طرح نگهداشت و افزایش تولید 27 مخزن

Mechanical Design Criteria

نگهداشت و افزایش تولید میدان نفتی بینک

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D00	JUL. 2021	IFC	M.Asgharnejad	M.Fakharian	Sh.Ghalikar	
Rev.	**Date**	**Purpose of Issue/Status**	**Prepared by:**	**Checked by:**	**Approved by:**	**CLIENT Approval**

Class: **CLIENT Doc. Number: F0Z-707120**

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

REVISION RECORD SHEET

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CONTENTS

1.0 INTRODUCTION

Binak oilfield in Bushehr province, 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.
D01 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.

2.0 SCOPE

The purpose of this document is to provide the contractors with the design and selection criteria for the new equipment to be provided during the project.

It shall be used in conjunction with data/requisition sheets for present document subject.

3.0 NORMATIVE REFERENCES

If the revision of a standard or code is note specified, latest revision should be assumed.

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3.1 LOCAL CODES AND STANDARDS (LATEST REVISION)

- IPS-G-ME-100 General Standard for Atmospheric Above Ground Welded Steel Storage Tanks.
- IPS-G-ME-110 General Standard for Large Welded Low Pressure Storage Tanks.
- IPS-G-ME-150 General Standard for Towers, Reactors, Pressure Vessels and Internals.
- IPS-G-ME-200 Engineering and Material Standard for Fired Heaters.
- IPS-G-ME-210 General Standard for Flare Details for General Refinery and Petrochemical Service.
- IPS-C-PM-216 Construction Standard for Machinery Installation and Installation Design.
- IPS-E-PM-100 Engineering Standard for General Standard Requirements of Process Machineries.
- IPS-E-PM-385 Engineering Standard for Process Machinery Piping.
- IPS-G-PM-105 General Standard for Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries.
- IPS-G-PM-120 General Standard for Accessibility and Safety of Machineries.
- IPS-M-PM-115 Material and Equipment Standard for Centrifugal Pumps for General Services.
- IPS-M-PM-125 Material and Equipment Standard for Centrifugal Fire Water Pumps.
- IPS-M-PM-140 Material and Equipment Standard for Positive Displacement Pumps-Rotary.
- IPS-M-PM-150 Material and Equipment Standard for Positive Displacement Pumps-Controlled Volume.
- IPS-M-PM-180 Material and Equipment Standard for Packaged, Integrally Geared Centrifugal Compressors for Utility and Instruments.
- IPS-G-PM-200 Reciprocating Compressors For Petroleum, Chemical, And Gas Industry Services.
- IPS-M-PM-211 Material and Equipment Standard for Reciprocating Compressors for Instrument Air Services.

- IPS-M-PM-220 Material and Equipment Standard for Positive Displacement Compressors-Rotary.
- IPS-M-PM-290 Material and Equipment Standard for Reciprocating Internal Combustion Engines.
- IPS-M-PM-300 Material and Equipment Standard for Special Purpose Gear Units.
- IPS-M-PM-310 Material and Equipment Standard for Special Purpose Couplings.
- IPS-M-PM-320 Material and Equipment Standard for Lubrication, Shaft Sealing and Control-oil Systems and Auxiliaries for Process Services.
- IPS-M-PM-330 Material and Equipment Standard for Mixers.
- IPS-E-PR-250 Engineering Standard for Performance Guarantee.
- IPS-E-PR-330 Engineering Standard for Process Design of Compressed Air Systems.
- IPS-E-PR-460 Engineering Standard for Process Design of Flare and Blowdown Systems.
- IPS-E-PR-700 Engineering Standard for Process Design of Crude Oil Electrostatic Desalters.
- IPS-E-PR-750 Engineering Standard for Process Design of Compressors.
- IPS-E-PR-771 Engineering Standard for Process Requirements of Heat Exchanging Equipment.
- IPS-E-PR-850 Engineering Standard for Process Requirements of Vessels and Separators.
- IPS-E-PR-905 Engineering Standard for Process Design of Dryers.
- IPS-C-SF-242 Construction Standard for Delivery, Testing, Inspection, Quality Control, Commissioning and Maintenance of Fire Fighting Pumps.
- IPS-E-SF-504 Engineering Standard for Fire Fighting Vessels.
- IPS-E-SF-860 Engineering Standard for Air Pollution Control.
- IPS-G-SF-900 General Standard for Noise Control and Vibration.
- IPS-M-SF-504 Material and Equipment Standard for Fire Fighting Vessels.
- IPS-G-GN-210 General Standard for Packing & Packages.
- IPS-M-GN-350 Material and Equipment Standard for Overhead and Gantry Cranes.

