COMPANY NAME	**QW-482 Welding Procedure Specification (WPS)** QW-482 Especificación del Procedimiento de Soldadura (WPS) **By:** (Por) 1

WPS No. 2 **Date** Fecha 3 **Rev.** 4 **Date** Fecha 5

Supporting PQR No.(s) Soporte PQR No. (s) 6 **Date** Fecha 7

Welding Process(es) Proceso(s) de Soldadura 8 **Type (s)** Tipo (s) 9

JOINTS (QW-402) JUNTAS

Joint Design Diseño de Juntas 10

Root Spacing Abertura de raíz 11

Backing (Respaldo) ☐ **Yes** (Si) ☐ **No** 12

Retainers (Retenedores) ☐ **Yes** (Si) ☐ **No** 13

Backing Material (Type) Material de Respaldo (Tipo) 14

Metal (Metálico) ☐
Non-Fusing Metal (Metal no fundible) ☐
Non-Metallic (No metálico) ☐
Other (Otro)
} 15

Details Detalles

16

BASE METALS (QW-403) METAL BASE

P-No. No. P 17 **Group No.** No. Grupo 18 **To** a **P-No.** No. P 19 **Group No.** No. Grupo 20

OR / *O*

Specification and type/grade Especificación y tipo/grado 21 **To** a **Specification and type/grade** Especificación y tipo/grado 22

OR / *O*

Chem. Analysis and Mech. Prop. Análisis Químico y Prop. Mecánicas 23 **To a** **Chem. Analysis and Mech. Prop.** Análisis Químico y Prop. Mecánicas 24

Base Metal Thickness Range : Rango de Espesor del Metal Base

Groove Ranura 25 **Fillet** Filete 26

Maximum Pass Thickness ≤ ½" Espesor máximo del paso de soldadura ≤ ½" ☐ **Yes** (Si) ☐ **No** 27

Other (Otro) 28

FILLER METALS QW-404 METAL DE APORTE	1	2
Spec. No. (SFA) [No. de Especificación (SFA)]	29	
AWS No. (Class) (Clasificación AWS No.)	30	
F-No. (No. F)	31	
A-No. (No. A)	32	
Size of Filler Metals (Tamaño del metal de aporte)	33	
Filler Metal Product Form (Forma del producto del metal de aporte)	34	
Supplemental Filler Metal (Metal de aporte suplementario)	35	
Weld Metal Thickness Range: (Rango de esp. del metal de soldadura) **Groove** (Ranura)	36	
Fillet (Filete)	37	
Consumable Insert (Inserto consumible)	38	
Alloy Flux (aleación del Fundente)	39	
Alloy elements (Elementos aleantes)	40	
Flux Type (Tipo de fundente)	41	
Electrode - Flux (class) (Clasificación Electrodo – fundente)	42	
Flux trade name (Nombre commercial del fundente)	43	
Recrushed slag (Fundente reciclado)	44	
Filler (Metal de Aporte)	45	
Other (Otro)	46	

COMPANY NAME | **WPS No. : 2** | **Rev** 4

POSITIONS QW-405 POSICIONES

Position(s) of Groove 47
Posición (es) en Ranura

Welding Progression: ☐ **Up** 48 ☐ **Down** 49
Progresión de la soldadura — Ascendente — Descendente

Position(s) of Fillet 50
Posición (es) en Filete

Other: (Otro) 51

PWHT QW-407 TRATAMIENTO TERMICO

Temperature Range 52
Rango de Temperatura

Time Range 53
Rango de Tiempo

Other: 54
Otro:

PREHEAT QW-406 PRECALENTAMIENTO

Preheat Temperature, Minimum 55
Temp. minima de Precalentamiento

Interpass Temperature, Maximum 56
Temperatura maxima entre pasos

Preheat Maintenance 57
Mantenimiento de Precalentamiento

Other 58
Otro

GAS QW-408

Percent Composition (Porcentaje de Composición)

