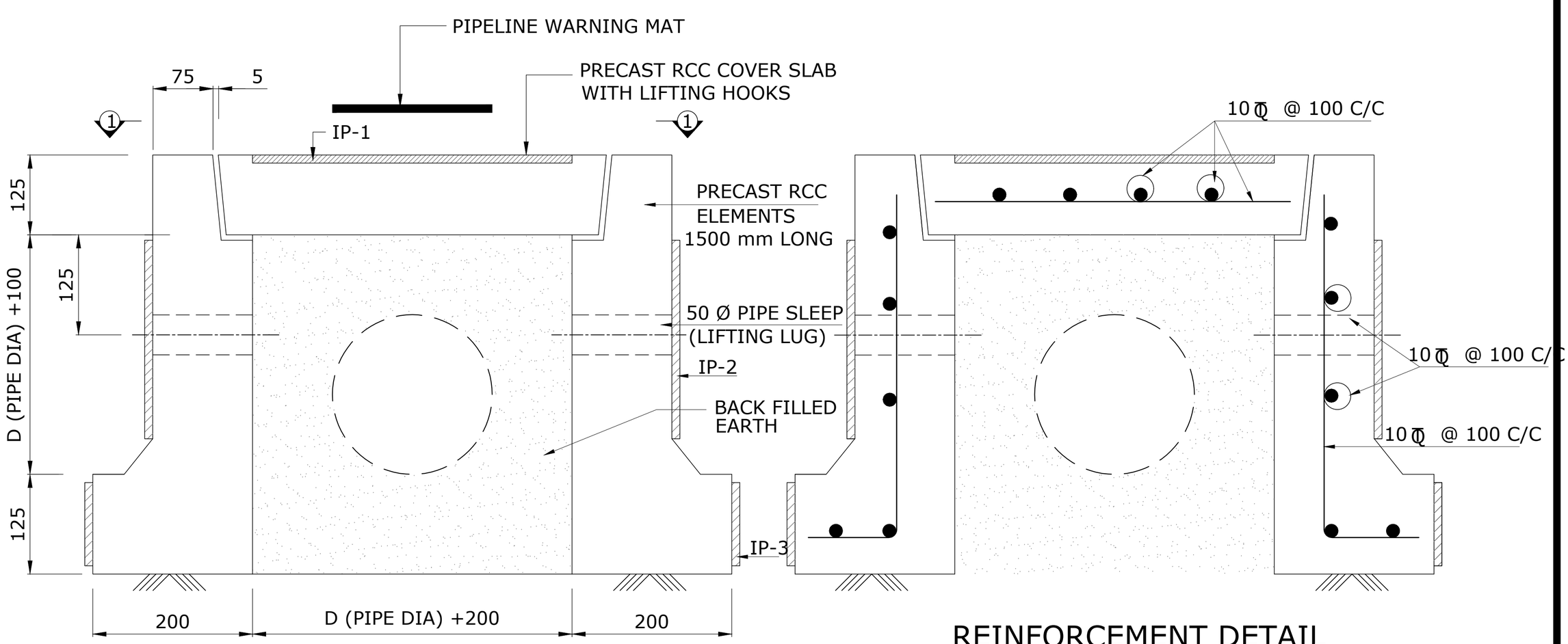
1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METRES.
2. GRADE OF CONC MIX SHALL BE M-25 CONFORMING TO IS- 456.
3. REINF SHALL BE HYSD BARS OF GRADE Fe 415 CONFORMING TO IS- 1786.
4. THIS STANDARD SHALL BE NOT BE USED FOR VEHICULAR MOVEMENT AREAS

TABLE - 1		
S.NO	PIPE DIA	LENGTH IN mm
1.	UP TO 16" Ø	1000
2.	18" Ø & ABOVE	D+600

REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	25.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

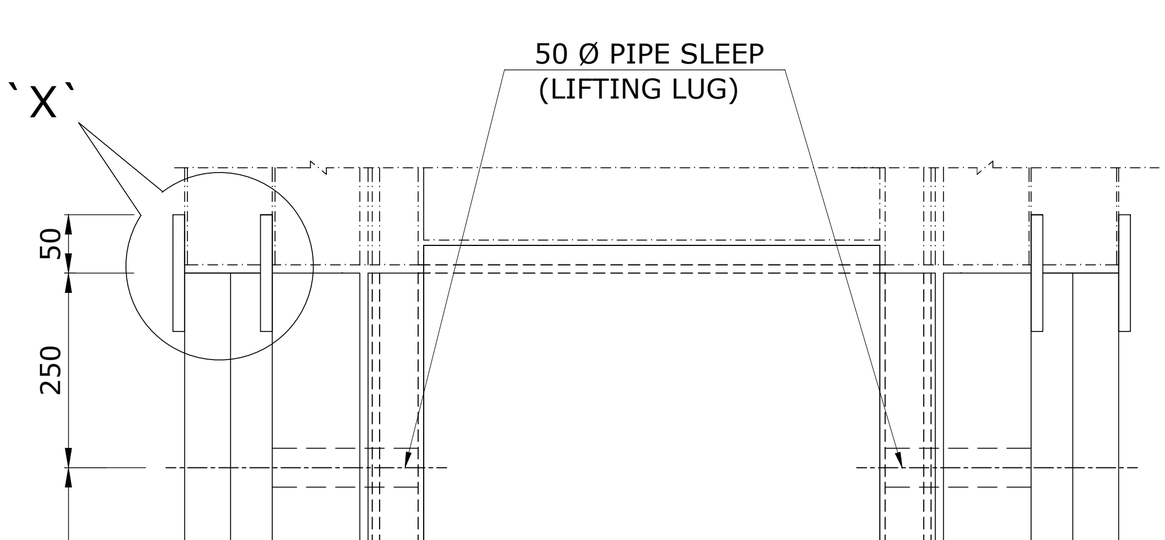
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VCS PROJECT CONSULTANT PVT.LTD.	IN SERVICE PIPELINE SAFETY PROTECTION AGAINST ACCIDENTAL DAMAGE	DRAWING NO.
		VPC-STD-CS-057
		SHEET NO. 1 OF 2

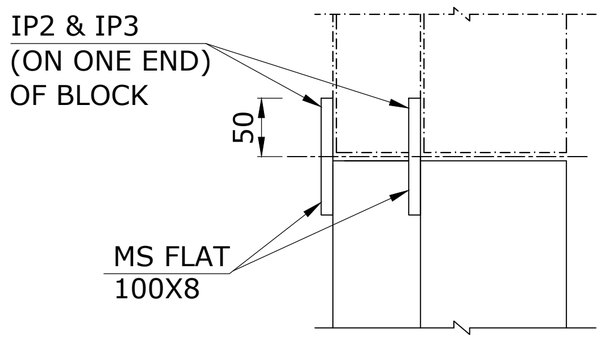


G.A. OF SAFETY PROTECTION

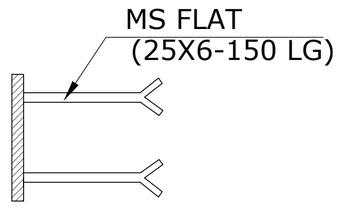
REINFORCEMENT DETAIL OF SAFETY PROTECTION



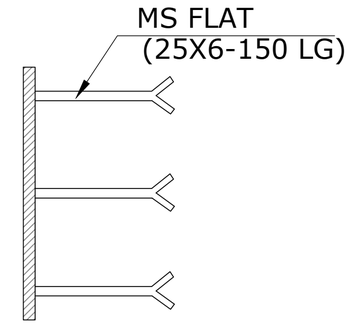
VEIW 1-1



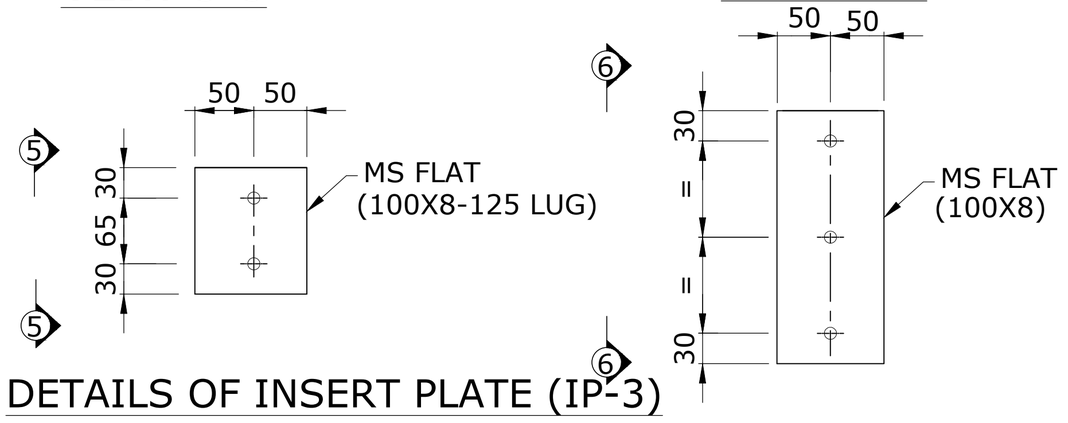
DETAIL- `X`



VEIW 5-5



VEIW 6-6



DETAILS OF INSERT PLATE (IP-3)

