



Fermi National Accelerator Laboratory

Technical Division-Machine Shop

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| Procedure Qualification Record No. <i>Fermi PQR AMI/Orbital 003</i> | Date |
| Revision: __ Date: _____ Remarks: | 2/01/2010 |
| Welding Process/Weld Type: <i>GTAW/Automatic</i> | WPS No. <i>Fermi WPS AMI/Orbital 003</i> |

Joins (QW-402)

Details:

| | | | | | | | |
|-------------------|--------------------|-----------------|------------------|----------------------|----------------|-------------------|--------------|
| Weld Type: | <i>Groove Weld</i> | Backing: | <i>Argon Gas</i> | Root Opening: | <i>0-.002"</i> | Root Face: | <i>.049"</i> |
|-------------------|--------------------|-----------------|------------------|----------------------|----------------|-------------------|--------------|

ASTM A269-04 316/316L .049 x 0.500 Ø

| | |
|---|---|
| Base Metals (QW-403) | Postweld Heat Treatment (QW-407) |
| Material Spec.: <i>ASTM A 269-04 Type: 316/316L</i> | Temperature: |
| S-No. <i>8, Group 1</i> To S-No. <i>8, Group 1</i> | Time: |
| Coupon Thickness: <i>.049"</i> Coupon Diameter: <i>.500"Ø</i> | Other: |
| Other: | |

| | | | | |
|--|---------------------|-----------|-----------|--------|
| Filler Metals (QW-404) | Gas (QW-408) | | | |
| SFA Specification: | Gas | % Mixture | Flow Rate | |
| AWS Classification: | Shielding: | Argon | 99.9% | 12 CFH |
| Filler Metal F- No.: Weld Metal Analysis A-No.: <i>8</i> | Trailing: | None | | |
| Size of Filler Metal : Weld Metal Thickness: | Backing: | Argon | 99.9% | 10 CFH |
| Other: | | | | |

| | |
|---|--|
| Position (QW-405) | Electrical Charastics (QW-409) |
| Position of Groove: <i>5G</i> | Current & Polarity: <i>DCEN-Pulsing</i> |
| Weld Progression (Uphill, Downhill): <i>Uphill & Downhill</i> | Amps & Volts: <i>See AMI Sequence Chart</i> |
| Other: | Tungsten Electrode & Size: <i>EWCe-2 .040Ø</i> |

| | | |
|-------------------------|--------------------------------|----------------------|
| Preheat (QW-406) | Technique (QW-410) | |
| Preheat Temperature: | Travel Speed: | Stringer or Weave |
| Interpass Temperature: | Oscillation: | Multipass or Single: |
| Other: | Single or Multiple Electrodes: | |

| Sequence Chart : <i>AMI Orbital Model 227 STD2.1 with Model 9-500 Weld Head .049" x .500" Ø (ASTM A 269)</i> | | | | | | | | | | |
|---|-------|------------|---------|------|------|---------|------|---------|------|---|
| Weld Levels | Pulse | Rotation | RPM | | Time | AMPS | | PULSE | | <i>Manual GTAW Tacking of assembly optional by qualified welder. Use pre-shaped and pre-sized factory supplied tungsten</i> |
| | | | Primary | Back | | Primary | Back | Primary | Back | |
| 1 | ON | Continuous | 1.00 | -- | 122 | 38 | 5 | .22 | .20 | |
| | | | | | | | | | | |
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Technical Division-Machine Shop

Procedure Qualification Record No. *Fermi PQR AMI/Orbital 003*

Revision: ___ Date: _____ Remarks:

Back PQR

Welding Process/Weld Type: *GTAW/Automatic*

WPS No. *Fermi WPS AMI/Orbital 003*

Tensile Test (QW-150)

| Specimen No. | Dimensions | Area (Squared in.) | Ultimate Total Load (lbs.) | Ultimate Stress (PSI) | Failure Type & Location |
|--------------|-----------------|--------------------|----------------------------|-----------------------|-------------------------|
| 1 | 0.5000 x 0.4020 | 0.0694 | 5429.0 | 78200 | Ductile- WM |
| 2 | 0.5000 x 0.4020 | 0.0694 | 5450.0 | 78500 | Ductile-WM |

Guided Bend Test (QW-160)

| Figure Number & Type | Result | Figure Number Type | Result |
|----------------------|-------------------|--------------------|-------------------|
| QW-462.3 Face Bend | <i>Acceptable</i> | QW-462.3 Root Bend | <i>Acceptable</i> |
| QW-462.3 Face Bend | <i>Acceptable</i> | QW-462.3 Root Bend | <i>Acceptable</i> |

Visual Examination: *Acceptable*

Radiography per ASME Section IX, QW-191.2.

N/A

Radiography conducted by:

Reference Number

Mechanical Tests conducted by: *Exova*

3/5/2010

Reference Number

T002962

Welding of Test Coupon conducted by: *Fermi National Accelerator Laboratory*

Verification No. *2012010-3RH*

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code.

Fermi National Accelerator Laboratory _____

Manufacturer

Authorized Representative

Date