Fermilab *Fermi National Accelerator Laboratory*
Technical Division-Machine Shop

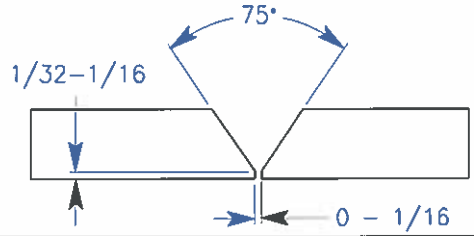
Procedure Qualification Record	**No.** ***Fermi PQR Ti-1***	Date	*6/13/2008*
Revision: 1, Date:1/08/09, Remarks: Amended welding position to 5G. Revision: 2 Date: 2/9/09 Remarks: Revised to correct clerical spelling errors			
Welding Process/Weld Type: *GTAW/Manual*	**WPS No.** *Fermi WPS Ti-1*		

Joints (QW-402)

Weld Type: *Single V Groove Weld*
Backing: *Open Butt, Gas Backing Only*
Root Opening: *0.0625"*
Root Face: *0.031"*

Details:

0.160 wall X 5.50" Tube
Manual Weld in Chamber



Base Metals (QW-403)
Material Spec., Type or Grade
SB-338, Grade 2 to *SB-338, Grade 2*
P-No. *51* to **P-No.** *51*
Thickness of Coupon (in.) *0.160 inches*
Diameter of Test Coupon (in.) *5.50 inches*

Post Weld Heat Treatment (QW-407)
Type: *No PWHT performed*
Temperature: *None*
Time: *None*

Filler Metals (QW-404)
SFA Specification: *5.16*
AWS Classification: *ERTi-2*
Filler Metal F-No.: *51*
Weld Metal Analysis A-No.: *N/A*
Size of Filler Metal (in.): *3/32 diameter*
Weld Deposit "t"(in.): *0.197 inches*
Filler Metal Product Form: *Solid/Bare Wire*

Gas (QW-408)

	Gas	Percent Composition Mixture%	Flow Rate
Shielding:	*Argon*	*>99.995%*	*@ 30 CFH*
Trailing:		*None*	
Backing:	*Argon*	*>99.995%*	*@ 7 CFH*

Other: *Welding done in Argon Chamber at <10 PPM using Oxygen Analyzer*

Positions (QW-405)
Position of Joint: *5G*
Weld progression: *Upward*
Coupon welded in Chamber @ 10 PPM

Electrical Characteristics (QW-409)
Current/Polarity: *DCEN (Straight)*
Amps: *50-110* **Volts:** *8-18*
Tungsten Type & Size: *EWCe-2* *3/32 diameter*
Other: *Non-Pulsing Current*

Preheat (QW-406)
Preheat Temperature: *32° F Minimum*
Interpass Temperature: *350° F Maximum*

Technique (QW-410)
Travel (ipm): *As Required* **Oscillation:** *None*
String/Weave Bead: *Stringer & Weave*
Multiple/Single Pass (per side) *Multiple one side*
Multiple/Single Electrode: *Single Electrode*
Nozzle/Gas Cup Size: *#4 Gas Lens welded in chamber*

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Tensile Test (QW-150)

Specimen No.	Width (in.)	Thickness (in.)	Area (Squared in.)	Ultimate Total Load (lbs.)	Ultimate Stress (PSI)	Failure Type & Location
1	0.7465	0.1474	0.1100	6580	59,800	Ductile-WM
2	0.7440	0.1562	0.1162	7137	61,400	Ductile-WM

Guided Bend Test (QW-160)

Figure Number & Type	Result	Figure Number Type	Result
QW-462.3 (a) Face Bend	*Acceptable*	QW-462.3 (a) Root Bend	*Acceptable*
QW-462.3 (a) Face Bend	*Acceptable*	QW-462.3 (a) Root Bend	*Acceptable*

Visual Examination: *Acceptable* | **X-ray per ASME Section IX, QW-191.2.2** *Acceptable*

Welder's Name: *Daniel J. Watkins* **ID #** *03991N* **Weld Stamp #** *24*

Welding of coupon Verified by: *Michael P. Reynolds ID# 03993N* Michael P. Reynolds

Tests Conducted by: *Bodycote Testing Group* **Test ID#:** *T-714091*

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 Code.

PQR prepared by: ***Fermi National Accelerator Laboratory***

Authorized Representative Roger A Hiller ID# 00362N