|  |
| --- |
| **طرح نگهداشت و افزایش تولید 27 مخزن** |
| **MTO For Cathodic Protection System for Siahmakan Gas Injectionنگهداشت و افزایش تولید میدان نفتی بینک** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| D01 | Mar. 2025 | IFI | S.Medhat | M.Fakharian | S.Faramarzpour |  |
| D00 | Apr. 2022 | IFI | H.Shakiba | M.Aki | M.Mehrshad |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
| **Class:** | **CLIENT Doc. Number:** **F8Z-709077** |
| **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**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |  | **PAGE** | **D00** | **D01** | **D02** | **D03** | **D04** |
| **1** | X | X |  |  |  | **51** |  |  |  |  |  |
| **2** | X | X |  |  |  | **52** |  |  |  |  |  |
| **3** | X |  |  |  |  | **53** |  |  |  |  |  |
| **4** | X |  |  |  |  | **54** |  |  |  |  |  |
| **5** | X |  |  |  |  | **55** |  |  |  |  |  |
| **6** | X |  |  |  |  | **56** |  |  |  |  |  |
| **7** | X | X |  |  |  | **57** |  |  |  |  |  |
| **8** | X | X |  |  |  | **58** |  |  |  |  |  |
| **9** | X | X |  |  |  | **59** |  |  |  |  |  |
| **10** |  |  |  |  |  | **60** |  |  |  |  |  |
| **11** |  |  |  |  |  | **61** |  |  |  |  |  |
| **12** |  |  |  |  |  | **62** |  |  |  |  |  |
| **13** |  |  |  |  |  | **63** |  |  |  |  |  |
| **14** |  |  |  |  |  | **64** |  |  |  |  |  |
| **15** |  |  |  |  |  | **65** |  |  |  |  |  |
| **16** |  |  |  |  |  | **66** |  |  |  |  |  |
| **17** |  |  |  |  |  | **67** |  |  |  |  |  |
| **18** |  |  |  |  |  | **68** |  |  |  |  |  |
| **19** |  |  |  |  |  | **69** |  |  |  |  |  |
| **20** |  |  |  |  |  | **70** |  |  |  |  |  |
| **21** |  |  |  |  |  | **71** |  |  |  |  |  |
| **22** |  |  |  |  |  | **72** |  |  |  |  |  |
| **23** |  |  |  |  |  | **73** |  |  |  |  |  |
| **24** |  |  |  |  |  | **74** |  |  |  |  |  |
| **25** |  |  |  |  |  | **75** |  |  |  |  |  |
| **26** |  |  |  |  |  | **76** |  |  |  |  |  |
| **27** |  |  |  |  |  | **77** |  |  |  |  |  |
| **28** |  |  |  |  |  | **78** |  |  |  |  |  |
| **29** |  |  |  |  |  | **79** |  |  |  |  |  |
| **30** |  |  |  |  |  | **80** |  |  |  |  |  |
| **31** |  |  |  |  |  | **81** |  |  |  |  |  |
| **32** |  |  |  |  |  | **82** |  |  |  |  |  |
| **33** |  |  |  |  |  | **83** |  |  |  |  |  |
| **34** |  |  |  |  |  | **84** |  |  |  |  |  |
| **35** |  |  |  |  |  | **85** |  |  |  |  |  |
| **36** |  |  |  |  |  | **86** |  |  |  |  |  |
| **37** |  |  |  |  |  | **87** |  |  |  |  |  |
| **38** |  |  |  |  |  | **88** |  |  |  |  |  |
| **39** |  |  |  |  |  | **89** |  |  |  |  |  |
| **40** |  |  |  |  |  | **90** |  |  |  |  |  |
| **41** |  |  |  |  |  | **91** |  |  |  |  |  |
| **42** |  |  |  |  |  | **92** |  |  |  |  |  |
| **43** |  |  |  |  |  | **93** |  |  |  |  |  |
| **44** |  |  |  |  |  | **94** |  |  |  |  |  |
| **45** |  |  |  |  |  | **95** |  |  |  |  |  |
| **46** |  |  |  |  |  | **96** |  |  |  |  |  |
| **47** |  |  |  |  |  | **97** |  |  |  |  |  |
| **48** |  |  |  |  |  | **98** |  |  |  |  |  |
| **49** |  |  |  |  |  | **99** |  |  |  |  |  |
| **50** |  |  |  |  |  | **100** |  |  |  |  |  |

