



Offshore Design Section  
Engineering Services  
ISO – 9001:2008

Functional Specification  
for  
Unbonded Flexible Pipe  
for Submarine Application

Spec. No.	2020E
Rev. No.	4
Discipline	PIPELINE
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**SPECIFICATION**  
**FOR**  
**UNBONDED FLEXIBLE PIPE**  
**FOR**  
**SUBMARINE APPLICATION**

**OIL AND NATURAL GAS CORPORATION LTD.**  
**INDIA**

AVIN ASHOK AEE(C)	R.P. PUROHIT DYSE(C&M)	SUDHIR KUMAR CE(C&M)	H.NANDKISHORE CE(C&M)
SANJAY NARAIN CE(C&M)	ROHIT PANT CE(M)	B.P.MALIK CE(C&M)	K.P.VARGHESE C.E.(C&M)
PREPARED BY			
A.K.MISHRA DYGM (C&M)		S.B. SRIVASTAVA GM (C&M)	
REVIEWED BY		APPROVED BY	
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## 1 SCOPE

This Specification is based on API-17J, Third edition, July 2008/ ISO-13628-2: 2006 and shall be read in conjunction with that document. Unless modified by this Specification to suit Company requirements, the stipulations of API-17J / ISO-13628-2 standard shall govern.

Note: The Sections and paragraphs contained herein have the same numberings as the sections and paragraphs of API-17J / ISO-13628-2 in order to facilitate reference.

Additional requirements which are not specified in API-17J / ISO-13628-2 have also been included in this Specification and accordingly indicated.

The pipes shall be rough / smooth bore as per requirements specifically mentioned in Table 4.2B, Section 4B of Bid Package.

## 2 NORMATIVE REFERENCES


Following additional standards / Recommended Practices are included :

- a. ANSI-B16.5 - Steel Pipe Flanges and Flanged Fittings.
- b. ANSI-B16.9 - Factory made Wrought Steel Butt Welding Fittings.
- c. ANSI-B16.25 - Butt Welding Ends.
- d. API RP 17B/ ISO-13628-11 -Recommended Practice for Flexible Pipe

## 5 FUNCTIONAL REQUIREMENTS

- 5.1.1 Functional requirements of the flexible pipes shall be as per Appendix A of this specification.

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## 5.2. OVERALL REQUIREMENTS

### 5.2.2 End Fittings

(c) (New) Lifting lugs shall be provided integral with the end fittings.

## 5.3 General Design Parameters

Specific design parameters shall be as per Table 4.1B and Table 4.2B of Part-IV, Section-4 of the bid document and Appendix-A of this Specification.

## 5.4 Internal Fluid Parameters

5.4.1 Requirements pertaining to internal fluid parameters shall be as per Table 4.2 B & Appendix-E of Section 4B and Process Design Criteria of Part-IV, of this bid document and Appendix-A of this Specification.


## 5.5 External Environment

Details of external environment shall be as given in Table 4.1 B and Table 4.2B of Part-IV, Section-4 of this bid document and Appendix-A of this Specification.

## 5.6 System Requirement

5.6.1.1.2 Manufacturer shall submit to Company four copies of all documents listed in clause 9.1.2 for this specification for Company's review/approval and information as applicable. Manufacturer shall obtain Company's approval on the Design Premise prior to flexible pipe design. Company's approval shall also be obtained on Design Load Report, Design Report, and Manufacturing Quality Plan & Fabrication Specification prior to start of manufacture of pipe. Once the approval has been given by the Company, any changes in the design, material, etc. shall be notified to Company and whose approval in writing of all such changes shall be obtained before the flexible pipes are manufactured. Manufacturer shall submit four copies of as-built documentation and Operation manual for Company's information and record.

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#### 5.6.1.5 Gas Venting

In addition to the requirement of API 17J, Manufacturer shall carry out a permeability analysis, using the fluid composition and flow parameters likely to be governing for the entire design life and pipes shall be designed accordingly with protective features wherever required.

#### 5.6.1.9 Connectors

Connector shall be an integral part of the end fitting. Connectors shall have appropriate Class rating. RTJ, swivel flanges shall be as per ANSI B16.5. Butt weld ends, if specified, shall have ends prepared as per ANSI B16.25.

#### 5.6.1.12 Installation Requirements

5.6.1.12.1 Requirement pertaining to installation shall be as per the details included in Part IV, Section 4B and Spec No. 2015A of the Bid Package. Manufacturer shall ensure that the flexible pipe design shall incorporate the specified installation requirements.

