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| طرح نگهداشت و افزایش تولید 27 مخزن | | | | | | | | |
| **PROCESS BASIS OF DESIGN** | | | | | | | | |
| D06 | JUL. 2022 | IFA | | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D05 | MAY. 2022 | IFA | | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D04 | MAR. 2022 | IFA | | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D03 | JAN. 2022 | IFA | | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D02 | NOV. 2021 | IFA | | M.Aryafar | M.Fakharian | M.Mehrshad |  |
| D01 | OCT. 2021 | IFA | | M.Aryafar | M.Fakharian | Sh.Ghalikar |  |
| D00 | JUL. 2021 | IFC | | M.Asgharnejad | M.Fakharian | Sh.Ghalikar |  |
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**REVISION RECORD SHEET**

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| **2** | X | X | X | X | X | X | X | **67** |  |  |  |  |  |  |  |
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| **14** | X | X | X |  |  |  |  | **79** |  |  |  |  |  |  |  |
| **15** | X | X | X | X | X |  |  | **80** |  |  |  |  |  |  |  |
| **16** | X | X | X | X |  |  |  | **81** |  |  |  |  |  |  |  |
| **17** | X | X | X | X | X |  |  | **82** |  |  |  |  |  |  |  |
| **18** | X | X | X |  | X |  |  | **83** |  |  |  |  |  |  |  |
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1. **INTRODUCTION**

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 25 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. |

1. **Scope**

**Sub-Surface**

* **New Wells & Manifold Extension:**

With the aim of increasing the oil production rate from BINAK field, the construction of flow lines and wellhead facilities has been on the agenda. Therefore, National Iranian South Oil Company has intends to establish the project of "Construction of flow lines and wellhead Facilities for BINAK Oil Field ".

The most important activities and facilities needed for the project are as follows:

* Construction of 6 wells with 6 wellhead facilities series (class 5000 for wellhead facilities & class 3000 for flow lines)
* Construction of 6 flow lines with construction and installation of supports with all necessary facilities for pipelines and connecting lines to the manifold in BINAK Cluster unit.
* Design, Construction & Extension of existing manifold for connecting new 8 flow lines (which 2 connections will be considered for future). As mentioned flow line of the six new wells connected to the header A/B on existing manifold(expands if needed) whit new connection and oil from existing oil sump send to header A/B of manifold via oil sump pump (P-1701),also considered two new flow line connection for new.
* **Workover wells (with electric power supply):**

Electrification for Wells in Binak Oil fields including 2 parts:

* Construction of 5 outdoor substations 11/0.42 KV & 1 outdoor substation 33/0.42 KV.

In this regard, engineering, procurement & installation of power transformers, diesel generators, LV switchgear, UPS, lighting & … are in contractor scope of work.

* Routing, detail design, procurement & construction of electrical transmission lines.

**Surface**

* **New Compressor Station:**

This document defines process design basis for Binak Compressor Station to process sour gas from Golkhari booster/cluster and Binak production unit with cumulative rate of 15 MMSCFD. The new compressors will be added “new” section of existing Binak compressor station plant. Excluding electrical power, which is supplied from existing facilities, all required utilities should be designed as part of project.



Figure No.1: Overall Block Diagram in Binak Compressor Station Area

* **Pipeline 8" & 4":**

With the aim of increasing the oil production rate from BINAK field, the construction of 8 inch gas transmission pipeline from new BINAK Compressor Station to SIAHMAKAN Gas Injection Station and 4 inch gas condensate transmission pipeline from new BINAK Compressor Station to BINAK Cluster, has been on the agenda.

1. **NORMATIVE REFERENCES**

## Local Codes and Standards

In design of this plant all of the IPS standard relevant to process must be considered, some of them which are more compatible to this project are listed below.

|  |  |
| --- | --- |
| IPS-E- PM-100 | * Engineering Standard for Process Flow Diagram |
| IPS-E- PR- 170 | * Engineering Standard for General Design Requirements of Process Machineries |
| IPS-E- PR-150 | * Basic Design Package and Recommended Practice for Feasibility Studies |
| IPS-E-PR- 200 | * Engineering Standard for Basic Engineering Design Data |
| IPS-E-PR- 230 | * Engineering Standard for Piping & Instrumentation Diagrams |
| IPS-E-PR- 360 | * Engineering Standard for Process Design of Liquid & Gas Transfer & Storage |
| IPS-E-PR- 440 | * Engineering Standard for Process Design of Piping Systems (Process Piping and Pipeline Sizing) |
| IPS-E-PR- 450 | * Engineering Standard for Process Design of Pressure Relieving Systems Inclusive Safety Relief Valves |
| IPS-G-ME- 150 | * General Standard For Towers, Reactors, Pressure Vessels And Internals |