NOTES:-

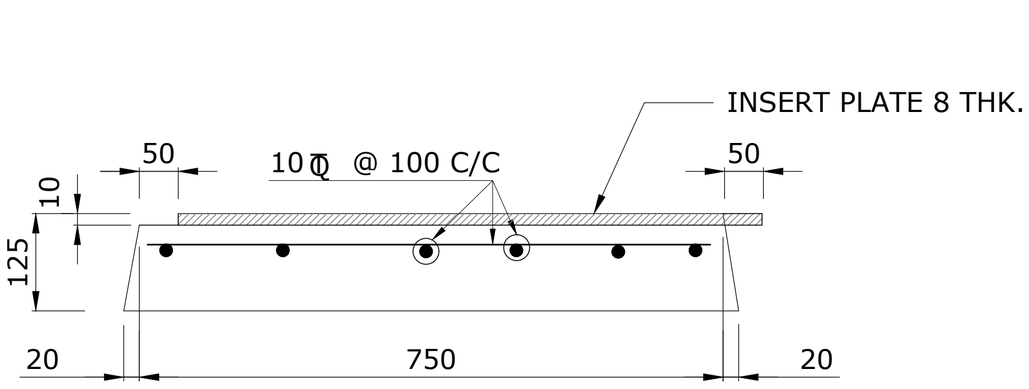
1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METRES.
2. GRADE OF CONC MIX SHALL BE M-25 (MIN.) CONFORMING TO IS- 456.
3. REINF SHALL BE HYSD BARS OF GRADE Fe 415 CONFORMING TO IS- 1786.
4. THIS STANDARD SHALL BE NOT BE USED FOR VEHICULAR MOVEMENT AREAS
5. ALL INSERTS PLATES SHALL BE EPOXY PAINTED

DETAILS OF INSERT PLATE (IP-2)

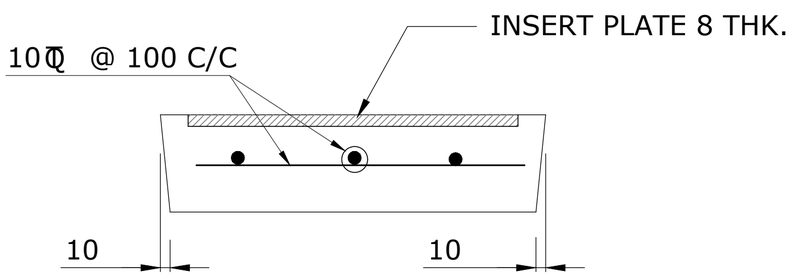
REV. NO.	DATE	SUBJECT OF REVISION	Prepared by	Reviewed by	Approved by	Approved by
1	25.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK

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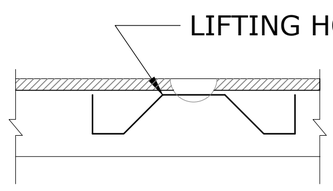
VCS PROJECT CONSULTANT PVT.LTD.	IN SERVICE PIPELINE SAFETY PROTECTION AGAINST ACCIDENTAL DAMAGE	DRAWING NO.
		VPC-STD-CS-057
		SHEET NO. 2 OF 2



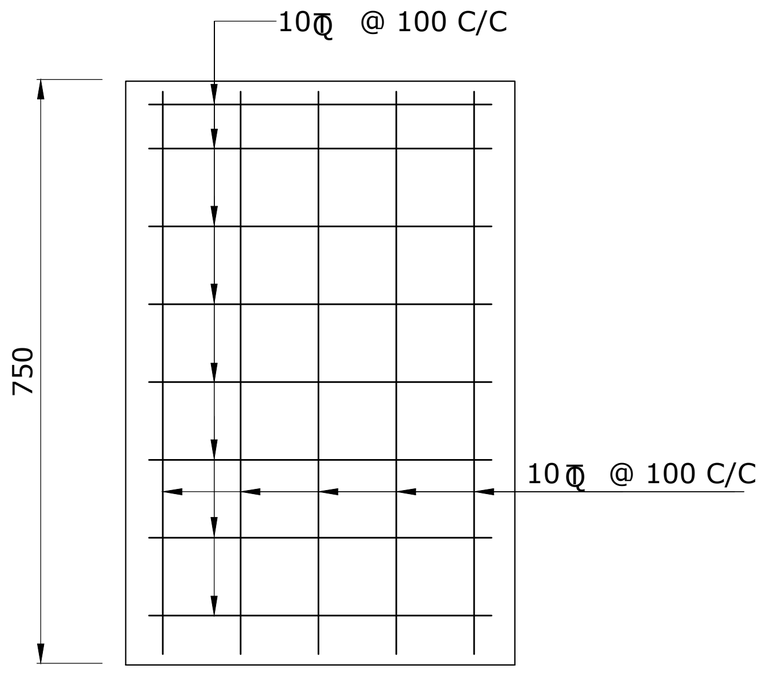
SECTION 2-2



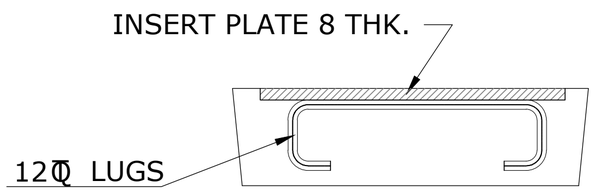
SECTION 3-3



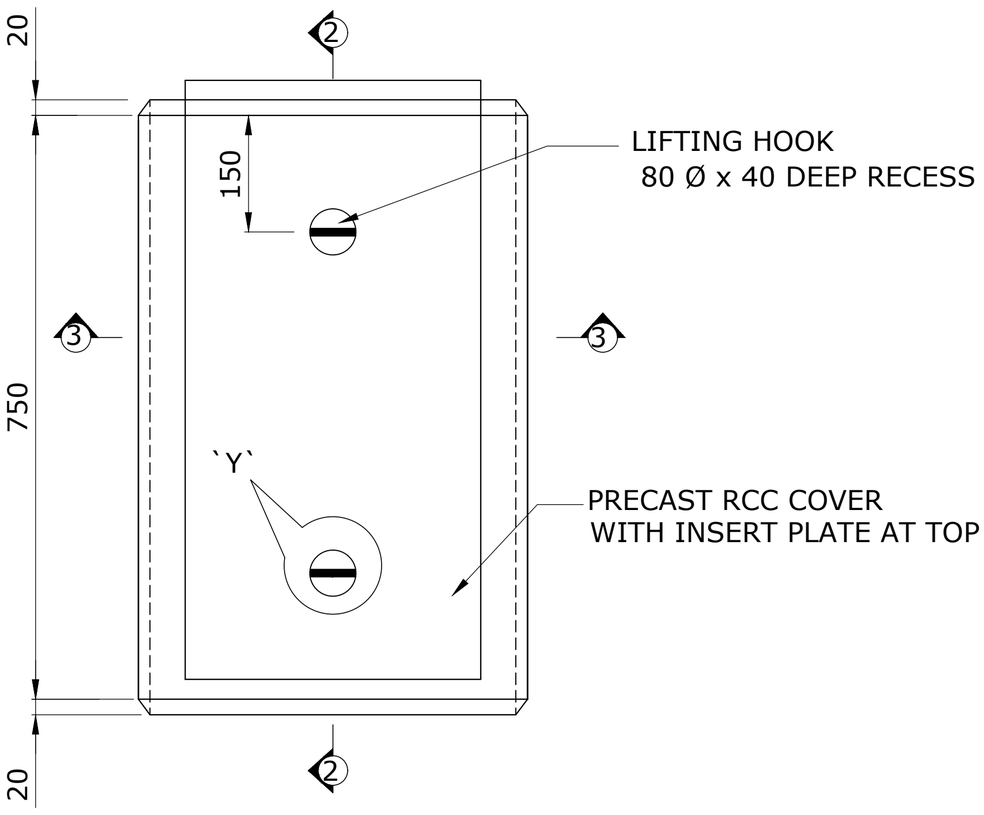
DETAIL- `Y`
(TYP.)