5.6.1.12.2 Flexible pipes shall be designed considering its reusability within its design life.

#### 5.6.2 Flow line Parameters

Flow line parameters shall be as per Appendix A Table 4.1 B and 4.2B.

#### 5.6.3 Riser Parameters


Riser parameters shall be as per Appendix-A, Table 4.1B & Table 4.2B.

### 6 DESIGN REQUIREMENTS

#### 6.1 Loads & Load Effects

6.1.1 Flexible pipe design shall be based on the information provided at APPENDIX-A of this Specification, Table 4.1B and Table 4.2B of Part-IV, Section 4B of Bid document.

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## 9 DOCUMENTATION

### 9.1.3 General

Once the approval has been given by Company, Manufacturer shall submit the required number of copies of the documents listed in 9.1.2, within four weeks from the approval date.

### 9.1.4 (New) Additional Requirement

Manufacturer shall submit the following additional documents at the time of bidding:

9.1.4.1 Product catalogues and details of the flexible pipe offered including component relevant drawings and data sheet with materials. License for manufacturing of flexible pipes as per API 17J.

9.1.4.2 Reference list of similar supplies including all relevant details viz. Project, Year, Client Location, Service, Water depth, Type of unbonded flexible pipe design, Pressure rating, length, no. of reels etc. pertaining to projects which are in operation for a minimum period of two years from the date of submission of Bid.

9.1.4.3 Type approval certificate issued by an independent verification agent for the flexible pipe design offered as per this specification.

### 9.4 Design Report

9.4.4 Following are also to be considered.

- 1) Safe load, externally and locally applied, which will not damage.
- 2) Maximum allowable decompression rate.


9.4.6 Following is additional requirement to Clause 9.4.6.

The design report shall include calculations pertaining to on-bottom stability using the design criteria specified by the Company.

## 10 FACTORY ACCEPTANCE TEST

10.1..1 The Company reserves the right to witness stage wise Manufacture of flexible pipes and all tests carried during manufacturing of pipe including Factory Acceptance Tests (FAT). In addition, Company requires that

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inspection by an independent third party Inspection Agency shall be carried out at all stages of manufacture as per approved PS & QA/QC Plan at Manufacturer's works.

10.3.1.1 The minimum hydrostatic test pressure shall be 1.5 times the design pressure.

**12 (New)** Manufacturer shall have a valid license for manufacture of flexible pipes as per API 17J. Flexible pipes shall have API monogram.

**13 (New) MANUFACTURER'S QUALIFICATION CRITERIA**

The manufacturer who intends bidding for flexible pipes as per this specification shall have supplied unbonded flexible pipes conforming to API RP17B /17J in the past for similar installation and service. Such installation shall be in operation and functioning satisfactorily for a minimum period of two years, as on the date of submission of Bid. Bidder shall submit along with the Bid, the relevant information and details as mentioned in Clause 9.1.4 of this specification to establish the same. Flexible pipes of design that are not installed in the last 2 years in similar installation and service are not acceptable to Company.

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**APPENDIX – ‘A’  
TABLE A-1 FUNCTIONAL REQUIREMENTS FOR  
FLEXIBLE PIPE**

<b>I.</b>		<b>GENERAL DESIGN PARAMETERS</b>	
	1.	Internal Diameter	Refer Table 4.2B, Part-IV Sec-4
	2.	Approximate Length	Refer Table 4.2B, Part-IV Sec-4 & Note-1
	3.	Pipe Structural requirement (MBR etc.)	Ref. Note-1
	4.	Weight Requirements in Air (Empty)	Ref. Note-1
	5.	External Protection Requirements	As per API RP 17B
	6.	Service Life	25 Years
	7.	Maximum Axial Load, KN	Ref. Note-1
	8.	Maximum Effective Tension KN	Ref. Note-1
	9.	Torsional Balance Requirement, degree C/m	Ref. Note-1
	10.	Compression Strength Requirement, KN	Ref. Note-1
<b>II.</b>		<b>DESIGN LOAD CASE PROBABILITIES</b>	
	1.	Installation	1 Year
	2.	Normal Operation	100 Years
<b>III.</b>		<b>INTERNAL FLUID PARAMETERS</b>	
	1.	Fluid Description	Refer Table 4.2
	2.	Flow Regime Description	Single Phase/Multiphase
	3.	Flow Description	Unidirectional
	4.	Design Pressure, kg/cm <sup>2</sup>	Ref. Table 4.2B
	5.	Operating Pressure, kg/cm <sup>2</sup>	Ref. Note – 2
	6.	Design Temperature	Ref. Table 4.2B
	7.	Service Definition	Ref. Table 4.2B
	8.	Flow Rate	Ref. Note – 2
	9.	Fluid Composition and Density	Ref. Note – 2
	10.	Viscosity	Ref. Note – 2
	11.	Fluid Heat Capacity	Re. Note – 2






