

| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های روزمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p>                                                                                                                                                                                                          |  |      |         |            |           |       |  |  |      |       |          |      |         |            |           |       |     |      |    |    |     |       |       |    |                    |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|---------|------------|-----------|-------|--|--|------|-------|----------|------|---------|------------|-----------|-------|-----|------|----|----|-----|-------|-------|----|--------------------|
| شماره پیمان:<br><br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                       | <table><tr><th colspan="8">PIPELINE WALL THICKNESS CALCULATION</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادر کننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>D04</td><td>0001</td><td>CN</td><td>PL</td><td>110</td><td>PEDCO</td><td>SSGRL</td><td>BK</td></tr></table> | PIPELINE WALL THICKNESS CALCULATION                                                 |      |         |            |           |       |  |  | نسخه | سریال | نوع مدرک | رشته | تسهیلات | صادر کننده | بسته کاری | پروژه | D04 | 0001 | CN | PL | 110 | PEDCO | SSGRL | BK | شماره صفحه: ۱ از ۹ |
| PIPELINE WALL THICKNESS CALCULATION                                                        |                                                                                                                                                                                                                                                                                                                                  |                                                                                     |      |         |            |           |       |  |  |      |       |          |      |         |            |           |       |     |      |    |    |     |       |       |    |                    |
| نسخه                                                                                       | سریال                                                                                                                                                                                                                                                                                                                            | نوع مدرک                                                                            | رشته | تسهیلات | صادر کننده | بسته کاری | پروژه |  |  |      |       |          |      |         |            |           |       |     |      |    |    |     |       |       |    |                    |
| D04                                                                                        | 0001                                                                                                                                                                                                                                                                                                                             | CN                                                                                  | PL   | 110     | PEDCO      | SSGRL     | BK    |  |  |      |       |          |      |         |            |           |       |     |      |    |    |     |       |       |    |                    |

## طرح نگهداشت و افزایش تولید ۲۷ مخزن

## PIPELINE WALL THICKNESS CALCULATION

### نگهداشت و افزایش تولید میدان نفتی بینک

|      |           |                         |                |             |                |                 |
|------|-----------|-------------------------|----------------|-------------|----------------|-----------------|
| D04  | SEP. 2023 | AFD                     | M.NOORI        | M.Fakharian | S.Faramarzpour |                 |
| D03  | OCT. 2022 | AFD                     | M.NOORI        | M.Fakharian | M.Mehrshad     |                 |
| D02  | AUG. 2022 | AFD                     | F.Mosayebnejad | M.Fakharian | M.Mehrshad     |                 |
| D01  | DEC. 2021 | IFA                     | H.Shahrokhi    | M.Fakharian | M.Mehrshad     |                 |
| D00  | OCT. 2021 | IFC                     | H.Shahrokhi    | M.Fakharian | M.Mehrshad     |                 |
| Rev. | Date      | Purpose of Issue/Status | Prepared by:   | Checked by: | Approved by:   | CLIENT Approval |

Class: 2

CLIENT Doc. Number: F0Z-707363

#### 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



نگهداشت و افزایش تولید میدان نفتی بینک  
فعالیت های رو زمینی در بسته های کاری تحت الارض  
عمومی و مشترک



شماره پیمان:

۰۵۳ - ۰۷۳ - ۹۱۸۴

PIPELINE WALL THICKNESS CALCULATION

| نسخه | سریال | نوع مدرک | رشته | تسهیلات | صادرکننده | بسته کاری | پروژه |
|------|-------|----------|------|---------|-----------|-----------|-------|
| D04  | 0001  | CN       | PL   | 110     | PEDCO     | SSGRL     | BK    |