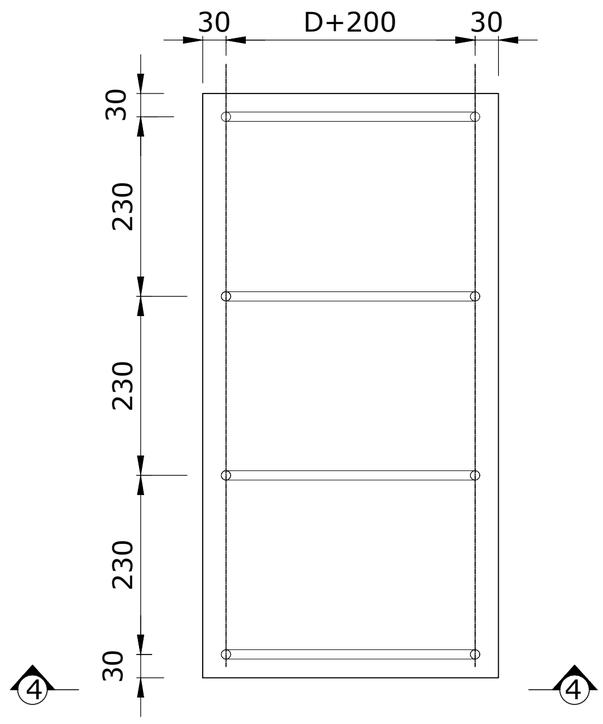
REINFORCEMENT DETAILS OF COVER SLAB



VEIW 4-4



DETAIL OF PRECAST COVER



DETAILS OF INSERT PLATE (IP-1)

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS ARE IN METRES.
2. GRADE OF CONC MIX SHALL BE M-25 (MIN.) CONFORMING TO IS- 456.
3. REINF SHALL BE HYSD BARS OF GRADE Fe 415 CONFORMING TO IS- 1786.
4. THIS STANDARD SHALL BE NOT BE USED FOR VEHICULAR MOVEMENT AREAS
5. ALL INSERTS PLATES SHALL BE EPOXY PAINTED

1	25.10.19	RE-ISSUED AS STANDARD	RJS	MO	AD	SK
0	26.03.18	ISSUED AS STANDARD	RJS	MO	AD	SK
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ENERGISING QUALITY

VCS PROJECT CONSULTANTS PVT. LTD.

STANDARD SPECIFICATION
FOR
OPTICAL FIBRE CABLES AND CONDUIT

VPC-SPC-5501

Rev. No	Date	Purpose	Prepared By	Checked By	Approved By	Approved By
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ABBREVIATION

ASTM	American Society of Testing and Materials
CSTA	Computer Supported Telecommunication Application
FAT	Factory acceptance Test
DC	Direct Current
HDPE	High Density Poly Ethylene
ITU	International Telecommunication Union
OFC	Optical Fibre Cable
IEC	International Electro-technical Commission
IS	Indian Standards
PLB	Permanently Lubricated
SAT	Site acceptance Test
UV	Ultra violet

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1 SCOPE

This Standard Specification, together with the Data Sheets attached herewith, establishes the minimum technical and functional requirements for design, engineering, materials, fabrication, painting, inspection and testing, documentation, marking, packing and shipping of Optical Fiber Cables (OFC) and Conduit / Ducts along with its spares and accessories.

2 DEFINITIONS

For the purpose of this document, the words and expressions listed below shall have the meanings assigned to them as follows:

Owner/ Purchaser/ Company	Owner of the particular Project (Project Specific).
Consultant	The party which comes out all or part of the engineering, procurement, construction, pre-commissioning and assistance for commissioning, monitors and controls the overall project management.
Bidder/ Manufacturer / Supplier / Vendor	The party(s) which manufactures and / or supplies material, equipment, technical documents / drawings and services to perform the duties specified by Contractor.
Works/ Shop	The place where the Item / Unit is fabricated and tested and transported to Purchaser.
Datasheet	Technical data provided by the Purchaser / Owner / Company.
Standard Specification	Specifications Developed as Standard by the Company.
Job Specification	Specifications Developed pertaining to particular project / Job in regard.
Material Requisition	Requisition as raised to Supplier for Quotation of the item
Purchase Requisition	Requisition as raised to Supplier for Procurement of the item
Purchase Order	Legal Order supplied to Supplier for procurement of the Engineered Item
Site	The work place where the equipment is installed and commissioned.

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3 REFERENCE DOCUMENTS

3.1 Codes & Standards

The related standards referred to herein and mentioned below shall be of the latest editions prior to the date of the Purchaser's enquiry.

ASTM D 1693	Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
IS 12235	Methods of test for un plasticized PVC Pipes' for potable water supplies
IS 2530	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4984	Specification for high density polyethylene pipes for potable water supplies
IS 7328	High Density Polyethylene Materials for Moulding and Extrusion -Specification
IS 9938	Recommended colours for PVC insulation for LF wires and cables
ITU-T G 652	Characteristics of a single-mode optical fibre and cable

3.2 Order of Precedence

In the event of conflict between Specifications, Data sheets, related standards, codes etc., the order of precedence shall be as follows:

a. Data sheets

b. Job Specifications

c. Standard Specifications

d. Codes and Standards

Vendor shall refer the matter to the Purchaser for clarification and only after obtaining the approval in writing, the same should proceed with the manufacture of the items in question.

Krishna

4 MATERIALS

Materials selected shall be in accordance with the Data Sheets and Company's Standard Specifications.

5 DESIGN & CONSTRUCTION

5.1 General

The fibre shall fulfil latest ITU-T Recommendation G-652 / G-655 for single mode optical fibres.

Total Number of Fibers	Project Specific
Type	G.652 or Composite (G.652+G.655)

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5.2 Geometrical, Optical and Physical characteristics of Optical Fibres

Mode field diameter	Vendor to Specify
Cladding Diameter	125 µm ± 1%
Mode field concentricity error	Less than 1 µm
Cladding non-circularity	Less than 2%
Cut-off wavelength	Vendor to specify and the project job specification shall be referred
Protective materials / coatings	Optical fibers shall be coated with UV cured double Acrylic Resin. It should not have any reaction with cladding or core material
Nominal Overall thickness	250 µm

The coatings should provide max. Resistance to micro bending & abrasion and ensure mechanical & optical strength. The coatings shall be easily stripped with mechanical tools.

5.3 Fiber Identification

The coating shall be in various colors in order to facilitate fiber identification. Fiber colors shall correspond to IEC publications. The colors shall be durable. The colors should have color fast properties also in the presence of other materials during the lifetime of cable. The coating and the color shall not react with surrounding jelly.

Each fiber and tube shall be identifiable thought the length of the cable in accordance with following color sequence:

Tube No.	Colour of Tube	Fibre Colour	Tube No.	Colour of Tube	Fibre Colour
1	Blue	Blue	7	Red	Blue
		Orange			Orange
2	Orange	Green	8	Black	Green
		Brown			Brown
3	Green	Slate	9	Yellow	Slate
		White			White
4	Brown	Red	10	Violet	Red
		Black			Black
5	Slate	Yellow	11	Pink	Red
		Black			Black
6	Black	Pink	12	Aqua	Pink
		Aqua			Aqua

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5.4 Transmission Characteristics of Fibres

Attenuation	The cabled fiber shall have attenuation coefficient 0.38 dB/km at 1310 nm wavelength region and 0.22 dB/km at 1550 nm wavelength region
Chromatic dispersion coefficient	• Less than 3.5 ps/nm.km at 1288 to 1339 nm • Less than 5.3 ps/nm.km for 1271 to 1360 nm
Polarization mode dispersion coefficient	Less than 0.5 ps / $(km)^{1/2}$

5.5 Cable Construction

5.5.1 Design Life

Operating life of cable shall be better than 35 years.

5.5.2 Drum Length

Drum length shall be 4 km +/- 5%.

Cable weight in drum (for nominal drum length) shall be provided by Vendor. No splicing shall be permitted on any fibre in a drum length of the cable.

5.5.3 Protection Required

The cable shall be protected against damages from termite, fire, chemicals (such as oil & natural gas and other petroleum products), moisture and water, over the lifetime of the cable.

5.5.4 Construction Details of Cable

Strength member: Vendor has to specify the "strength member" (in case of metallic strength member, the same shall be provided with suitable chemical coating to prevent corrosion).

Filling of cores: The stranded tubes shall be filled with moisture resistant jelly, which should be compatible with the coated fiber and the surroundings.

Number of fibers per tube shall be two.

Moisture barrier: Polymer coated Aluminium tape placed longitudinally over the loose tubes. The tape shall form a close fit around the cable core with a sealed overlap of 6 mm minimum. Alternatively, water swellable tape or water swellable powder may be provided over the tube.

Inner sheath shall be of MDPE. Thickness of inner sheath shall be 1.50 mm minimum Aluminium foil.

Outer sheath shall be of HDPE with a thickness of 1.50 mm minimum.

Electrical continuity of the respective metallic layers shall be maintained between the ends of the cable in each drum. The different metallic layers shall not be electrically shorted to each other.