## International Codes and Standards

1. ANSI American National Standards Institute
2. API American Petroleum Institute
3. ASME American Society of Mechanical Engineers
4. ISA Instrument Society of America
5. ISO International Standards Organization
6. NACE National Association of Corrosion Engineers
7. NFPA National Fire Protection Association
8. OSHA Occupational Safety and Health Act

## The Project Documents

The provided data of this document, such as summer and winter feed composition of GCS and 6 wellhead facilities series, Extension of existing manifold and Construction of two new pipelines are based on unit specifications which are given by client.

## ENVIRONMENTAL DATA

Refer to "Process Basis of Design; section 7".

## Abbreviations

NISOC: National Iranian South Oil Company

PEDCO Petro Iran Development Company

PFD Process Flow Diagram

P&ID Piping and Instrumentation Diagram

KOM Kick off Meeting

MMSCFD Million Standard Cubic Feet per Day

BBL Barrel

SBLPD Standard Barrel per Day

DP Differential Pressure

1. **Process Design Basis**

A new Binak compressor station with working (design) capacity of 15 MMSCFD with TEG dehydration package should be added into existing Binak compressor station facilities to increase feed gas pressure from 5.5 Barg to 54.8 Barg .In order to maximize flexibility of new compressor station, 2 +1 arrangement (2 in operation and 1 as standby) is considered for the system. Moreover:

* Flare system with smokeless facilities
* Instrument air and plant air facilities to cover demand of process



Figure No.2: Relative Location of Binak Oil Reservoir in South West of Iran

* Fire water system should be considered within design package.
* Nitrogen for tank blanketing, compressors sealing.
* Corrosion inhibitor package

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* Fuel gas system
* Diesel Fuel Storage and pumping system
* Open & Closed Drain System
* Service Water System
* Oil water sump
* Waste Water collection pit
* Electrical Power System

and all required utility and off-site should be considered for safe operation of new compressor station.

1. **Feed Characteristics**

## compressor station feed CHARACTERISTICS

Table No.5-1.1 indicates feed Properties for use in design of compressor station:

**Table No.5-1.1: Binak Compressor Station Feed Composition (dry basis (**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Components** | **GOLKHARI** | | **Binak** | |
| **(Mol. %) in Summer** | **(Mol. %) in Winter** | **(Mol. %) in Summer** | **(Mol. %) in Winter** |
| CO2 | 3.030 | 2.970 | 3.510 | 3.630 |
| H2S | 6.821 | 6.201 | 2.850 | 3.140 |
| Methane | 67.757 | 71.887 | 58.364 | 62.046 |
| Ethane | 11.951 | 11.231 | 17.658 | 17.592 |
| Propane | 6.311 | 5.021 | 10.719 | 9.181 |
| i-Butane | 0.620 | 0.430 | 1.290 | 0.940 |
| n-Butane | 1.310 | 0.870 | 2.980 | 2.030 |
| i-Pentane | 0.670 | 0.400 | 0.770 | 0.460 |
| n-Pentane | 0.320 | 0.180 | 0.500 | 0.280 |
| n-Hexane | 0.580 | 0.290 | 0.820 | 0.400 |
| n-Heptane | 0.150 | 0.070 | 0.290 | 0.120 |
| n-Octane | 0.050 | 0.020 | 0.080 | 0.030 |
| n-Nonane | 0.030 | 0.010 | 0.030 | 0.010 |
| n-Decane | 0.010 | 0.000 | 0.010 | 0.000 |
| Nitrogen | 0.390 | 0.420 | 0.130 | 0.140 |
| **Total** | **100** | **100** | **100** | **100** |
| **Feed Pressure, Barg** | **5.5** | **5.5** | **5.5** | **5.5** |
| **Feed Temperature, ºC** | **32.00** | **15.5** | **46.11** | **26.67** |

