

# **TWI Welding Software**



## Quick Start Tutorial for Weldspec™, Welderqual™ & NDTspec™

Contains:

**How to create a PQR** (plus printout samples)  
ASME IX Procedure Qualification Record (Weldspec™)

**How to create a WPS** (plus printout samples)  
ASME IX Welding Procedure Specification (Weldspec™)

**How to create a pWPS** (plus printout samples)  
AWS D1.1 Prequalified WPS (Weldspec™)

**How to create a WPQ** (plus printout samples)  
ASME IX Welder Performance Qualification (Welderqual™)

**How to create an NDE Report** (plus printout samples)  
Radiographic Report used as example (NDTspec™)



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# How to create a PQR (page 1)

Start Weldspec by clicking on the Weldspec icon on your desktop. The system displays a form giving you various options. Click "close" to remove the form.

**1**

Click on the small drop-down arrow  as shown. Select **ASME IX PQR**.

**2**

For the fastest possible data entry, always select the desired data from the drop-down menus  or databases  rather than typing the information manually. Notice how this form grows dynamically based on the information that you select.

**3**

Weldspec is equipped with an extensive database of pre-drawn typical joint details. For more information on these sketches refer to the help system by clicking on Help/Contents. Then select topic 2.2.3.

**4**

As you select a welding process, the form will grow, supplying you with the required fields specific to the process selected. Notice that Weldspec allows the use of up to three processes on a single PQR.

**5**

When specifying the filler metal, select it from the Filler Material Database instead of manually typing the information. To do this, place the cursor in the "SFA spec" field and click on the database icon . Locate the same material listed in this example and double-click on it. Notice that Weldspec enters the proper SFA, AWS, F and A numbers automatically.

**NOTE: Only a few filler metals and base metals are visible in the materials database while in demonstration mode.**

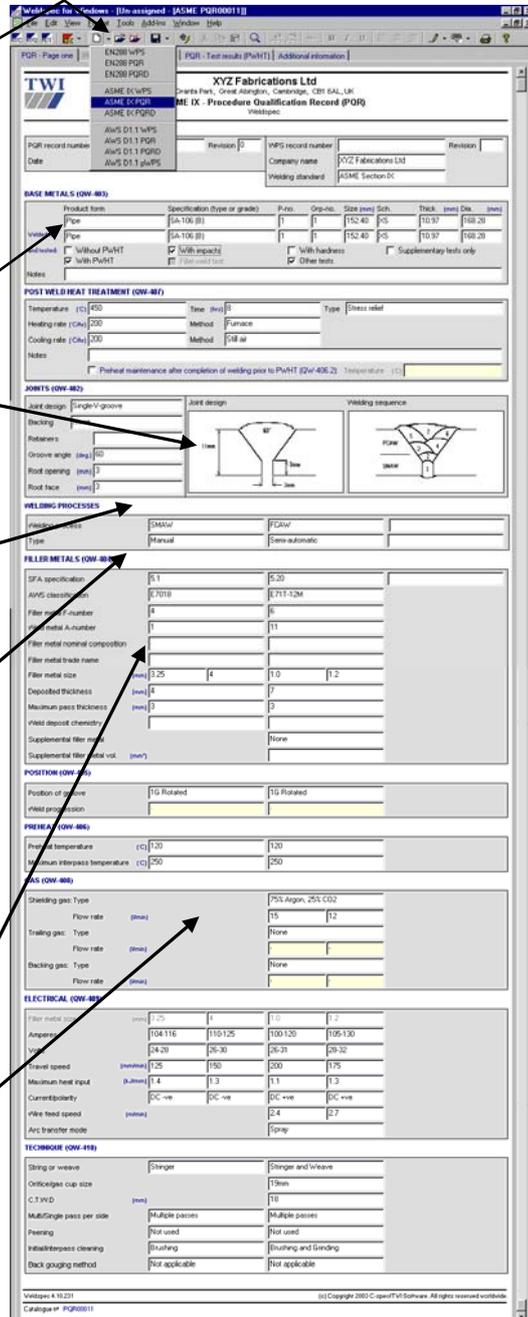
**6**

In addition to three welding processes, Weldspec also allows you to specify up to five different filler metal sizes for each process. To do this, click inside the filler metal size field and then locate the Add Column

icon  on the Tool Bar at the top of the screen. Click this icon and watch how this field splits with each click. This will also split any other applicable fields such as the electrical parameters.

**7**

Notice the missing "Gas" fields for SMAW. This is another feature of the dynamic forms. Weldspec prevents entry of non-relevant information and minimises potential introduction errors. Helpful features like this are included in many places.



The screenshot shows the Weldspec software interface for creating a Procedure Qualification Record (PQR) for ASME IX. The form is titled "ME IX - Procedure Qualification Record (PQR)" and is for "XYZ Fabrications Ltd".

**BASE METALS (QW-402)**

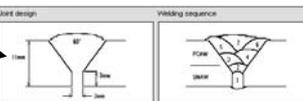
Product form	Specification (type or grade)	P-No.	Qp-No.	Size (mm)	Sch.	Thick. (mm)	Dia. (mm)
Pipe	SA 106 (B)	1	F	152.40	FS	10.97	168.28

**POST WELD HEAT TREATMENT (QW-407)**

Temperature (°C)	Time (hrs)	Type
250	8	Stress relief

**JOINTS (QW-403)**

Joint design: Single V-groove

Sketches: 

**WELDING PROCESSES**

Process	Type
Stick	Manual
FCW	Semi-automatic

**FILLER METALS (QW-404)**

SFA specification	Time (hrs)	Size (mm)
E 7018	1	5.20
E 711-12M	4	6
F 11	1	11

**POSITION (QW-405)**

Position of joint	Filler metal
TG Rotated	TG Rotated

**PREHEAT (QW-406)**

Preheat temperature (°C)	Minimum interpass temperature (°C)
120	250

**GAS (QW-408)**

Shielding gas: Type	Flow rate (l/min)
75% Argon, 25% CO2	15

**ELECTRICAL (QW-409)**

Filler metal size (mm)	Amperage	Voltage	Weld speed (mm/min)	Current density (A/mm²)	Wire feed speed (mm/min)	Wire feed rate (mm/min)	Wire feed diameter (mm)
5.20	104-116	24-29	120	4	1.4	1.1	1.3
6	110-125	26-30	150	5.3	1.3	1.1	1.3
11	130-130	28-31	175	6.3	1.1	1.1	1.3
12	130-130	28-31	175	6.3	1.1	1.1	1.3

**TECHNIQUE (QW-410)**

String or weave	String and Weave
String	String and Weave
Orifices cup size	13mm
C.T.W.D (mm)	18
Multiple passes per side	Multiple passes
Peening	Not used
Interpass cleaning	Brushing and grinding
Back gouging method	Not applicable

## PQR (page 2)

To enter data into the second page of the PQR, click on the tab at the top of the page entitled "PQR – Test Results (PWHT)".

