طرح نگهداشت و افزایش تولید ۲۷ مخزن

SPECIFICATION FOR THE DESIGN OF PIPING IN MECHANICAL PACKAGES

نگهداشت و افزایش تولید میدان نفتی بینک

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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.

COMPANY:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR :	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 EPC CONTRACTOR and approved by GC & COMPANY (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 COMPANY rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This specification together with CODES/STANDARDS and, relevant specifications prescribes the minimum requirements for design, materials, fabrication, assembly, erection, insulation, examination, inspection, and testing of piping systems within the limits of packaged systems.
It is the intent of this specification to supplement the **code B31.3.** With certain conditions not fully covered therein.
In case of conflicts between this specification and references of clause 3, unless the conflicts are raised by the vendor and agreed upon, the information included in this specification shall govern.

3.0 NORMATIVE REFERENCES

3.1 Local Codes and Standards

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- IPS-G-GN-210 General Standard for Packing & Packages
- IPS-G-PI-280 General Standard for Pipe Supports
- IPS-E-PI-240 Engineering Standard for Plant Piping System
- IPS-C-PI-240 Construction Standard for plant piping system
- IPS-C-PI-350 Construction Standard for plant piping systems pressure testing
- IPS-C-TP-101 Construction Standard for surface preparation
- IPS-E-PI-221 Engineering Standard for Piping Material Selection
- IPS-M-PI-110 Material & Equipment Standard for Valve
- IPS-M-PI-150 Material & Equipment Standard for Flange & Fittings
- IPS-E-IN-110 Engineering Standard for Pressure Instrument
- IPS-E-IN-120 Engineering Standard for Temperature Instrument
- IPS-E-PR-190 Engineering Standard for Layout & Spacing
- IPS-E-PR-420 Engineering Standard for Heat Tracing & Winterizing
- IPS-G-IN-200 General Standard for Instrument Air System

3.2 International Codes and Standards

- ASME B31.3 Process Piping
- ANSI B16.5 Pipe Flanges and Flanged Fittings
- ASTM American Standard for Testing and Material

- API 610 Centrifugal Pumps
- ASME SEC II Boiler and Pressure Vessel Code- Material Specification
- ASME section V Boiler and Pressure Vessel Code -Nondestructive Examination
- ASME Section VIII Boiler and Pressure Vessel Code- Pressure Vessel
- ASME sec IX Boiler and Pressure Vessel Code- Welding and Brazing Qualification
- AWS American Welding Society
- NACE MR-0175 Materials for Use in H2S-Containing Environments in Oil and Gas / ISO 15156 Production

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3.3 The Project Documents

BK-GNRAL-PEDCO-000-PI-SP-0016	Specification For Piping Design & Plant Layout
BK-GNRAL-PEDCO-000-PI -SP-0012	Specification For Flexibility Analysis
BK-GNRAL-PEDCO-000-PI-SP-0014	Specification For Pipe Support
BK-GNRAL-PEDCO-000-PI-SP-0015	Specification For Piping Construction, Fabrication & Erection
BK-GNRAL-PEDCO-000-PI-SP-0010	Specification For Plant Piping Systems Pressure Testing
BK-SSGRL-PEDCO-320-PI-SP-0001& BK-PPL-PEDCO-320-PI-SP-0001& BK-GCS-PEDCO-120-PI-SP-0001	Piping & Pipeline Material Specification
BK-GNRAL-PEDCO-000-PI-SP-0004	Specification For Metallic Pipes
BK-GNRAL-PEDCO-000-PI-SP-0005	Specification For Fittings, Flanges, Gaskets and Bolts
BK-GNRAL-PEDCO-000-PI-SP-0009	Specification For Manual Valves
BK-GCS-PEDCO-120-PI-RT-0001 & BK-PPL-PEDCO-320-PI-RT-0001	Corrosion Study & Material Selection Report
BK-GNRAL-PEDCO-000-PI-SP-0006	Specification For Painting
BK-GNRAL-PEDCO-000-PI-SP-0013	Specification For Coating Of Underground Piping
BK-GNRAL-PEDCO-000-PI-SP-0011	Specification For Welding Of Plant Piping System

BK-SSGRL-PEDCO-110-PI-DW-0001& BK-GCS-PEDCO-120-PI-DW-0001	Standard Pipe Support Drawings
BK-SSGRL-PEDCO-110-PI-DW-0002 & BK-GCS-PEDCO-120-PI-DW-0002	Piping Assembly Drawing

3.4 Exception and Deviation

The vendor shall clearly identify in his proposal any deviation or exception to this specification and other referenced documents/drawings.