## GAS & CONDENSATE PIPELINE STUDY

There are two gas and condensate pipelines to be studied in this document which is described as below table:

**Table No.5-2.1: Gas/Condensate Pipeline Properties**

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| **Item** | **Pipeline** | **Estimated Diameter (in)** | **Length**  **(km)** | **From** | **To** | **Destination pressure (Barg)** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | Gas to  SIAHMAKAN Gas Injection Station | 8” | ~44 | BINAK Compressor Station | SIAHMAKAN Gas Injection Station | 40 |
| **2** | Gas condensate to  BINAK Cluster | 4” | ~ 1.4 | BINAK Compressor Station | BINAK BINAK Cluster | 12.8 |

## FLOWLINES AND WELLHEAD FACILITIES

Dry basis composition of the incoming fluid is given in following tables:

**Table No.5-3.1: Asmari and Bangestan Crude Oil Composition**

| **Reservoir Oil Component** | **Bangestan (%MOLE )** | **ASMARI (%MOLE )** |
| --- | --- | --- |
| H2S | 0.32 | 0.17 |
| Nitrogen | 0.06 | 0.13 |
| CO2 | 1.77 | 0.88 |
| Methane | 28.14 | 14.14 |
| Ethane | 9.74 | 5.3 |
| Propane | 7.78 | 6.37 |
| i-Butane | 1.47 | 1.4 |
| n-Butane | 4.16 | 4.51 |
| i-Pentane | 1.36 | 1.26 |
| n-Pentane | 1.36 | 1.19 |
| n-Hexane | 5.44 | 6.77 |
| n-Heptane | 6.24 | 6.13 |
| n-Octane | 3.81 | 3.98 |
| n-Nonane | 3.29 | 5.2 |
| n-Decane | 3.07 | 3.74 |
| n-C11 | 2.58 | 3.11 |
| C12+\*BANGESTAN | 19.31 | - |
| C12+\*ASMARI | - | 35.72 |
| C12+ of BANGESTAN: Sp.Gr = 0.9312 & Molecular weight = 454 | | |
| C12+ of ASMARI: Sp.Gr = 0.9532 & Molecular weight = 418 | | |

The volume percentage of water formed in crude oil is as following table:

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**Table No.5-3.2: Water Cut**

|  |  |
| --- | --- |
| **Crude Oil** | **Volume Percent (%)** |
| Asmari | 0 ~ 15 |
| Bangestan | 3 ~ 40 |

The maximum and minimum amount of oil produced from the Bangestan & Asmari wells is provided in the following table:

**Table No.5-3.3: Fluid Properties**

| **WELL NO.** | **Minimum flow rate for well (bbl/day)** | **Maximum flow rate for well (bbl/day)** |
| --- | --- | --- |
| W018S (AS) | 500 | 1500 |
| W008N (AS) | 500 | 1500 |
| W028 | 1500 | 2500 |
| W035 | 1500 | 2500 |
| W046S | 1000 | 1500 |
| W007S | 500 | 1000 |
| BINK 5 | 500 | 1000 |
| BINK 12 | 500 | 1000 |
| BINK 14 | 500 | 1000 |
| BINK 15 | 500 | 1000 |

## WELLHEAD OPERATING CONDITION

Preliminary wellhead information for new oil production wells and flowlines from wellhead to production unit are reported in following table:

**Table No.5-4.1: Asmari and Bangestan Wellhead Condition**

| **RESERVOIR** | **Asmari** | **Bangestan** |
| --- | --- | --- |
| Wellhead Pressure (before Choke valve) (Barg) | 43.81 | 43.81 |
| Wellhead Shut-in Pressure (Barg) | 193.79 | 310.34 |
| Wellhead Temperature (before Choke valve) (ₒC) | 75 | 80 |

Note: Pressure at the flow line destination is considered 12.78 Barg

1. **EQUIPMENT DESIGN BASIS**

## COMPRESSORS

Three reciprocating compressor are considered to increase pressure of 15 MMSCMD of natural gas.

