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| **طرح نگهداشت و افزایش تولید 27 مخزن** | | | | | | | |
| **WPS & PQR**  **نگهداشت و افزایش تولید میدان نفتی بینک** | | | | | | | |
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| V00 | NOV. 2024 | IFA | IDR | M.Fakharian | M.Sadeghian |  |
| **Rev.** | **Date** | **Purpose of Issue/Status** | **Prepared by:** | **Checked by:** | **Approved by:** | **CLIENT Approval** |
|  | | | | | | |
| **Status:** | **IFA: Issued For Approval**  **IFI: Issued For Information**  **AFC: Approved For Construction** | | | | | |

**REVISION RECORD SHEET**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |  | **PAGE** | **V00** | **V01** | **V02** | **V03** | **V04** |
| **1** | X |  |  |  |  | **66** |  |  |  |  |  |
| **2** | X |  |  |  |  | **67** |  |  |  |  |  |
| **3** | X |  |  |  |  | **68** |  |  |  |  |  |
| **4** | X |  |  |  |  | **69** |  |  |  |  |  |
| **5** | X |  |  |  |  | **70** |  |  |  |  |  |
| **6** | X |  |  |  |  | **71** |  |  |  |  |  |
| **7** | X |  |  |  |  | **72** |  |  |  |  |  |
| **8** | X |  |  |  |  | **73** |  |  |  |  |  |
| **9** | X |  |  |  |  | **74** |  |  |  |  |  |
| **10** | X |  |  |  |  | **75** |  |  |  |  |  |
| **11** | X |  |  |  |  | **76** |  |  |  |  |  |
| **12** | X |  |  |  |  | **77** |  |  |  |  |  |
| **13** | X |  |  |  |  | **78** |  |  |  |  |  |
| **14** | X |  |  |  |  | **79** |  |  |  |  |  |
| **15** | X |  |  |  |  | **80** |  |  |  |  |  |
| **16** | X |  |  |  |  | **81** |  |  |  |  |  |
| **17** | X |  |  |  |  | **82** |  |  |  |  |  |
| **18** | X |  |  |  |  | **83** |  |  |  |  |  |
| **19** | X |  |  |  |  | **84** |  |  |  |  |  |
| **20** | X |  |  |  |  | **85** |  |  |  |  |  |
| **21** | X |  |  |  |  | **86** |  |  |  |  |  |
| **22** | X |  |  |  |  | **87** |  |  |  |  |  |
| **23** | X |  |  |  |  | **88** |  |  |  |  |  |
| **24** | X |  |  |  |  | **89** |  |  |  |  |  |
| **25** | X |  |  |  |  | **90** |  |  |  |  |  |
| **26** | X |  |  |  |  | **91** |  |  |  |  |  |
| **27** | X |  |  |  |  | **92** |  |  |  |  |  |
| **28** | X |  |  |  |  | **93** |  |  |  |  |  |
| **29** | X |  |  |  |  | **94** |  |  |  |  |  |
| **30** | X |  |  |  |  | **95** |  |  |  |  |  |
| **31** | X |  |  |  |  | **96** |  |  |  |  |  |
| **32** | X |  |  |  |  | **97** |  |  |  |  |  |
| **33** | X |  |  |  |  | **98** |  |  |  |  |  |
| **34** | X |  |  |  |  | **99** |  |  |  |  |  |
| **35** | X |  |  |  |  | **100** |  |  |  |  |  |
| **36** | X |  |  |  |  | **101** |  |  |  |  |  |
| **37** | X |  |  |  |  | **102** |  |  |  |  |  |
| **38** | X |  |  |  |  | **103** |  |  |  |  |  |
| **39** | X |  |  |  |  | **104** |  |  |  |  |  |
| **40** | X |  |  |  |  | **105** |  |  |  |  |  |
| **41** | X |  |  |  |  | **106** |  |  |  |  |  |
| **42** | X |  |  |  |  | **107** |  |  |  |  |  |
| **43** | X |  |  |  |  | **108** |  |  |  |  |  |
| **44** | X |  |  |  |  | **109** |  |  |  |  |  |
| **45** | X |  |  |  |  | **110** |  |  |  |  |  |
| **46** | X |  |  |  |  | **111** |  |  |  |  |  |
| **47** | X |  |  |  |  | **112** |  |  |  |  |  |
| **48** | X |  |  |  |  | **113** |  |  |  |  |  |
| **49** | X |  |  |  |  | **114** |  |  |  |  |  |
| **50** | X |  |  |  |  | **115** |  |  |  |  |  |
| **51** | X |  |  |  |  | **116** |  |  |  |  |  |
| **52** |  |  |  |  |  | **117** |  |  |  |  |  |
| **53** |  |  |  |  |  | **118** |  |  |  |  |  |
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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.