	Gas(s) Gas (es)	**Mixture** Mezcla	**Flow Rate** Rango de Flujo
Shielding Protección	59	60	61
Trailing Arrastre	62	63	64
Backing Respaldo	65	66	67

ELECTRICAL CHARACTERISTICS QW-409 CARACTERISTICAS ELECTRICAS

Weld Pass(es) Pasos de Soldadura	**Process** Proceso	**Filler Metal** Metal de Aporte: **Classification** Clasificación	**Filler Metal**: **Diameter** Diámetro	**Current** Corriente: **Type and Polarity** Tipo y Polaridad	**Amps (Range)** Amperaje (Rango)	**Wire Feed Speed (Range)** Velocidad de Alimentación (Rango)	**Energy or Power (Range)** Energía o Poder (Rango)	**Volts (Range)** Voltaje (Rango)	**Travel Speed (Range)** Velocidad de Avance (Rango)	**Other** Otro
68	69	70	71	72	73	74	75	76	77	78

Pulsing Current 79
Corriente Pulsada

Heat Input (max.) 80
Entrada de calor (max.)

Tungsten Electrode Size and Type 81
Electrodo de Tungsteno tamaño y tipo
(Pure Tungsten, 2% Thoriated, etc.)

Mode of Metal Transfer for GMAW (FCAW) 82
Modo de transferencia para GMAW (FCAW)
(Spray Arc, Short Circuiting Arc, etc.)

Other (Otro) 83

TECHNIQUE QW-410

84 ☐ **String Bead** (Cordon Recto)
85 ☐ **Weave Bead** (Cordon Oscilado)
86 ☐ **Single Electrode** (Electrodo único)
87 ☐ **Multiple Electrode** (Electrodo Multiple)
88 ☐ **Single Pass Per Side** (Paso sencillo por lado)
89 ☐ **Multiple Pass Per Side** (Paso múltiple por lado)

Initial Cleaning (Limpieza inicial) 90

Interpass Cleaning (Limpieza entre pasos) 91

Orifice or Gas Cup Size (Orificio o tamaño de la boquilla de gas) 92

Method of Back Gouging (Método de limpieza posterior) 93

Oscillation (Oscilación) 94

Contact Tube to Work Distance (Distancia de la boquilla de contacto a la pieza) 95

Electrode Spacing (Espacio entre electrodos) 96

Closed to out chamber (Cámara cerrada) 97

Thermal processes (procesos térmicos) 98

99 ☐ **Peening Permitted** (Martillado permitido)
100 ☐ **Peening Not Permitted** (Martillado no permitido)

Other (Otro) 101

Instructions for Completion of Welding Procedure Specification
Form QW-482

The paragraph numbers correspond to the numbers on the lines on Form QW-482. These instructions are applicable to SMAW, GTAW, PAW, SAW and/or GMAW (including FCAW). *Sentences in Italics are the references to the applicable paragraphs in Section IX that address the item.*

1. The company representative responsible for approving the WPS, and all revisions to the WPS. Name and title.
2. Unique number assigned for each WPS.
3. Date WPS was prepared or approved.
4. WPS Revision number.
5. Date WPS was revised (If applicable).
6. Supporting PQR or PQR's [unique PQR number(s)]
7. Date PQR qualified.
8. Welding process (i.e. GMAW, SMAW, etc.).
9. Type of process (i.e. Automatic, Semiautomatic, Manual or Machine).
10. Types of joints that "may be used" with this WPS (e.g. groove and fillet weld joint.)
11. Enter the range of root opening, if used. (e.g. 0 – 3/16" or enter "See Fabrications Drawings").
12. Mark the appropriate box, if WPS was qualified for use with or without backing or both.
13. Mark the appropriate box, if WPS was qualified for use with or without retainers or both.
14. List type of backing or retainers of the WPS was qualified for use with (e.g. steel, metal, cooper, nitrogen, flux, weld metal, etc.).
15. Mark the appropriate box for the material of backing used.
16. The WPS shall show a sketch of the general joint configuration acceptable for use with this WPS or the WPS may reference the production drawings or a weld symbol (e.g. "See Fabrications Drawings).