**Table No.6-1.1: Binak Compressor Station Condition**

|  |  |
| --- | --- |
| **BINAK New GCS** | |
| **Design Data** | **BINAK STATION** |
| Gas transport Capacity (MMSCMD) | 15.00 |
| No. Of Duty / Stand By Gas Compressor Trains | 2+1 |
| Gas Product Outlet Temperature From GCS (◦C) | ~ 60 |
| Product Dew Point (◦C) | 5 |

**Utility CONDITIONS OF BINAK New GCS**

## Compressed and Instrument Air

**Table No.6-2.1: Operating Conditions at Producer's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Instrument Air | - | 65 | - | - | 9 | - |
| Plant Air | - | 60 | - | - | 4.5 | - |

**Table No.6-2.2: Operating Conditions at User's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Instrument Air | - | 65 | - | 4.5 | - | 8.0 |
| Plant Air | - | 60 | - | 4.5 | - | 9.0 |

**Table No.6-2.3: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (bar g)** |
| Instrument Air | 85 | 12.5 |
| Plant Air | 85 | 12.5 |

**Other Characteristics**

Plant air

* + Oil and dust free
  + Saturated Air

Instrument air

* + Dew point at operating pressure: -40°C maximum at 8 barg.
  + Oil content : nil
  + Max. Particle size : 3μ

## Nitrogen

**Table No.6-3.1: Operating Conditions at Producer's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Nitrogen | - | 60 | - | - | 8 | - |

**Table No.6-3.2: Operating Conditions at User's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Nitrogen | - | 60 | - | - | 7.5 | - |

**Table No.6-3.3: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (bar g)** |
| Nitrogen | 85 | 12.5 |

## Fuel Oil

**Table No.6-4.1: Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Specification** | **Unit** | **Value** | **Test Method** |
| Specific gravity at 60/60°F | - | 0.820-0.860 | ASTM D1298 |
| FBP | °C | 385 max | ASTM D86 |
| Flash point | °F | 130 min | ASTM D93 |
| Sulphur total | %wt | 1.0 max | ASTM D129 |
| Viscosity kinematics at 100°F | cS | 2.0-5.5 | ASTM D445 |
| Cloud point | °F | 35 max | ASTM D2500 |
| Pour point | °F | 25 max | ASTM D97 |
| Carbon residue (on 10% bottoms) | %wt | 0.10 max | ASTM D189 |
| Ash | %wt | 0.01 max | ASTM D482 |
| Water & sediment | %vol | 0.05 max | ASTM D2709 |
| Diesel index |  | 55 min | ASTM IP21 |
| Cetane index |  | 50 min | ASTM D,976 |

**Table No.6-4.2: Operating Conditions at User's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (Barg)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Fuel Oil | - | Amb. | - | - | 1.5 | - |

**Table No.6-4.3: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (Barg)** |
| Fuel Oil (V-2206) | 85 | ATM +FULL OF WATER |

## Fuel Gas

**Table No.6-5.1: Operating Conditions at Producer's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Fuel Gas | - | 48 | - | - | 4.9 | - |

**Table No.6-5.2: Operating Conditions at User's Battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Fuel Gas | - | 33~36 | - | - | 0.5~4.7 | - |

**Table No.6-5.3: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (Barg)** |
| Fuel Gas (V-2205) | 85 | 9 |

**Fuel Gas Physical Properties**

Fuel gas is supplied from flashed gas in gas separator located in process area. Refer to Process Flow Diagram (PFDs) for Separation (BK-GCS-PEDCO-120-PR-PF-0001-PFD) for more detail for composition and specification of fuel gas.

## ELECTRIC Power

For plant electricity supply and also frequency and voltages levels, refer to Job specification "Electrical Design Criteria".

## Water

**Table No.6-7.1: Operating conditions at producer's battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
| **Min** | **Norm.** | **Max** | **Min** | **Norm.** | **Max** |
| Plant (Utility)/Potable Water(NOTE) | - | Amb | - | - | 0.7 | - |
| Fire water | - | Amb | - | - | 11 | - |

Note: Elevated Tank

**Table No.6-7.2: Operating conditions at user's battery limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature(oC)** | | | **Pressure (bar g)** | | |
| **Min** | **Norm.** | **Max** | **Min** | **Norm.** | **Max** |
| Plant (Utility)/Potable Water | - | Amb | - | - | 0.5 | - |
| Fire water | - | Amb | - | - | 10 | - |

**Table No.6-7.3: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (bar g)** |
| Plant (Utility)/Potable Water (TK-2209) | 85 | Atm+Full Of Water |
| Fire water (TK-2301 A/B) | 85 | Atm+Full Of Water |

## Flare Network

**Table No.6-8.1: Operating Conditions**

|  |  |
| --- | --- |
| **System** | **Maximum Back Pressure (barg)** |
| LP Flare Network | \*NOTE |

**Table No.6-8.2: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (bar g)** |
| LP Flare Network | 150\*NOTE | \*NOTE |

\*NOTE: Maximum back pressure will be finalized after flare network calculation.