If OFC is to be buried directly into the soil / ground, a metal jacket or armoring shall be provided outside the cable. The project job specifications shall be referred for the exact requirement of the same. Also, the metal portion of the cable have to be well grounded before entering building, to protect it from lightning strike effects.

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5.5.5 Mechanical Characteristics of Cable

Temperature: Installation, Operation & Storage	0°C to +60 °C
Tensile Strength for Cable	9.81 W Newton (W is weight of 1 km of Cable in kg)
Cable Weight in kg/km	Vendor to specify
Minimum Bending Radius	20 x Cable Diameter

5.5.6 Average Splice Loss

Average splice loss shall be 0.01 db / splice.

5.6 Identification Marking

The outer surface of the cable shall be permanently & legibly marked with color in contrast to the outer sheath at regular intervals not exceeding one meter, with the following details:

- Name of Client;
- Name of Manufacturer;
- Part Number;
- "OPTICAL FIBRE CABLE";
- Year of Manufacture;
- Drum No.;
- Meter Markings;
- No. of Cores.

All the marking over OFC shall be such that it should not be erased during field use.

The outer surface of each completed cable shall have sequentially numbered metric length markers spaced at regular intervals of one meter.

6 PERMANENTLY LUBRICATED CONDUIT

6.1 General

The HDPE conduit shall be permanently lubricated with an inner layer of solid permanent lubricant by co-extrusion method to minimize the internal coefficient of friction. The duct/conduit should have shallow groove for air cushioning. The co-extruded inner layer of above lubricant shall be continuous throughout the length of the HDPE conduit.

The HDPE conduits shall also be free of blisters. Shrink hooks, break and other defects. The internal and external pipe surfaces shall be smooth. Pipes shall not display any stress edged grooves or sink marks. The colour of the pipes shall be orange and be uniform throughout. The HDPE conduit shall unroll off the drums without snaking or waving having zero coil set. Following are the mechanical and dimensional specifications of HDPE conduit:

Pressure Rating	Minimum 6 Kg/cm2 and suitable for blowing at 6 Kg/cm2

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Outer diameter	50 mm (50 mm + 0.4 mm)
Wall thickness	4.0 ± 0.3 mm with shallow groove
Tensile strength	20 N/mm2 or better
Density	940.0 - 950.0 kg/cm at 27 Deg.C
Melt Flow index	0.4 to 0.95 gm/10 minutes at 90°C under 5 kg load
Intrinsic coefficient of friction	0.06 (max) when-tested with respect to Nylon
Impact strength	As per IS: 12235 (part 9)

The pipes should confirm to following IS specifications:

- IS – 2530;
- IS – 4984;
- IS – 7328;
- IS – 9938;
- ASTM D -1693.

6.2 Conduit / Duct Construction Specification

6.2.1 Outer Layer

The base HDPE rein used for the outer layer of the PLB HDPE duct/conduit shall conform to any designation of IS - 7328 or to any equivalent standard meeting the following requirements, when tested as per IS - 2530. However, the manufacturers shall furnish the designation for the HDPE resin as permanently IS - 7328 as applicable.

Density	: 0.940 to 0.958 g/cc at 27 Deg.C
Melt Flow Rate (MFR)	: 0.2 to 1.1 g/10 minutes at 190 Deg.C & 5 kg load

6.2.2 Inner Layer

The inner lubrication material shall be of friction reducing, polymeric material which shall be integral with HDPE layer. The lubricant materials shall have no toxic or dermatic hazards for safe handling. In the finished PLB HDPE duct/conduit, the co-extruded layer of solid permanent lubricant shall be integral part with HDPE and shall be white in colour and clearly visible in cross- section of duct/conduit.

The inner layer of solid permanent lubricant shall be continuous all through and shall not come out during storage, usage and throughout the life of the duct/conduit.

6.2.3 Homogeneous Construction

The HDPE material used for this construction shall meet the requirements of project specification and relevant data sheets.

The raw material (s) used for the duct/conduit shall meet the following requirements:

a. The anti-oxidants used shall be physiologically harmless;

b. None of the additives shall be used separately or together in quantities as to impair long term physical and chemical properties of the duct/conduit;

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c. Single pass rework material of the same composition produced from the manufacturer's own production shall be used and it shall not exceed 10% in any case;

d. The raw material used for extrusion shall be dried the moisture content to less than 0.1%;

e. Suitable UV stabilizers shall be used for manufacturer of the duct/conduit to protect against ultra violet degradation, when stored in open for a minimum period of 8 months;

f. The raw material used in the manufacturer of the duct/conduit shall be such that the service life of the duct/conduit and all its accessories can be expected to be more than 50 years including the life of permanent lubricant.

6.3 PLB HDPE Conduit / Duct Accessories

The following accessories are required for jointing the duct/conduits and shall be supplied along with the duct/conduits. The manufacturers shall provide complete design details, procedure for method of installation and type/ grade of the material used for the accessories.

6.3.1 Duct / Conduit Coupler (Fusion Type)

It is used to couple two duct/conduits. The design of this shall be simple, easy to install and shall provide airtight and water tight joint between the two duct/conduits by way of fusion technique. The coupler shall ensure that the two duct/conduits are fused smoothly without any step formation in the inner surface. The jointing shall meet the air pressure test of 10 kg/cm2 for a minimum period of 2 hours without any leakage.

6.3.2 End Plug

This is for sealing the ends of the empty duct/conduits, prior to installation of the Optical Fiber Cable and shall be fitted immediately after laying of the duct/conduit, to prevent the entry of any dirt, water, moisture, insects/ rodents etc.

6.3.3 Cable Sealing Plug

This is used to seal the ends of the duct/conduits perfectly, after the cable is installed in the duct/conduit, to prevent the entry of dirt, water, moisture, insects/ rodents etc. This is required at all places where cable has come out of the duct/conduit either for jointing or entry into the building as required. The sealing plug shall be capable of accommodating standard sizes of optical fibre cable taking into account the variation in diameter due to tolerance limits, etc.

6.3.4 End Cap

This cap is made of hard rubber, shall be fitted into both ends of duct/conduit coil after manufacturing the duct/conduit. This shall avoid entry of duct/conduit, mud and rainwater into the duct/conduit during the transit and storage.

6.4 Name Plate

The OFC duct / conduit shall be prominently marked with indelible ink, with the following information at intervals every meter to enable identification of the pipe. The size of ink markings shall be distinct, clearly and easily visible.

a. Client Name;

b. Client Logo;

c. Manufacturer's Name (Also can be abbreviated form);

d. Name of the duct/conduit with size;

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e. Machine number / specific serial number of the duct/conduit;

f. Date of manufacturing;

g. Sequential length marking at every meter.

All the markings over HDPE conduit shall be such that it should not be erased during field use.

6.5 Jointing Closures

Jointing closure shall be suitable for armoured and unarmoured optical fibre cables of all construction designs (slotted core, stranded tube, central tube). Jointing closures shall' have 4 entry ports to allow entry/exit of four optical fibre cables. The same shall have provision of blocking/sealing of the ports, if not in use.

The fibres and their storage shall be managed with proper bend radius controls and protection. The fibre organizer trays shall have provision of maximum 6 fibres per tray. The trays should be hinged in such a manner that if moved about the hinge, the fibres are not strained, kinked or stressed. Also, it should be possible to work on the fibres on one tray without disturbing the fibres on the other trays.

The jointing closure shall enable the metal parts of the cable and the internal metal parts of the closure to be maintained at earth potential.

The sealing of the entry ports, shall provide adequate sealing and shall be capable of withstanding an axial pull applied using 50 kg freely suspended weight of the cable, without using any additional clamps, etc.

Jointing closures should be Dust tight (No dust ingress) and protected against immersion in water (suitable for continuous immersion in saline water under 4-meter water-head). It should be complete with all accessories including splice cassettes splice protection and all other accessories including accessories for electrical continuity of metallic layer of optical fibre cable, etc. along-with instruction sheets.

The complete jointing closures including trays, joint protection sleeves etc. shall be sourcing form the above sub-vendors as a composite item.

7 INSPECTION AND TESTING

Vendor shall perform all inspection and testing as per Job Specification requirements, and as per relevant codes, prior to shipment. The inspection and testing for Optical Fiber Cables and Conduit / Ducts shall be carried out as per approved Inspection and Test Plan. Vendor shall submit the Inspection and Testing for Approval. Vendor shall submit the test certificates to the Company for the tests conducted during the manufacturing process like hydro test, material test, hazardous area certification test, and any other before Factory Acceptance Testing (FAT).

7.1 Factory Acceptance Testing (FAT)

Prior to FAT, Vendor shall submit to the Company a detailed FAT procedure, for review and approval. FAT shall be carried out as per approved Inspection and Test Plan. FAT shall be carried out prior to shipment of the Optical Fiber Cable drums and OFC conduits.