- IPS-C-TP-101 Construction Standard for Surface preparation.
- IPS-C-TP-102 Construction Standard for Painting.
- IPS-C-TP-352 Construction Standard for Lining.
- IPS-C-TP-701 Construction Standard for Application of Thermal Insulation.
- IPS-E-TP-100 Engineering Standards for Paints.
- IPS-E-TP-350 Engineering Standards for Linings.
- IPS-E-TP-700 Engineering Standards for Thermal Insulations.
- IPS-E-IN-100 Engineering Standards for General Instrumentation.
- IPS-E-EL-100 Engineering Standards for Electrical System Design.
- IPS-E-CE-210 Construction Standards for Steel Structure.
- IPS-M-PI-130 Material and Equipment Standard for Pig Launching and Receiving Traps

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3.2 INTERNATIONAL CODES AND STANDARDS

- **American Society of Mechanical Engineers (ASME)**

Boiler and Pressure Vessel Codes

Section II	Material Specifications
Section V	Non-destructive Examination
Section VIII-Division 1 & 2	Design
Section IX	Welding and Brazing Qualification

- **American Society of Mechanical Engineers/American National Standard Institute (ASME/ANSI)**

A 12.1	Safety Requirements for Floor and Openings, Railings and Toe Boards
A 14.3	Safety Requirements for Fixed Ladders
B 16.1	Cast Iron Pipe Flanges and Flanged Fittings
B 16.11	Forged Fittings Socket Welding and Fitting
B 16.25	Butt Welding Ends
B 16.47	Large Diameter Steel Flanges , NPS 26 Through NPS 60 , Metric / Inch Standard
B 16.5	Pipe Flanges and Flanged Fittings , NPS 1/2 Through NPS 24 , Metric / Inch Standard
B 16.9	Factory Made Wrought Steel Butt Welding Fittings

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B 30.11	D01	Monorails and Under Hung Cranes
B 30.17		Overhead and Gantry Cranes (Top-Running Bridge, Single Girder, Under Hung Hoist)
B 30.2		Overhead & Gantry Cranes
B 31.3		Process Piping
B 31.4		Pipeline Transportation Systems for Liquids Hydrocarbons & Other Liquids
B 31.8		Gas Transmission and Distribution Piping System
B 73.1		Specification for End Suction Centrifugal Pumps
PTC 10		Power Test Code – Compressors & Exhausters
PTC 17		Power Test Code – Diesel Engines
STS-1		Steel Stacks

- **American Petroleum Institute (API)**

SPEC. 7B-11C		Specification for Internal-Combustion Reciprocating Engines for Oil-Field Service
530		Calculation of Heater Tube Thickness in Petroleum Refineries Petroleum and natural gas industries
PUBL. 535		Burners for Fired Heaters in General Refinery Services
537	D01	Flare Details for General Refinery and Petrochemical Service
610		Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
613		Special Purpose Gear Units For Petroleum, Chemical, And Gas Industry Services
614		Lubrication, Shaft-Sealing And Control-Oil Systems For Special Purpose Applications
618		Reciprocating Compressors For Petroleum, Chemical And Gas Industry Services
619		Rotary Type Positive Displacement Compressors For General Refinery Services
620		Design And Construction Of Large, Welded, Low-Pressure Storage Tanks
650		Welded Carbon Steel Tanks for Oil Storage
662		Plate Heat Exchangers for General Refinery Services
670		Vibration, Axial Position, And Bearing