**GENERAL DEFINITION**

The following terms shall be used in this document.

|  |  |
| --- | --- |
| CLIENT: | National Iranian South Oilfields Company (NISOC) |
| PROJECT: | Binak Oilfield Development – Supply Storage Tank |
| EPD/EPC CONTRACTOR (GC): | Petro Iran Development Company (PEDCO) |
| OWNER: | OWNER is collectively referring to National Iranian South Oil Company (NISOC) and Petro Iran Development Company (PEDCO) |
| EPC CONTRACTOR: | Joint Venture of: Hirgan Energy – Design & Inspection(D&I) Companies (HE/DI) |
| VENDOR: | iDrill Middle East (iDrill M.E) |
| EXECUTOR: | Executor is the party which carries out all or part of construction and/or commissioning for the project. |
| THIRD PARTY INSPECTOR (TPI): | Third Party Inspector |
| 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. **LIST OF WPS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | WPS No. | Mat. | BM Thk. (mm) | Process | Filler Metal | Impact | PWHT\* | PQR No. | Remark |
| 1 | W1-GT,SM-NHT-01 | P-No 1 | 6~10 | GTAW SMAW | ER 70S-3 | NO | NO | PQ-PV-220 |  |
| E 7018 |
| 2 | W1-SM-NHT-01 | P-No 1 | 6~10 | SMAW | E 7018 | NO\*\* | NO | PQ-PV-220 |  |
| 3 | W1-SM-NHT-02 | P-No 1 | 6~10 | SMAW | E 7018 | NO | NO | PQ-PV-220 |  |
| 4 | W1-SM-NHT-01 | P-No 1 | 6~10 | SMAW | E 7018 | NO | NO | PQ-PV-220 |  |
| 5 | W1-SM-NHT-01 | P-No 1 | 6~10 | SMAW | E 7018 | NO | NO | PQ-PV-220 |  |
| 6 | W1-SM-NHT-01 | P-No 1 | 6~10 | SMAW | E 7018 | NO | NO | PQ-PV-220 |  |
| 7 | W1-GM-NHT-01 | P-No 1 | 6~10 | SMAW | ER 70S-6 | NO | NO | ? |  |
| 8 | W1-GM-NHT-01 | P-No 1 | 6~10 | SMAW | ER 70S-6 | NO | NO | ? |  |

###### Notes:

\*According to clause 5.7.4 of API 650 (Thermal Stress Relief), Heat Treatment is required when the shell material is Group I, II, III, or IIIA, all openings NPS 12 or larger in nominal diameter in a shell plate, insert plate, or thickened insert plate more than 25 mm (1 in.), therefore, Heat Treatment is not required for any of Tanks in Project.

\*\*Based on Clause 9.2.2.3 Weld Metal of PQR which is used for Vertical Joint shall be subjected to impact test for Tanks with MDT less than 10°C. Impact test is required for Tank with MDT less than -7°C based on Clause 9.2.2.4which is not Applicable for this project.

1. **LIST OF PQR**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | PQR No. | Mat. | Thk. (mm) | Process | Filler Metal | Thk. (mm) | Impact | PWHT | Remark |
| 1 | PQ-PV-220 | P No. 1 | 8 | GTAW SMAW | ER 70S-3 | 3 | YES | NO |  |
| E 7018 | 5 |
| 2 | N | P No. 1 | ? | GMAW | ER 70S-6 | ? | YES | NO |  |