\*\*NOTE: Mechanical design temperature will be finalized after flare network calculation.

**Utility CONDITIONS OF w007s; W046S, BK-05; BK-12; BK-14, BK15**

## Water

**Table No.6-9.1: Operating conditions**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (bar g)** | | |
| **Min** | **Norm** | **Max** | **Min** | **Norm.** | **Max** |
| Plant (Utility)/Potable Water(NOTE) | - | Amb | - | - | 0.4 | - |

Note: Elevated Tank

**Table No.6-9.2: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (bar g)** |
| Plant (Utility)/Potable Water | 85 | Atm+Full Of Water |

## Fuel Oil

**Table No.6-10.1: Operating Conditions**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **System** | **Temperature (°C)** | | | **Pressure (Barg)** | | |
|  | Min | Norm. | Max | Min | Norm. | Max |
| Fuel Oil | - | Amb. | - | - | 0.25 | - |

**Table No.6-10.2: Mechanical Design Conditions**

|  |  |  |
| --- | --- | --- |
| **System** | **Temperature (°C)** | **Pressure (Barg)** |
| Fuel Oil | 85 | Atm+Full Of Water |

1. **Site CONDITION**

## SITE Location

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 25 km northwest of Genaveh city.

Longitude: 50°, 35'

Latitude: 29°, 73'

* GCS UTM COORDINATES:

**Table No.7-1.1:** **GCS UTM COORDINATION**

|  |  |
| --- | --- |
| **NORTHING** | **EASTING** |
| *3289991.269* | *437245.830* |
| *3289761.280* | *437704.660* |

H.P.G and H.P.P. elevation +100.00 correspond to +11.20 M.S.L.

* SIAHMAKAN UTM COORDINATES:

**Table No.7-1.2: SIAHMAKAN UTM COORDINATION**

|  |  |
| --- | --- |
| **NORTHING** | **EASTING** |
| *3331743.89* | *438033.74* |

* BINAK **CLUSTER** UTM COORDINATES:

**Table No.7-1.3: BINAK CLUSTER UTM COORDINATES**

|  |  |
| --- | --- |
| **NORTHING** | **EASTING** |
| *3290752.321* | *438636.645* |

* WELLS COORDINATES

**Table No.7-1.4: WELLS COORDINATES**

|  |  |  |  |
| --- | --- | --- | --- |
| **WELL NO.** | **RESERVOIR** | **UTM COORDINATION** | |
| **NORTHING** | **EASTING** |
| W-018S | ASMARI | *3291914* | 437440 |
| W-008N | ASMARI | *3291837* | *438713* |
| W-028 | BANGESTAN | *3293091* | *437126* |
| W-035 | BANGESTAN | *3293648* | *436604* |
| W-046S | BANGESTAN | *3294379* | *435604* |
| W-007S | BANGESTAN | *3290543* | *437425* |
| BK-5 | - | *3286512* | *41725* |
| BK-12 | - | *3288580* | *440692* |
| BK-14 | - | *3295176* | *437805* |
| BK-15 | - | *3287973* | *442385* |

## Geotechnical Data

According to general geological zoning of Iran, the proposed plant area is located in the coastal zone of Zagros Folded Belt in south-central Fars along the Persian Gulf.

From the lithological point of view the Zagros Folded Belt composed of a sequence of thick bedded sedimentary rocks mainly limestone, dolomite and marl of Paleozoic to Cenozoic age, folded during middle to Late Alpine Organic Stage in Tertiary.