**TENSILE TESTS (QW-158)**

Specimen number	Width (mm)	Thickness (mm)	Area (mm <sup>2</sup> )	Ultimate total load (N)	Ultimate unit stress (MPa)	Type of failure and location
001	19	11	209.00	93000	445	Ductile-Base Metal
002	19	11	209.00	92000	440	Ductile-Base Metal

**GUIDED BEND TESTS (QW-168)**

Type of test	Acceptance criteria	Result	Comments
2 transverse face bends per QW-161.2 and QW-462.3(a)	QW-163	Acceptable	see - ASME IX - QW-451.1
2 transverse root bends per QW-161.3 and QW-462.3(a)	QW-163	Acceptable	see - ASME IX - QW-451.1

**TOUGHNESS TESTS (QW-178)**

Specimen number	Notch location	Notch type	Specimen size (mm) (L x W)	Test temp (°C)	Impact values (J)	Impact values (% shear)	Drop weight break (mm)
BM001	Base Metal	V-notch	10 x 10	-30	45	18	2
BM002	Base Metal	V-notch	10 x 10	-30	40	15	2
BM003	Base Metal	V-notch	10 x 10	-30	38	12	3
BM004	Base Metal	V-notch	10 x 10	-30	39	18	2
BM005	Base Metal	V-notch	10 x 10	-30	42	14	2
HZ001	HAZ	V-notch	10 x 10	-30	35	11	3
HZ002	HAZ	V-notch	10 x 10	-30	38	18	1.5
HZ003	HAZ	V-notch	10 x 10	-30	33	12	2
HZ004	HAZ	V-notch	10 x 10	-30	40	14	2
HZ005	HAZ	V-notch	10 x 10	-30	31	14	2
VM001	Weld Metal	V-notch	10 x 10	-30	35	16	1.5
VM002	Weld Metal	V-notch	10 x 10	-30	37	17	3
VM003	Weld Metal	V-notch	10 x 10	-30	39	16	2.5
VM004	Weld Metal	V-notch	10 x 10	-30	41	20	2.5
VM005	Weld Metal	V-notch	10 x 10	-30	44	13	3

**OTHER TESTS**

Type of test	Acceptance criteria	Result	Comments
Visual examination per QW-302.4	QW-194	Acceptable	see - ASME IX - QW-452.1 (a)
Radiographic examination per QW-191 and QW-302.2	QW-191.2	Acceptable	see - ASME IX - QW-1420,

**CERTIFICATION**

Welders name John Smith	ID number 142	Stamp number 1002532-82	Mechanical testing by ABC Testing Services
			Laboratory test number 711009-1
			Test file number 03/0001432-01
			Tests conducted by Norman Smith

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.

<b>Welding Engineer</b> Name: JWS Date: 25/07/2003	Signature: <i>Simon Ward</i>	<b>QA Manager</b> Name: Date:	Signature:
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Weldspec v 10.231  
Catalogue N° PQR00011  
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**8** As you enter data in the Tensile Test section, notice how Weldspec automatically calculates "Area" and "Ultimate Unit Stress". Note: If the calculated Ultimate stress is below the specified requirements for the base metals on page one, Weldspec will prompt you with a Code Checking warning after selecting "Type of failure and location".

**9** Bend test information is already entered for you. Based on the information entered on page one, Weldspec's Code Checking automatically specifies the required testing.

**10** When entering Toughness Test information, enter ONLY the top line of data. When the first line is completed, click the cursor in the "Specimen Number" field on the second line. Weldspec automatically replicates the test information from the previous line.

**11** **Printing this PQR:**  
To print this record, go to the top of the screen and click on File. Select the second print option which should say Print **Unassigned ASME PQR000x**.

**12** **Instantly create a WPS from this PQR:**  
Now that you are finished creating this PQR, Weldspec can automatically create a WPS using the data on this record. To do this, go to the top of the screen and click on **File/Save As New**. Then select **WPS**. Weldspec will then take all applicable data from this PQR and place it on the WPS. Additionally, notice how the Code Checking supplies you with even more data straight out of the code such as the Thickness and Diameter ranges qualified.

# PQR printout sample (page 1)



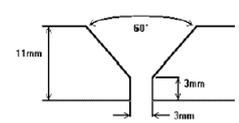
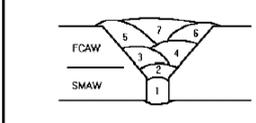
**XYZ Fabrications Ltd**  
Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
**ASME IX - Procedure Qualification Record (PQR)**  
Weldspec

PCR record number	PCR101	Revision	0	WPS record number		Revision	
Date	25/07/2003			Company name	XYZ Fabrications Ltd		
				Welding standard	ASME Section IX		

BASE METALS (QW-403)							
	Product form	Specification (type or grade)	P no.	Grp-no.	Size	Sch.	Thick. (mm) Dia. (mm)
Welded to:	Pipe	SA-196 (B)	1	1	152.40	XS	10.97 168.28
	Pipe	SA-196 (B)	1	1	152.40	XS	10.97 168.28
and tested:	With PWHT, With impacts						
Notes							

POST WELD HEAT TREATMENT (QW-407)							
Temperature (°C)	450	Time (hrs)	8	Type	Stress relief		
Heating rate (°C/hr)	200	Method	Furnace				
Cooling rate (°C/hr)	200	Method	Still air				
Notes							

JOINTS (QW-402)							
Joint design	Single-V-groove						
Backing	None						
Retainers							
Groove angle (deg)	60						
Root opening (mm)	3						
Root face (mm)	3						

WELDING PROCESSES		
Welding process	SMAW	FCAW
Type	Manual	Semi-automatic

FILLER METALS (QW-404)					
SFA specification	E51		E520		
AWS classification	E7018		E71T-12M		
Filler metal F-number	4		6		
Weld metal A-number	1		11		
Filler metal nominal composition					
Filler metal trade name					
Filler metal size (mm)	3.25	4	1.0	1.2	
Deposited thickness (mm)	4		7		
Maximum pass thickness (mm)	3		3		
Weld deposit chemistry					
Supplemental filler metal	-		None		
Supplemental filler metal vol. (mm³)	-				

POSITION (QW-405)		
Position of groove	1G Rotated	
Weld progression	-	

PREHEAT (QW-406)		
Preheat temperature (°C)	120	
Maximum interpass temperature (°C)	250	

GAS (QW-408)				
Shielding gas:	Type	-	75% Argon, 25% CO2	
	Flow rate (l/min)	-	15	12
Trailing gas:	Type	-	None	
	Flow rate (l/min)	-	-	-
Backing gas:	Type	-	None	
	Flow rate (l/min)	-	-	-