17-19. Enter the combinations of P-Numbers of the material covered by this WPS. *See QW-403.11*. Base metals are assigned P-Number in table QW / QB-422. (i.e. P1 to P1 or P1 to P8).

18-20. Enter the combinations of Group No.'s covered by this WPS (when required supplementary essential variable) *See QW-403.5*. When a nonessential variable apply may be enter "ALL".

21-22. If either material does not appear in table QW/QB-422, are considered to be unassigned metals. S*ee QW-424 and QW-403.11*. If there is no way to assign the base metal P-Number under the provisions of these paragraphs, write down the specification, type and grade of the material covered by this WPS. (e.g. SA-516-70 to SA-516-70 or SA-516-70 to SA-240-304). If P-Number was entered in # 17 & 19, this space must be blank or enter "None" or a line cross the space.

23-24. In lieu of 21-22 the WPS may list the chemical analysis and mechanical properties of the unassigned metals used by this WPS. *See QW-424 and QW-403.11*. If specification, type and grade of the material were entered, this space must be blank or enter "None" or a line cross the space.

25. Thickness range of base metal covered for this WPS for use in groove welds (e.g. 1/16" to 3/4"). *See QW-451, QW-403.6, QW-403.8, QW-407.4, QW-403.9 and QW-403.10.*
26. Thickness range of base metal covered for this WPS for use in fillet welds. *See QW-200(c) & QW-451.4 Qualified all fillets sizes on all base metal thicknesses and all diameters.[*e.g. enter Fillet: "All", if fillet weld joint is enter in space 10, or "None", if fillet weld joint is not enter in space 10.
27. Mark the appropriate box if the WPS was qualified or not for use Maximum Pass Thickness ≤1/2". *See QW-403.9. For single pass or multipass welding in which any pass is greater than ½ in thick, an increase in base metal thickness beyond 1.1 times that of the qualification test coupon.*
28. Other: (i.e. "None", remarks, etc.).

29. Enter the specification (e.g. SFA-5.4) of the electrode or filler metal for use with this WPS. See Section II Part C of ASME Code. If the weld was made using GTAW or PAW without the addition of filler metal or the filler metal is not whiting an SFA specification, enter "None".