	Temperature Monitoring Systems
671	Special-Purpose Couplings For Refinery Services
672	Packaged, Integrally Geared, Centrifugal Plant And Inst. Air Compressors
675	Positive Displacement Pumps – Controlled Volume
676	Positive Displacement Pumps-Rotary
677	General Purpose Gear Units
680	Packaged Reciprocating Plant and Instrument Air Compressors for General Refinery Services
682	Shaft Sealing Systems For Centrifugal And Rotary Pumps
692	Dry Gas Sealing Systems for Axial, Centrifugal, Rotary Screw Compressors and Expanders
RP 500	Recommended Practice for Classification For Locations For Electrical Installations At Petroleum Facilities
RP 520	Recommended Practice for Sizing, Selection And Installation Of Pressure Relieving Devices in Refineries
RP 521	Guide for Pressure-Relieving and Depressurizing System
RP 686	Recommended Practice for Machinery Installation and Installation Design
2000	Venting Atmospheric and Low-pressure Storage Tanks

- **National Association of Corrosion Engineers (NACE)/ International Standard Organization (ISO)**

MR 0175 / ISO 15156	Petroleum and Natural Gas Industries – Material for Use in H2S-Containing Environments in Oil & Gas Production
MR 0103	Materials resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
TM 0177	Laboratory Testing of Metals for Resistance to Sulphide Stress Cracking and Stress Corrosion in H2S Environments
TM 0284	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking

- **American Society of Testing and Materials (ASTM)**
- **American Welding Society (AWS)**

  D 1.1 — Structural Steel Welding Code

- **American Institute of Steel Construction (AISC)**
- **American Society of Civil Engineers (ASCE 7-10)** D01
- **Welding Research Council (WRC)**

  107 — Local Stresses in Spherical & Cylindrical Shells Due to External Loadings

  297 — Local Stresses in Cylindrical Shells Due to External Loadings on Nozzles – Supplement to WRC Bulletin No. 107

- **International Standard Organization (ISO)**

  10440-2 — Packaged Air Compressors (Oil-free)

  1328-1 — Cylindrical Gears – ISO System of Accuracy – Part 1: Definitions and Allowable Valves of Deviations Relevant to Corresponding Flanks of Gear Teeth

  1461 — Hot-dip Galvanized Coating on Fabrication Iron and Steel Articles Specification and Test Methods

  5199 — Technical Specification for Centrifugal pumps – Class II

  9001-2008 — Quality Systems- Requirements

  15608 — Welding- Guidelines for a Metallic Materials Grouping System

  ISO 1940-1/2 — Mechanical Vibration - Balance Quality Requirements of Rigid

  ISO 10440-2 — Petroleum and Natural Gas Industries – Rotary-Type Positive-Displacement Compressors – Part 2: Packaged Air Compressors (Oil-Free) D01

  ISO 1217 — Displacement Compressors – Acceptance Tests

  ISO 12500 — Filters for Compressed Air - Test Methods

ISO 8573-1	D01	Compressed Air —Part 1: Contaminants and Purity Classes
ISO 10816-6		Mechanical Vibration - Evaluation of Machine Vibration by Measurements on Non-Rotating Parts

- **British Standards Institution (BSI)**

466	Specification for Power Driven Overhead Traveling Cranes for General Use
477	Inspection, Access and Entry Openings for Pressure Vessels
2573 Parts 1 & 2	Rules for the Design of Cranes – Specification for Classification, Stress Calculation & Design of Structures/Mechanism
2594	Carbon Steel Welded Horizontal Cylindrical Tanks
4592	Specification for Open Bar Grating
5276-2	Pressure Vessel Details (Dimensions). Specification for Saddle Supports for Horizontal Cylindrical Pressure Vessels
5304	Safe Use of Machinery
5514	Reciprocating Internal Combustion engines: Performance
6399-2	Loading for Buildings. Code of Practice for Wind Loads
EN 10204	Metallic Products. Types of Inspection Documents
EN 13184	Non-Destructive Testing. Leak Testing. Pressure Change Method
EN 13185	Non-Destructive Testing. Leak Testing. Tracer Gas Method

