



**Major Tool and Machine, Inc.**  
 1458 E. 19th Street, Indianapolis, Indiana, 46218  
**Welding Procedure Specification - Page 1**  
 Weldspec for Windows

|                   |                  |            |              |                              |
|-------------------|------------------|------------|--------------|------------------------------|
| WPS record number | WPS328.5-PPPL    | Revision 2 | Qualified to | ASME IX                      |
| Date              | 12/4/03          |            | Company name | Major Tool and Machine, Inc. |
| Supporting PQR(s) | PQR328.5 - Rev 2 |            |              |                              |
| Reference docs.   |                  |            |              |                              |

|       |   |
|-------|---|
| Scope | All Groove welds (i.e Single Vee, Double Vee, Single U, Double U, Single Bevel, Double Bevel) and Fillet Welds<br>Groove, fillet, no PWHT (As-welded) |
| Joint | Joint details for this welding procedure specification in:<br>Production drawings   |

**BASE METALS (QW-403)**

|           |                            |          |           |
|-----------|----------------------------|----------|-----------|
| Type      | Ni-Cr-Mo alloys (P43)      | P-no. 43 | Grp-no. - |
| Welded to | Austenitic stainless steel | P-no. 8  | Grp-no. 1 |
| Backing:  | Weld or base metal         | P-no.    | Grp-no.   |
| Retainers | None                       |          |           |
| Notes     |                            |          |           |

**THICKNESS RANGE QUALIFIED** (in.)

|               | As-welded |         | With PWHT |      |
|---------------|-----------|---------|-----------|------|
|               | Min.      | Max.    | Min.      | Max. |
| Complete pen. | 0.063     | 0.75    | -         | -    |
| Impact tested | -         | -       | -         | -    |
| Partial pen.  | 0.063     | 0.75    | -         | -    |
| Fillet welds  | no min.   | no max. | -         | -    |

**DIAMETER RANGE QUALIFIED** (in.)

|                   | As-welded |         | With PWHT |      |
|-------------------|-----------|---------|-----------|------|
|                   | Min.      | Max.    | Min.      | Max. |
| Nominal pipe size | no min.   | no max. | -         | -    |

**FILLER METALS (QW-404)**

|              | SFA  | Classification | F-no. | A-no. | Chemical analysis or Trade name | As-welded |      | With PWHT |      |
|--------------|------|----------------|-------|-------|---------------------------------|-----------|------|-----------|------|
|              |      |                |       |       |                                 | Min.      | Max. | Min.      | Max. |
| GTAW         | 5.14 | ERNiCrMo-3     | 43    | NA    | Inconel 625                     | no min.   | 0.75 | -         | -    |
| Cons. insert | -    | -              | -     | -     | -                               | - None -  |      |           |      |
| Flux         | -    | -              | -     | -     | -                               | - None -  |      |           |      |

**WELDING PROCEDURE**

|                                    |                              |
|------------------------------------|------------------------------|
| Welding process                    | GTAW                         |
| Type                               | Manual                       |
| Preheat temperature (°F)           | 70                           |
| Maximum interpass temperature (°F) | 350                          |
| Tungsten size (in.)                | .093                         |
| Tungsten type                      | SFA 5.12 EWTh-2              |
| Filler metal size (in.)            | 0.093                        |
| Layer number                       | All                          |
| Position of groove                 | All                          |
| Weld progression                   | Uphill for vertical welding. |
| Current/polarity                   | DCEN                         |
| Amperes                            | 120 - 210                    |
| Volts                              | manual                       |
| Travel speed (in./min)             | manual                       |
| Maximum heat input (kJ/in.)        | not controlled               |
| DC pulsing current                 | Not used                     |
| Shielding: Gas type                | Argon                        |
| Flow rate (cfh)                    | 25 - 40                      |
| Trailing: Gas type                 | None                         |
| Flow rate (cfh)                    | -                            |
| Backing: Gas type                  | Argon - If required          |
| Flow rate (cfh)                    | 5 - 20                       |
| String or weave                    | Stringer                     |
| Orifice/gas cup size               | .44                          |
| Multi/Single pass per side         | Single or Multiple passes    |
| Weld deposit chemistry             | N/A                          |
| Notes                              |                              |



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**TECHNIQUE (QW-410)**

|                            |   |
|----------------------------|---|
| Peening                    | Not used  |
| Surface preparation        | Brushing and/or grinding as required. See Notes for additional information. |
| Initial/interpass cleaning | Brushing and/or grinding as required. See Notes for additional information. |
| Back gouging method        | Grinding  |

**NOTES**

1. Initial cleaning requirements: Grind a minimum of 0.500" clean on each side of the weld joint. Solvent wipe to remove all oil, grease, coolant, etc.
2. Interpass cleaning requirements: Wire brush each pass to remove oxides. Light grinding may be required to remove oxide or silicon islands. Wire brush as needed. Wire brush must be stainless steel and must be either new or previously used only on similar material.
3. Argon backing gas is required on full penetration, open root butt welds. Argon backing should be maintained until 3/16" of weld metal has been deposited.

**Signature 1 (definable in Tools-Options-Default Settings)**

|                    |           |
|--------------------|-----------|
| Name               | Signature |
| Michael G. Iverson |           |
| Date               |           |
| 12/4/2003          |           |



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**Welding Procedure Specification - Additional Information**  
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|                   |               |            |              |                              |
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1. Rev 0 - Added into C Spec - 9/29/03 - D.H.L.
2. This procedure tested and accepted to the requirements of both ASME Sect. IX and AWS B2.1.
3. Rev 1. - Removed consumable insert option, Weld progression was changed to Uphill for Vertical, amperage range increased - 11/25/03 - MGI
4. Rev 2. - Updated Rev level of PQR to match most current revision of PQR, Added types of groove weld to Scope, - 12/4/03 - MGI