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طرح نگهداشت و افزایش تولید 27 مخزن

SPECIFICATION FOR PIPELINE COLD BENDING

نگهداشت و افزایش تولید میدان نفتی بینک

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Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

Class:2 CLIENT Doc. Number: F0Z-707153

Status:

IDC: Inter-Discipline Check
 IFC: Issued For Comment
 IFA: Issued For Approval
 AFD: Approved For Design
 AFC: Approved For Construction
 AFP: Approved For Purchase
 AFQ: Approved For Quotation
 IFI: Issued For Information
 AB-R: As-Built for CLIENT Review
 AB-A: As-Built –Approved

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

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2.0 SCOPE

This Specification covers the minimum requirements for pipeline cold field bending. It describes limits to be observed in field bending in terms of minimum bend radius as well as maximum stretching or thinning of the pipe wall thickness.

This specification does not apply to non-metallic pipes.

Bending covered by this specification may be produced from seamless pipe or welded pipe.

The bending operation shall be carried out by the Construction Contractor, using a bending machine with an internal mandrel of appropriate design to be approved by Engineer's Representative. This Specification will be used in construction of pipeline cold bend.

The Construction Contractor shall appropriately cold bend the Pipe-Joints during pipeline laying operation in under-ground pipelines. The Construction Contractor shall make all necessary field bends, required for the construction of the pipeline.

All bends shall be made cold and uniform by the use of an approved bending machine with bending shoes of proper size and of a design suitable for bending operation. An internal hydraulically expanded mandrel shall be used to maintain circular shape of the pipe.

3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS-C-PI-140 Construction standard for transportation pipelines (onshore)
- IPS-E-PI-140 Engineering Standard for Onshore Transportation Pipelines
- IPS-C-PI-270 Construction Standard for Welding Of Transportation Pipeline

3.2 INTERNATIONAL CODES AND STANDARDS

- ASME B 16.49 Factory Made Wrought Steel Butt welding Induction Bends for Transportation and Distribution Systems
- ASME B31.4 Liquid Transportation System for Hydro Carbons and other liquids
- ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- API 5L Specification for line pipe

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3.3 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No.BK-GNRAL-PEDCO-000-PR-DB-0001".

3.4 CONFLICT REQUIREMENT

In case of any conflict between requirements specified herein & the requirements of any other referenced document, this subject shall be reflected to CLIENT and the final decision will be made by CLIENT.

4.0 BENDING

Performed bends shall be used when changes of slope or direction are required.

No bends will be permitted on pipe which has been or is to be concrete coated. For river crossings the pipe may only be laid in natural curves which cannot over stress the pipe or the reinforced concrete sheath.

Maximum permissible angle of cold field bending shall conform to IPS-C-PI-140.

No wrinkle, buckling bends or hot bends are permissible

If bend is made from pipe lengths containing longitudinal seam, the seam shall be positioned on the neutral axis of the bend and length shall be arranged so that successive lengths have the seam properly staggered as per IPS-C-PI-270.

All bends shall be made cold and uniform by the use of an approved bending machine with bending shoes of proper size and skilled operator.

5.0 DIMENSIONS / LIMITATIONS

All bends shall be made to a minimum radius as specified in IPS-C-PI-140. The minimum radius of field cold bends shall be based on 1.5° per length of pipe equal to nominal diameter. No bend shall be made within two (2) meters of a circumferential butt weld or beveled end of pipe unless the pipe is double jointed, in which case this dimension may be reduced to a minimum of one meter.

NOTE

In such cases the circumferential weld joint shall have been successfully passed the N.D.T. inspection prior to bending activity.

Bending shall be carried out by successive partial cold bending operation. Each individual bending action shall not deflect the pipe permanently by more than the amount mentioned in following table in any length along the pipe equal to pipe diameter. Less degree per pipe diameter is more desirable, if practical and an accurate method of measurement shall be used. Any length of pipe, which is buckled or flattened by bending operation shall be cut- out and replaced by the

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Construction Contractor at his own expense.

To achieve a desired angle over pipe length (single or double) by cold bending operation, it shall be carried out by successive operation at frequent uniform intervals.

Each individual bending action shall not deflect the pipe permanently by more than the recommended limits mentioned in following table.

6.0 GAS SERVICE

For gas service, the wall thickness after bending shall not be less than minimum permitted by following formula:

$$D = P = \frac{2St}{D} FET \quad \text{Nominal Outside Diameter of Pipe, in.}$$

E= Longitudinal Joint Factor. (see table 841.115A, ASME 31.8)

F=Design Factor obtained from table 2 of IPS-E-PI-140(1)

P=design pressure, psig.

S=specified minimum yield strength, psi.