ELECTRICAL (QW-409)					
Filler metal size (mm)	3.25	4	1.0	1.2	
Amperes	104-116	110-125	100-120	105-130	
Volts	24-28	26-30	26-31	28-32	
Travel speed (mm/min)	125	150	200	175	
Maximum heat input (kJ/mm)	1.4	1.3	1.1	1.3	
Current/polarity	DC -ve	DC -ve	DC +ve	DC +ve	
Wire feed speed (m/min)	-	-	2.4	2.7	
Arc transfer mode	-		Spray		

TECHNIQUE (QW-410)		
String or weave	Stringer	
Orifice/gas cup size (mm)	-	
C.T.W.D	-	
Multi/Single pass per side	Multiple passes	
Peening	Not used	
Initial/Interpass cleaning	Brushing and Grinding	
Back gouging method	Not applicable	

# PQR printout sample (page 2)



**XYZ Fabrications Ltd**  
 Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
**ASME IX - Procedure Qualification Record (PQR) - Test results (PWHT)**  
 Weldspec

PQR record number	PQR101	Revision	0	WPS record number		Revision	
Date	25/07/2003	Company name		Company name	XYZ Fabrications Ltd		
		Welding standard		Welding standard	ASME Section IX		

Specimen number	Width (mm)	Thickness (mm)	Area (mm <sup>2</sup> )	Ultimate total load (N)	Ultimate unit stress (MPa)	Reduced section
						Type of failure and location
001	19	11	209.00	93000	445	Ductile-Base Metal
002	19	11	209.00	92000	440	Ductile-Base Metal

Comments: 2 reduced section tension tests per QW-151.2 and QW-462.1(c)

Type of test	Acceptance criteria	Result	Comments
2 transverse face bends per QW-161.2 and QW-462.3(a)	QW-163	Acceptable	see - ASME IX - QW-451.1
2 transverse root bends per QW-161.3 and QW-462.3(a)	QW-163	Acceptable	see - ASME IX - QW-451.1

Comments:

Specimen number	Notch location	Notch type	Specimen size (mm) x (mm)	Test temperature (°C)	Impact values			Drop weight break
					(J)	(% Shear)	(mm)	
BM001	Base Metal	V-notch	10 x 10	-30	45	18	2	-
BM002	Base Metal	V-notch	10 x 10	-30	40	15	2	-
BM003	Base Metal	V-notch	10 x 10	-30	38	12	3	-
BM004	Base Metal	V-notch	10 x 10	-30	39	16	2	-
BM005	Base Metal	V-notch	10 x 10	-30	42	14	2	-
HZ001	HAZ	V-notch	10 x 10	-30	35	11	3	-
HZ002	HAZ	V-notch	10 x 10	-30	38	18	1.5	-
HZ003	HAZ	V-notch	10 x 10	-30	33	12	2	-
HZ004	HAZ	V-notch	10 x 10	-30	40	14	2	-
HZ005	HAZ	V-notch	10 x 10	-30	31	14	2	-
WM001	Weld Metal	V-notch	10 x 10	-30	35	16	1.5	-
WM002	Weld Metal	V-notch	10 x 10	-30	37	17	3	-
WM003	Weld Metal	V-notch	10 x 10	-30	39	16	2.5	-
WM004	Weld Metal	V-notch	10 x 10	-30	41	20	2.5	-
WM005	Weld Metal	V-notch	10 x 10	-30	44	13	3	-

Comments:

Type of test	Acceptance criteria	Result	Comments
Visual examination per QW-302.4	QW-194	Acceptable	see - ASME IX - QW-452.1 (a)
Radiographic examination per QW-191 and QW-302.2	QW-191.2	Acceptable	see - ASME IX - QW-142/3, QW-304/5

Comments:

Welder's name	ID Number	Stamp number	Mechanical testing by	
John Smith	142	1002532-82	Laboratory test number	711009-1
			Test file number	030001432-01
			Tests concluded by	Norman Smith

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.

Welding Engineer

QA Manager

Name	Signature	Name	Signature
SYS			
Date		Date	
25/07/2003			

# How to create a WPS (page 1)

For automatic creation of a WPS, refer to item 9 on the next page.

**1**  
From Weldspec's main menu bar, click on the small drop-down arrow as shown. Select **ASME IX WPS**.

**2**  
Fill out your WPS with the same data that appears in this example. For fast data entry, always select the desired data from the drop-down menus or databases rather than typing the information manually. See how this form grows dynamically based on the data entered.

**3**  
When specifying the filler metal, remember to select it from the Filler Material Database instead of manually typing the information. To do this, place the cursor in the "SFA" field and click on the database icon. Locate and select the same filler metals listed in this example and then press the Accept button. Notice that the proper SFA, Classification, F and A numbers are entered automatically. **Note:** Multiple filler metal classifications may be specified. However, in this example we will only use one for demonstration purposes.

**NOTE: Only a few filler metals and base metals are visible in the materials database while in demo mode.**

**4**  
In addition to three welding processes, Weldspec also allows you to specify up to five different filler metal sizes for each process. To do this, click inside the filler metal size field and then locate the Add Column icon on the Tool Bar at the top of the screen. Click this icon and watch how this field splits with each click. This will also split any other applicable fields such as the electrical parameters.

**5**  
Notice the missing "Gas" fields for SMAW. This is another feature of the dynamic forms. Weldspec prevents entry of non-relevant information and minimises potential introduction of errors. Helpful features like this are included throughout the software.

The screenshot shows the 'Weldspec' software interface for creating an ASME IX WPS. The window title is 'Weldspec for Windows [WPS101 Rev 0 [ASME WPS-00011]]'. The main form is titled 'XYZ Fabrications Ltd ASME IX WPS - Page 1'. The form is divided into several sections:

- Information:** Includes fields for WPS record number, date, supporting PQR, and revision. It also has a 'Qualified to' field set to 'ASME Section IX' and a 'Company name' field set to 'XYZ Fabrications Ltd'.
- Scope:** Contains checkboxes for 'Groove', 'Fillet', 'Corrosion resistance', 'With PWHT', 'No PWHT (As-welded)', 'Stud welding', and 'Impact tested'.
- WELDING PROCESSES:** Shows 'SMAW' and 'FCAW' with 'Manual' and 'Semi-automatic' options.
- BASE METALS (QW-383):** A table with columns for 'Type', 'Welded to', 'Backing', 'Retainers', and 'Notes'. It lists 'Carbon steel (P1)' with 'P.no. 1' and 'Grp.no. 1'. It also includes 'Complete pen.', 'Impact tested', and 'Partial pen.' columns with values like '4.763' and '21.34'.
- FILLER METALS (QW-404):** A table with columns for 'SFA', 'Classification', 'F.no.', 'A.no.', 'Chemical analysis or Trade name', and 'Thickness Range'. It lists 'SMAW E70B' and 'FCAW E71T-12M'.
- WELDING PROCEDURE:** A large table comparing SMAW and FCAW processes. It includes parameters like 'Minimum preheat/Interpass temp. (C)', 'Maximum interpass temperature (C)', 'Fillet metal size', 'Layer number', 'Position of groove', 'Weld progression', 'Current/polarity', 'Amperes', 'Voltage', 'Travel speed', 'Maximum heat input', 'Wire feed speed', 'Arc transfer mode', 'Shielding gas', 'Trailing gas', 'Backing gas', 'String or weave', 'Chatter/cup size', 'T.W.D.', 'Multi/Single pass per side', 'Maximum pass thickness', and 'Weld deposit chemistry'.