- PD 5500 (D01) Specification for Unfired Fusion welded Pressure Vessels

- **National Fire Protection Association (NFPA)**

20	Centrifugal fire Pumps

- **AWWA American Water Works Association**

D 100	Welded Steel Tanks for Water Storage

- **International Electrotechnical Commission (IEC)**

79	Electrical Apparatus for Explosive Gas Atmospheres
60529	Degree of Protection Provided by Enclosures

- **NEMA SM 23 Nozzle Loads**
- **HI Hydraulic Institute**
- **DIN Institute for Normung Deutsches**
- **EEMUA 140 Noise Procedure Specification**
- **Environmental Codes, Standards & Regulations**
- **EFRC Guide Lines**

3.3 THE PROJECT DOCUMENTS

- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-PR-DC-0001 Process Design Criteria
- BK-GNRAL-PEDCO-000-ST-DC-0001 Structural Design Criteria
- BK-GNRAL-PEDCO-000-CV-DC-0001 Civil Design Criteria D01
- BK-GNRAL-PEDCO-000-ST-DC-0001 Design Criteria For Steel Structure
- BK-GNRAL-PEDCO-000-ME-SP-0001 Specification For Pressure Vessels
- BK-GNRAL-PEDCO-000-ME-SP-0002 Specification for Atmospheric Above Ground Welded Steel Tanks
- BK-GCS-PEDCO-120-ME-SP-0010 Specification for Large Welded Low Pressure Storage Tanks D01
- BK-GCS-PEDCO-120-ME-SP-0001 Specification for Air Cooled Heat Exchangers
- BK-GCS-PEDCO-120-ME-SP-0002 Specification for Reciprocating Compressors (API 618)
- BK-GCS-PEDCO-120-ME-SP-0003 Specification for Centrifugal Pumps For Process Services

- BK-GCS-PEDCO-120-ME-SP-0004 Specification For Centrifugal Pumps For General Services
- BK-GCS-PEDCO-120-ME-SP-0005 Specification For Fire Water Pumps
- BK-GCS-PEDCO-120-ME-SP-0006 Specification For Air Compressor Package
- BK-GCS-PEDCO-120-ME-SP-0007 Specification For Air Dryer Package
- BK-GCS-PEDCO-120-ME-SP-0008 Specification For Chemical Injection Package
- BK-GCS-PEDCO-120-ME-SP-0009 Specification for Overhead Travelling Cranes

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- BK-GCS-PEDCO-120-ME-SP-0011 Specification For Control Volume Pump (API 675)
- BK-GCS-PEDCO-120-ME-SP-0012 Specification For Diesel Engine
- BK-GCS-PEDCO-120-ME-SP-0013 Specification For Flare Package
- BK-GCS-PEDCO-120-ME-SP-0014 Specification For Nitrogen Package
- BK-GNRAL-PEDCO-000-PI-SP-0006 Specification For Painting
- BK-GNRALPEDCO-000-PI-DC-0001 Piping Design Criteria

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- BK-GNRAL-PEDCO-000-PI-SP-0008 Specification For Material Requirements in Sour Service
- BK-GNRAL-PEDCO-000-IN-SP-0001 Specification For Instrumentation
- BK-GNRAL-PEDCO-000-EL-DC-0001 Electrical System Design Criteria
- BK-GNRAL-PEDCO-000-EL-SP-0009 Specification For Diesel Generator
- Piping and Instrumentation Diagrams

3.4 ENVIRONMENTAL DATA

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

4.0 ORDER OF PRECEDENCE

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In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the

CLIENT. The final decision in this situation will be made by CLIENT.