30. Enter the classification (e.g. E309-16) of the electrode or filler metal whiting an SFA specification for use with this WPS. For classification of the electrode or filler metal see Section II, Part C. *See QW-404.33 and QW-404.12*. If the weld was made using GTAW or PAW without the addition of filler metal, enter “None”. *See QW-404.14.* If the filler metal classification is not whiting an SFA specification, enter the manufacturer’s trade name (change in the filler metal manufacturer’s trade name require WPS requalification).
31. Enter the F-Number of the filler metal. See QW-432 of Section IX. The F-Number depends on the welding process and electrode or filler metal that was used. *See QW-404.4 which leads to QW-432*. If the weld was made using GTAW or PAW without the addition of filler metal or the F-Number cannot be assigned, enter “None”. *See QW-404.14*.
32. Enter the A-Number of the weld metal chemical composition. *See QW-442*. The A-Number depends of the welding processes from the chemical analysis of the weld deposit that was used. *See QW-404.5.* If the A-Number cannot be assigned, enter the chemical analysis of the weld deposit.
33. Enter the sizes of filler metal (electrode, rod, etc.) that may be used with this WPS (i.e. 1/8”, 3/32, 5/32”, etc.). *See QW-404.3, QW-404.6 and QW-404.7.*
34. For GTAW, GMAW or PAW, record whether solid, metal cored, powder or flux cored wire for use with this WPS. Leave blank or enter “NA” if the welding process is not GTAW, GMAW or PAW. *See QW-404.23*.
35. Enter the supplemental filler metal if used with this WPS. If not used, enter “None”. *See QW-404.24.* If is not SAW or GMAW processes leave in blank or enter “NA”.
36. Enter the weld metal thickness range qualified in groove for this WPS. That is, if more than one process or variation on a process is used (e.g. E6010 root / E7018 balance, downhill root/ uphill fill, etc.), enter a separate deposit thickness for each variation, welding process, each F-Number and for each set of essential variables. *See QW-451*, *QW-404.30 and QW-404.32.*
37. Enter the weld metal thickness range qualified in fillet for this WPS (i.e. Fillet: All). *See QW-451.4 qualified all fillets sizes on all base metal thicknesses and all diameters.*
38. Enter the consumable insert, if used with this WPS in the root pass; if an insert was not used, enter “Not allow”. Leave blank or enter “NA” if the process is not GTAW or PAW. *See QW-404.22*.
39. Enter the alloy flux if used with this WPS. If an alloy flux was not used, enter “Not allow”. Leave in blank or enter “NA” if the process is not SAW. *See QW-404.10.*
40. Enter the alloy elements if used with this WPS. If an alloy element was not used, enter “Not allow”. Leave in blank or enter “NA” if the process is not SAW, GMAW or PAW. *See QW-404.27.*
41. Enter the flux type if used with this WPS (i.e. neutral, active, etc.). Leave in blank or enter “NA” if the process is not SAW. *See QW-404.34.*
42. Enter the electrode - flux (class) if used with this WPS (i.e. F7A2-EM12K) See Section II, Part C. Leave in blank or enter “NA” if the process is not SAW. *See QW-404.9 and QW-404.35.*
43. Enter the flux trade name (designation) if used with this WPS (i.e. Lincoln 780); if the flux is not classified in an SFA specification, change in the flux trade name required WPS requalification. Leave in blank or enter “NA” if the process is not SAW. *See QW-404.29.*
44. Enter the flux from recrushed slag if used with this WPS. If a flux from recrushed slag was not used, enter “None”. Leave in blank or enter “NA” if the process is not SAW. *See QW-404.36.*
45. Enter if the weld was made using GTAW or PAW with the addition of filler metal, enter “Yes”. If the weld was made using GTAW or PAW without the addition of filler metal, enter “None”. Leave in blank or enter “NA” if the process is not GTAW or PAW. *See QW-404.14.*
46. Other: Enter if added flux to the face of a weld joint for the purpose of affecting weld penetration is used with this WPS. *See QW-404.50*. If a flux was not used, enter “No flux added”. Leave blank if the process is not GTAW.
47. Enter the position of groove covered by this WPS (i.e. 1G, 3G, “All”, etc.). *See QW-405.1 and QW-405.2. See QW-120, for definitions of testing positions and QW-203 unless specifically required otherwise by the welding variables (QW-250), a qualification in any position qualifies the procedure for all positions.QW-120 lead to QW-461.3 though QW-461.4 sketches.*

48-49. Mark the box if the progression “Uphill or Downhill” use with this WPS. If was welded in the 3G, 5G, 6G, 3F or 5F positions. Enter nothing if welding was done in any other position. *See QW-405.2 and QW-405.3. If this is not a supplementary essential variable may be mark both box if is permitted by the process.*