# WPS (page 2)

To continue entering data into the second page of the WPS, click on the tab at the top of the page entitled "WPS - Page Two".

**XYZ Fabrications Ltd**  
Granta Park, Great Abington, Cambridgeshire, CB1 6AL, UK  
ASME IX - WPS - Page 2  
Weldspec

WPS record number: WPS101      Revision 0      Qualified to: ASME Section IX  
Date: 28/07/2003

**JOINTS (QW-402)** Typical joint(s). See actual production drawings and engineering specifications for details.

**PREHEAT TABLE**

Applicable standard	Preheat (°C)
ASME B31.1	80 (°C) for thickness over 25 (mm) and specified maximum carbon content over 0.30%; 10 (°C) for all other materials.
ASME B31.3	10 (°C) for thickness less than 25.4 (mm) and specified minimum tensile strength not over 490 (MPa); 80 (°C) for 25.4 (mm) and greater thickness, or if specified minimum tensile strength is over 490 (MPa).
ASME Section VIII Div. 1	75 (°C) for thickness over 25 (mm) and specified maximum carbon content over 0.30%; 10 (°C) for all other materials.

**POST WELD HEAT TREATMENT (QW-407)**

Temperature (°C)	450	Time (hrs)	1hr/(25 mm)	Type	Stress relief
Heating rate (°C/hr)	200	Method	Furnace		
Cooling rate (°C/hr)	200	Method	Still air		

**TECHNIQUE (QW-410)**

Peening	Not used
Surface preparation	
Initial/interpass cleaning	Brushing
Back gouging method	Not applicable

**Prepared by**

Name	Signature
SYS	<i>Simon Ward</i>
Date	
30/07/2003	

**Reviewed by**

Name	Signature
Date	

**Approved by**

Name	Signature
Date	

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Catalogue n° WPS00011

**6** Weldspec is equipped with a comprehensive database of typical joint details already drawn for you. For more information on these sketches refer to the help system by clicking on **Help/Contents**. Then select topic **2.2.3**.

**7** To specify the applicable preheat for the materials entered on page one, simply select up to four standards from Weldspec's drop-down lists and the Code Checking will supply the appropriate data.

**8** **Printing this WPS:**  
When you are ready to print this record, go to the top of the screen and click on **File**. Then select the second print option which should say Print **Unassigned ASME WPS000x**.

**9** **Automatically create a WPS from a PQR:**  
another way to create a WPS is to have Weldspec automatically generate the WPS from a PQR. To do this you will need to open a completed PQR. If you have not yet made a PQR, please follow the instructions on the page entitled "**How to create a PQR**". With a PQR opened, go to the top of the screen and click on **File/Save As New**. Then select **WPS**. Weldspec will begin to take all applicable data from the PQR and place it on the WPS. Additionally, notice how the Code Checking supplies you with even more data straight out of the code such as the Thickness and Diameter ranges qualified.

# WPS printout sample (page 1)



**XYZ Fabrications Ltd**  
 Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
**ASME IX - WPS - Page 1**  
 Weldspec

WPS record number	WPS101	Revision 0	Qualified to	ASME Section IX
Date	28/07/2003		Company name	XYZ Fabrications Ltd
Supporting PQR(s)	PQR101 - Rev 0			
Reference docs.	General Welding Standard GWS 1			

Scope	Groove, fillet, impact testing, with PWHT
Joint	Joint details for this welding procedure specification in: JOINTS section of this WPS

**BASE METALS (QW-403)**

Type	Carbon steel (P1)	P-no. 1	Grp-no. 1
Welded to	Carbon steel (P1)	P-no. 1	Grp-no. 1
Backing:	None	P-no.	Grp-no.
Retainers			
Notes			

**THICKNESS RANGE QUALIFIED (mm)**

	As-welded		With PWHT	
	Min.	Max.	Min.	Max.
Complete pen.	-	-	4.763	21.94
Impact tested	-	-	10.97	21.94
Partial pen.	-	-	4.763	21.94
Fillet welds	-	-	no min.	no max.

**DIAMETER RANGE QUALIFIED (mm)**

	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.
SMAW	5.1	E7018	4	1		-	-	no min.	8
FCAW	5.20	E71T-12M	6	11		-	-	no min.	14
Sup. filler								None	

**WELDING PROCEDURE**

	SMAW		FCAW	
	Manual		Semi-automatic	
Welding process	SMAW		FCAW	
Type	Manual		Semi-automatic	
Preheat temperature (°C)	64		64	
Maximum interpass temperature (°C)	306		306	
Filler metal size (mm)	3.25	4	1.0	1.2
Layer number	All	All	All	All
Position of groove	All	All	All	All
Weld progression	Uphill	Uphill	Uphill	Uphill
Current/polarity	DC -ve	DC -ve	DC +ve	DC +ve
Amperes	104-116	110-125	100-120	105-130
Volts	24-28	26-30	26-31	28-32
Travel speed (mm/min)	125	150	200	175
Maximum heat input (kJ/mm)	1.4	1.3	1.1	1.3
Wire feed speed (m/min)	-	-	2.4	2.7
Arc transfer mode	-	-	Spray	Spray
Shielding:	-		75% Argon, 25% CO2	
Gas type	-		-	
Flow rate (l/min)	-		15	12
Trailing:	-		None	
Gas type	-		-	
Flow rate (l/min)	-		-	
Backing:	-		None	
Gas type	-		-	
Flow rate (l/min)	-		-	
String or weave	Stringer		Stinger or Weave	
Orifice/gas cup size	-		19mm	
C.T.W.D (mm)	-		18	
Multi/Single pass per side	Multiple passes		Multiple passes	
Maximum pass thickness (mm)	3		3	
Weld deposit chemistry	-		-	
Notes	-		-	

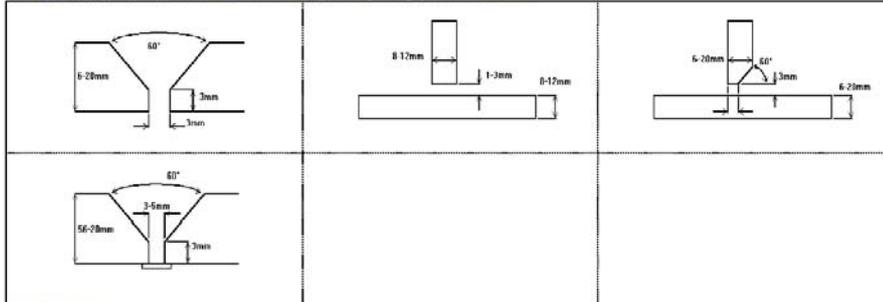
# WPS printout sample (page 2)



XYZ Fabrications Ltd  
Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
ASME IX - WPS - Page 2  
Weldspec

WPS record number	WPS101	Revision 0	Qualified to	ASME Section IX
Date	28/07/2003		Company name	XYZ Fabrications Ltd

JOINTS (QW-402) Typical joint(s). See actual production drawings and engineering specifications for details.