**Note: The PQR of GMAW will be provided and attached to this document later.**

**WPS**

1. **WPS NO: W1-GT, SM-NHT-01**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | | | | |
| WPS No: W1-GT,SM-NHT-01  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) GTAW+SMAW | Revision No : 00 Date: Nov. 2024 P 1/3  Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Single V Groove   SMAW  Backing Yes ■ (Weld Metal)  Part: Nozzle to Flange/ Pipe / Fitting | | GTAW  No ■ | | See Page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 2 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 105 to Spec. type and Gr.: SA 106 Gr. B, SA 283 -C, SA234 WPB  Thickness Range:  Test Coupon Thickness: 8mm , Qualification Range for GTAW: 3~6 / Qualification Range for SMAW: 5~10  Base Metal: Groove: 6 ~10 mm Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 6 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   GTAW SMAW  Spec. No. (SFA): 5.18 5.1  AWS No. (Class): ER70S-3 E7018 F-No.: 6 4  A-No.: 1 1  Size of Filler Metals(mm): 2.4 3.25, 4.0, 5.0 Weld Metal Thickness Range:  Groove: Up to 6 mm Up to 10 mm Fillet: -  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: All Welding Progression: ■ Uphill | Fillet: All  □ Downhill | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX**  WPS No: W1-GT,SM-NHT-01 Revision No : 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: Ar (GTAW) 99.99% (l/min)  Trailing: 10-20 | | | | | | |
| Other: None | | | | | | | Backing: | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: As below Polarity : As below | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : 2.4 mm, 2% Thoriated  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding GTAW 2. Welding SMAW | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : ■ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : GTAW ; I.D.:10 mm Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing ■ Grinding Travel Speed(Range) : As Below  Method of Back Gauging: □Arc Air Gaug. □ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : 10-20 mm Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| Root & Hot | GTAW | | | ER70S-3 | 2.4 | | DCEN | 100~120 | | 10~12 | 5~8 | | 10.8 |
| Fill | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Fill | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Fill | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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|  | |  |  | | |  | | |  | | |  | |
| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | |
| WPS No: W1-GT,SM-NHT-01  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : GTAW+SMAW | Revision No: 00 Date: Nov. 2024 P 3/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine |
|  | |

1. **WPS NO: W1-SM-NHT-01**

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| --- | --- | --- | --- | --- |
| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | | | | |
| WPS No: W1- SM-NHT-01  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No : 00 Date: Nov. 2024 P 1/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Single Bevel   SMAW  Backing Yes ■ (Weld Metal)  Part: Horizontal Weld of Shell Courses | |  | | See Page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C to Spec. type and SA 283 Gr.C  Thickness Range:  Test Coupon Thickness: 8mm , Qualification Range for GTAW: 3~6 / Qualification Range for SMAW: 5~10  Base Metal: Groove: 6 ~10 mm Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 5 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   SMAW  Spec. No. (SFA): 5.1  AWS No. (Class): E7018  F-No.: 4  A-No.: 1  Size of Filler Metals(mm): 3.25, 4.0  Weld Metal Thickness Range:  Groove: Up to 10 mm  Fillet: -  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: 2G Progression: □ Uphill | □ Downhill | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX**  WPS No: W1-SM-NHT-01 Revision No : 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: N/A  Trailing: N/A | | | | | | |
| Other: None | | | | | | | Backing: N/A | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC:DCEP Polarity : As below table | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : N/A  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding SMAW 2. Back Grinding 3. Back Weld | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : □ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : N/A Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing ■ Grinding Travel Speed(Range) : As Below Table  Method of Back Gauging: □Arc Air Gaug. ■ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : N/A Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| 1st Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Back Grinding | | | | | | | | | | | | | |
| 1st Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
|  | |  |  | | |  | | |  | | |  | |
|  | |  |  | | |  | | |  | | |  | |
| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | |
| WPS No: W1-SM-NHT-01  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No: 00 Date: Nov. 2024 P 3/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine |
|  | |

# WPS NO: W1-SM-NHT-02

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | | | | |
| WPS No: W1- SM-NHT-02  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No: 00 Date: Nov. 2024 P 1/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Single V Groove   SMAW  Backing Yes ■ (Weld Metal)  Part: Vertical Weld of Shell Courses | |  | | See Page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C to Spec. type and SA 283 Gr.C  Thickness Range:  Test Coupon Thickness: 8mm , Qualification Range for GTAW: 3~6 / Qualification Range for SMAW: 5~10  Base Metal: Groove: 6 ~10 mm Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 5 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   SMAW  Spec. No. (SFA): 5.1  AWS No. (Class): E7018  F-No.: 4  A-No.: 1  Size of Filler Metals(mm): 3.25, 4.0  Weld Metal Thickness Range:  Groove: Up to 10 mm  Fillet: -  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: 3G Progression: ■ Uphill | □ Downhill | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX**  WPS No: W1-SM-NHT-02 Revision No : 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: N/A  Trailing: N/A | | | | | | |
| Other: None | | | | | | | Backing: N/A | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC:DCEP Polarity : As below table | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : N/A  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding SMAW 2. Back Grinding 3. Back Weld | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : □ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : N/A Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing ■ Grinding Travel Speed(Range) : As Below Table  Method of Back Gauging: □Arc Air Gaug. ■ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : N/A Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| 1st Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Back Grinding | | | | | | | | | | | | | |
| 1st Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | |
| WPS No: W1-GT,SM-NHT-02  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) SMAW | Revision No : 00 Date: Nov. 2024 P 3/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine |
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# WPS NO: W1-SM-NHT-03