FAT procedures shall be submitted at least 4 weeks prior to FAT testing taking place. FAT shall be carried out at the manufacturing facilities. The tests shall be witnessed by the Company or their approved representative. FAT procedure will be signed off by the Vendor and Company or their approved representative at the successful completion and conclusion of testing.

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7.1.1 For Optical Fiber Cables

The following minimum tests shall be conducted at the factory for the acceptance of the cable:

a. Core (mode field) diameter and concentricity error test;

b. Cut-off wavelength;

c. Attenuation coefficient at 1300nm, 1550nm, Spectral attenuation;

d. Chromatic dispersion at 1300nm, 1550nm, from 1530 to 1565nm;

e. Cladding: Diameter, Non circularity.

7.1.2 Tests on Completed Cables

a. Visual Inspection:

- Cable lay-up and fiber identification;
- Identification and length marking on outer jacket;
- Colour contrast of the marking with the outer sheath of the cables;
- Overall diameter of the cable.

b. Tests for moisture barrier:

- Thickness of layers;
- Extent of overlapping;
- Electrical continuity of metallic layers;
- Water swellable tape or power;
- Water immersion.

c. Tests for corrugated steel tape armouring:

- Thickness of layers;
- Extent of overlapping;
- Electrical continuity of metallic layers;
- Electrical discontinuity between CSTA and moisture barrier.

d. Other Tests

- Attenuation at 1310 nm & 1550 nm Polarization Mode dispersion;
- Tensile performance: direct underground burial type OFC (with a tensile load of value T= 9.S1W Newton, where W = weight of 1 km 'Cable' in kg);
- Crush (with 200 kg of load to be slowly placed and held for 60 seconds. The change in attenuation should not exceed 0.1 dB/km);
- Impact (with a mass of 5 kg allowed to fall freely from 500 mm height on the cable sample 10 times repeatedly with a gap between one impacts to another approximately at 60 seconds. The change in attenuation should not exceed 0.05dB/km);
- Torsion (with a weight of 7.5 kg attached to the stationery chuck and shall be subjected to 10 cycles. The change in attenuation should not exceed 0.05dB/km);
- Bend (To be performed preferably with Procedure 1 (of IEC) with a mandrel diameter of 240 mm, where 0 is the diameter of the cable and testing shall be

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done with 4 turns of cable wrapped and then unwrapped for 10 complete cycles. The change in attenuation should not exceed 0.05 dB/km);

- Snatch (with a load of 100 N. No damage to the fibre, sheath or to the other cable elements);
- Kink Radius: 10 x Cable diameter. No kink shall occur;
- Temperature cycling (This test shall be performed with a cable length of 200 m;
- Temperature cycle shall be taken as (The change in attenuation should not exceed 0.1 dB/km);

At room temperature	1 hr
At zero degrees temperature	12 hrs
At 65 degrees temperature	12 hrs
From 65 degrees to room temperature	1 hr

- Water penetration test;
- Water immersion;
- Sheath integrity (spark test). The sheath shall withstand a spark test voltage of at least 8 KV RMS or 12 KV DC.

7.1.3 For OFC Conduits

A separate sample size for each of the tests shall be taken as stipulated at random from the samples already examined for dimensions and visual inspection. All the conduits shall be tested for compliance as per the requirements.

Following tests are needed to be done for acceptance:

a. Visual Inspection;

b. Dimension of Duct/conduits;

c. Tensile Strength & Elongation;

d. Reversion Test;

e. Environmental Stress Crack Resistance;

f. Impact Strength;

g. Crush Resistance;

h. Mandrel Test;

i. Ovality Test;

j. Coil Set Test;

k. Oxidation Induction Test;

l. Hydraulic Characteristics;

m. Internal Co-efficient of Friction;

n. Optical Fibre Cable Blowing Test;

o. Duct / Conduit coupling test by fusion technique.

7.1.4 For Jointing Closures

The following tests shall be conducted as a minimum:

a. Water Ingress Test;

b. Impact test;

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c. Drop and topple test;

d. Pulling test;

e. Static load test.

7.2 Site Acceptance Testing (SAT)

A SAT shall be carried out on completion of the installation of the Optical Fiber Cables and Conduit / Ducts at site which shall be witnessed by the Company / Owner's representative. SAT shall be performed as per the approved test procedure. A comprehensive test procedure in compliance with the company specification shall be developed and issued to Company / Owner for review and approval.

The Site Acceptance Test (SAT), in general, shall demonstrate that the Optical Fiber Cables and Conduit / Ducts functions correctly and properly in accordance with the specified requirements.

8 MARKING, PACKING AND SHIPMENT

Following FAT completion, Vendor ensure that all Cables, associated materials and accessories are designed properly, marked and packed, and secured for transit to site without damage.

Vendor shall provide and submit his standard "Marking, Packing and Shipping Procedures" for review by Company / Owner.

Vendor shall specify any conditions, normal or special, to be verified in intermediate storage and during transport.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Conduits/Ducts shall be suitably packed including any dismantling, transit fastening and bracing necessary to prevent distortion or damage during transit.

Preparation for shipment and packing will be subject to inspection and rejection by Company's inspectors. All costs occasioned by such rejection shall be to account of the Vendor.

9 SPARES AND ACCESSORIES

Vendor shall include recommended spare parts list for start-up, pre-commissioning and two years operation as per the following:

a. Itemized recommended spare parts list for start-up and pre-commissioning;

b. Itemized recommended spare parts list for two years operation.

Vendor shall recommend accessories and special tools required for operation and maintenance of OFC and conduit / ducts for Company review.

All the spare parts furnished by Vendor shall be wrapped and packaged to preserve an original as-new condition under normal conditions of storage. The same parts shall be properly tagged with stainless steel tags and coded so that later identification as to their intended equipment usage shall be clear.

All items supplied shall be packaged separately and clearly marked as "Spare Parts" and shipped with the equipment.

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10 DOCUMENTATION

The following documentation shall be fulfilled by the Vendor, if it is not covered in Job Specification.

10.1 Documentation Required with Technical Bid

During bidding stage Vendor shall submit in his offer the following documents as a minimum:

- Standard Specification, Data Sheets;
- Bill of Materials including Vendor list, details of third-party items;
- Catalogues and Manuals;
- Quality Assurance Plan;
- Any other documents.

10.2 Documentation Required for Approval

Upon placement of Purchase Order, Vendor shall submit as a minimum the following drawings, documents and specifications for the Company's approval:

- Specifications, Data Sheets;
- Bill of materials including Vendor list, details for third party items;
- Catalogues, Manuals and relevant drawings and documents;
- Dimensional drawings;
- Material test certificates;
- Procedures for FAT;
- Quality Assurance Plan.

10.3 Guarantee & Warranty

Vendor shall guarantee that the complete scope of supply shall be safely and reliably meet all of the requirements of this Company Specification.

Vendor shall provide warranty support for a period of 12 months from the date of supply or 18 months from the date of manufacturing. Warranty shall apply to defective material workmanship and facility design .The cost of correction / replacement of any warranty items shall be borne by the Vendor, as per the purchase conditions of the Material / Purchase Requisition.

The Job specifications / Data sheets shall be referred for any specific warranty / guarantee.

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ANNEXURE – 1

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1 INSTALLATION AND ASSOCIATED WORKS

1.1 Trench Excavation

OFC shall be laid at depth of 1 meter in the pipeline trench generally. At crossings, OFC installation depth shall be 1.5 meter typically. Refer to OFC installation standard drawing, SD-IC-033 for more information.

The trench shall be enlarged at the splicing points as needed to carry out the splicing works. The enlargement shall be carried out on the same side of the cable for the entire route.

1.2 Laying Bed Preparation

All works concerning the preparation of the laying bed shall be carried out by the contractor.

The laying bed of 10cm depth shall be made of sand or riddled earth obtained by passing through a sieve having meshes not exceeding 15 mm2, or of a natural soft around not requiring riddling.

1.3 Cable Laying

All works concerning the cable laying shall be earned out by the Contractor.

Contractor shall plan the cable-laying operation such that the complete drum-length of cable can be laid without cutting in-between.

The cable cable shall be carefully inspected for jacket defects as it is removed from the reel. If defects are noticed, the pulling operation shall be terminated immediately and the Construction Manager (Site Incharge) notified.

The Contractor shall establish section by section the ways and means for the cable laying taking into account the characteristics of the layout.

In all jointing locations including the normal joint at the end of the drum length and also at points of cable-cuts due to laying necessities, at least one of cable from each end of the cables at the joint location shall be left in a coiled form in the pit to allow for splicing and jointing of the cable. Minimum 15 meters of extra length of optical fiber cable shall be left at jointing locations for future maintenance.

At all telecom building locations (including terminals and intermediate stations) an extra length of about 20 meters of each cable shall be kept in a coiled form.