PREHEAT TABLE

Applicable standard	
ASME B31.1	80 (°C) for thickness over 25 (mm) and specified maximum carbon content over 0.30%. 10 (°C) for all other materials.
ASME B31.3	10 (°C) for thickness less than 25.4 (mm) and specified minimum tensile strength not over 490 (MPa). 80 (°C) for 25.4 (mm) and greater thickness, or if specified minimum tensile strength is over 490 (MPa).
ASME Section VIII Div. 1	79 (°C) for thickness over 25 (mm) and specified maximum carbon content over 0.30%. 10 (°C) for all other materials.

POST WELD HEAT TREATMENT (QW-407)

Temperature (°C)	450	Time (hrs)	1hr/25 mm	Type	Stress relief
Heating rate (°C/hr)	200	Method	Furnace		
Cooling rate (°C/hr)	200	Method	Still air		
Notes					

TECHNIQUE (QW-410)

Piercing	Not used
Surface preparation	Brushing
Initial interpass cleaning	Brushing
Back gouging method	Not applicable

NOTES

Prepared by		Reviewed by	
Name	Signature	Name	Signature
SYS	<i>Simon Ward</i>		
Date		Date	
30/07/2003			

Approved by	
Name	Signature
Date	

# How to create a prequalified WPS

**1**  
From Weldspec's main menu, click on the small drop-down arrow as shown. Select **AWS D1.1 pWPS**.

**2**  
In one step most of the prequalified WPS will be filled out automatically. Place the cursor in the "Joint Type" field and click on the database button. Locate the joint entitled **B-U2a-GF** from the database of prequalified joints and double-click on it.

**3**  
For the fields that were not automatically filled in, duplicate the **SAME** data that appears in this example. Whenever possible, select the desired data from the drop-down menus or databases rather than typing the information manually.

**4**  
When specifying the filler metal, select it from the Filler Material Database instead of manually typing the information. To do this, place the cursor in the "AWS spec" field and click on the database icon. Locate the same material listed in this example and double-click on it. Weldspec will enter the proper AWS Specification and Classification automatically.

**NOTE: Only a few filler metals and base metals are visible in the materials database while in demo mode.**

**5**  
Based on the information entered, the Code Checking in Weldspec automatically supplies the proper Preheat/Interpass data. With code intelligent features like this, Weldspec will greatly reduce (or eliminate) the need to waste time looking for information in the code.

**6**  
**Printing this WPS:**

When you are ready to print this record, go to the top of the screen and click on File. Select the second print option which will say: Print **Unassigned ASME PWP000x**.

**XYZ Fabrications Ltd**  
Owens Park, Great Abington, Cambridge, CB1 6AL, UK  
Prequalified Welding Procedure Specification (pWPS)  
Weldspec

Company name: XYZ Fabrications Ltd  
Welding process: GMAW  
Process type:  Manual  Semi-automatic  Machine  Automatic

Identification #: pWPS101 Rev. 0  
Originated by: Simon Ward  
Date: 30/07/2003  
Authorized by: Andy Bingham  
Date: 30/07/2003

**Joint design used**  
Joint type: B - Butt joint  
Joint design: Single V groove (2)  
Backing:  Yes  No  
Backing material: AWS D1.1 Table 3.1 Group 1  
Root opening (R) (mm): 0, +2, 0 [-6, -2]  
Root face (r) (mm): N/A  
Groove angle (A) (deg.): 45, +10, 0 [-10, 5]  
Radius (r - U) (deg.): N/A  
Back gouging:  Yes  No  
Back gouging method: N/A

**Position**  
Welding position: Groove: F, V, OH  
Filet: N/A  
Vertical progression:  Up  Down

**Electrical characteristics**  
Transfer mode (GMAW):  Short circuiting  Globular  
 Spray  N/A  
Current type:  AC  DCEP  DCEN  Pulsed  
Other:

**Base metals**  
Spec. type or grade: AWS D1.1 Table 3.1 Group 1  
Thickness: Groove (mm): T1 Unalined  
Filler (mm): N/A  
Diameter (Pipe) (mm): Unalined

**Filler metals**  
AWS specification: E70S-SH16  
AWS Classification: ER70S-SH16

**Shielding**  
Flux:  
Electrode flux (class):  
Gas composition: 75% Argon, 25% CO2  
Gas flow rate (liters/hr): 15-19  
Gas cup size (mm): T8

**Technique**  
Stringer or weave bead: Stringer or Weave  
Multiple pass (per side): Single or Multiple  
Number of electrodes: Single electrode  
Spacing: Longitudinal (mm):  
Lateral (mm):  
Angle (deg.):  
Contact tube to work (mm): T2-25  
Peening: Not permitted  
Interpass cleaning: Brushing or grinding

**Preheat**  
Preheat temp. Min. (°C): See notes  
Interpass temp. Min. (°C): See notes  
Max. (°C): See notes

**Post weld heat treatment**  
Temperature (°C): None  
Time (hrs):

Layer	Pass	Process	Filler metal class	Filler metal diam. (mm)	Current type / polarity	Amps	Wire feed speed (mm/min)	Volts	Travel speed (mm/min)	Joint details
1	All	GMAW	ER70S-SH16		DCEP	100-155	650-1000	25-35	250-350	

**Notes**  
PREHEAT/INTERPASS  
For thickness 3 to 19mm: 11°C Preheat to 20°C if the base metal temperature is below 11°C.  
Over 19 thru 38 Tensile: 50°C  
Over 38 thru 63 Tensile: 107°C  
Over 63 thru 150: 150°C  
See additional information page for further limitations.