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX** | | | | |
| WPS No: W1-SM-NHT-03  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) :SMAW | Revision No : 00 Date: Nov. 2024 P 1/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Single V Groove   SMAW  Backing Yes ■ (Base Metal)  Part: Annular to Annular Plate | |  | | See Page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C to Spec. type and: SA 283 Gr.C  Thickness Range:  Test Coupon Thickness: 8mm, Qualification Range for GTAW: 3~6 / Qualification Range for SMAW: 5~10  Base Metal: Groove: 6 ~10 mm Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 6 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   SNAW  Spec. No. (SFA): 5.1  AWS No. (Class): E7018  F-No.: 4  A-No.: 1  Size of Filler Metals(mm): 3.25, 4.0  Weld Metal Thickness Range:  Groove: Up to 10 mm  Fillet: -  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: 1G Progression: □ Up | Fillet: All  □ Down | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API 650 & ASME IX**  WPS No: W1-SM-NHT-03 Revision No : 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: N/A  Trailing: N/A | | | | | | |
| Other: None | | | | | | | Backing: N/A | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: DCEP Polarity:As below table | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : N/A  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding SMAW | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : □ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : N/A Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing ■ Grinding Travel Speed(Range) : As Below Table  Method of Back Gauging: N/A □Arc Air Gaug. □ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : N/A Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| 1st Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| 2nd Root | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Filling | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | |
| WPS No: W1-SM-NHT-03  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No : 00 Date: Nov. 2024 P 3/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine |
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# WPS NO: W1-SM-NHT-04

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | | | |
| WPS No: W1-SM-NHT-04  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No : 00 Date: Nov. 2024 P 1/3    Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Groove   SMAW  Backing Yes ■ (Weld Metal)  Part: First Course to Annular Plate | |  | | See Page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C to Spec. type and SA 283 Gr.C  Thickness Range:  Test Coupon Thickness: 8mm  Base Metal: Groove: N/A Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 6 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   SMAW  Spec. No. (SFA): 5.1  AWS No. (Class): E7018  F-No.: 4  A-No.: 1  Size of Filler Metals(mm): 3.25, 4.0  Weld Metal Thickness Range:  Groove: N/A  Fillet: Unlimited  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: N/A Progression: □ Up | Fillet: 2F/3F  □ Down | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX**  WPS No: W1-SM-NHT-04 Revision No : 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: N/A  Trailing: N/A | | | | | | |
| Other: None | | | | | | | Backing: N/A | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: DCEP Polarity: As below table | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : N/A  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding SMAW | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : □ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : N/A Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing □ Grinding Travel Speed(Range) : As Below Table  Method of Back Gauging: N/A □Arc Air Gaug. □ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : N/A Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| Inside | | | | | | | | | | | | | |
| Initial Pass | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Outside | | | | | | | | | | | | | |
| Initial Pass | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Cap | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | |
| WPS No: W1-SM-NHT-04  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) SMAW | Revision No : 00 Date: Nov. 2024 P 3/3  Type: ■ Manual □ Semi-Auto □ Auto □ Machine |
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# WPS NO: W1-SM-NHT-05