Contractor shall provide the necessary cable leading pipes for cable(s) entry inside the telecom room. All these leading-in-pipes shall be properly scaled to prevent entry of rodents, snakes, insects and foreign materials. At locations where the telecom room shall not be available, extra length of the cable shall be kept buried in ground near the proposed telecom room location.

If the splicing or termination operation does not follow immediately after the cable laying, all cable ends must be sealed carefully with heat-shrinkable end-caps.

Bi – directional "center pull" techniques shall be acceptable in order to accommodate long continuous installation length and shall be implemented as follows:

- From the midpoint pull the optical fiber cable into the conduit from the shipping reel in accordance with the manufacturer's specifications.
- When this portion of the pull is complete, remainder of the cable shall be removed from the reel to make the inside end available for pulling in the opposite direction.
- This is accomplished by hand pulling the cable from the reel and laying into large "figure eight 8". The purpose of the figure eight pattern is to avoid cable tangling and kinking. This loop shall be laid carefully one upon the other (to prevent

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subsequent tangling) and shall be placed in a protected area. The inside reel end of the cable is then available for installation.

- In some cases, it may be necessary to set up a winch at an intermediate cable vault. The required length of cable shall be pulled to that point, and brought out of the cable vault and coiled into a figure eight "8".
- The figure eight is the then turned over to gain access to the tree cable end. This can then be reinserted into the duct system for installation into the next section.
- When power equipment is used install optical fiber cables, the pulling speed shall not exceed 30 meters per minute. The pulling tension, bending radius and twist limitation for optical fiber cable shall not be exceeded under any circumstances.
- Large diameter wheels, pulling sheaves. and cable guides shall be used to maintain the appropriate bending radius. Tension monitoring shall be accomplished using commercial dynamometers or load cell instruments.
- The pulling eye / sheath termination hardware on the optical fiber cables shall not be pulled over any sheave blocks.
- Under no conditional shall OFC be left exposed or unattended.
- Repair of cable jacket shall not be permitted. Jacket damage shall require removal and reinstallation of a new cable run at the Contractor's expense.

1.4 OFC Pressure Blowing Procedure in HDPE Duct

The cable laying consists in using a mechanical feeder to push a OFC into a HDPE duct, through which flows a powerful air-stream, generated by a compressor. This high speed airflow exerts a drag on the entire surface of the cable, assisting its progression. The cable is therefore being not pulled but pushed and carried in the air. It moves easily along inside the duct, following any undulations or change in direction, even if these are abrupt and/or frequent. As no tractive force is exerted at the front end of the cable, it is not subjected to the stress usually encountered with conventional methodize, like pulling with a shuttle or rope. After installation, the cable rests on the bottom of the duct.

This is also called Cable Jet method and provides lowest friction, lowest tension method of installing optical cables into sealed duct system as depicted in figure below.

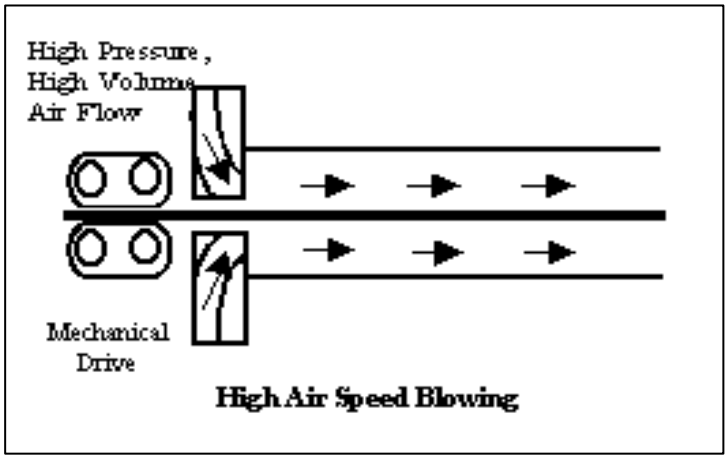


Figure 1: High Air Speed Blowing

In this process, duct shall be wide open and high air volume (300-600 cfm) is blown through it. This wind pushes on the cable and advances it forward at whatever speed pusher shall support. There is no pulling force on the front end of the cable, only a

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mechanical pushing force at the back and an air drag force distributed along its length.

The following are general steps required for the installation:

- The HDPE duct shall be in the range of 1075 m – 1500 m drums:
- Dielectric and seamless Accessories shall be used for jointing HDPE ducts. The jointing accessories shall withstand the pressure required to blow the cable.
- Suitable jointing tubes with indented rings, which mate with external corrugations, shall be utilized for all joints. Joints shall provide a watertight seal.
- During construction the ends of the conduit shall be closed to prevent foreign objects.
- Upon completion the ends shall be sealed to prevent ingress of water and using a plug.
- The Telecom contractor shall provide the sealing and it shall be achieved without use of glues, sealing compounds or foams.
- After its installation, the conduit shall be cleaned on the inside from any kind of material (earth, stones, etc.)
- Air blowing test shall be conducted to confirm the intact of the joints and no air leaks exist.
- The HDPE duct shall be provided in a 1075m – 1500m per drum. The Telecom Contractor shall advise for any preferable change subject to COMPANY approval.
- After duct installation, integrity testing shall be conducted to ensure proper duct installation.
- Using one blowing machine (Cable Jet), Up to 1500 or 2000m can be blown, depending on quality and characteristics of the cable, ambient temperature and profile of the trench.

1.4.1 Factor to be considered

Following important factors are to be considered in air assisted installation of OFC in order to obtain best performance in blown installations:

- **Flexibility of the cable:** A cable that is too flexible cannot be pushed properly without bunching up. While stiffer cables can be blown, some cables are designed specifically for blowing. Consult your cable manufacturer for recommendations.
- **Selection of cable:** Choosing the proper cable is important for optimal blowing. Although most fibre cables can be blown, some cables are designed specifically for blowing. Consult your cable manufacture for recommendations.
- Type of duct is another significant factor in optimized blowing. Smooth wall and longitudinal ribbed HDPE conduits are preferable.

1.4.2 Field Procedures

General field practices followed in air assisted installation of OFC are as listed below:

- Ensure that the duct system is properly installed with pressure tight splices. This shall be tested by sealing one end of the duct and pressurizing the duct using a sealed blowing machine. The duct shall not lose air pressure at any significant rate. Sand and projectiles can be blown from the duct, and poor-quality duct splices can fly apart.
- For HASB, end cap the front end of the cable so that it does not hang up in the duct. Be sure that you have air seals to fit the OD of the cable you are installing.

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- Clean, dry, and prove the duct. If it was not done previously, blow through a hard mandrel to establish that the duct is not crushed. Then blow a tight-fitting foam carrier through the duct at high pressure. The foam should travel through at approximately 100 ft/sec in a clean duct. If excess water or dirt comes from the duct, repeat the process. If necessary, dry the duct with dry airflow.
- For high air speed machines (no missile), inject the recommended amount of lubricant and spread it by blowing through another foam carrier. For piston type machine, majority of the lubricant are injected in front of the missile with some placed behind it.
- Hook the blowing machine to the duct. For HASP machines, hand pushes a hundred feet or so of cable into the duct. Close and seal the cable and air chamber on the blowing machine. Follow the machine manufacturer's instructions for all operations.
- Check all pneumatic and hydraulic hook-ups. Slowly turn up the air and watch it go.
- An after-cooler shall be sued for all for all pressure blowing (Cable Jet) installation, particularly when the cable is to be installed in high ambient temperatures (such as in Oman and the Middle East). The use of an un-cooled compressed air source can cause a dramatic increase in the coefficient of friction between the duct and the cable sheath.

1.4.3 Lubrication

HDPE duct shall be sufficiently lubricated by a water based lubricant approved by cable Manufacturer, as the cable is pulled into the duct.

Lubricant shall be applied at a rate to provide a continuous 10-Mil coating, as recommended by the manufacturer.

1.5 Jointing / Installation at Pull Box

The Pulling of the cable shall be hand assisted at each pull box. The cable shall not be crushed, kinked or forced around a sharp corner. Sufficient slack shall be left at each end the cable to allow proper cable termination.

The extra length of optical fiber cable shall be coiled and secured with cable ties ion the pull box. The contractor shall ensure that the minimum bending radius of the optical fiber cable is not compromised when preparing this stored cable slack.

Imprinted plastic – coated cloth identification forwarding tags shall be securely attached to the cables in at least two locations in each pull box / manhole.

When all cables at each pull box are securely racked, unused conduits and void area around conduit containing cables shall be sealed.

The joint enclosure shall support an optical fiber organizer and allow sealing-off the outer sheaths of the cable.

Contractor shall provide detailed procedure for jointing of the cable along with the details of the jointing pits to be used for housing the joint enclosure and the excess cable after jointing.