**CONTENTS**

[1.0 INTRODUCTION 4](#_Toc101869608)

[2.0 Scope 5](#_Toc101869609)

[3.0 NORMATIVE REFERENCES 5](#_Toc101869610)

[3.1 Local Codes and Standards 5](#_Toc101869611)

[3.2 International Codes and Standards 5](#_Toc101869612)

[3.3 The Project Documents 6](#_Toc101869613)

[3.4 ENVIRONMENTAL DATA 6](#_Toc101869614)

[3.5 Order of Precedence 6](#_Toc101869615)

[4.0 MTO for Permanent cathodic protection system 7](#_Toc101869616)

[5.0 MTO for temporary cathodic protection system 10](#_Toc101869617)

1. **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, New Gas/Condensate Pipelines (from Binak New GCS to Siahmakan GIS/Binak PU) shall be constructed.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT:  | National Iranian South Oilfields Company (NISOC)  |
| PROJECT: | Binak Oilfield Development – Surface Facilities; Gas & Gas-Condensate Pipelines |
| 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 COMPANY (in writing) for the inspection of goods. |
| SHALL: | Is used where a provision is mandatory. |
| SHOULD: | Is used where a provision is advisory only. |
| WILL:  | Is normally used in connection with the action by COMPANY rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR. |
| MAY:  | Is used where a provision is completely discretionary. |

1. **Scope**

This document covers Material Take Off of cathodic protection system of UG pipeline section from Gas Compressor station to Gas injection facility.

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

1. **NORMATIVE REFERENCES**

## Local Codes and Standards

* IPS-E-TP-820 Engineering Standard for Electrochemical Protection
* IPS-C-TP-820 Construction Standard for Cathodic Protection
* IPS-I-TP-820: Inspection Standard for Monitoring Cathodic Protection
* IPS-M-TP-750 Material and Equipment Standard For Cathodic Protection

## International Codes and Standards

* ASTM American Society for Testing Materials Relevant Parts
* API 610 Centrifugal Pumps for General Refinery Service, 10th Edition
* NACE SP 0169 Control of External Corrosion on Underground or Submerged Metallic Piping System.
* NACE-SP 0286 The Electrical Isolation of Cathodically Protected Pipelines.
* BS 7361(1991) Cathodic Protection Part 1. Code of Practice for Land and Marine Applications.
* NACE SP 0177 Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems.
* ISO 15589,1-2 Cathodic protection of pipeline transportation systems
* NACE SP 0502 External corrosion direct assessment (ECDA) process — assessing and reducing the impact of external corrosion on pipeline integrity.
* NACE SP 0207 Performing Close-Interval Potential Surveys and DC Surface Potential Gradient Surveys on Buried or Submerged Metallic Pipelines.
* NACE-SP0104 The Use of Coupons for Cathodic Protection Monitoring Applications

## The Project Documents

* BK-GCS-PEDCO-120-EL-CN-0008 Specification for Cathodic Protection System
* BK-GNRAL-PEDCO-HD-000-EL-DC-0001 Electrical System Design Criteria
* BK- GCS - PEDCO -320-GT-RT-0001 Geotechnical Report

## ENVIRONMENTAL DATA

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

Cathodic Protection System shall be designed for use under the conditions specified as below:

R01

Ambient temperatures for equipment:

|  |  |
| --- | --- |
| Maximum design temperature indoor/outdoor (under sun shade)  | +55°C |
| Minimum design temperature | -5°C  |
| Maximum surface temperature exposed to the sun | 85°C |
| Maximum relative humidity | 100%  |
| Altitude | <1000m above sea Level |
| Special Atmospheric Condition | dust and salt corrosive |

For the ambient conditions special care will be paid to:

* Enclosures of equipment for outdoor installation
* Painting and coating of metal parts to resist to the severe environmental conditions
* Any environmental derating factors shall be considered by vendor before design

## Order of Precedence

In case of conflict between requirements specified herein & the requirements of any other referenced document, the most approved stringent requirements of below listed items shall be considered based on the approval given by the owner’s representative:

Purchase order

Material Requisition

MTO & Data Sheet

This Specification

Drawing & Other Specification

Reference Project Specification

Iranian Petroleum Standard (IPS)

Reference international Code & Standards

When the term “Authorized”, Authorization”, “Approval”, or “Approved” are used in this specification, it shall mean authorization or Approval from OWNER.