50. Enter the position of fillet covered by this WPS (i.e. 1F, 2F, All, etc.). *See QW-405.1 and QW-405.2. See QW-130, for definitions of testing positions and QW-203 unless specifically required otherwise by the welding variables (QW-250), a qualification in any position qualifies the procedure for all positions.QW-130 lead to QW-461.5 though QW-461.6 sketches.*
51. Other: (i.e. “None”, remarks, etc.).
52. Enter the temperature range if PWHT is performed with this WPS. If not PWHT performed, enter “None”. *See QW-407.1 and QW-407.2.*
53. Enter the time range if PWHT is performed with this WPS. If not PWHT performed, enter “None”.
54. Other: Enter maximum qualified base metal thickness T when PWHT performed above the upper transformation temperature. If not PWHT performed above the upper transformation temperature or with P-No. 7, P-No. 8 and P-No. 45, enter “None.”
55. Enter the minimum preheat temperature for welding covered by this WPS. *(See QW-406.1).*
56. Enter the maximum allowed interpass temperature for welding covered by this WPS. *(See QW-406.3)*.
57. Enter the range if preheat maintenance for welding is performed with this WPS. If not preheat maintenance performed, enter “None”. *(See QW-406.2)*.
58. Other: Additional information if is required noted in this paragraph (i.e. 2” from each edge of joint must be preheated) or “None”.
59. Enter the single shielding gas type used with this WPS (i.e. CO2, Ar, etc.). Enter “None” if no shielding gas was single used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.2.*
60. Enter the mixture shielding gas (i.e. 75% Ar – 25 % CO2). Enter “None” if not mixture shielding gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.2*.
61. Enter the shielding gas flow rate range (i.e. 25 a 35 CFH). Enter “None” if no shielding gas was used (single or mixture). Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.3*.
62. Enter the single trailing gas type used with this WPS (i.e. CO2, Ar, etc.). Enter “None” if not single trailing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.1 and QW-408.10.*
63. Enter the mixture trailing gas (i.e. 75% Ar – 25 % CO2). Enter “None” if no mixture trailing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.1 and 408.10.*
64. Enter the trailing gas flow rate range (i.e. 25 a 35 CFH). Enter “None” if no trailing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.10*.
65. Enter the single backing gas type used with this WPS (i.e. Ar, etc.). Enter “None” if no single backing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.5 and QW-408.9.*
66. Enter the mixture backing gas (i.e. 75% Ar – 25 % CO2). Enter “None” if no mixture backing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.5 and QW-408.9.*
67. Enter the backing gas flow rate range (i.e. 25 a 35 CFH). Enter “None” if no backing gas was used. Leave blank (or enter “NA”) if the process is not GMAW, FCAW, GTAW or PAW. *See QW-408.5*.
68. Enter the number or identification per every weld pass to describe the welding performed by this WPS (i.e. **1**, **2** or **any** or **root**, **fil**l, etc.).
69. Enter the welding process to be used for the corresponding weld pass (i.e. GTAW for weld pass 1 or root, FCAW for weld pass 2 or fill, etc.)
70. Enter the filler metal classification to be used for the corresponding weld pass (i.e. **ER70S-3** for weld pass 1 and **E71T-1** for weld pass 2).
71. Enter the filler metal diameter to be used for the corresponding weld pass (i.e. 1**/8**” for weld pass 1 and **1/16”Ø** for weld pass 2)
72. Enter the type of current and polarity to be used for the corresponding weld pass (i.e. **DC - EN** for weld pass 1 and **DC- EP** for weld pass 2). *See QW-409.4 and Section II, Part C (describe recommended current and polarity used with electrode or rod).*

73. Enter the amperage range to be used for the corresponding weld pass (i.e. **130 to 275** for weld pass 1 and **180 to 240 amps** for weld pass 2). *See QW-409.8, QW-409.1 and Section II, Part C (for recommended amperage range use with electrode or rod) or Manufacturer's electrode recommendations.*
74. Enter Wire Feed Speed range if is listed in lieu of amperage or leave in blank. *See QW-409.8.*
75. Enter Energy or Power range when used waveform controlled welding. *See QW-409.1.*
76. Enter the voltage range to be used for the corresponding weld pass if the process used were other than SMAW and GTAW or waveform controlled welding (i.e. **N/A** for weld pass 1 and **20 to 28 volts** for weld pass 2). *See QW-409.8 and Section II, Part C (recommended voltage range use with electrode or rod) or Manufacturer's recommendations.* When supplementary welding variable apply for all process, inclusive SMAW & GTAW shall be enter the voltage range. *See QW-409.1.*
77. Enter the travel speed range to be used for the corresponding weld pass (i.e. **2 to 4 in/min** for weld pass 1 and **8 to 10 in/min** for weld pass 2). *See QW-409.1.*
78. Other: Additional information i.e. weld bead length range or arc time range (*See QW-409.1),* or "None"
79. Enter the pulsing current when used with this WPS. Enter "None" if no pulsing current was used. Leave blank (or enter "NA") if the process is not GTAW. *See QW-409.3.*
80. Enter the maximum heat input allowed with this WPS. Leave blank if is not required as a supplementary essential variable or when WPS is qualified with PWHT above the upper transformation temperature. *See QW-409.1.*
81. Enter tungsten electrode size range and type [i.e. 3/32" and 1/16"Ø, EWth-2 (2% thoriated)]. Leave blank (or enter "NA") if the process is not GTAW or PAW.
82. Enter transfer mode for GMAW or FCAW (i.e. Short circuiting arc, pulsating arc, spray arc, globular arc, etc.). If the welding process is not a GMAW or FCAW leave blank (or enter "NA").
83. Other: Enter "Melt-in to keyhole" technique when used PAW welding process *See QW-410.12*. Enter "None" with the welding process is performed with other process.