5.0 DELETED

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6.0 GENERAL CRITERIA

The following general principles and objectives shall be adopted during the selection and design of mechanical equipment:

6.1 EMISSION LIMITS

Emission levels for the design and operation of equipment used on the Project must be established on the basis of Iranian legislation and regulations, as defined by the Environmental Protection Agency of Iran and specified in IPS-E-SF-860, Air Pollution Control.

6.2 DESIGN LIFE

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Equipment and its auxiliaries shall be conceived, configured, designed, and manufactured to achieve a minimum design life of 20 years.

6.3 PERFORMANCE

Equipment shall be designed and selected so as to meet the specified performance requirements, including any specified design margins, and to function safely and satisfactorily under all conditions of operation. Performance guarantees shall be provided by the equipment supplier where required.

6.4 FIT FOR PURPOSE

Equipment shall be fit for purpose, designed and manufactured so as to be a cost-effective solution that meets the specified requirements.

6.5 USE OF PROVEN TECHNOLOGY

Proven technologies only shall be considered in the selection of equipment. Only equipment with at least two years' trouble-free running experience in similar duty and environment to those specified for this project should be considered.

6.6 CONSTRUCTABILITY

Equipment shall be designed so as to enable safe and easy installation. Equipment shall be supplied with any special tools that are required for installation.

6.7 OPERABILITY

Equipment shall be designed ergonomically, so as to be simple and safe to operate. All local instrumentation, controls and associate equipment required for full operation shall be provided. Equipment shall be supplied with any special tools that are required for operation.

6.8 MAINTAINABILITY

Equipment shall be designed so as to minimize routine maintenance requirements. Where maintenance activities are required, equipment design and layout shall permit safe, unobstructed and easy access. Equipment shall be supplied with any special tools that are required for maintenance activities.

6.9 RELIABILITY AND AVAILABILITY

Equipment design and selection shall aim to maximize reliability and availability (and to achieve any specified availability targets).

6.10 AREA CLASSIFICATION

All equipment shall be designed to suit electrical hazardous area classification as determined during the basic engineering design phase layout.

6.11 UTILITIES

During the selection and design of equipment, consideration shall be given to the availability of utilities. Chemicals and lubricants requirements to be advised by equipment VENDOR.

6.12 LOCAL STATUTORY REQUIREMENTS

Any applicable local statutory rules and regulations concerning the design, fabrication, assembly, inspection and/or testing of mechanical equipment shall be adhered to.

6.13 EQUIPMENT STANDARDIZATION

Effort shall be made to standardize the spares stocking by minimizing the variety of makes and types of driven equipment, drivers and auxiliary equipment and systems. This standardization shall be applied so far as if does not interfere with the selection of an optimal solution for the specified operating conditions.

6.14 EQUIPMENT PACKAGING

In order to have single source responsibility for the functioning of each complete machine train and equipment package, each shall be supplied as a packaged unit to the maximum extent possible. Whenever practical, both the main and auxiliary equipment in each package shall be mounted and delivered on a common skid/baseplate to the maximum possible extent, for ease of handling and to minimize site installation, hook-up and commissioning. Each package skid shall include all interconnecting piping, valves pipe supports, cables and cable trays, with flanged piping connections and junction boxes located at the skid edge.

6.15 MATERIALS OF CONSTRUCTION

Materials of construction shall be shown on the equipment data sheets.

6.16 MATERIAL CERTIFICATION

All materials shall be provided with inspection/test certificates in accordance with BS EN 10204. The minimum level of inspection document shall be BS EN 10204 "2.2".

Materials which are for pressure containing parts and their attachments, or for highly stressed non-pressure containing parts, shall be provided with full chemical analysis and mechanical test certification to BS EN 10204 "3.1", as a minimum.

Austenitic stainless steel, duplex, super duplex and titanium materials shall be provided with full chemical analysis and mechanical test certification to BS EN 10204 "3.2".