3.5 Conflicting Requirements

If conflict persists, the Vendor shall seek clarification from EPC CONTRACTOR before proceeding. Generally, the most stringent requirements shall be applied.

3.6 ENVIRONMENTAL DATA

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

4.0 DESIGN

Piping design shall be in accordance with the code B31.3 and Specification For Piping Design & Plant Layout (BK-GNRAL-PEDCO-000-PI-SP-0016).

The following requirements shall also be observed:

4.1 General

4.1.1. The vendors shall layout, design, and engineer all piping systems within the package unit.

4.1.2. Flanged connections shall be provided to allow removal any piece of equipment for maintenance.

4.1.3. The vendor shall specify line numbers on P&ID and prepare line list which contains Line Characteristics, Process Conditions, Finishing Type, Test Medium and Pressure

as a minimum .The vendor shall calculate pipe size based upon his hydraulic calculations.

4.1.4. The vendor shall provide detail drawings and design for pipe and equipment installation as per project specifications.

4.2 Clearances and Layout

4.2.1. All piping shall be arranged to provide full access to all equipment for operation and maintenance with a minimum amount of labor.

4.2.2. All valves, control valves, and instruments shall be accessible from grade, platforms, or permanent ladders, and conveniently located for operation and maintenance.

4.2.3. Terminal piping connections shall be flanged and supported at or near the edge of the packages.

4.2.4. Liquid and gas traps shall be avoided in piping arrangements. In the event this is not possible, all gas traps shall have plugged vents, and liquid traps shall have plugged drain valves.

4.2.5. Actuator of Control valves shall be installed in a vertical upward position. When arranging manifolds, attention shall be paid to access, clearance, maintenance and removal of control valve without removing stop valves. Control valve manifold shall preferably be located within view of associated instruments.

4.2.6. Local gauges and indicators shall be located where they can be visible and readable from the ground and at the control valve assembly.

4.2.7. Connections to instruments and vents and drains shall be in accordance with Piping Assembly Drawing BK-SSGRL-PEDCO-110-PI-DW-0002 & BK-GCS-PEDCO-120-PI-DW-0002.

4.2.8. Pressure relief valves shall be installed with the spring in the vertical position. Lifting devices shall be provided for pressure relief valves weighting more than 45 Kg.

4.2.9. Valves on horizontal lines shall not be installed with hand wheels downward. Operating valves more than 2 meters above the operating level; require extensions, for 2” and larger chain wheels, for smaller extended stems.

4.2.10. Locked open valves shall have their stems in the horizontal position with a metal tag attached. This tag shall be read: “This valve must not be closed without written permission from responsible authority”.

4.2.11. Diameters shall be chosen from the customary series:

½’’, ¾’’, 1’’, 1 ½’’, 2’’, 3’’, 4’’, 6’’, 8’’, 10’’, 12’’, 18’’, 20’’, 24’’, etc

In particular, pipes having nominal diameters of ¼'', 3/8'', 1 ¼'', 2 ½', 5'' and 7'', 22" shall not be used. If vessels have connections at these diameters, the piping from the equipment shall be increased to the next largest diameter.

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4.2.12. The minimum diameter used shall be ½''. This restriction on diameter does not apply to tracing, utilities connections, to orifice flanges, drains and vents etc.

4.2.13. The clearance between two pipes shall be a minimum of flange to pipe plus 25 mm, or insulated flange to pipe insulation plus 50 mm, with flanges staggered. Consideration shall be given to the expansion/contraction in spacing of pipes. The clearance between bottom of pipes and top of skid shall be min. 300 mm.

Screwed connections to instruments shall not be seal welded. The space between the axis of two adjacent pipes shall be at least equal to the sum of. O.D of flanges (with higher rating) or. O.D. of each pipe plus 25 mm. This dimension (25 mm) shall be increased to 50 mm for insulated pipes.