## Barometric Pressure

**Table No.7-3.1: BAROMETRIC PRESSURE**

|  |  |  |
| --- | --- | --- |
| **Barometric pressure** | **BINAK New GCS** | **Flow Lines & Wellhead Facilities** |
| **Winter** (Psia) | 14.37 | 13.7 |
| **Summer** (Psia) | 13.26 | 13.2 |

## Elevation

* Elevation from sea level for BINAK New GCS ~ 12.5 m
* Elevation from sea level for W-018S ~ 33.6 m
* Elevation from sea level for W-008N ~ 76.0 m
* Elevation from sea level for W-028 ~ 33.2 m
* Elevation from sea level for W-035 ~ 30.1 m
* Elevation from sea level for W-046S ~ 57.9 m
* Elevation from sea level for W-007S ~ 26.2 m
* Elevation from sea level for BK-5 ~ 50.0 m
* Elevation from sea level for BK-12 ~ 69.0 m
* Elevation from sea level for BK-14 ~ 190.0 m
* Elevation from sea level for BK-15 ~ 125.0 m

## Soils Conditions

**BINAK New GCS:**

The basic data required are as follows:

* Seismic Zone : 0.3 g
* Soil Temp. in Winter :15.6ºC
* Soil Temp. in Summer: 32.2ºC

**Flow Lines & Wellhead Facilities:**

* Seismic Zone : 0.3 g

## Solar Radiation

**BINAK New GCS:**

* Solar radiation (maximum): 1010 W /m2

**Flow Lines & Wellhead Facilities:**

* Solar radiation: 946 W /m2

## Ambient Conditions

**Table No.7-7.1: Ambient Conditions**

|  |  |  |
| --- | --- | --- |
| **LOCATION** | **BINAK New GCS** | **Flow Lines & Wellhead Facilities** |
| Maximum ambient temperature (°C) | 50 | 50 |
| Minimum ambient temperature (°C) | 5 | -5 |
| Maximum steel surface exposed to sun (°C) | 85 | 85 |
| Maximum summer dry bulb (°C) | 50 | - |
| DB/RH for Summer HVAC Design | 41 °C / 61 % (Note \*/ Note\*\*) | |
| DB FOR Winter HVAC Design | 6 °C Note \* | |

\* Refer to " HVAC Design Criteria; N.I.O.C. NO.: F-1-B-422001".

\* \*Refer to “NISOC Meteorological Studies Report".

## Relative Humidity

**BINAK New GCS & Flow Lines & Wellhead Facilities:**

* Maximum Design relative humidity (%): 100
* Minimum Design relative humidity (%): 0

## Rainfall

**BINAK New GCS:**

* Maximum rainfall during one hour: 53 mm

**Table No.7-9.1: BINAK New GCS RAINFALL**

|  |  |
| --- | --- |
| **Average Monthly (mm)** | **Month** |
| 83.5 | January |
| 37.2 | February |
| 45.0 | March |
| 18.2 | April |
| 5.6 | May |
| 0.7 | June |
| 0.0 | July |
| 0.4 | August |
| 0.2 | September |
| 3.4 | October |
| 57.5 | November |
| 81.2 | December |
| 332.9 | Annual |

**Flow Lines & Wellhead Facilities:**

* Maximum rainfall during one year: 487.5 mm
* Maximum rainfall during one day: 138 mm

## Wind Conditions

**BINAK New GCS:**

Design velocity and direction of prevailing wind:

Wind velocity at 10m above ground level for:

|  |  |
| --- | --- |
| * Structure calculation: | 120 Km/h |
| * Wind velocity for thermal calculations | 5 m/s |
| * Prevailing wind direction: | NW to SE |
| * Flare thermal radiation | 10 m/s |

**Flow Lines & Wellhead Facilities:**

|  |  |
| --- | --- |
| * Structure calculation: | 120 Km/h |

## Lightining storms

**BINAK New GCS:**

Isoceraunic Level 15 storm-day/year. The EPC Contractor shall inquiry and verifies these data from the related authorities.