**Welding Engineer**  
Name: SWS  
Date: 30/07/2003  
Signature: *Simon Ward*

**Senior Welding Engineer**  
Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Signature: \_\_\_\_\_

Weldspec 4.10.231  
Catalogue #: PWP00000  
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# pWPS printout sample



**XYZ Fabrications Ltd**  
Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
**AWS - D1.1 Prequalified Welding Procedure Specification (pWPS)**  
Weldspec

Company name	XYZ Fabrications Ltd	Identification #	pWPS101	Rev.	0
Welding process	GMAW	Originated by	Simon Ward	Date	30/07/2003
Process type	Semi-automatic	Authorized by	Andy Brightmore	Date	30/07/2003

**Joint design used**

Joint type	B - Butt joint
Joint design	Single V groove (Z)
Backing	Yes
Backing material	AWS D1.1 Table 3.1 Group I
Root opening (R)*	6 +2, -0 (+6, -2)
Root face (f)*	n/a
Groove angle (α)*	45, +10, -0 (+10, -5)
Radius (J - U)*	n/a
Back gouging	No
Back gouging method	n/a

**Position**

Welding position:	Groove	F.V.OH
	Filet	n/a
Vertical progression		

**Electrical characteristics**

Transfer mode (GMAW)	Globular
Current type	DCEP
Other	

**Technique**

Stringer or weave bead	Stringer or Weave
Multi/single pass (per side)	Single or Multiple
Number of electrodes	Single electrode
Spacing:	Longitudinal (mm) -
	Lateral (mm) -
	Angle (deg.) -
Contact tube to work	12 - 25
Peening	Not permitted
Interpass cleaning	Brushing or grinding

**Base metals** \* Datum, As Detailed (As Fit-Up)

Spec., type or grade	AWS D1.1 Table 3.1 Group I
Thickness:	Groove (mm) T1: unlimited
	Filet (mm) n/a
Diameter (Pipe)	Unlimited

**Filler metals**

AWS Specification	E 5.18
AWS Classification	ER70S-SH16

**Shielding**

Flux	-
Electrode-flux (class)	-
Gas composition	75% Argon, 25% CO <sub>2</sub>
Gas flow rate	(l/min) 15-19
Gas cup size	(mm) 19

**Preheat**

Preheat temp.:	Min. (°C)	See notes
Interpass temp.:	Min. (°C)	See notes
	Max. (°C)	See notes

**Post weld heat treatment**

Temperature	(°C)	None
Time	(hrs)	

**Welding procedure**

Layer	Pass	Process	Filler metal class	Filler metal diameter (mm)	Current type / polarity	Amps	Wire feed speed (m/min)	Volts	Travel speed (m/min)	Joint details
1	All	GMAW	ER70S-SH16		DCEP	100-135	850-1000	25-35	250-350	

Designation B-U2a-GF

**Notes**

PREHEAT/INTERPASS  
For thickness 3 to 19(mm): 0(°C). Preheat to 20(°C) if the base metal temperature is below 0(°C).  
Over 19 thru 38.1(mm): 66(°C).  
Over 38.1 thru 63.5(mm): 107(°C).  
Over 63.5(mm): 150(°C).  
See additional information page for further limitations

Welding Engineer		Senior Welding Engineer	
Name	Signature	Name	Signature
SYS			
Date		Date	
30/07/2003			

# How to create a WPQ

Start Welderqual by clicking on the Welderqual icon on your desktop. The system displays a form giving you various options. Click "close" to remove the form.

**1**

Click on the small drop-down arrow  as shown. Select **ASME IX WPQ**.

**2**

For the fastest possible data entry, always select the desired data from the drop-down menus  or databases  rather than typing the information manually.

**3**

**Do not enter "Range Qualified" data manually.** All you need to enter are the "Actual Values" of the welder qualification test and the Code Checking will fill in the Qualified Ranges based on the Actual Values that you enter.

**4**

As you select a welding process, the form will grow supplying you with the required fields specific for the process selected. Notice that Welderqual allows the use of up to three processes on one WPQ.

**5**

When specifying the filler metal, select it from the Filler Material Database instead of manually typing the information. To do this, place the cursor in the "Filler metal spec" field and click on the database icon . Locate the same material listed in this example and double-click on it. Welderqual enters the proper Specification, Classification and F numbers automatically.

**NOTE: Only a few filler metals and base metals are visible in the materials database while in demonstration mode.**

**6**

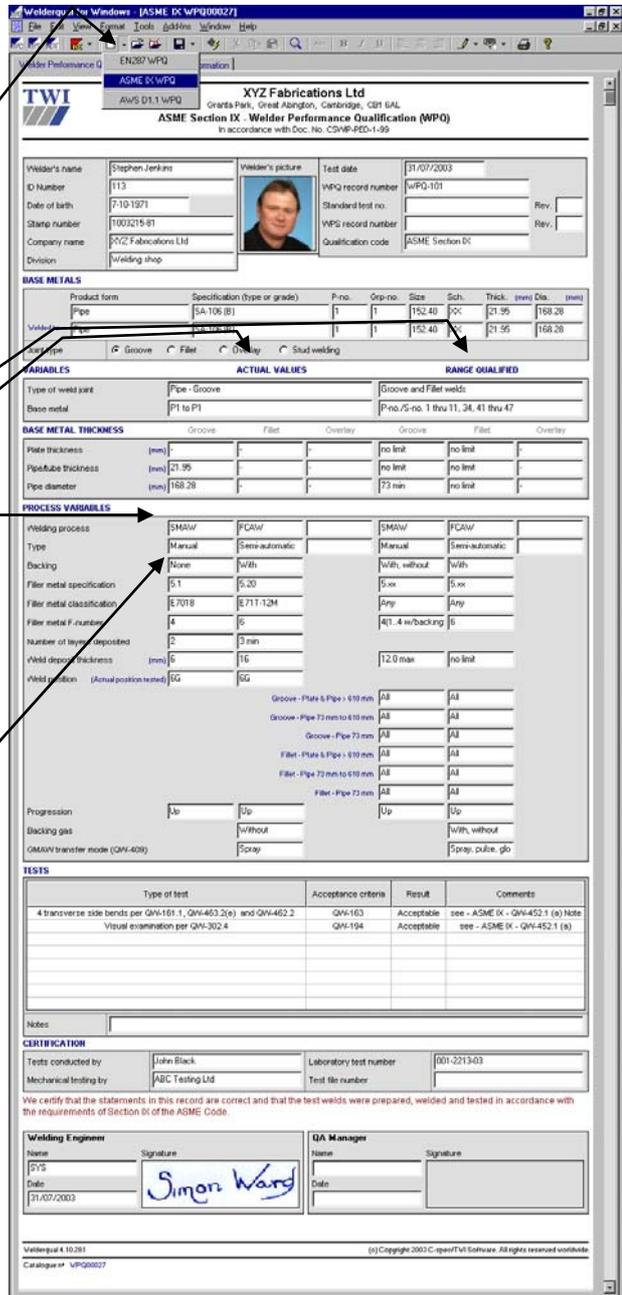
**Printing this WPQ:**

To print this record, go to the top of the screen and click on File. Select the second print option which will say: **Print Unassigned ASME WPQ000x**.

**7**

**Instantly clone a WPQ:**

One of the best time saving features in Welderqual is the ability to create duplicates of a completed WPQ. To do this, go to the top of the screen and click on **File/Save As New**, then select WPQ. Welderqual will create a duplicate of this current record.



The screenshot shows the Welderqual software interface for creating an ASME IX WPQ. The window title is "Welderqual - Windows [ASME IX WPQ00027]". The form is for "XYZ Fabrications Ltd" and is titled "ASME Section IX - Welder Performance Qualification (WPQ)".