IV		EXTERNAL ENVIRONMENT - STATIC LOADS	
	1.	Design Water Depth	Ref. Table 4.2 B
	2.	Tidal Variation	Ref. Table 4.1B Part IV, Sec. 4 of Bid Package
	3.	Minimum Sea bed Temperature	22.8°C
	4.	Details of water depth variation over Route	Ref. Note – 3
	5.	Sea Water Density	1030 kg/m <sup>3</sup>
	6.	Sea Water ph value	Ref. Note – 3
	7.	Min/Max. surface temperature	16°C/ 40°C
	8.	Soil Description	Ref. Note – 3
	9.	Soil Shear Strength	Ref. Note – 3
	10.	Angle of Internal friction	Ref. Note – 3
	11.	Lateral Friction Coefficient	Ref. Note – 3
	12.	Longitudinal Friction Coefficient	Ref. Note – 3
	13.	Current Data	Ref. Table 4.1B Part – IV, Section – 4 of Bid Package
	14.	Marine Growth	For I-Tube/J-Tube, as per Table 4.1B
	15.	Other requirements	Ref. Table 4.1B and 4.2B Part –IV, Section- 4
V		EXTERNAL ENVIRONMENT - DYNAMIC LOADS	
	1.	Wave Data	Ref. Table 4.1B and 4.2B Part –IV, Section- 4

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VI.		GENERAL SYSTEM REQUIREMENTS	
	1.	System Description	Refer. Table 4.2B
	2.	Application Definition	Static
	3.	Pipe Bore Definition	Rough/Smooth (Refer Table 4.2B)
	4.	Corrosion Protection Required	Manufacturer to Recommend based on Product Composition/Environment
	5.	Cathodic Protection system	Yes
	6.	Electrical Continuity Required	Yes
	7.	End-fitting Coating Required	Yes
	8.	External Coating Required	Epoxy Coating suitable for the Environment
	9.	Internal Coating Description (End Fitting)	Nil
	10.	Thermal Insulation Required	Refer Note -1
	11.	End Connector Type	Refer Note -1
	12.	Gas Venting Required	Ref. Note –1
VII		FLOWLINE PARAMETERS	
	1.	Pipeline Routings	Ref. Note –3
	2.	Trenching	Ref. Table 4.2B
	3.	Rock Dumping	No
	4.	Allowable bend radius	Ref. Note-1
	5.	Load Cases	As per 5.1.3.5
	6.	On-bottom stability to be checked	Yes Ref. Part – IV, Section – 4B


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	7.	Crossover Requirement	Yes, Design to be firmed up during detail engineering by Contractor
VIII.		RISER PARAMETERS	
	1.	Riser configuration	Vertical, to be installed within I-tube/J- tube
	2.	Riser upper connection description	As specified in Bid Package
	3.	Required pipe attachment	Nil
	4.	Marine Growth	Ref. Table 4.1B Part –IV, Section 4
IX		ACCESSORIES/OTHER COMPONENTS REQUIRED	
	1.	I-Tube/J-Tube Hang-off assembly	Ref. Note – 1
	2.	I-Tube/J-Tube seals	Ref. Note – 1
	3.	Bell mouth for I-Tube/J-Tube	Ref. Note – 1
	4.	Pull-in head	Ref. Note – 1

- Note:
1. To be furnished/confirmed by Contractor during detailed engineering stage.
  2. Refer to Process Design Criteria included elsewhere in the bid package.
  3. To be confirmed/ indicated by the Contractor based on data collected during pre- engineering survey.
  4. Manufacturers shall specify in the Design premise the values assumed for all parameters in Table A-1.

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## APPENDIX – ‘D’ (NEW)

### SOUR SERVICE REQUIREMENTS

- |    |                         |   |   |
|----|-------------------------|---|---|
| 1. | CODES                   | - | For Sour application, product shall conform to NACE-MR-01-75 Standard.  |
| 2. | TESTS                   | - | All relevant test viz. SSCC, HIC etc. as described in the Code shall be applicable for sour service condition.                          |
| 3. | END FITTING<br>MATERIAL | - | Corrosion resistant alloy viz. DSS /INCOLOY/<br>CS (NACE) with special internal coating shall be provided for sour service application. |

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