In case of any conflict between the project documents, the most stringent one shall be considered.

1. **MTO for Permanent cathodic protection system**

|  |  |  |  |
| --- | --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Transformer/Rectifier, Outdoor, 3‐Phase, 400 V, 50 Hz. IP 55, DC Output: 50V-100 A, ONAN , Oil immersed type, continuous duty.Transformer/Rectifier equipped with step less voltage regulating system and thyristor control , IPS-M-EL-155 and IEC 60146. | Set | 2 |
| 2 | AC Supply Box “The AC Supply Box enclosure shall have a minimum, degree ofprotection IP-54 (in accordance with IEC-60 529), The AC Supply Boxes shall besupplied with all necessary accessories such as copper link, cable lugs, 25 AmpMiniature fuse, with suitable MCCB , Support and the others. | No. | 2 |
| 3 | Earthing System for Transformer Rectifiers (Hard Copper), Copper Earthing set, with all accessories such as 2 copper rods (1500×16mm), 1 driving cap, 1 driving tip, 1 coupling screw, and 2 conductor clamps. (IPS-D-TP-717) | Set | 2 |
| 4 | MMO Anode TUBLAR, 25 x1000 mm dimension with 5 m 1x16 HMWPE/PVDF attached cable; anodes shall be canister type with suitable coke breeze backfill type III | No. | 44 |
| 5 | 3-way splicing kit with line tap or relevant clamp , according to IPS-M-TP-750 | No. | 44 |
| 6 | 1×35 mm2 Single Core Copper Conductor Cu/XLPE/Bd/PVC cable for Anode Header Cable, RED | m | 450 |
| 7 | Negative Bond Box, Safe type , “The negative 6 Terminal bond box enclosure shall have a minimum, degree of protection IP-54 (in accordance with IEC-60529 and IPS type), The negative bond boxes shall be supplied with all necessary accessories such as 2 copper links, 6 cable lugs, couplings, 6 cable glands, 6 cable tag number , supports and the others. With resistors 2 no.s 4 ohm-25 watt. | No. | 2 |
| 8 | Safe Type, Positive Bond Box “The Positive 4 Terminal bond box enclosure shall have a minimum, degree of protection IP-54 (in accordance with IEC-60 529 and IPS type), The positive bond boxes shall be supplied with all necessary accessories such as 2 copper links 4 cable lugs, couplings, 4 cable glands, 4 cable tag number, supports and the others. | No. | 2 |
| 9 | 1×50 mm2 Single Core Copper Conductor Cu/XLPE/Bd/AWA/PVC cable for Main Negative and Drain Cable, Black, from T/R to Negative Bond Box and Pipe | m | 150 |
| 10 | 1×50 mm2 Single Core Copper Conductor Cu/XLPE/Bd/AWA/PVC cable for Main Positive Cable, Red, from T/R to Positive Bond Box | m | 500 |
| 11 | Concrete Type Test Point with 3 no.s terminals | No. | 45 |
| 12 | Concrete Type Test Box for Crossings and river, with 4 no.s terminals and resistors | No. | 7 |
| 13 | Ground Bed Marker, Coated carbon steel as per Installation Drawing | No. | 4 |
| 14 | Cable 1\*16 mm2 Cu/XLPE/Bd/PVC for test connection | Mt | 600 |
| 15 | Handy Cap 4\*4” | No. | 120 |
| 16 | Primer for Handy Cap, liquid | Lit | 4 |
| 17 | Exothermic weld mould for connecting cable 35 mm2 to 8" pipe | No. | 2 |
| 18 | Exothermic weld mould for connecting cable 16 mm2 to 8" pipe | No. | 2 |
| 19 | Powder 32 gr for above item | No. | 120 |
| 20 | Cleaning tool Kits | Set | 4 |
| 21 | Anode Vent Pipe (6" Dia.) min 3 m length, none asbestos type, with H type header | No. | 44 |
| 22 | Safe‐ Type spark gap 100KA | No. | 2 |
| 23 | Bulk Material including cable lug, shroud, conduit, nut and bolt | Pack | 2 |
| 24 | PORTABLE REFRENCE ELECTRODE (Cu/CuSO4) | No | 1 |
| 25 | Digital Multimeter | No | 1 |
| 26 | Stainless Steel Cable Tag | Lot | 1 |
| 27 | Zinc Earthing Cell, double electrode type, 35x35x1525 mm with 10m Cable 1\*16 mm2 XLPE/PVC , IPS type box and supports. | Set | 2 |
| 28 | Synchronizing GPS system with antenna and all of accessories such as boxes or etc. | Set | 2 |