**Welder Information:**

- Welder's name: Stephen Jenkins
- D Number: 113
- Date of birth: 7-10-1971
- Stamp number: 1003215-81
- Company name: XYZ Fabrications Ltd
- Division: Welding shop
- Welder's picture: 
- Test date: 31/07/2003
- WPQ record number: WPQ.101
- Standard test no.:
- WPS record number:
- Qualification code: ASME Section IX

**BASE METALS:**

Product form	Specification (type or grade)	P-no.	Qp-no.	Size	Sch.	Thick. (mm)	Clas.	Items
Pipe	SA 106 B	1	1	152.40	5K	21.95	168.28	
Welded joint				152.40	5K	21.95	168.28	

**ACTUAL VALUES:**

Type of weld joint: Pipe - Groove  
 Base metal: P1 to P1  
 Groove and Fillet welds: P-no./Q-no. 1 thru 11, 24, 41 thru 47

**RANGE QUALIFIED:**

Plate thickness (mm)	Pipe/Tube thickness (mm)	Pipe diameter (mm)	Groove	Fillet	Overlay	Groove	Fillet	Overlay
			no limit	no limit		no limit	no limit	

**PROCESS VARIABLES:**

Welding process	SMAW		FCAW	
	Type	Manual	Semi-automatic	Manual
Backing	None	With	With	Without
Filler metal specification	E 5.1	E 5.20	E 5-w	E 5-wr
Filler metal classification	E 7018	E 711-72M	Any	Any
Filler metal F numbers	4	5	4/1, 4 w/backing	5
Number of layers deposited	2	3 min		
Weld deposit thickness (mm)	6	16	12.0 max	no limit
Weld position (Actual position tested)	5G	5G		
Progression	Up	Down	Up	Down
Backing gas	With	Without	With, without	
CGMAY transfer mode (QW-409)	Spray		Spray, pulse, glo	

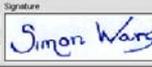
**TESTS:**

Type of test	Acceptance criteria	Result	Comments
4 transverse side bends per QW-161.1, QW-463.2(e) and QW-462.2	QW-163	Acceptable	see - ASME IX - QW-452.1 (a) Note
Visual examination per QW-302.4	QW-194	Acceptable	see - ASME IX - QW-452.1 (a)

**CERTIFICATION:**

Tests conducted by: John Black  
 Laboratory test number: 001-221303  
 Mechanical testing by: ABC Testing Ltd  
 Test file number:

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.

**Welding Engineer:** Name: SVS, Date: 31/07/2003, Signature:   
**QA Manager:** Name: \_\_\_\_\_, Date: \_\_\_\_\_, Signature: \_\_\_\_\_

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# WPQ printout sample



**XYZ Fabrications Ltd**  
 Granta Park, Great Abington, Cambridge, CB1 6AL  
**ASME Section IX - Welder Performance Qualification (WPQ)**  
 In accordance with Doc. No. CSWIP-PED-1-99

Welder's name	Stephen Jenkins		Test date	31/07/2003
ID Number	113		WPQ record number	WPQ-101
Date of birth	7-10-1971		Standard test number	Rev.
Stamp number	1003215-81		WPS record number	Rev.
Company name	XYZ Fabrications Ltd		Qualification code	ASME Section IX
Division	Welding shop			

**BASE METALS (QW-403)**

	Product form	Specification (type or grade)	P no.	Grp-no.	Size	Sch.	Thick. (mm)	Dia. (mm)
Welded to:	Pipe	SA-106 (B)	1	1	152.40	XX	21.95	168.28
	Pipe	SA-106 (B)	1	1	152.40	XX	21.95	168.28
Joint type	Groove							

**VARIABLES**

	Actual values	RANGE QUALIFIED
Type of weld joint	Pipe - Groove	Groove and Fillet welds
Base metal	P1 to P1	P-no./S-no. 1 thru 11, 34, 41 thru 47

**BASE METAL THICKNESS**

		Groove	Fillet	Overlay	Groove	Fillet	Overlay
Plate thickness (mm)		-	-	-	no limit	no limit	-
Pipe/tube thickness (mm)		21.95	-	-	no limit	no limit	-
Pipe diameter (mm)		168.28	-	-	73 min	no limit	-

**PROCESS VARIABLES**

	Actual values		RANGE QUALIFIED	
Welding process	SMAW	FCAW	SMAW	FCAW
Type	Manual	Semi-automatic	Manual	Semi-automatic
Backing	None	With	With, without	With
Filler metal specification	5.1	5.20	5xx	5xx
Filler metal classification	E7018	E71T-12M	Any	Any
Filler metal F-number	4	6	4(1.4 w/backing)	6
Number of layers deposited	2	3 min		
Weld deposit thickness (mm)	6	16	12.0 max	no limit
Weld position (Actual position tested)	6G	6G		
Groove - Plate & Pipe > 610mm			All	All
Groove - Pipe 73mm to 610mm			All	All
Groove - Pipe < 73mm			All	All
Fillet - Plate & Pipe > 610mm			All	All
Fillet - Pipe 73mm to 610mm			All	All
Fillet - Pipe < 73mm			All	All
Progression	Up	Up	Up	Up
Backing gas	-	Without	-	With, without
GMAW transfer mode (QW-409)	-	Spray	-	Spray, pulse, globular

**TESTS**

Type of test	Acceptance criteria	Result	Comments
4 transverse side bends per QW-161.1, QW-463.2(e) and QW-462.2	QW-163	Acceptable	see - ASME IX - QW-452.1 (a) Note (1)
Visual examination per QW-302.4	QW-194	Acceptable	see - ASME IX - QW-452.1 (a)

**Notes**

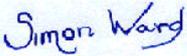
**CERTIFICATION**

Tests conducted by	John Black	Laboratory test number	001-2213-03
Mechanical tests by	ABC Testing Ltd	Test file number	

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.

**Welding Engineer**

**QA Manager**

Name	Signature	Name	Signature
SYS			
Date		Date	
31/07/2003			

# How to create an NDE Report (RT shown)

Start NDTspec by clicking on the NDTspec icon on your desktop. The system displays a form giving you various options. Click "close" to remove the form.

**1**

Click on the small drop-down arrow as shown. Select **Radiographic Report**.

**2**

For fast data entry, always select the desired data from the drop-down menus or databases rather than typing the information manually.

**3**

When entering the **Examination results**, specify the welder that performed the welding, the length of the examined area, length of rejectable welding and the process used. Tracking this data may enable the use of Performance Reports, which determine reject rates and helps to monitor production.

**4**

You can enter as many lines of data into the Examination Results section as you wish. NDTspec will automatically print your report over multiple pages if necessary.

**5**

Based on the number of techniques specified in the Examination results section (A,B,C,D), NDTspec provides the proper number of **Equipment and Technique details** sections.