84-85. Mark the box "**String Bead**" or "**Weave Bead**" for the bead technique covered by this WPS. *See QW-410.1 and QW-405.2. For manual or semiautomatic welding, a change from the stringer bead technique to the weave bead technique, or vice versa.*

86-87. Mark the box for "Single electrode" or "Multiple electrodes" applicable for this WPS. *See QW-410.10. A change from single electrode to multiple electrodes, or vice versa, for machine or automatic welding only.*

88-89. Mark the box for "Single Pass" or "Multiple Pass" applicable for this WPS. *See QW-410.9.*

90. Enter the method of "initial cleaning" required and / or allowed (e.g. min. requirements of UW-32). *See QW-410.5.*
91. Enter the method of "interpass cleaning" required and / or allowed (e.g. min. requirements of UW-32). *See QW-410.5.*
92. Enter "Orifice or Gas Cup Size" range if is use for GTAW, GMAW, FCAW and/or PAW process. If the welding process is not GTAW, GMAW, FCAW and/or PAW leave blank (or enter "NA"). *See QW-410.3*.
93. Enter the "Method of Back Gouge" technique required and/or allowed (e.g. min. requirements of UW-37). *See QW-410.6.*
94. Enter "Oscillation" parameters range if the welding is performed in machine or automatic process with GTAW, SAW, FCAW, GMAW and/or PAW. *See QW- 410.7 changes in width, frequency, or dwell time of oscillation technique*. If the welding process is SMAW the space of oscillation leave blank (or enter "NA"). If is performed GTAW, SAW, FCAW, GMAW and/or PAW welding process and not machine or automatic process used enter "None" in the space of oscillation.
95. Enter "Contact Tube to Work Distance" range if the welding is performed in SAW, GMAW and/or FCAW. If the welding process is not SAW, GMAW and/or FCAW leave blank (or enter "NA"). *See QW-410.8.*
96. Enter electrode spacing if the welding process is performed in the spacing of multiple electrodes for machine or automatic and with the following process SAW, GMAW, FCAW, GTAW and/or PAW. *See QW-410.15*. If the welding process is performed with SMAW leave blank this space (or enter "NA"). If the welding process is performed with SAW, GMAW, FCAW, GTAW and/or PAW and not multiple electrodes for machine or automatic welding enter "None".

97. Enter the technique of closed chamber or out-of chamber torch welding if is used with PNo.-.51 through PNo.-53 and with GTAW or PAW welding process. *See QW-410.11*. If the process used is not PAW or GTAW leave blank (or enter “NA”). If the welding process used is GTAW or PAW and not PNo. 51 to PNo. 53 materials used enter “None”.

98. Enter “Use”, if use of thermal processes on materials PNo. 11A and PNo. 11B. *See QW-410.64*. Enter “None” if not PNo. 11A and PNo. 11B material used.

99-100. Mark the box for “Peening Permitted” or “Peening not Permitted” that apply for this WPS. *See QW-410.26.*

101. Other: (i.e. “None”, remarks, etc.).