4.2.14. The minimum clearance between hand wheels on valve manifolds shall be 75 mm.

4.2.15. Minimum clearance for access ways shall be as follows:

Overhead clearances:

- For passage of truck :4.0 m
- Over fork-lift truck: 2.7 m
- For Passage of personnel's: 2.1 m

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- For Over Railways or Main Road: 6.8 m
- For Over Access Roads for Heavy Trucks: 6 m

Horizontal clearances:

- Vehicular access way within units: 4.0 m
- Pedestrian access way and elevated walkway: 1.2 m
- Stairway & Platform: 0.8 m
- Maintenance access around equipment: 1 m

4.2.16. All allocated areas for access, service, maintenance, and operation shall be kept clear of piping or any other obstruction.

4.3 Piping Flexibility and Supports

Supports shall be designed in such a way as to comply with flexibility analysis results and according to the Specification for Flexibility Analysis (BK-GNRAL-PEDCO-000-PI-SP-0012). The following general rules shall be observed:

4.3.1. All piping shall be analyzed and adequately supported, guided, anchored, or strutted so as to prevent undue vibration, deflection, stress, or strain on equipment. Thermal expansion/contraction, dynamic effects (impact, wind, earthquake, vibration, etc.) and weight effects (live loads, dead loads, test loads, etc.) shall be considered in the analysis so that the stresses created by above mentioned loadings shall not exceed the allowable stresses prescribed by the code B31.3. When analyzing piping, particular attention shall be paid to thermal expansion/contraction of piping exposed to sunlight and severe temperature changes during start-up, operation, shutdown, and emergency conditions. See “Process Basis of Design” for site conditions . (PS-E-PI-200 shall be followed in this case.

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4.3.2. Piping flexibility shall be used in preference of any type of expansion joints. If a suitable piping configuration cannot be designed to eliminate the use of expansion joints, the matter shall be discussed with Client before proceeding with any work.

4.3.3. For piping associated with reciprocating machinery consideration shall be given to the amplitude and the spectral frequency distribution of pulsations. Supports for pipes directly connected to reciprocating machinery shall be adjustable and have separate foundations to avoid transmission of vibrations.

4.3.4. Control valves and other piping components shall be properly supported and braced to prevent excessive vibration. Any additional restraint shall be considered in flexibility analysis of the piping system.

4.3.5. Pipe supports shall be wide enough to ensure pipes do not fall off the supports during maximum expansion/contraction.

4.3.6. Supports shall not interfere with clear passages provided for access to equipment, machinery, instruments, handling of valves, etc.

4.3.7. Wherever necessary, pipe supports shall be adjustable.

4.3.8. Local compressive stresses on large-diameter pipes shall be taken into account; using, where necessary, suitable reinforcing plates.

4.3.9. Supports shall be installed in a manner not to transmit any movement to off-skid piping connected thereto.

4.3.10. All supports shall be identified on assembly drawings.

4.3.11. The end actions on equipment and machinery imposed by connected piping, shall be checked within the limits set for that type of equipment by manufacturer considering the latest editions of following publications and standards:

- For equipment, per ASME Section VIII Divisions I and II.
- For centrifugal pumps, per API STD 610.
- For centrifugal compressors and Turbines, per API 617/ NEMA SM 23.

4.3.12. All piping shall be anchored at tie-in points with Purchaser interface or vendor shall identify allowable loads and displacement at tie-ins.

5.0 MATERIALS

5.1 The vendor shall select the piping material so that, they will meet the require corrosion allowances using corrosion control methodologies client requirements specified in project specifications (Including the followings) and acceptable industry experiences.

BK-GCS-PEDCO-120-PI-RT-0001 & BK-PPL-PEDCO-320-PI-RT-0001.	Corrosion Study & Material Selection Report
BK-SSGRL-PEDCO-320-PI-SP-0001& BK-PPL-PEDCO-320-PI-SP-0001& BK-GCS-PEDCO-120-PI-SP-0001	Piping Material Specification

5.2 The material selection considerations shall be provided by the Vendor and submitted to the Purchaser for review and approval

5.3 All materials are subject to tests and inspections indicated in this specification and the relevant ASTM/ASME specification.