شماره صفحه: ۲ از ۹

REVISION RECORD SHEET

| PAGE | D00 | D01 | D02 | D03 | D04 |
|------|-----|-----|-----|-----|-----|
| 1    | X   | X   | X   | X   | X   |
| 2    | X   | X   | X   | X   | X   |
| 3    | X   |     |     |     |     |
| 4    | X   |     |     |     |     |
| 5    | X   | X   |     |     |     |
| 6    | X   | X   |     |     |     |
| 7    | X   | X   |     |     |     |
| 8    | X   | X   |     | X   |     |
| 9    | X   | X   |     | X   |     |
| 10   |     | X   |     |     |     |
| 11   |     |     |     |     |     |
| 12   |     |     |     |     |     |
| 13   |     |     |     |     |     |
| 14   |     |     |     |     |     |
| 15   |     |     |     |     |     |
| 16   |     |     |     |     |     |
| 17   |     |     |     |     |     |
| 18   |     |     |     |     |     |
| 19   |     |     |     |     |     |
| 20   |     |     |     |     |     |
| 21   |     |     |     |     |     |
| 22   |     |     |     |     |     |
| 23   |     |     |     |     |     |
| 24   |     |     |     |     |     |
| 25   |     |     |     |     |     |
| 26   |     |     |     |     |     |
| 27   |     |     |     |     |     |
| 28   |     |     |     |     |     |
| 29   |     |     |     |     |     |
| 30   |     |     |     |     |     |
| 31   |     |     |     |     |     |
| 32   |     |     |     |     |     |
| 33   |     |     |     |     |     |
| 34   |     |     |     |     |     |
| 35   |     |     |     |     |     |
| 36   |     |     |     |     |     |
| 37   |     |     |     |     |     |
| 38   |     |     |     |     |     |
| 39   |     |     |     |     |     |
| 40   |     |     |     |     |     |
| 41   |     |     |     |     |     |
| 42   |     |     |     |     |     |
| 43   |     |     |     |     |     |
| 44   |     |     |     |     |     |
| 45   |     |     |     |     |     |
| 46   |     |     |     |     |     |
| 47   |     |     |     |     |     |
| 48   |     |     |     |     |     |
| 49   |     |     |     |     |     |
| 50   |     |     |     |     |     |
| 51   |     |     |     |     |     |
| 52   |     |     |     |     |     |
| 53   |     |     |     |     |     |
| 54   |     |     |     |     |     |
| 55   |     |     |     |     |     |
| 56   |     |     |     |     |     |
| 57   |     |     |     |     |     |
| 58   |     |     |     |     |     |
| 59   |     |     |     |     |     |
| 60   |     |     |     |     |     |
| 61   |     |     |     |     |     |
| 62   |     |     |     |     |     |
| 63   |     |     |     |     |     |
| 64   |     |     |     |     |     |
| 65   |     |     |     |     |     |

| PAGE | D00 | D01 | D02 | D03 | D04 |
|------|-----|-----|-----|-----|-----|
| 66   |     |     |     |     |     |
| 67   |     |     |     |     |     |
| 68   |     |     |     |     |     |
| 69   |     |     |     |     |     |
| 70   |     |     |     |     |     |
| 71   |     |     |     |     |     |
| 72   |     |     |     |     |     |
| 73   |     |     |     |     |     |
| 74   |     |     |     |     |     |
| 75   |     |     |     |     |     |
| 76   |     |     |     |     |     |
| 77   |     |     |     |     |     |
| 78   |     |     |     |     |     |
| 79   |     |     |     |     |     |
| 80   |     |     |     |     |     |
| 81   |     |     |     |     |     |
| 82   |     |     |     |     |     |
| 83   |     |     |     |     |     |
| 84   |     |     |     |     |     |
| 85   |     |     |     |     |     |
| 86   |     |     |     |     |     |
| 87   |     |     |     |     |     |
| 88   |     |     |     |     |     |
| 89   |     |     |     |     |     |
| 90   |     |     |     |     |     |
| 91   |     |     |     |     |     |
| 92   |     |     |     |     |     |
| 93   |     |     |     |     |     |
| 94   |     |     |     |     |     |
| 95   |     |     |     |     |     |
| 96   |     |     |     |     |     |
| 97   |     |     |     |     |     |
| 98   |     |     |     |     |     |
| 99   |     |     |     |     |     |
| 100  |     |     |     |     |     |
| 101  |     |     |     |     |     |
| 102  |     |     |     |     |     |
| 103  |     |     |     |     |     |
| 104  |     |     |     |     |     |
| 105  |     |     |     |     |     |
| 106  |     |     |     |     |     |
| 107  |     |     |     |     |     |
| 108  |     |     |     |     |     |
| 109  |     |     |     |     |     |
| 110  |     |     |     |     |     |
| 111  |     |     |     |     |     |
| 112  |     |     |     |     |     |
| 113  |     |     |     |     |     |
| 114  |     |     |     |     |     |
| 115  |     |     |     |     |     |
| 116  |     |     |     |     |     |
| 117  |     |     |     |     |     |
| 118  |     |     |     |     |     |
| 119  |     |     |     |     |     |
| 120  |     |     |     |     |     |
| 121  |     |     |     |     |     |
| 122  |     |     |     |     |     |
| 123  |     |     |     |     |     |
| 124  |     |     |     |     |     |
| 125  |     |     |     |     |     |
| 126  |     |     |     |     |     |
| 127  |     |     |     |     |     |
| 128  |     |     |     |     |     |
| 129  |     |     |     |     |     |
| 130  |     |     |     |     |     |

| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های روزمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p>                                                                                                                                                                                                          |  |         |      |          |       |      |  |  |       |           |            |         |      |          |       |      |    |       |       |     |    |    |      |     |                    |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------|------|----------|-------|------|--|--|-------|-----------|------------|---------|------|----------|-------|------|----|-------|-------|-----|----|----|------|-----|--------------------|
| شماره پیمان:<br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                           | <table><tr><th colspan="8">PIPELINE WALL THICKNESS CALCULATION</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</th><th>تسهیلات</th><th>رشته</th><th>نوع مدرک</th><th>سریال</th><th>نسخه</th></tr><tr><td>BK</td><td>SSGRL</td><td>PEDCO</td><td>110</td><td>PL</td><td>CN</td><td>0001</td><td>D04</td></tr></table> | PIPELINE WALL THICKNESS CALCULATION                                                 |         |      |          |       |      |  |  | پروژه | بسته کاری | صادر کننده | تسهیلات | رشته | نوع مدرک | سریال | نسخه | BK | SSGRL | PEDCO | 110 | PL | CN | 0001 | D04 | شماره صفحه: ۳ از ۹ |
| PIPELINE WALL THICKNESS CALCULATION                                                        |                                                                                                                                                                                                                                                                                                                                  |                                                                                     |         |      |          |       |      |  |  |       |           |            |         |      |          |       |      |    |       |       |     |    |    |      |     |                    |
| پروژه                                                                                      | بسته کاری                                                                                                                                                                                                                                                                                                                        | صادر کننده                                                                          | تسهیلات | رشته | نوع مدرک | سریال | نسخه |  |  |       |           |            |         |      |          |       |      |    |       |       |     |    |    |      |     |                    |
| BK                                                                                         | SSGRL                                                                                                                                                                                                                                                                                                                            | PEDCO                                                                               | 110     | PL   | CN       | 0001  | D04  |  |  |       |           |            |         |      |          |       |      |    |       |       |     |    |    |      |     |                    |

## CONTENTS

|     |                                         |   |
|-----|-----------------------------------------|---|
| 1.0 | INTRODUCTION .....                      | 4 |
| 2.0 | SCOPE .....                             | 5 |
| 3.0 | NORMATIVE REFERENCES.....               | 5 |
| 3.1 | LOCAL CODES AND STANDARDS .....         | 5 |
| 3.2 | INTERNATIONAL CODES AND STANDARDS ..... | 5 |
| 3.3 | THE PROJECT DOCUMENTS .....             | 5 |
| 3.4 | ENVIRONMENTAL DATA.....                 | 6 |
| 3.5 | ORDER OF PRECEDENCE.....                | 6 |
| 4.0 | GENERAL .....                           | 6 |
| 5.0 | CALCULATION NOTE & DESIGN DATA .....    | 6 |
| 5.1 | GENERAL .....                           | 6 |
| 5.2 | NOMENCLATURE.....                       | 6 |
| 5.3 | CALCULATION FORMULA.....                | 7 |
| 6.0 | LINE SERVICE INDEX.....                 | 7 |
| 7.0 | THICKNESS CALCULATION.....              | 8 |

|                                                                                            |                                                                                                                          |           |           |         |      |          |       |                                                                                     |      |
|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------|------|----------|-------|-------------------------------------------------------------------------------------|------|
| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های رو زمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p> |           |           |         |      |          |       |  |      |
| شماره پیمان:<br><br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                       | PIPELINE WALL THICKNESS CALCULATION                                                                                      |           |           |         |      |          |       | شماره صفحه : ۴ از ۹                                                                 |      |
|                                                                                            | پروژه                                                                                                                    | بسته کاری | صادرکننده | تسهیلات | رشته | نوع مدرک | سریال |                                                                                     | نسخه |
|                                                                                            | BK                                                                                                                       | SSGRL     | PEDCO     | 110     | PL   | CN       | 0001  | D04                                                                                 |      |