Splicing loss shall not be more than 0.1 dB / splice.

Contractor shall provide electronic marker & electronic indicator of approved make at each jointing location.

1.6 OFC Splicing

Splicing of fibers shall be done by fusion splicing only. Splicing loss in each fiber in the joint location should be better than 0.02 dB (mechanical splice loss as shown in the splicing machine) & better than 0.1 dB at 1310 nm / 1550 nm as shown in the OTDR of each fiber.

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Minimum 15 meters of extra length of optical fiber cable shall be left at jointing locations for future maintenance.

1.7 Crossing

Canal and river crossings shall be through a suitable casing pipe, provided as part of the pipeline laying. An additional pulling rope shall be kept inside to meet future requirements.

After installation, the casing pipe shall be cleaned inside of any kind of dirt and stones etc. Bituminized jute shall be used to close the ends of the conduit to prevent any dirt deposit. Similarly, bituminized jute shall be used to close the conduits ends after introduction of the cable.

Where crossing of existing underground pipelines and cables, pipes on sleepers, etc. occur, the same requirements for normal laying shall apply, the cable maintaining the normal position with respect to the pipeline.

1.8 Back Filling

Above the laid cable, a cover of 75 mm minimum depth of fine sand shall be provided by the Contractor. Above this cover a single layer of second-class brick shall be laid in a transverse manner over the cable laid in the trench. The bricks shall be fully soaked in water before being laid in the trench.

Minimum seven bricks per meter shall be laid with uniform spacing over the length of the laid cable.

A warning tape / mat made of PVC sheet of orange color with clear permanent print as "<Client Name>" minimum 150 mm wide and 0.1 mm thick shall be laid over the cable at regular interval of 1.5 meters.

Thereafter the trench shall be backfilled with the excavated earth. Normally, no mechanical protection shall be provided on the cable except at spiking points and rocky areas and as stated in particular cases.

The joints, relevant cable rings and other underground constructions shall be protected by bricks or concrete slabs to be supplied by the Contractor.

At the splicing points, the Contractor shall also take care to backfill the trench and to restore the relevant area and to repair any damaged works.

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ANNEXURE – 2

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1 HOP TESTING

After backfilling of the trench, optical fiber cable shall be tested for continuity and attenuation over the laid length.

The test shall be conducted both before and after the splicing. It shall be ensured that the cable attenuation does not exceed as recommended for G 655 or G 652 cables (excluding the splice loss) and the splice loss on each fiber shall be 0.1 dB per splice (max.). Test procedures mentioned herein are minimum requirements to be followed. However, Contractor shall provide the detailed procedure for cable testing.

Fiber optic cable test-results shall clearly provide the attenuation for each fiber in following aspects:

- Different Wavelengths (1310 nm and 1550 nm);
- Each cable section;
- Individual splice.

Total Attenuation = (wavelength (λ) loss dB/km x fiber length) + (connector loss x number of connectors) + (splice loss x number of splices).

Where,

L = Length of the cable between two nodes;

N = No. of joints between two nodes.

Result shall be within permissible limits. After hop testing results with average losses shall be recorded for each fiber and hop wise report shall be submitted as per approved procedure. Testing shall be witnessed jointly by Client and PMC. Contractor shall furnish as built documents and hop loss report hop wise.

2 FIBER LENGTH MEASUREMENT

2.1 Test Description

This test will check the continuity of the fibre from station to station and record the length of fibre. Average loss per kilometre of fibre length shown in dB/km shall be recorded for information only. Testing will be done from both ends and average loss will be calculated (for 310nm/1550nm/1625nm, as applicable).

2.2 Test Equipment

Following test equipment shall be used:

- Optical time Domain Reflectometer (OTDR);
- Patch cords;
- Pigtails

2.3 Procedure

Test procedure shall be as detailed below. Test formats (1A & 1B) shall be as depicted in Section 2.4 and 2.5.

- Power ON the OTDR and make the settings as required for the hop under test;
- Connections OTDR with patch cord to the connector in OTC;
- Make the Laser ON and observe the trace till it gets settled up to the end of the trace;
- Store the results in the hard disk/floppy disk with proper identification of the fibre under test;
- Record the result in format provided;

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- Repeat the procedure for the opposite direction;
- Repeat above steps for each fiber.

2.4 Format 1A

Fiber Length Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1310 nm & 1550 nm

Equipment Used

Tube No. / Color	Fiber No. / Color	Fiber Length (m)	Optical Loss dB/km		Average Cable Loss (dB/km)
			From A	From B	

2.5 Format 1B

Fiber Length Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1550 nm & 1625 nm

Equipment Used:

Tube No. / Color	Fiber No. / Color	Fiber Length (m)	Optical Loss dB/km		Average Cable Loss (dB/km)
			From A	From B	

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3 INSERTION LOSS MEASURMENT

3.1 Test Description

During insertion loss measurement, light is launched (LASER) in the fibre by using a LASER source from one end at the other end by using an Optical Power meter the received power is measured. Fiber loss is calculated by subtracting the receive power from the transmit power. This test also determines the fiber termination continuity on end-to-end basis as the measurement is done on both the ends of a link.

3.2 Test Equipment

Following test equipment shall be used:

- Power meter working on 1310 nm / 1550 nm / 1625 nm;
- Laser source working on 1310 nm / 1550 nm / 1625 nm;
- Patch cords;
- Pigtails;

3.3 Procedure

- Test procedure shall be as detailed below. Test formats (2A & 2B) shall be as depicted in Section 3.4 and 3.5.
- One power meter , one laser source and one unit of optical talk set is required at each station between which the link is to be tested.
- At location A, switch ON the laser source, set it to operating wavelength of 1310nm and connect it to the power meter (set at 1310nm for G.652 fibres) by two FC/PC patch cords (these FC/PC patch cords will be connected to each other with FC / PC coupler) and record the laser power transmitted. Subtract 0.5 dB (Coupler Loss) from this reading and record it in the test sheet (Appendix-2A & 2B) as 'Power transmitted'.
- Disconnect the power source and power meter by disconnecting FC/PC patch cords from the FC/PC connector. Do not disconnect patch cords from the power meter and power source.
- Connect the power source to the one of the fibres terminated in FTC at location A and the power meter to the same fibre under test in FTC at location B.
- Record the power received in test sheet.
- To establish communication between two stations A & B, optionally connect optical talk set to one of the fiber (e.g. No 12) at both the stations. When that particular fiber is due for testing connect the talk set to one on which testing is complete (e.g. No 1).
- Confirm on the talk set that the power received is recorded.
- Repeat the test for 1550nm.
- Connect the source to next fibre terminated in FTC at location A and power meter at location B.
- Repeat the same procedure with source at location B and power meter at location A.
- Continue the above process till all fibers are tested.
- Average loss of each fiber should be less than the average loss estimated.

Above test procedure shall be repeated for G.655 fibers for 1550 nm / 1625 nm as required. Test formats (3A & 3B) shall be as depicted in section 3.6 and 3.7.

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3.4 Format 2A

Insertion Loss Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1310

Equipment Used:

Cable Length (km) (L):

Number of splices including Pigtails (N):

Number of Connectors (C):

Average Insertion Loss Estimated (dB/km) (037L + 0.07N + 0.5C):

Tube No. / Color	Fiber No. / Color	A-B		B-A		Average Insertion Loss (IL) (dB/km)
		Power Transmitted at A		Power Transmitted at B		
		Power Received at B	Insertion Loss (A-B) (dB/km)	Power Received at A	Insertion Loss (B-A) (dB/km)	

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3.5 Format 2B

Insertion Loss Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1550

Equipment Used:

Cable Length (km) (L):

Number of splices including Pigtails (N):

Number of Connectors (C):

Average Insertion Loss Estimated (dB/km) (0.22L+0.07N+0.5C):

Tube No. / Color	Fiber No. / Color	A-B		B-A		Average Insertion Loss (IL) (dB/km)
		Power Transmitted at A		Power Transmitted at B		
		Power Received at B	Insertion Loss (A-B) (dB/km)	Power Received at A	Insertion Loss (B-A) (dB/km)	

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3.6 Format 3A

Insertion Loss Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1550

Equipment Used:

Cable Length (km) (L):

Number of splices including Pigtails (N):

Number of Connectors (C):

Average Insertion Loss Estimated (dB/km) (0.244L+0.07N+0.5C)

Tube No. / Color	Fiber No. / Color	A-B		B-A		Average Insertion Loss (IL) (dB/km)
		Power Transmitted at A		Power Transmitted at B		
		Power Received at B	Insertion Loss (A-B) (dB/km)	Power Received at A	Insertion Loss (B-A) (dB/km)	

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3.7 Format 3B

Insertion Loss Measurement (G.652)

Date:-

Location A:

Location B:

Wavelength: 1625

Equipment Used:

Cable Length (km) (L):

Number of splices including Pigtails (N):

Number of Connectors (C):

Average Insertion Loss Estimated (dB/km) (026L+0.07N+0.5C):

Tube No. / Color	Fiber No. / Color	A-B		B-A		Average Insertion Loss (IL) (dB/km)
		Power Transmitted at A		Power Transmitted at B		
		Power Received at B	Insertion Loss (A-B) (dB/km)	Power Received at A	Insertion Loss (B-A) (dB/km)	

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ENERGISING QUALITY	**PROJECT NUMBER : 1015-047**	

Datasheets - OFC and HDPE Duct	Client Job Number	BEN-006-4100000327-047-04.02.2019
	Total Sheets	3

Document no.	**1015**	**47**	**IN**	**DS**	**5001**

GAIL (INDIA) LTD.