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | | | |
| WPS No: W1-SM-NHT-05  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) : SMAW | Revision No : 00 Date: Nov. 2024 P 1/4    Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | |
| * JOINT(QW-402) Joint Design: Groove   SMAW  Backing Yes ■ (Weld Metal)  Part: All Fillet Parts Based on Sketches on Next Page | |  | | See Page 3/4 & 4/4 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C, A36 to Spec. type and SA 283 Gr.C, A36  Thickness Range:  Test Coupon Thickness: 8mm  Base Metal: Groove: N/A Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): 6 mm  Other: None | | | | |
| * FILLER METALS (QW-404)   SMAW  Spec. No. (SFA): 5.1  AWS No. (Class): E7018  F-No.: 4  A-No.: 1  Size of Filler Metals(mm): 3.25, 4.0  Weld Metal Thickness Range:  Groove: N/A  Fillet: Unlimited  Electrode-Flux (Class): -  ***Electrode Trade Name: Ama***  Flux Trade Name: - Consumable Insert: -  Other: Filler metal baking and holding according to manufacturer instruction on their bags. ***(Baking 300-350°C, Holding 100°C)*** | | | | |
| * POSITION (QW-405)   Position: Groove: N/A Progression: □ Up | Fillet: All  □ Down | | * PREHEAT (QW-406)   Preheat Temp. Min. (˚C): 10 for THK < 25 mm 80 for THK > 25mm  Inter-pass Temp. Max.(˚C): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX**  WPS No: W1-SM-NHT-05 Revision No : 00 Date: Nov. 2024 P 2/4 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407) | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate | | | | | | |
| Temperature Range (˚C): N/A | | | | | | | Shielding: N/A  Trailing: N/A | | | | | | |
| Other: None | | | | | | | Backing: N/A | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: DCEP Polarity: As below table | | | | | | | * WELDING SEQUENCES | | | | | | |
| Tungsten Electrode Size and Type : N/A  Mode of Metal Transfer for GMAW : - Electrode Wire feed speed range : - Pulsing Current : - | | | | | | | 1- Cleaning of weld edge 2- Fit up   1. Welding SMAW | | | | | | |
| Other: None | | | | | | |  | | | | | | |
| * TECHNIQUE (QW-410)   String or Weave Bead : □ Stringer ■ Weave Multiple or Single Pass (Per Side) : ■ Multi. □ Single Orifice or Gas Cup Size : N/A Multiple or Single Electrodes : □ Multi. ■Single Initial and Inter-pass Cleaning: ■ Brushing □ Grinding Travel Speed(Range) : As Below Table  Method of Back Gauging: N/A □Arc Air Gaug. □ Grinding Peening : □ Yes ■ No Oscillation : -  Contact Tube to Work Distance : N/A Other : None | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity type | Ampere range | | Volt range | Travel speed range (cm/min) | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | |
| Initial Pass | SMAW | | | E 7018 | 3.25 | | DCEP | 100~120 | | 25~28 | 10~15 | | 20.1 |
| 2~n | SMAW | | | E 7018 | 4.0 | | DCEP | 140~160 | | 25~28 | 10~15 | | 22.4 |
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| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | |
| WPS No: W1-SM-NHT-05  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) SMAW | Revision No : 00 Date: Nov. 2024 P 3/4  Type: ■ Manual □ Semi-Auto □ Auto □ Machine | |
|  | |  |
| Bottom Plate to Annular Plate | | Bottom Plate to Bottom Plate |
|  | |  |
| Top Angle to Shell | | Manhole Neck to Roof Plate |
|  | |  |
| Nozzle Neck of Manhole to Bolting Flange | | Back strip to Annular |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | |
| WPS No: W1-SM-NHT-05  Supporting PQR No.(s): PQ-PV-220  Welding Process(es) SMAW | Revision No : 00 Date: Nov. 2024 P 4/4  Type: ■ Manual □ Semi-Auto □ Auto □ Machine | |
|  | |  |
| Anchor Chair | | Anchor chair: Pad to bottom |
|  | |  |
| Manhole Pad to Roof | | Joint of Three Roof Plate |
|  | |  |
| Wind Girder to Shell | | Neck and Pad of Nozzle to Shell |