T=temperature derating factor obtained from Table 841.116 A, ASME 31.8.

t=nominal wall thickness, in.

For pipe smaller than NPS 12, the requirements of next paragraph must be met, and wall thickness after bending shall not be less than the minimum permitted by before paragraph. This may be demonstrated through appropriate testing.

A bend shall be free from buckling, cracks, or other evidence of mechanical damage.

7.0 LIQUID SERVICE

For liquid service (oil, water), bends shall be made from pipe having wall thickness determined in accordance with next paragraph. Bends shall be made in such a manner as to preserve cross-sectional shape of the pipe, and shall be free from buckling, cracks, or other evidence of mechanical damage. the pipe diameter shall not be reduced at any point by more than 2 % of the nominal diameter, and the completed bend shall pass the specified sizing pig. The minimum radius of field cold bends shall be based on 1.5° per length of pipe equal to nominal diameter. Tangents approximately 6 ft. (2m) in length are preferred on both ends of cold bends. Bends shall meet the flattening limitations of this paragraph.

The wall thickness of pipe before bending shall be determined as for straight pipe in accordance

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with bellow formula. Nominal wall thickness shall be equal to or greater than t_n determined in accordance with the following equation:

$$t = \frac{PiD}{2S}$$

$$t_n = t + A$$

t = pressure design wall thickness as calculated, inches (mm).

t_n = nominal wall thickness, inches (mm).

A = sum of allowance for threading and grooving, inch (mm).

Pi=internal design gage pressure psi (bar).

D=outside diameter of pipe, in.(mm)

S=applicable allowance stress value, psi (Mpa).

8.0 METHOD

The longitudinal weld shall not be under any circumstances in direct contact with bending shoe. In such case, CLIENT representative reserve the right to reject the said bend.

At the option of CLIENT's Representative, the longitudinal weld, which has been subjected to the shoe of bending machine, shall be ultrasonically and radio-graphically inspected.

9.0 MEASUREMENTS AND TOLERANCES

On each pipe joint to be bent, the weld-seam shall be located within Plus/Minus maximum 20 degrees from the neutral axis of the bend, but more preferably on neutral axis.

Bends of lesser radius specified in this Specification due to any particular Site condition may be done with CLIENT's Representative prior Approval.

After the bend has been completed, measurement across the minimum and maximum axis of the cross-section of the center of the bend shall not vary by a value greater than 2% of the nominal diameter of the pipe and at the straight ends of the bend shall not vary by a value greater than 2% (two percent) or 2mm whichever is greater.

All pipes, which have been subjected to field bends, shall not contain any buckles, cracks and excessive thinning.

Miter bends shall not be permitted. The Construction Contractor shall strictly adhere to the

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stipulation of ASME B 31.4/31.8.

Any defects beyond the limits set forth in this Specification shall be rejected and immediately replaced by new pipes.

The Construction Contractor shall be responsible for all the relevant costs including the value for line-pipe.

Hammering and use of jacks at any time to reform buckled or deformed portion of the pipe is strictly prohibited.

10.0 PIGGING REQUIREMENT

Permanent pigging facilities shall be considered for those pipelines which require frequent pigging and/or have operational constraints. The distance between pigging stations should be determined on the basis of anticipated pig wear and amount of collected solids which can be pushed through as well as time required for traveling of pig between launcher and receiver. Bends should have a sufficient radius to allow passage of those types of pigs which are anticipated to pass through them, the minimum radius of bend shall be 7D.

Limit of thinning and deformation

At the discretion of CLIENT's Representative, stretching and thinning of the pipe shall be limited to 1.5 percent of the nominal wall thickness; in any case the remaining wall thickness shall not be less than 98.5 percent of the nominal wall thickness of the pipe under any conditions.

Where a maximum allowable bend angle per each length of pipe is required at locations where thin wall pipe is unavoidable, a section of the pipe with thicker wall thickness may be used at the location of the bends so as to prevent wrinkle or other deformation limits specified here in this Specification.

The pipe diameter shall not be reduced by more than 2% of nominal pipe diameter. Care must be taken to avoid wrinkling and not to exceed this limit of deformation. Wrinkled pipe or pipe exceeding the said deformation shall be rejected.

11.0 TEST

For pipe NPS 2 and smaller, bending test shall meet the requirements of ASTM A53 or API 5L for pipe larger than NPS 2 in nominal diameter ,flattening tests shall meet the requirements in ASTM A53.

12.0 INSPECTION AND MINIMUM TEST REQUIREMENT

Out-of-roundness inspections shall be carried out by inserting a gauge or by any other method that has been submitted for the approval of CLIENT's Representative.

Minimum test requirement shall be according to clause 9 this specification.