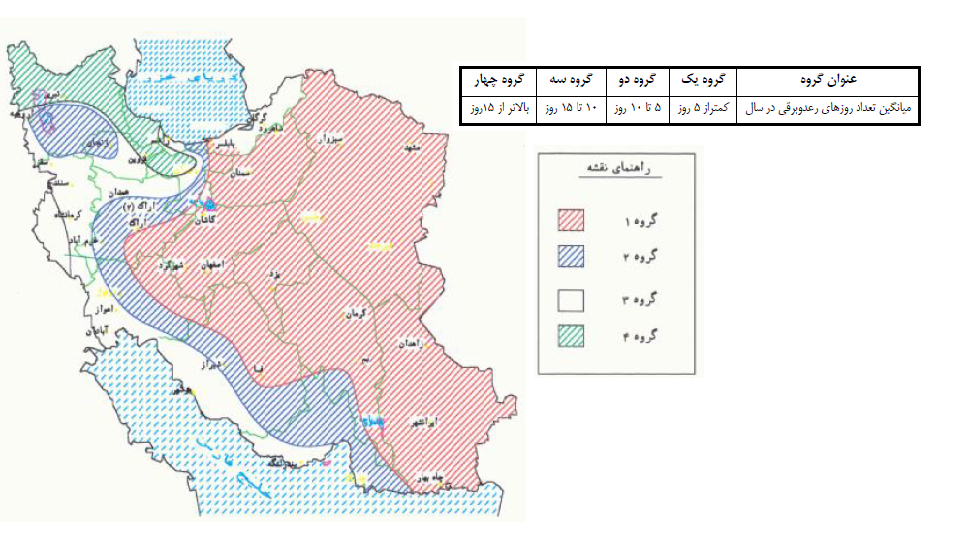
## AVERAGE LIGHTNING Flash Density

**Flow Lines & Wellhead Facilities:**

According to below map, 10-15 thunderstorm days per year exist in BINAK field. Average lightning flash density (Ng) may be estimated from following relationship:

= yearly lightning strike frequency to the structure or object

= lightning ground flash density in flashes/km2/year



1. **General Matters**

## Units of Measurement

As a general rule, the SI metric system of units shall be used and particularly:

* Pressure (gauge) Barg
* Pressure (absolute) Bara
* Mass kg
* Temperature °C
* Length m & mm except the pipes diameter for which "inches" are allowed
* Liquid relative density sp. gr. T ◦C /15◦C
* Liquid absolute density kg/cm3 at 15◦C
* Vapour flowing density kg/cm3
* Mass kg/h
* Liquid m3/h, l/min for fire fighting
* Normal conditions :

Vapour Nm3 (m3 at 0◦C & 1.013 bar a) or Sm3 vapour (at 15◦C & 1.013 bar a)

Liquid Std m3 (m3 at 15◦C)

* Specific enthalpy kj/kg
* Heat rate MW
* Gross calorific value kj/kg
* Viscosity (Dynamic) cp
* In addition to the above units, the following units shall be used for material balance purposes:
* Vapour flow rate MMSCFD Million Standard cubic feet per day

(at 15◦C and 1.013 Bara).

* Liquid flow rate SBLPD or SBOPD Standard barrel of liquid, or

Oil, per day (at 15◦C & 1.013 bar a).

* Absolute press=gauge press + barometric pressure.
* Gas Volumetric flow rate (standard [m3/hr], MMSCFD)
* Liquid volumetric flow rate ([m3/hr], STB/D at 15.50 [°C] and 14.70 [psia])

## Service Life

The design service life of the onshore plant is 25 years. (For Gas Compressor Station) and for other facilities (Transmission Pipelines & Flow lines & Wellhead facilities) shall be designed for a service life of 20 years.

## Turndown and Overdesign

Turndown refers to how flexible a compressor is at different operating conditions (flow and pressure).The greater the turndown capability of the compressor unit, the greater the flexibility the compressor unit has to operate under different flow and pressure conditions.

The turn down ratio and over design of compressor station plant is considered to be 40 % and 110% respectively.

1. **LIST OF ENGINEERING SOFTWARS**

Following computer programs approved and authorized for use during EPC stage:

Aspen HYSYS (Ver. 7.3 and higher): Plant Thermodynamic Simulation

Aspen Flare System Analyzer: Flare Network Calculation

Honeywell Predict 6.1: Corrosion prediction Tool

Flare sim: Flare Radiation Studies

Olga: Steady State Pipeline Hydraulic Calculation and Surge Analysis

AutoCAD P&ID: Process Drawing (PFD, P&IDs)

DNV Phast: Fire and Explosion Analysis (Consequence Analysis)

HTRI: Heat Exchanger Thermal Calculations