## WPS No: W1-GM-NHT-01

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | | | |
| WPS No: W1-GM-NHT-01  Supporting PQR No.(s): ?  Welding Process(es) GMAW | | Revision No : 00 Date: Nov. 2024 P 1/3    Type: □ Manual ■Semi-Auto □ Auto □ Machine | | |
| * JOINT(QW-402) Joint Design: Groove   GMAW  Backing Yes ■ (Weld Metal) No □  Part: Structure | | | | See page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C, A36, SA516 Gr.60 or Eq to Spec. type and Gr.: SA 283 Gr.C, A36, SA516 Gr.60 or Eq  Thickness Range:  Test Coupon Thickness: ?  Base Metal: Groove: ? Fillet: N/A  Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): ?  Other: None | | | | |
| * FILLER METALS (QW-404) |  | | | |
|  | GMAW | | | |
| Spec. No. (SFA) : | 5.18 | | | |
| AWS No. (Class) : | ER70S-6 | | | |
| F-No. : | 6 | | | |
| A-No. : | 1 | | | |
| Size of Filler Metals(mm) : | 1.2 | | | |
| Weld Metal Thickness Range : |  | | | |
| Groove : | ? | | | |
| Fillet : - |  | | | |
| Electrode-Flux(Class) : -  ***Electrode Trade Name : Ama*** |  | | | |
| Flux Trade Name : - |  | | | |
| Consumable Insert : - |  | | | |
| Other: |  | | | |
| * POSITION (QW-405) Position: Groove: All   Welding Progression : ■ Up | Fillet:N/A  □ Down | | * PREHEAT (QW-406) Preheat Temp. Min. (ºC): N/A   Inter-pass Temp. Max.(ºC): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code AWS D.1.1 & ASME IX**  WPS No: W1-GM-NHT-01 Revision No: 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407)   Temperature Range (ºC): N/A Time Range:  Other: None | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate (l/min) Shielding: CO2+Ar 80-20% 10-12  Trailing: Backing: | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: As below Polarity : As below Tungsten Electrode Size and Type : N/A   Mode of Metal Transfer for GMAW : Globular Electrode Wire feed speed range : -  Pulsing Current : - Other: None | | | | | | | * WELDING SEQUENCES   1- Cleaning of weld edge 2- Fit up  3- Back Grinding  3- Welding GMAW | | | | | | |
| * TECHNIQUE (QW-410) Multiple or Single Pass (Per Side) : ■ Multi. □ Single String or Weave Bead : □ Stringer ■ Weave Multiple or Single Electrodes : □ Multi. ■ Single Orifice or Gas Cup Size : GTAW ; I.D.:25 mm Travel Speed(Range) : As Below   Initial and Inter-pass Cleaning : □ Brushing ■Grinding Peening : □ Yes ■ No  Method of Back Gauging: □Arc Air Gaug. □Grinding  Oscillation : - Other : None  Contact Tube to Work Distance : 10-20 mm | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity | | | Volt range | Travel speed range | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | | type | Ampere  range | |
| Root | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Fill | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Cap | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Back Grinding | | | | | | | | | | | | | |
| Root | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Fill | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Cap | GMAW | | | ER70S-6 | 1.2 | | DCEP | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | **Reviewed By Project Manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | | |
| WPS No: W1-GM-NHT-01  Supporting PQR No.(s): ?  Welding Process(es) GMAW | Revision No : 00 Date: Nov. 2024 P 3/3  Type: □ Manual ■ Semi-Auto □ Auto □ Machine | |
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## WPS No: W1-GM-NHT-02

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| **WELDING PROCEDURE SPECIFICATION(WPS)**  **Applicable Code API650 & ASME IX** | | | | |
| WPS No: W1-GM-NHT-02  Supporting PQR No.(s): ?  Welding Process(es) GMAW | | Revision No : 00 Date: Nov. 2024 P 1/3    Type: □ Manual ■Semi-Auto □ Auto □ Machine | | |
| * JOINT(QW-402)   Joint Design: Fillet  GMAW  Backing Yes ■ (Base Metal) No □  Part: Structure Part | | | | See page 3/3 |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 1 OR  Spec. type and Gr.: SA 283 Gr.C, A36, SA516 Gr.60 or Eq to Spec. type and Gr.: SA 283 Gr.C, A36, SA516 Gr.60 or Eq  Thickness Range:  Test Coupon Thickness: ?  Base Metal: Groove: N/A Fillet: Unlimited Pipe Dia. Range: Unlimited  Maximum thickness per Pass (mm): ?  Other: None | | | | |
| * FILLER METALS (QW-404) |  | | | |
|  | GMAW | | | |
| Spec. No. (SFA) : | 5.18 | | | |
| AWS No. (Class) : | ER70S-6 | | | |
| F-No. : | 6 | | | |
| A-No. : | 1 | | | |
| Size of Filler Metals(mm) : | 1.2 | | | |
| Weld Metal Thickness Range : |  | | | |
| Groove : | ? | | | |
| Fillet : - |  | | | |
| Electrode-Flux(Class) : -  ***Electrode Trade Name : Ama*** |  | | | |
| Flux Trade Name : - |  | | | |
| Consumable Insert : - |  | | | |
| Other: |  | | | |
| * POSITION (QW-405) Position: Groove: N/A   Welding Progression : ■ Up | Fillet: All  □ Down | | * PREHEAT (QW-406) Preheat Temp. Min. (ºC): N/A   Inter-pass Temp. Max.(ºC): 250 Preheat Maintenance: None | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code AWS D.1.1 & ASME IX**  WPS No: W1-GM-NHT-02 Revision No: 00 Date: Nov. 2024 P 2/3 | | | | | | | | | | | | | | |
| * POST WELD HEAT TREATMENT (QW-407)   Temperature Range (ºC): N/A Time Range:  Other: None | | | | | | | | * GAS (QW-408)   Gas (es) Mixture Flow Rate (l/min) Shielding: CO2+Ar 80-20% 10-12  Trailing: Backing: | | | | | | |
| * ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC: As below Polarity : As below Tungsten Electrode Size and Type : N/A   Mode of Metal Transfer for GMAW : Globular Electrode Wire feed speed range : -  Pulsing Current : - Other: None | | | | | | | | * WELDING SEQUENCES   1- Cleaning of weld edge 2- Fit up  3- Welding GMAW | | | | | | |
| * TECHNIQUE (QW-410) Multiple or Single Pass (Per Side) : ■ Multi. □ Single String or Weave Bead : □ Stringer ■ Weave Multiple or Single Electrodes : □ Multi. ■ Single Orifice or Gas Cup Size : GTAW ; I.D.:25 mm Travel Speed(Range) : As Below   Initial and Inter-pass Cleaning : □ Brushing ■Grinding Peening : □ Yes ■ No  Method of Back Gauging: □Arc Air Gaug. □Grinding  Oscillation : - Other : None  Contact Tube to Work Distance : 10-20 mm | | | | | | | | | | | | | | |
| Layer No | Process | | | Filler metal | | | Current/Polarity | | | | Volt range | Travel speed range | | Max.Heat Input (KJ/cm) |
| AWS  Classification | size | | type | | Ampere  range | |
| Root | GMAW | | | ER70S-6 | 1.2 | | DCEP | | 185~210 | | 22~28 | 18~25 | | 19.6 |
| Fill | GMAW | | | ER70S-6 | 1.2 | | DCEP | | 185~210 | | 22~28 | 18~25 | | 19.6 |
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| Notes: 1. Any P-No. 1 Gr. No. 1,2 Material in QW-422 of ASME Sec. IX  2. This WPS shall be used where impact test is not required by applicable code | | | | | | | | | | | | | | |
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| 00 | | Nov.2024 | S.Hajati | | | M.Shahbazi Zadeh | | | | S. Ghobeiti | | |  | |
| **Revision** | | **Date** | **Prepared** | | | **Approved by QC Manager** | | | | **Reviewed By Project Manager** | | | **Reviewed By Purchaser Inspector** | |