## 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, construction of well location, access roads, wellhead facilities for 6 new wells (with electric power supply for 2 of them) and required modifications on 4 workover wells (with electric power supply) shall be done. In addition, construction of 6 new flowlines from new wells to Binak B/C unit (with extension of relevant manifold) are in the Project scope of work.

### GENERAL DEFINITION

The following terms shall be used in this document.

|                              |                                                                                                                                                                                                  |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLIENT:                      | National Iranian South Oilfields Company (NISOC)                                                                                                                                                 |
| PROJECT:                     | Binak Oilfield Development – Construction of New Well Locations, Modifications on Workover Wells, Wellhead Facilities, Electrification Facilities, Flowlines and Extension of Binak B/C Manifold |
| 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.                                                                                                                                           |

|                                                                                            |                                                                                                                          |           |            |         |      |          |       |                                                                                     |
|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|------------|---------|------|----------|-------|-------------------------------------------------------------------------------------|
| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های رو زمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p> |           |            |         |      |          |       |  |
| شماره پیمان:                                                                               | PIPELINE WALL THICKNESS CALCULATION                                                                                      |           |            |         |      |          |       | شماره صفحه : ۵ از ۹                                                                 |
| ۰۵۳ - ۰۷۳ - ۹۱۸۴                                                                           | پروژه                                                                                                                    | بسته کاری | صادر کننده | تسهیلات | رشته | نوع مدرک | سریال | نسخه                                                                                |
|                                                                                            | BK                                                                                                                       | SSGRL     | PEDCO      | 110     | PL   | CN       | 0001  | D04                                                                                 |

## 2.0 SCOPE

This document covers the wall thickness calculation for Binak 6 new wellheads and flow lines based on IPS standard (IPS-E-PI-140), ASME B 31.4 and ASME B 31.8.

## 3.0 NORMATIVE REFERENCES

The latest edition of following codes & standards are applicable in this project (unless otherwise):

### 3.1 LOCAL CODES AND STANDARDS

- IPS-E-PI-140 Engineering Standard for Onshore Transportation Pipelines
- IPS-M-PI-190 Material and Equipment Standard for Line Pipe
- NOSIC-S4L8001-001D 3000 API Rating Production Wellhead Fittings-6"
- NOSIC-S4L8004-001C 3000 Bangestan Production Wellhead Fittings-6"
- NOSIC-S5L-9002-0010 5000API/3000 API Oil Well Production Wellhead Fittings 6"

### 3.2 INTERNATIONAL CODES AND STANDARDS

- ASTM American Society for Testing Materials Relevant Parts
- API 5L Specification for Line Pipe
- ASME B31.8 Gas Transmission and Distribution Piping Systems
- ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids Unified screw threads
- ASME B 36.10 Welded and Seamless Wrought Steel Pipe
- NACE MR 0175-ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H2S Containing Environments in Oil and Gas Production

### 3.3 THE PROJECT DOCUMENTS

- BK-SSGRL-PEDCO-110-PL-RT-0001 Pipeline Corrosion Study & Material Selection Report
- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-PL-DC-0001 Pipeline Design Criteria

|                                                                                            |                                                                                                                          |           |           |         |      |          |       |                                                                                     |      |
|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------|------|----------|-------|-------------------------------------------------------------------------------------|------|
| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های رو زمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p> |           |           |         |      |          |       |  |      |
| شماره پیمان:<br><br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                       | PIPELINE WALL THICKNESS CALCULATION                                                                                      |           |           |         |      |          |       | شماره صفحه: ۶ از ۹                                                                  |      |
|                                                                                            | پروژه                                                                                                                    | بسته کاری | صادرکننده | تسهیلات | رشته | نوع مدرک | سریال |                                                                                     | نسخه |
|                                                                                            | BK                                                                                                                       | SSGRL     | PEDCO     | 110     | PL   | CN       | 0001  | D04                                                                                 |      |