**6**

When filling out the Equipment and Techniques details, Source and Film data can be entered straight out of the Source and Film Profile databases, preventing the need to ever enter the same information twice. Additionally, Curies will be automatically calculated based on the report date above.

**7**

Instead of drawing an NDE sketch, the Sketch Selection Manager includes a database of typical pre-drawn images.

The screenshot shows the NDTspec software interface for creating a Radiographic Examination Report (RT). The window title is "NDTspec - [Standard RT-00079]". The menu bar includes File, Edit, View, Format, Tools, Add-ins, Window, and Help. The main window is titled "XYZ Fabrications Ltd Radiographic Examination Report (RT) NDTspec".

**Client Information:**

- Client: The Power Generation Company
- Project: ABC Power Plant
- Location: Powertown
- Project specification: ABC PFD01
- Acceptance standards: ASME B31.3

**Exam Details:**

- NDE procedure number: RT 001
- Exam date: 31/07/2003
- Project ID number: 314 001 03
- Job/serial number: 110221
- Drawing number: Drawing 001
- NDE reference number: RT 03/1771

**Examination results table:**

Weld piece ID	Anno	Result	Discontinuity	Comments	Tech	Welder ID	Length of area (mm)	Length of defect(s) (mm)	Process
Weld 001	0-1	ACC			A	101	250	-	SMAWV
	1-2	ACC					250	-	
	2-3	ACC					250	-	
Weld 002	0-1	ACC			A	113	275	-	SMAWV
	1-2	ACC					275	-	
	2-3	ACC					275	-	
Weld 003	0-1	ACC			B	151	250	-	SMAWV
	1-2	ACC					250	-	
	2-3	ACC					250	-	
Weld 004	0-1	ACC			A	101	250	-	SMAWV
	1-2	ACC					250	-	
	2-3	REJ	Porosity				250	15	
Weld 005	0-1	ACC			B	102	300	-	FCWV
	1-2	REJ	Crack				300	25	
	2-3	ACC					300	-	

**Equipment and Technique details - Technique "A"**

- Source/Equip: Iridium 192
- Type/AV: 91010
- Curies/MA: 62
- Size/F.S (mm): 2.5
- IGI type: Hole
- IGI size: 15.2T
- IGI side: Film
- Developer time/temp: 5 min / 20°C
- Density range: 2.8 - 3.2
- Screen size: 005 / 010
- Object to film (mm): 12.5
- Material: C.Fe
- Pipe dia./Hole: 250
- Thickness (mm): 10
- Shim (mm): 3
- Screen type: Lead
- Unsharp. Ug (mm): 1
- Exposure time: 45 sec
- Exposure/view type: Double Wall Exposure/Single Wall View

**Equipment and Technique details - Technique "B"**

- Source/Equip: Iridium 192
- Type/AV: 91010
- Curies/MA: 62
- Size/F.S (mm): 2.5
- IGI type: Hole
- IGI size: 20.2T
- IGI side: Source
- Developer time/temp: 5 min / 20°C
- Density range: 2.4 - 2.9
- Screen size: 005 / 010
- Object to film (mm): 12.5
- Material: C.Fe
- Pipe dia./Hole: 275
- Thickness (mm): 10
- Shim (mm): 3
- Screen type: Lead
- Unsharp. Ug (mm): 1
- Exposure time: 32 sec
- Exposure/view type: Single Wall Exposure/Single Wall View

**Signature Section:**

- NDE Technician: Name: SYS, Date: 31/07/2003, Signature: Simon Ward
- Client: Name: \_\_\_\_\_, Date: \_\_\_\_\_, Signature: \_\_\_\_\_
- ASNT Level 3: Name: \_\_\_\_\_, Date: \_\_\_\_\_, Signature: \_\_\_\_\_

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# RT Report printout sample



**The Power Generation Company**  
 Granta Park, Great Abington, Cambridge, CB1 6AL, UK  
**Radiographic Examination Report (RT)**  
 NDTspec

		NDE procedure number	RT 001
Client	The Power Generation Company	Exam date	31/07/2003
Project	ABC Power Plant	Project ID number	3-14-001-03
Location	Powertown	Job/serial number	110221
Project specification	ABC PP001	Drawing number	Drawing 001
Acceptance standards	ASME B31.3	NDE reference number	RT 03/1771

**Examination results**

Weld piece ID	Area	Result	Discontinuity	Comments	Tech.	Welder ID	Weld Area	Defect length(s)	Process
Weld 001	0-1	ACC			A	101	250	-	SMAW
	1-2	ACC					250	-	
	2-3	ACC					250	-	
Weld 002	0-1	ACC			A	113	275	-	SMAW
	1-2	ACC					275	-	
	2-3	ACC					275	-	
Weld 003	0-1	ACC			B	151	250	-	SMAW
	1-2	ACC					250	-	
	2-3	ACC					250	-	
Weld 004	0-1	ACC			A	101	250	-	SMAW
	1-2	ACC					250	-	
	2-3	REJ					250	15	
Weld 005	0-1	ACC			B	102	300	-	FCAW
	1-2	REJ					300	25	
	2-3	ACC					300	-	

**Equipment and Technique details - Technique "A"**

Source/Equipment	Iridium 192	Source to film	295	Screen size	.005 / .010	<p>Double Wall Exposure/Single Wall View</p>
Type/kV	91010	Object to film	19	Film type	1	
Curies/mA	62	Material	C-Fe	Film make	Kodak	
Size/Focal size	2.5	Pipe dia./Plate	250	Film speed	T	
IQI type	Hole	Thickness	10	Film size	75 x 200	
IQI size	15-2T	Shim.	3	Film per cassette	1	
IQI side	Film	Screen type	Lead	Total film	16	
Dev. time/temp	5 min / 20°C			Unsharpness Ug	1	
Density range	2.8 - 3.2			Exposure time	45 sec	

**Equipment and Technique details - Technique "B"**

Source/Equipment	Iridium 192	Source to film	295	Screen size	.005 / .010	<p>Single Wall Exposure/Single Wall View</p>
Type/kV	91010	Object to film	12.5	Film type	1	
Curies/mA	62	Material	C-Fe	Film make	Kodak	
Size/Focal size	2.5	Pipe dia./Plate	275	Film speed	T	
IQI type	Hole	Thickness	10	Film size	3.5 x 17	
IQI size	20-2T	Shim.	3	Film per cassette	1	
IQI side	Source	Screen type	Lead	Total film	12	
Dev. time/temp	5 min / 20°C			Unsharpness Ug	1.5	
Density range	2.4 - 2.9			Exposure time	32 sec	

We, the undersigned, certify that the statements in this record are correct and that the welds and/or pieces were examined in accordance with the requirements of the above specified project specification and acceptance standard.

NDE Technician	Name	SYS	Signature	
	Date	31/07/2003		
	Level	II		
Client	Name		Signature	
	Date			
ASNT Level 3	Name		Signature	
	Date			