FEASIBILITY STUDY OF RE-ROUTING /RECOMMENDING SAFETY MEASURES TO CO-EXIST 18" BANGALORE PIPELINE ALONG PROPOSED METRO ALIGNMENT IN

C1	18.03.2020	Issued For Client Review	RB	VB	KNC
REV	**DATE**	**DESCRIPTION**	**PREP**	**CHKD**	**APPR**

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DATASHEET FOR OPTICAL FIBER CABLE				Rev.
GENERAL	1	Cable No.	**	
	2	Application	OFC for Pipeline SCADA / Telcommunication	
	3	Quantity	3000 Mtrs	
	4			
CONSTRUCTION	5	Standard	IEC 60793-1-1, 60794-3	
	6	Fiber Type	Single Mode	
	7	Fiber Count	24	
	8	Color Code	EIA/TI598B	
	9	No of Buffer and Fiber per Loose Tube	6 buffer tubes and 8 fibers / loose tube*	
	10	Cable Drum Length	Minimum 4km *	
	11	Fibre Core Diameter	8.6 to 9.5 µm (±10%)	
	12	Cable Core	Filled	
	13	Cladding Diameter	125 µm ± 2 µm	
	14	Primary Coating Material (over Fiber)	Ultra Violet cured Acrylic or Silicone	
	15	Primary Coating Diameter	250 µm ± 15 µm	
	16	Secondary Coating Material (over Primary Coating)	Optional *	
	17	Secondary Coating Diameter (if any)	250 µm to 900 µm	
	18	Index Profile	Step or Graded	
	19	Inner Sheath	Natural / Black Polyethylene	
	20	Inner Sheath Thickness	1.2 mm (Nominal)	
	21	Internal and Outer Sheath	Hydrocarbon Resistant, Flame Retardant Polyvinyl Chloride, Black Colour	
	22	UV Shielding on Outer Sheath	Required	
	23	Thickness of UV resistant Protective Primary Coating	Cured acrlylate 0.062 mm	
	24	Outer Sheath Thickness	3.0 mm (minimum)	
	25	Operational Wave Length	1310 nm to 1550 nm	
	26	Cable Tensile Strength	Better than 2000 N	
	27	Bending radius at Min. Installation Temperature	Minimum Bending Radius: Under Maximum Tension: 20 X Cable OD Without Tension: 10 x Cable OD	
	28	Bedding	Polyvinyl Chloride, Black Colour	
	29	Armour	Corrugated Steel Tape Armour	
	30	Fiber Identification	Colour Coded Fibers and Tubes	
	31	Cable Marking	Durable Marking Embossed Every One (1) Meter	
	32	Drum Identification Labels	Required	
	33	OTDR Measurements Test	Required	
	34	End to end attenuation Test	Required	
	35			
OPTICAL PROPERTIES	36	Temperature Rating	-60 to +85 °C	
	37	Relative Humidity Suitability	95%, Non Condensing	
	38	Individual Splice Loss	≤ 0.1 dB	
	39	Cutoff Wavelength	λc=1150 -1320 nm, λcc<=1280 nm	
	40	Diff. in attenuation Coefficient when measured at both end	≤0.05 dB/Km (VTA)	
	41	Voltage withstand	10 KV DC	
	42	Numerical Aperture	at least 0.13	
	43	Expected Fiber Life Span	30 years (min.)	
	44	Crush Resistance	440 N/cm	
	45	Transmission Attenuation	At 1310 nm = 0.35 dB/km or less At 1550 nm = 0.20 dB/km or less	
	46	Central Strength Member Material	FRP / GRP	
	47	Central Strength Member Diameter	*	
	48	Cladding Non-Circularity	< 0.7 %	
	49	Polarization Mode Dispersion at 1310 & 1550 nm	as per ITU-T G.652 Standard	
	50	Weight in kg / 1000 Meters	*	
	51	Overall Diameter of Cable and Tolerance	*	
	52	Rip Cord	Yes (1 nos.)	
MISC.	53	Electrical Area Class	Zone 1 Group IIA /IIB as per IEC, T3	
	54	Make / Model No.	* / *	
	55			

Notes: **To be decided

1 Vendor to specify. *

2 Refer Standard Specification for OFC and Conduit, Document no. VPC-SPC-5501 for detail information.

ENERGISING QUALITY	**CLIENT:**	GAIL (INDIA) LTD.					
	PROJECT:	FEASIBILITY STUDY OF RE-ROUTING /RECOMMENDING SAFETY MEASURES TO CO-EXIST 18" BANGALORE PIPELINE ALONG PROPOSED METRO ALIGNMENT IN BANGALORE CITY	C1	18.03.2020	RB	VB	KNC
			REV.	**DATE**	**PRPD**	**CHKD**	**APPRD**

		DATASHEET FOR HDPE DUCT				Rev.
GENERAL	1	Duct Identificaiton No.		**		
	2	Application		Duct to include Pipeline OFC		
	3	Quantity		--		
	4					
	5					
CONSTRUCTION	6	Description		HDPE duct suitable for direct burial application		
	7	Standard		TEC GR No GR/CDS-008/03 March'11		
	8	Duct Drum Length (Mts)		3000 Mts		
	9	Outer Diameter (mm)		40 mm ± 0.4mm		
	10	Wall Thickness(mm)		3.0mm ± 0.4mm		
	11	Pressure Rating (kg/cm2)		10 kg/cm2		
	12	Lubrication		Solid permanent lubricant across drum length		
	13	HDPE Density (kg/m3 at 27 degC)		940 to 958 kg/m3 at 27° C		
	14	HDPE Melt Flow Index		0.2 to 1.1 grams per 10 min. at 190 ºC		
	15	Color		Orange - uniform across drum length		
	16	Identification		Black, Length mark at every meter		
	17	Preinstalled Tape		Factory installed Bull-line Pull tape		
	18	Ribbed		Internal straight ribs		
	19	Number of Ribs		80 / 32		
	20	Rib Height		0.2 - 0.5 mm/0.3 to 0.9mm		
	21	Tensile strength		Min. 20 N/mm2 (Testing as per IS-14151 (Part-I))		
	22	Elongation		Min. 350% (Testing as per IS-14151 (Part-I))		
	23	Internal Coefficient of friction		≤ 0.08		
	24					
	25					
	26					
	27					
ACCESSORIES	28	Plastic Coupler		Push-fit type having Push-Lock mechanism		
	29	Air Pressure Testing of Coupler		15 Kg/cm2 min period of 2 hours without any leakage		
	30	End plugs, Cable Sealing Plug & End Cap		Required		
	31	End Cap material		Hard rubber/plastics fitted to HDPE Ducts		
	32					
	33					
	34					
	35					
TESTS	36	Duct Integrity Test		Required		
	37	Pressue Test		Required		
	38	Crush and Deformity Test		Required		
	39	End Plug Test		Required		
	40					
	41					
	42					
	43					
MISC.	44	Make	Model No.	**	**	
	45					
	46					
	47					

Notes: ** TBD

1	Vendor to specify. *
2	Refer Standard Specification for OFC and Conduit, Document no. VPC-SPC-5501 for detail information.
3	HDPE duct specification shall confirm to IS 7328, IS 4984 and ASTM D-1963 standards.

ENERGISING QUALITY	**CLIENT:**	GAIL (INDIA) LTD.					
	PROJECT:	FEASIBILITY STUDY OF RE-ROUTING /RECOMMENDING SAFETY MEASURES TO CO-EXIST 18" BANGALORE PIPELINE ALONG PROPOSED METRO ALIGNMENT IN BANGALORE CITY	C1	18.03.2020	RB	VB	KNC
			REV.	**DATE**	**PRPD**	**CHKD**	**APPRD**

SECTION-VII

SCHEDULE OF RATES/PRICE SCHEDULE

[Note: Price schedule/BOQ is to be downloaded from e-tender portal of CPP portal"].

Signature Not Verified
Digitally signed by Bishar Bin Ali
Date: 2022.12.12 15:39:21 IST
Location: eProcurement System for Central PSUs