- BK-SSGRL-PEDCO-110-PL-SP-0001 Pipeline 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 GENERAL

Candidate material for pipeline as per Corrosion Study & Material Selection Report (with Doc. No. BK-SSGRL-PEDCO-110-PL-RT-0001) is carbon steel with 3 mm corrosion allowance. This document presents the calculation procedure of carbon steel pipeline wall thickness.

The types, size, length, operating & design pressure and temperature and service condition of pipelines (according to process documents such as Process Basis of Design with Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001, Pipeline Design Criteria with Doc. No. BK-GNRAL-PEDCO-000-PL-DC-0001) are as following tables.

## 5.0 CALCULATION NOTE & DESIGN DATA

### 5.1 GENERAL

The required thickness of straight sections of pipe shall be determined in accordance with Eq. (2)  $t_m = t + c$

### 5.2 NOMENCLATURE

**tm:** Minimum required thickness, including mechanical, corrosion, and erosion allowances

- **t** Calculated Wall Thickness (in)
- **ts** Selected Wall Thickness (in)
- **P** Design Pressure (psig)
- **D** Nominal Pipe Diameter (in)
- **SMYS** Specified Minimum Yield Strength (psi) (as per appendix D)
- **F** Design Factor (as per Table 841.1.6-2)
- **E** Longitudinal Joint Efficiency (as per Table 841.1.7-1)
- **T** Temperature Derating Factor (as per Table 841.1.8-1)



|                                                                                            |                                                                                                                         |           |           |         |      |          |       |                                                                                     |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------|-----------|---------|------|----------|-------|-------------------------------------------------------------------------------------|
| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های روزمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p> |           |           |         |      |          |       |  |
| شماره پیمان:<br><br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                       | PIPELINE WALL THICKNESS CALCULATION                                                                                     |           |           |         |      |          |       | شماره صفحه: ۸ از ۹                                                                  |
|                                                                                            | پروژه                                                                                                                   | بسته کاری | صادرکننده | تسهیلات | رشته | نوع مدرک | سریال |                                                                                     |
|                                                                                            | BK                                                                                                                      | SSGRL     | PEDCO     | 110     | PL   | CN       | 0001  | D04                                                                                 |

## 7.0 THICKNESS CALCULATION

### - For Pipeline

| Piping Class | Material                 | Design PRESS. <P> (Psig) | Design TEMP. (deg. C) | Corrosion Allowance <C>(mm) | Specific Min. Yield <S> (Psi) | Design Factor <F> | Welding Factor <E> |
|--------------|--------------------------|--------------------------|-----------------------|-----------------------------|-------------------------------|-------------------|--------------------|
| LN15         | API 5L-B PSL 2 for <2"   | 1035                     | 85                    | 3                           | 35000                         | 0.72              | 1.00               |
|              | API 5L-X52 PSL 2 for ≥2" |                          |                       |                             | 52000                         |                   |                    |

#### CALCULATING PROCEDURE BY ASME B31.4

$$t = \frac{P \times D}{2 \times S \times 0.72 \times E \times T}$$

$$t_m = t + C$$

where ;

$t_m$  = minimum required thickness (mm)

$t$  = calculated thickness (mm)

$C$  = corrosion allowance (mm)

$P$  = design pressure (Psig)

$D$  = outside diameter (mm)

$S$  = specific minimum yield strength (Psi)

$E$  = Weld Joint Factor

$F$  = design factor

$T$  = Temperature Derating Factor = 1

| NPS   | PIPE O.D. | CALCULATED THICKNESS |            | SELECTED WALL THICK. (mm) |
|-------|-----------|----------------------|------------|---------------------------|
| Inch  | <D> (mm)  | t (mm)               | $t_m$ (mm) |                           |
| 1/2   | 21.3      | 0.43                 | 3.43       | Sch. 80                   |
| 3/4   | 26.7      | 0.55                 | 3.55       | Sch. 80                   |
| 1     | 33.4      | 0.68                 | 3.68       | Sch. 80                   |
| 1 1/2 | 48.3      | 0.99                 | 3.99       | Sch. 80                   |
| 2     | 60.3      | 0.83                 | 3.83       | Sch. 40                   |
| 3     | 88.9      | 1.22                 | 4.22       | Sch. 40                   |
| 4     | 114.3     | 1.57                 | 4.57       | Sch. 40                   |
| 6     | 168.3     | 2.33                 | 5.33       | 7.9 mm (Note 1)           |