6.0 FABRICATION, ASSEMBLY, ERECTION AND INSULATION

Piping fabrication, assembly, and erection shall conform to specified referenced Codes/Standards and Specifications. The following requirements shall also be observed:

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6.1 When welding pipe end to the inside face of the flange, care shall be taken not to damage flange on which gasket will rest. When welding slip-on flanges, the distance between pipe end and the flange face shall be equal to the thickness of the pipe plus 1/8" (3.2mm).

6.2 Welding of butt-weld orifice flanges shall be full penetration type. Excess weld deposit material on inside surface shall be ground so as to align welded edges.

6.3 Welds inside connections for temperature sheaths and other components inside piping

shall be ground.

6.4 Full penetration welding procedure shall be used for stub-in connections. These connections shall be visually inspected both internally and externally.

6.5 Reinforcing pads (where necessary) shall be applied only after necessary inspection by third party inspector.

6.6 Reinforcement of branches having same diameter as the run pipe shall be avoided and equal tee shall be used in these cases.

6.7 Flange holes shall straddle the flange's centerline with respect to main symmetry planes.

6.8 Piping geometrical corrections shall be carried out under cold conditions. This operation shall be performed under close control/supervision.

6.9 Machined and threaded surfaces shall be protected against oxidation by graphitizing during heat treatment.

6.10 Piping shall be internally cleaned prior to erection.

6.11 Contact surfaces of flanges and gaskets shall be inspected prior to bolting up.

6.12 No flange joint shall be assembled without gaskets being inserted between flanges. Where there is risk of misalignment due to weld shrinkage, flanges shall be coupled by inserting a temporary gasket and then welded.

6.13 Non-asbestos or spiral-wound gaskets shall not be reutilized once they have been removed from flanges.

6.14 All tie rods and bolts shall be treated with graphitized oil before installation. All bolts shall be mounted from the same side. Tie rods projections shall be the same as that of nuts.

6.15 In the case of the threaded joint, where seal welding is not envisaged, threaded joint shall be covered by Teflon or suitable sealing material for temperatures greater than 200 °C.

6.16 On lines to be connected to machinery, alignment between flanges shall be checked

before executing connections.

6.17 Acceptable misalignment is that which, once tightening has been executed, the machine-driver alignment would not be changed beyond 70% of allowable tolerances. During tightening operations, a misalignment-checking instrument shall be installed.

6.18 During piping erection, elastic supports shall be kept in the locked position.

6.19 After erection and hydrostatic test, safety and control valves as well as level indicators and controllers shall be separated from remaining piping sections by means of blind spades.

6.20 All piping shall be checked to ensure dimensions and materials are according to drawings and works have been executed according to reference standards, codes, and specifications.

6.21 The external surfaces of piping, equipment, and other components of packaged system shall be insulated to meet prospects as below:

a) Saving of energy by reducing the heat transfer.

b) Maintenance the process temperatures.

c) Prevention of unpredictable incidents due to temperature decline.

d) Protection of personnel safety

e) To prevent condensation on the surface of equipment conveying fluids at low temperatures.

6.22 There are many requirements, which shall be deemed regardless of the type of insulation. Any deviation from the following requirements shall be approved by client :

6.22.1. Surface preparation shall be done in accordance with the IPS-C-TP-101. Surfaces, with external temperature up to 100 °C shall be painted as a primer layer according to the before mentioned standard.

6.22.2. All insulating material shall be in accordance with the Specification for Insulation (BK-GNRAL-PEDCO-000-PI-SP-0019).

6.22.3. Weather proof metal jacket shall be applied and sealed as necessary to prevent moisture, corrosive agents, rain, etc. The type, size, screw and related components characteristics shall meet the minimum requirements of Specification for Insulation (BK-GNRAL-PEDCO-000-PI-SP-0019).

6.22.4. For the purpose of personnel protection, all surfaces with operating temperatures above 65 °C accessible from normal working areas and access ways platform shall be insulated. The surface temperature after insulating shall be declined to 65°C and below. In this case, outer surface of pipe shall be painted in accordance with Requirements of Specification for Painting (BK-GNRAL-PEDCO-000-PI-SP-0006).

6.22.5. Insulation shall meet the following requirements in accordance with Specification for Insulation (BK-GNRAL-PEDCO-000-PI-SP-0019) both in material and technique:

I - Non-corrosive behavior

II – Minimum fire hazard

III - Lack of any cavity between insulating material and surface

IV - Protection of boundary surfaces

V – Optimum service life, heat capacity, chemical resistance, thermal expansion, and resistance to compaction.