6.17 NOISE LEVEL LIMITS

Noise levels shall not exceed 85 dBA at one (1) meter from source.

6.18 DISCIPLINE INTERFACE DOCUMENTS

The following documents are required for interfacing with other engineering disciplines (as may be applicable to specific mechanical equipment items):

- Process flow diagrams
- Piping and instrument diagrams
- Process data sheets
- Motor data sheets
- Instrument data sheets
- Electrical layout/location drawings
- Electrical area classification drawings
- Piping material specifications
- Piping layout/location drawings
- Civil/structural drawings
- Job specifications for packaged units by other disciplines
- Material selection diagrams

6.19 SAFETY MEASURES

In addition to the above, safety standards and features that are inherent in the specific mechanical equipment design codes, standards and regulations are also applicable.

Safety features to be incorporated into the design include, but are not limited to the following:

- Ladders and platforms for equipment:
  - Ladder cages
  - Safety chains across platform accesses
  - Step-off platforms, where necessary
  - Platform grating

- Toe plates.
- Hand rails

- Enclosed guards over rotating components (e.g., couplings and V-belts).
- Protection of personnel from hot surfaces through the use of thermal insulation or expanded metal covers and guards.

6.20 EQUIPMENT FABRICATION

Equipment design shall be based on maximizing shop fabrication and assembly where practical.

All external surfaces for shop fabricated equipment shall be painted in VENDOR's shop.

6.21 TRANSPORTATION LIMITATIONS

Equipment packaging, preparation for shipment and delivery shall be in accordance with the project Packing, Marking, Transportation Procedure Doc. No. "BK-GNRAL-PEDCO-000-QC-PR-0045".

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6.22 VENDOR AND MANUFACTURER DATA & RESPONSIBILITY

6.22.1 The equipment shall be performance, mechanical, electrical and instrumentation guaranteed by VENDOR/manufacturer.

6.22.2 The VENDORs/manufacturers shall submit the equipment ITP (inspection & test plan), spare part list with their technical offers. All of the tests & inspections shall be carried out after client approval.

6.22.3 The VENDORs/manufacturers shall submit the filled data sheets of the equipment which are prepared in detail design engineering phase.

6.22.4 The VENDORs/manufacturers to prepare the required items of the equipment according to NISOC VENDOR list (latest edition).

6.22.5 The guarantee period shall be eighteen (18) months from the date of delivery or twelve (12) months from the installation date of each equipment/packages at site.

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7.0 EQUIPMENT DESIGN CRITERIA

The design basis for the following equipment shall be as specified below:

- Pressure vessels
- Storage Tanks
- Air Cooled Heat Exchangers
- Gas Dehydration Package
- Instrument and Plant Air/Nitrogen Generation Package
- Rotating Equipment
- Packaged Equipment and Miscellaneous Items.

7.1 PRESSURE VESSELS

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Design and fabrication of pressure vessels shall be in accordance with "Specification for Pressure Vessels, No. BK-GNRAL-PEDCO-000-ME-SP-0001" and "Iranian Petroleum Standard No. IPS-G-ME-150(1)".

Materials used for pressure components of pressure vessels shall conform to ASME, Section II (applicable parts).

Non-destructive examination for pressure vessels shall conform to ASME, Section V. Welding for pressure vessels shall conform to the requirement of ASME, Section IX.

The used material for construction of pressure vessels shall be noted in the relevant data sheets.

7.2 STORAGE TANKS

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Design and fabrication of storage tanks shall be in accordance with "Specification for Atmospheric Above Ground Welded Steel Tanks, No. BK-GNRAL-PEDCO-000-ME-SP-0002" as well as "Specification for Large Welded Low Pressure Storage Tanks, No. BK-GCS-PEDCO-120-ME-SP-0010" and "Iranian Petroleum Standard No. IPS-G-ME-100 (1) for Atmospheric Above Ground Welded Steel Tanks for Oil Storage" and "Iranian Petroleum Standard No. IPS-G-ME-110 (1) for Large Welded Low Pressure Storage Tanks".