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| **WELDING PROCEDURE SPECIFICATION (WPS)**  **Applicable Code API650 & ASME IX** | |
| WPS No: W1-SM-NHT-02  Supporting PQR No.(s): ?  Welding Process(es) GMAW | Revision No : 00 Date: Nov. 2024 P 3/3  Type: □ Manual ■ Semi-Auto □ Auto □ Machine |
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**PQR**

## 12.PQR No.: PQ-PV-220

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| **PROCEDURE QUALIFICATION RECORD (PQR)**  **Applicable Code ASME IX** | | | | | | | | | |
| PQR No: PQR-PV-220 Revision No : 00 Date: July.2016 Page 1/2 Welding Process(es): GTAW+ SMAW Type: ■ Manual □ Semi-Auto □ Auto □ Machine | | | | | | | | | |
| * JOINT(QW-402) | Layer No. | Process | Electrode | Size  Φ  mm | | Amp s A | | Volts V | travel speed cm/min |
| 1 | GTAW | ER70S-6 | 2.4 | | 100~120 | | 12 | 5~8 |
| 2 | SMAW | E7018 | 3.25 | | 100~120 | | 25~28 | 10~15 |
| 3~5 | SMAW | E7018 | 4.0 | | 140~160 | | 25~28 | 10~15 |
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| Heat Inputs: GTAW( Φ 2.4):17.2, SMAW (Φ 3.2): 21, SMAW (Φ 4.0): 26.8 KJ/cm | | | | | | | | |
| * BASE METALS (QW-403)   P-No.1 Gr. No. 1 to P-No. 1 Gr. No. 2  Material Spec. SA 516 Gr. 60  to Material Spec. SA 516 Gr. 70 Thickness: 8 mm  Diameter N/A | * POSTWELD HEAT TREATMENT(QW-407) Temperature: N/A   Time: N/A Others: | | | | | | | | |
| * GAS(QW-408) | | | | | | | | |
| Deposited weld Metal THK: 3 mm (GTAW)  5 mm (SMAW)  Maximum thickness per Pass (mm): 5 mm | Shielding: Trailing: Backing: | | Gas (es) Ar | | Mixture 99.98% | | Flow Rate (l/min) 12 | | |
| * FILLER METALS (QW-404) | * ELECTRICAL CHARACTERISTIC(QW-409) | | | | | | | | |
| F No. 6, A No. 1, SFA No. 5.18 GTAW F No. 4, A No. 1, SFA No. 5.1 SMAW  AWS Classification: ER70S-6 GTAW  E7018 SMAW | Current: DC (GTAW) DC (SMAW) Polarity: EN (GTAW) EP (SMAW)  Tungesten Electrode Type: AWS A5.12 Class EWTh-2 Tungesten Electrode Size: Φ 2.4 mm  GMAW/FCAW Mode of metal transfer: N/A | | | | | | | | |
| Size of electrode: | * TECHNIQUE(QW-410) | | | | |  |  |  | |
| Φ 2.4(GTAW), Φ 3.25,4.0(SMAW)  Others: Brand Name (AMA)  Other: Filler metal baking Time and Temperature ***(300-350C, 2Hr)*** | String or Weave Bead: Oscillation:  Multipass OR Single Pass (per side): Tube work Distance:  Orifice, Cup or Nozzle size:  Peening:  Single or Multipass Electrode: Others: | | | | |  |  | Both N/A Multipass 10 mm  Φ 10 GTAW  None Single N/A | |
| * POSITION (QW-405) Position 1G   Welding Progression: N/A  Others: N/A |
| * PREHEAT (QW-406) Pre-Heat Temp.: 25 ºC Interpass Temp. 250 ºC Other: |