#### Note 1:

Final thickness of flowlines will be 7.9mm. So considering design pressure of 1035 psi (Approved by NISOC), the actual corrosion allowance would be 5~5.5 mm which is sufficient for the corrosion calculations.

|                                                                                            |                                                                                                                         |           |            |         |      |          |       |                                                                                     |      |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------|------------|---------|------|----------|-------|-------------------------------------------------------------------------------------|------|
| <br>NISOC | <p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>فعالیت های روزمینی در بسته های کاری تحت الارض</p> <p>عمومی و مشترک</p> |           |            |         |      |          |       |  |      |
| شماره پیمان:<br><br>۰۵۳ - ۰۷۳ - ۹۱۸۴                                                       | PIPELINE WALL THICKNESS CALCULATION                                                                                     |           |            |         |      |          |       | شماره صفحه: ۹ از ۹                                                                  |      |
|                                                                                            | پروژه                                                                                                                   | بسته کاری | صادر کننده | تسهیلات | رشته | نوع مدرک | سریال |                                                                                     | نسخه |
|                                                                                            | BK                                                                                                                      | SSGRL     | PEDCO      | 110     | PL   | CN       | 0001  | D04                                                                                 |      |

- For Crossings

| Piping Class | Material                 | Design PRESS. <P> (Psig) | Design TEMP. (deg. C) | Corrosion Allowance <C>(mm) | Specific Min. Yield <S> (Psi) | Design Factor <F> | Welding Factor <E> |
|--------------|--------------------------|--------------------------|-----------------------|-----------------------------|-------------------------------|-------------------|--------------------|
| LN15         | API 5L-B PSL 2 for <2"   | 1035                     | 85                    | 3                           | 35000                         | 0.6               | 1.00               |
|              | API 5L-X52 PSL 2 for ≥2" |                          |                       |                             | 52000                         |                   |                    |

CALCULATING PROCEDURE BY ASME B31.4

$$t = \frac{P \times D}{2 \times S \times 0.6 \times E \times T}$$

$$t_m = t + C$$

where ;

$t_m$  = minimum required thickness (mm)

$t$  = calculated thickness (mm)

$C$  = corrosion allowance (mm)

$P$  = design pressure (Psig)

$D$  = outside diameter (mm)

$S$  = specific minimum yield strength (Psi)

$E$  = Weld Joint Factor

$F$  = design factor

$T$  = Temperature Derating Factor = 1

| NPS   | PIPE O.D. | CALCULATED THICKNESS |            | SELECTED WALL THICK. (mm) |
|-------|-----------|----------------------|------------|---------------------------|
|       |           | t (mm)               | $t_m$ (mm) |                           |
| Inch  | <D> (mm)  |                      |            |                           |
| 1/2   | 21.3      | 0.52                 | 3.52       | Sch. 80                   |
| 3/4   | 26.7      | 0.66                 | 3.66       | Sch. 80                   |
| 1     | 33.4      | 0.82                 | 3.82       | Sch. 80                   |
| 1 1/2 | 48.3      | 1.19                 | 4.19       | Sch. 80                   |
| 2     | 60.3      | 1.00                 | 4.00       | Sch. 80                   |
| 3     | 88.9      | 1.47                 | 4.47       | Sch. 40                   |
| 4     | 114.3     | 1.90                 | 4.90       | Sch. 40                   |
| 6     | 168.3     | 2.79                 | 5.79       | 7.9 mm (Note 1)           |

**Note 1:**

Final thickness of flowlines will be 7.9mm. So considering design pressure of 1035 psi (Approved by NISOC), the actual corrosion allowance would be 5~5.5 mm which is sufficient for the corrosion calculations.