Tanks which exceed transportation limitations shall be field fabricated. All plates shall be cut, formed and nozzles welded in shop or factory prior to shipping field fabricated tanks. Smaller tanks shall be shop fabricated.

The used material for construction of storage tanks shall be noted in the relevant data sheets.

7.3 AIR COOLED HEAT EXCHANGERS

Design and fabrication of storage tanks shall be in accordance with "Specification for Air Cooled Heat Exchangers, No. BK-GCS-PEDCO-120-ME-SP-0001" and "Iranian Petroleum Standard No. IPS- G-ME-245(1)"

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7.4 GAS DEHYDRATION PACKAGE

Dehydration packages shall be in accordance with "Duty Specification for Gas Dehydration Package No. BK-GCS-PEDCO-120-PR-SP-0001" or VENDOR's standard, whichever is more stringent.

7.5 AIR COMPRESSOR PACKAGE

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Indirect fired heaters shall be complete packages of the bath-type design in accordance with "Specification for Air Compressor Package, No. BK-GCS-PEDCO-120-ME-SP-0006" or VENDOR's standard, whichever is more stringent.

7.6 ROTATING EQUIPMENT

7.6.1 General

Rotating equipment drivers shall be electric motors unless otherwise specified on equipment data sheets.

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7.6.2 Centrifugal Pumps

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For general service, pumps shall be provided in accordance with "Specification for Centrifugal Pumps for General Services, No. BK-GCS-PEDCO-120-ME-SP-0004".

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For process service applications, pumps shall conform to "Specification for Centrifugal Pumps For Process Services (API 610), No. BK-GCS-PEDCO-120-ME-SP-0003". For high-head applications, multistage ring section pumps shall be used. In all services (even water) BB4 type pumps are not allowed to use.

The metallurgy of pump components shall be suitable for the intended application. For sour service applications, materials meeting the NACE MR0175/ISO 16156 standard requirements shall be used.

Pumps and motors with speed increasing gears (if required) shall be mounted on a common baseplate.

Spare pumps in critical services shall be equipped with automatic start facilities.

All pumps shall be directly coupled to their drivers. All pumps and their drive train shall be mounted on common bases of rigid construction.

7.6.3 Reciprocating and Rotary Screw Compressors

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Rotary Screw-type compressors may be considered for applications involving relatively low flows and differential pressures. CLIENT approval is required for the application of this compressor type. The design and manufacture of reciprocating compressors shall be in accordance with the "Specification for Reciprocating Compressor (API 618), No. BK-GCS-PEDCO-120-ME-SP-002 ".

7.6.4 Deleted

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7.6.5 Packaged Equipment and Miscellaneous Items

Packaged units shall be VENDOR's standard process design and in compliance with the data sheets for the packaged units. Mechanical design and fabrication for the equipment involved shall be as per the corresponding specifications for those types of equipment.

Miscellaneous items (such as flare packages, chemical injection systems, utility units, diesel engines, handling equipment) shall be VENDOR's standard design and in compliance with the corresponding specifications & data sheets.

8.0 MISCELLANEOUS

8.1 PAINTING

Above ground facilities (e.g., equipment, piping, and structural steel) shall be protected by using external paint for appearance and corrosion prevention in accordance with the project "Specification For Painting, No BK-GNRAL-PEDCO-000-PI-SP-0006".

D01

8.2 COATINGS AND LININGS

Internal coatings or linings for mechanical equipment shall be as specified on the equipment data sheets.

8.3 INSULATION

Above ground equipment and piping shall be insulated for the conservation of heat and protection of personnel as indicated on the line list and/or the equipment data sheets or P&IDs.

8.4 DELETED

D01

8.5 FIELD ASSEMBLY, FABRICATION AND INSTALLATION

Items that require field assembly and/or fabrication shall be identified on the equipment data sheets.