طرح نگهداشت و افزایش تولید ۲۷ مخزن

WALL THICKNESS CALCULATION REPORT

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-708910**

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

NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک	شرکت توسعه پتروایران HIRGAN ENERGY

شماره پیمان:	WALL THICKNESS CALCULATION REPORT							شماره صفحه : 2 از 10
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	BK	GCS	PEDCO	120	PI	RT	0006	D03

REVISION RECORD SHEET

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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.

As a part of the Project, a New Gas Compressor Station (adjacent to existing Binak GCS) shall be constructed to gather of 15 MMSCFD (approx.) associated gases and compress & transfer them to Siahmakan GIS.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields CLIENT(NISOC)
PROJECT:	Binak Oilfield Development – Surface Fcilities; New Gas Compressor Station
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.

2.0 SCOPE

This specification covers the wall thickness calculation for BINAK Compressor Gas Station.

3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS-E-PI-140 Engineering Standard for Onshore Transportation Pipelines

3.2 INTERNATIONAL CODES AND STANDARDS

- ASME B16.5 Pipe Flanges and Flanged Fitting
- ASME B16.47 Large Diameter Steel Flanges
- ASME B31.3 Process Piping
- ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
- ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASME B36.10M Welded and Seamless Wrought Steel Pipe
- ASME B36.19M Stainless Steel Pipe
- ASTM A105/A105M Carbon Steel Forgings for Piping Applications
- ASTM A106/A106M Seamless Carbon Steel Pipe for High-Temperature Service
- ASTM A153/A153M Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A182/A182M Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
- ASTM A216/A216M Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
- ASTM A234/A234M Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- ASTM A240/A240M Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- ASTM A312/A312M Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- ASTM A320/A320M Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service
- ASTM A333/A333M Seamless and Welded Steel Pipe for Low-Temperature Service
- ASTM A350/A350M Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components

- ASTM A351/A351M — Castings, Austenitic, for Pressure-Containing Parts
- ASTM A352/A352M — Steel Castings, Ferritic and Martensitic, for Pressure Containing Parts, Suitable for Low-Temperature Service
- ASTM A358/A358M — Electric-Fusion-Welded Austenitic Chromium-Nickel Stainless Steel Pipe for High-Temperature Service and General Applications
- ASTM A403/A403M — Wrought Austenitic Stainless Steel Piping Fittings
- ASTM A420/A420M — Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
- ASTM A516/A516M — Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
- ASTM A671/A671M — Electric-Fusion-Welded Steel Pipe for Atmospheric and Lower Temperatures
- ASTM A694/A694M — Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
- ASTM A860/A860M — Wrought High-Strength Ferritic Steel Butt-Welding Fittings
- ASTM B148 — Aluminum-Bronze Sand Castings
- API 5L — Specification for Line Pipe
- MSS SP-6 — Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
- NACE MR0175-ISO 15156 — Petroleum and Natural Gas Industries-Materials for Use in H2S-Containing Environments in Oil and Gas Production
- NACE TM-0284 — Standard Test Method - Evaluation Of Pipeline And Pressure Vessel Steels For Resistance To Hydrogen-Induced Cracking
- NACE TM-0177 — Laboratory Testing Of Metals For Resistance To Sulfide Stress Cracking And Stress Corrosion Cracking In H2s Environments

3.3 THE PROJECT DOCUMENTS

- BK-GCS-PEDCO-120-PI-RT-0001 — Piping Corrosion Study & Material Selection Report
- BK-GCS-PEDCO-120-PI-SP-0001 — Piping Material Specification

3.4 ENVIRONMENTAL DATA

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

3.5 ORDER OF PRECEDENCE

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 ABBREVIATIONS

AFC	Approved For Construction
AFD	Approved For Design
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Material
CL	Class
Cr	Chromium
C.S.	Carbon Steel
EFW	Electric Fusion Welded
FF	Flat Faced
Gr.	Grade
HIC	Hydrogen-Induced Cracking
L.T.C.S.	Low Temperature Carbon Steel
MSS	Manufacturers Standardization Society
NPS	Nominal Pipe Size
PWHT	Post Weld Heat Treatment
RF	Raised Face
RTJ	Ring Type Joint
SAW	Submerged Arc Welding
SCH.	Schedule
SMLS	Seamless
SMYS	Specified Minimum Yield Strength
S.S.	Stainless Steel
STD	Standard
THK	Thickness

5.0 DESIGN

5.1 DEFINITION AND TERMINOLOGY

5.1.1 CA

Corrosion Allowance (based on Piping Material Specification)

5.1.2 DESIGN LIMITS

Design Pressure / Design Temperature limits given in piping classes (based on Piping Material Specification) and are applied in Wall Thickness Calculation Table

5.2 PIPING WALL THICKNESS CALCULATIONS

5.2.1 GENERAL

Based on ASME Codes for Pressure Piping Systems B31, there are three main different codes which are applicable in this project regard to Wall Thickness Calculation as follow.

5.2.2 PIPES WHICH ARE SUBJECTED TO REQUIREMENTS OF ASME B31.3

This codes deals with the pipes that are typically found in Petrochemical, Oil refineries, Gas Plants, Cryogenic Plants and related terminals.

Pressure Design of Pipes

Piping wall thickness calculation process follows the following formula:

$t_{mil} = t_m / ((100-M)/100) = t_m / 0.875$

$t_m = t + c$

Where:

t_{mil}= Calculated wall thickness considering Mill Tolerance

M= Mill Tolerance=12.5

t_m = Minimum required thickness including mechanical, corrosion, and erosion allowances.

C = Sum of mechanical allowances (groove and thread depth) plus corrosion and erosion allowances.

t = Pressure designed thickness calculated as following formula if $t < D/6$

$$t = \frac{PD}{2(SEW + PY)}$$

Where:

P = Internal Design Gauge Pressure. The design pressure of each component in a piping system shall be not less than the pressure at the most severe condition of coincident internal or external pressure and temperature (minimum or maximum) expected during service.

D = Outside Diameter of Pipe

S = Stress Value for Material from Table A-1 of ASME B31.3 code.

Stress valve is indicated in that table as Basic Allowable Stress at metal Temperature. This value can easily be extracted with base of material and design metal temperature.

E = Quality Factor, A factor deals with the manufacturing (Cast, Welded, Seamless) of the components. The factors can be extracted from table A-1A for components manufactured by casting method and Table A-1B for the components manufactured by welding or seamless methods. According to the project specification casting method cannot be used for piping components except valves. So the factor E is extracted only from Table A-1B.

W = Weld Joint Strength Reduction Factor. That says welded joint strength may decrease during operation because of the temperature. This factor can be extracted from Table-302.3.5 of ASME B31.3.

Y = Coefficient Value deals with the effect of dimension on a component. That can be extracted from Table 304.1.1 of ASME B31.3 if t< $D/6$.

For $t \geq D/6$

$$Y = \frac{d+2c}{D+d+2c}$$

6.0 APPENDIXES

APPENDIX 1

PIPING WALL THICKNESS CALCUALATION NOTE