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| **PROCEDURE QUALIFICATION RECORD (PQR)**  **Applicable Code ASME IX**  PQR No: PQR-PV-220 Revision No: 00 Date: July.2016 Page 2/2 | | | | | | | | | | | | | | | | | |
| * Tensile test (QW-150) | | | | | | | | | | | | | | | | | |
| Specimen Number | | | Dimension | | | | Area mm2 | | Yield Stress (Mpa) | | Ultimate stress (Mpa) | | | Type of fracture | | Remark | |
| Width | | Thickness | |
| T-1 | | | 18.78 | | 9.0 | | - | | 378 | | 545 | | | W.M | |  | |
| T-2 | | | 18.97 | | 9.0 | | - | | 388 | | 535 | | | W.M | |  | |
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| * Guide bend test (QW-160) | | | | | | | | | | | | | | | | | |
| Specimen No. | | | | | | Type of Test | | | | | | Result | | | | | |
| ROOT BEND I | | | | | | ROOT BEND | | | | | | ACCEPT | | | | | |
| ROOT BEND II | | | | | | ROOT BEND | | | | | | ACCEPT | | | | | |
| FACE BEND III | | | | | | FACE BEND | | | | | | ACCEPT | | | | | |
| FACE BEND IV | | | | | | FACE BEND | | | | | | ACCEPT | | | | | |
|  | | | | | | | | | | | | | | | | | |
| * Toughness test ( QW-170) | | | | | | | | | | | | | | | | | |
| Specimen No | | Notch Location | | | | Test Temperature ˚C | | | Impact Value (J) | | | Lateral Expansion | | | | | |
| Mils | | | %Shear | | |
| IMP-1 | | WELD(Cap) | | | | -29 | | | 68,35,78 | | |  | | |  | | |
| IMP-2 | | F.L(Gr.70) | | | | -29 | | | 72,97,71 | | |  | | |  | | |
| IMP-3 | | F.L(Gr.60) | | | | -29 | | | 98,93,75 | | |  | | |  | | |
| IMP-3 | | F.L +5(Gr.70) | | | | -29 | | | 61,50,86 | | |  | | |  | | |
| IMP-4 | | F.L +5 (Gr.60) | | | | -29 | | | 55,57,55 | | |  | | |  | | |
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| * Chemical Analysis Report Number: | | | | | | | | | | | | | | | | | |
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| * NONDESTRUCTIVE (RT, UT, ...): Number: | | | | | | | | | | | | | | | | | |
| ELDER'S STAMP NO.: LABORATORY TEST NO.: 4-4878  VISUAL INSPECTION: GOOD UNDERCUT: NONE PROSITY: NONE OTHER: Hardness, Micro& Macro Graphy  WE CERTIFY THAT STATEMENTS IN THIS RECORD ARE CORRECT AND THAT THE TEST WELDS WERE PREPARED, WELDED AND TESTED IIN ACCORDANCE WITH THE REQUIREMENTS OF Sec. IX OF ASME CODE | | | | | | | | | | | | | | | | | |
| S.Hajati | | | |  | | | | |  | | | |  | | | | |
| Prepared By | | | | Reviewed By | | | | | Certified By | | | | Reviewed By | | | | |

