Internal insulation and refractory are excluded from this concern. In such cases, any approach shall be done in the vendor scope of work and after client approval. Equivalent standards are permitted after client written approval. Any missed concern shall be adjusted with the introduced references.

7.0 INSPECTION, TESTING, AND PREPARATION FOR SHIPMENT

7.1 Inspection

The client reserves the right to inspect the piping systems prior to shipment.

a) WELDING REQUIREMENTS:

Welding procedures, welders qualification, welding materials, welding inspection techniques and repair and removal of defects shall strictly conform to the IPS-C-PI-290 and meet all requirements of Specification For Welding of Plant Piping System (BK-GNRAL-PEDCO-000-PI-SP-0011) and the latest edition of the ASME Sec II, V, VIII: Pressure Vessel Division 1, VIII: Pressure Vessel Division 2-A terminative Rules, IX, ASME B 31.3, and AWS series.

B) WELD EXAMINATION (NDE):

Nondestructive testing procedures, the extent of required examination, frequency of nondestructive testing, welding inspection techniques and welding operations and

nondestructive examination time lapse shall strictly conform to the IPS-C-PI-290 and meet all requirements of Specification For Welding of Plant Piping System (BK-GNRAL-PEDCO-000-PI-SP-0011) and the latest edition of the ASME Sec II, V ,VIII: Pressure Vessel Division 1, VIII: Pressure Vessel Division 2-A terminative Rules, ASME B 31.3 , and AWS series .

7.2 Test

Assembled piping shall be tested in accordance with the code B31.3. , IPS-C-PI-350, and relevant project specifications. Vendor shall provide test procedures prior to testing. The following requirements shall also be observed:

7.2.1. Approval of Client shall not relieve Vendor of his commitments under the terms of the purchase documents and this specification.

7.2.2. During hydraulic test, elastic supports and expansion joints shall be kept in locked position.

7.2.3. On each test segment, at least, 2 perfectly set-up pressure gauges shall be installed (one at highest point and one at lowest point, but in any case at maximum possible distance). Full-scale range of pressure gauges shall not exceed 1.5 times the test pressure.

7.2.4. Test pressure shall be maintained for an adequate time (not less than one hour), meanwhile no leakage and no pressure drop shall occur.

7.2.5. For convenience, prefabricated piping can also be tested before assembling. Assembled piping shall be pneumatically tested (for sealing only) in accordance with IPS-C-PI-350.

7.3 Painting

minimum requirements for the protection of metal structures, piping and equipment surfaces by painting, including surface preparation procedures, storage, mixing and thinning of paints, application of paints, required inspections, coating type and required color schedule and pipe identification method shall conform to the Specification for Painting (BK-GNRAL-PEDCO-000-PI-SP-0006).

7.4 Preparation For Shipment

Preparation for shipment shall be in accordance with IPS-G-GN-210, and the following requirements shall also be observed:
All shop fabricated piping shall be prepared for shipment in a manner that assures delivery to destination in good conditions. Vendor shall supply packing specification for Client's approval.

7.4.1. All openings shall be suitably covered to prevent entry of foreign materials. Particular attention shall be given to protection of flange faces and threads.

7.4.2. All flange faces shall be coated with an easily removable rust preventive grease or strippable protective coating, and the entire gasket surface of flange shall then be covered with metal plate or heavy-duty plastic flange protectors bolted in place (4 bolts) with blind plastic or rubber gasket placed between the coated flange face and the cover for additional protection.

7.4.3. Valves with external lubricator shall be lubricated prior to shipment.

7.4.4. Vendor is responsible for loading and proper anchoring of the piping systems to prevent any damage during shipment. Anchoring shall be inspected by Client's Representative, if required. Anchors used for shipment shall be indicated on shipment drawings (where available).

7.4.5. All shop fabricated piping shall be prepared for shipment in a manner that assures delivery to destination in good conditions. Vendor shall supply packing specification for Client's approval.

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7.5 Inspection Data Sheets

Inspection Data Sheets (IDS) indicate the extent of inspection and testing required for piping systems in accordance with the QCTM (Quality Control & Testing Manual). The QCTM shall be prepared by the vendor or contractor and submitted to client for approval.