1. **MTO for temporary cathodic protection system**

|  |  |  |  |
| --- | --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Magnesium anode 32 Lbs with 3 m 1\*16 XLPE/PVC cable, High potential Type, (‐1700~1750 mV VOCP) prepackaged, complete with backfill material | No. | 25 |
| 2 | Handy Cap 4\*4” | No. | 25 |
| 3 | Primer for Handy Cap, liquid | Lit | 2 |
| 4 | Exothermic weld mould for connecting cable 16 mm2 to 8" pipe | No. | 2 |
| 5 | Powder 32 gr for above item | No. | 25 |
| 6 | Cleaning tool Kits | Set | 1 |
| 7 | Miscellaneous Materials  | Set | 1 |

1. **MTO for INTERFERENCES (RIVER)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Magnesium anode 9 Lbs with 3 m 1\*16 XLPE/PVC cable, High potential Type, (‐1700~1750 mV VOCP) prepackaged, complete with backfill material | No. | 1 |
| 2 | Handy Cap 4\*4” | No. | 2 |
| 3 | Primer for Handy Cap, liquid | Lit | 0.5 |
| 4 | Exothermic weld mould for connecting cable 16 mm2 to 8" pipe | No. | 2 |
| 5 | Powder 32 gr for above item | No. | 2 |
| 6 | Miscellaneous Materials  | Set | 1 |

1. **MTO for MTO for INTERFERENCES (CROSSING)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Magnesium anode 17 Lbs with 3 m 1\*16 XLPE/PVC cable, High potential Type, (‐1700~1750 mV VOCP) prepackaged, complete with backfill material | No. | 12 |
| 2 | Handy Cap 4\*4” | No. | 30 |
| 3 | Primer for Handy Cap, liquid | Lit | 2 |
| 4 | Exothermic weld mould for connecting cable 16 mm2 to 8" pipe | No. | 4 |
| 5 | Powder 32 gr for above item | No. | 30 |
| 6 | Miscellaneous Materials  | Set | 2 |
| 7 | Cable 1\*16 mm2 XLPE/PVC for bonding connections | m | 400 |

1. **MTO for MTO for INTERFERENCES (AC INTERFERENCES)**

|  |  |  |  |
| --- | --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Zinc anode with 3 m 1\*16 XLPE/PVC cable , prepackaged, complete with backfill material | No. | 1 |
| 2 | Handy Cap 4\*4” | No. | 2 |
| 3 | Primer for Handy Cap, liquid | Lit | 2 |
| 4 | Exothermic weld mould for connecting cable 16 mm2 to 8" pipe | No. | 4 |
| 5 | Powder 32 gr for above item | No. | 2 |
| 6 | Miscellaneous Materials  | Set | 1 |
| 7 | Cable 1\*16 mm2 XLPE/PVC for bonding connections | m | 50 |
| 8 | Polarization Cell Replacement , with suitable accessories | Set | 1 |
| 9 | Suitable safe boxes for AC damping , 4 no.s terminals , support and glands | No. | 1 |