ASME SECTION IX
を理解しよう！

笹口技術士事務所

WPSとは？

溶接設計(Welding Design)

- 溶接方法(Welding Process)の選定
- 溶接材料(Welding Consumables)の選定
- 溶接開先(Welding Groove)の決定
- 溶接条件(Welding Conditions)の決定
  - 溶接条件(Electrical Characteristics)
  - 予熱温度(Preheat Temperature)
  - パス間温度(Interpass Temperature), etc.

“Variables”

WPS（設計のOutput)

WPS とは？

ASME IX, QW-200.1

- **Written document**
- **For making production welds**
- **Direction to the welder**

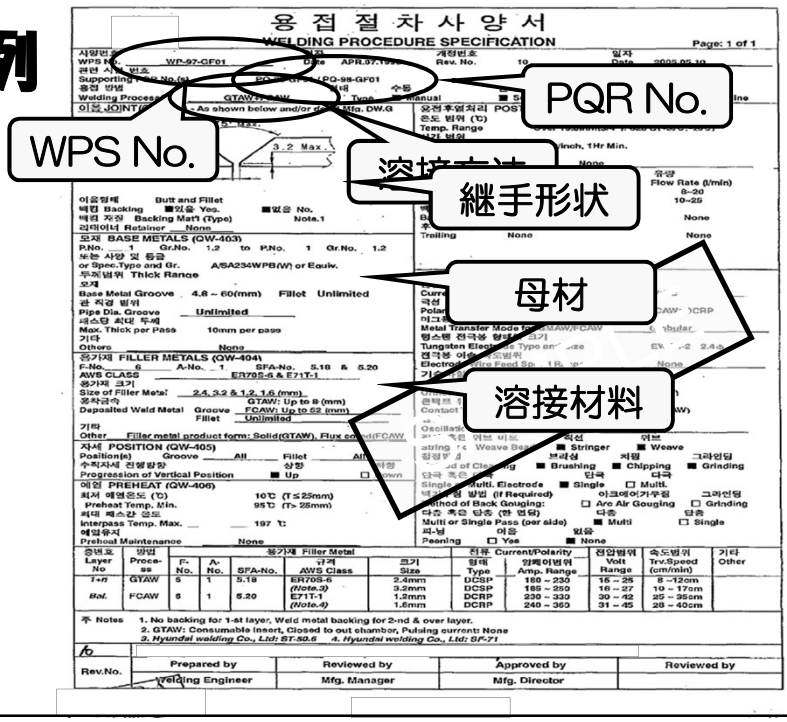
Contents : ① 数値に**Range**を持つ

② **ASME IX** の**Variables**を指示

Style : ① **Narrative Style** （国内**Job**に多い）

② **Tabular Style** ⇨ 狭義のWPS

WPSの実例



WPS の QUALIFICATION

- WPSは自社認定(Qualification)
- WPSがQualifiedされている = Supporting PQR がある

PQR = Procedure Qualification Record

溶接施工法認定試験の記録

PQRのContents : 試験中の溶接記録 + 機械試験記録 (Essential Variables)

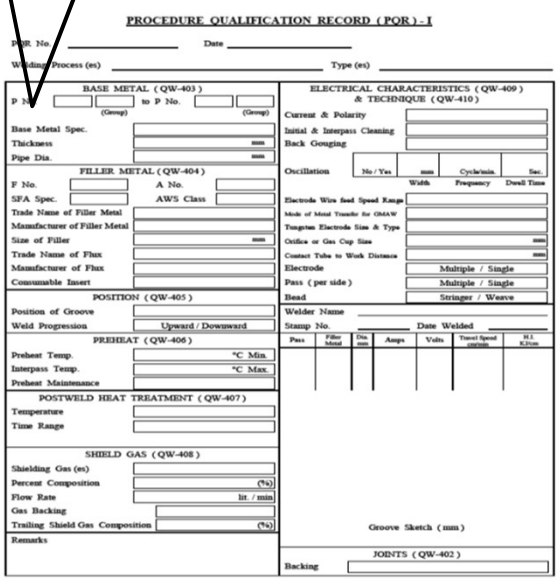
- WPSでできる溶接部の機械的性能を“事前に”確認する

PQR が WPS を Support するための ルール が ASME Section IX

PQRの実例

試験板の溶接記録

機械試験の記録



PROCEDURE QUALIFICATION RECORD (PQR) - I

PQR No. _____ Date _____

Welding Process (es) _____ Type (es) _____

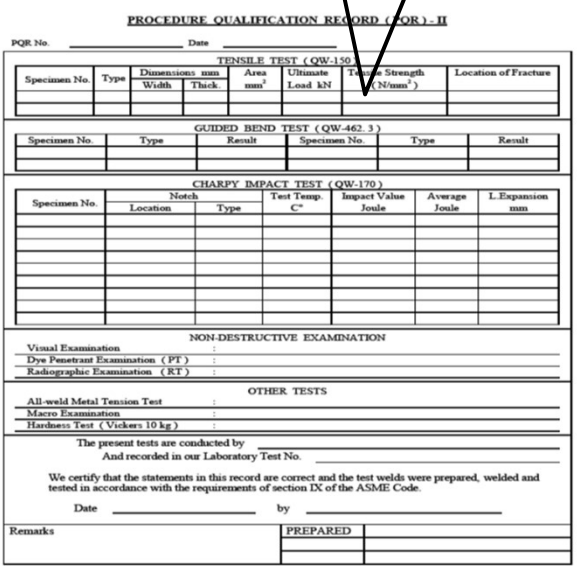
BASE METAL (QW-403)	
P No.	to P No.
Base Metal Spec.	
Thickness	mm
Pipe Dia.	mm
FILLER METAL (QW-404)	
F No.	A No.
SFA Spec.	AWS Class
Trade Name of Filler Metal	
Manufacturer of Filler Metal	
Size of Filler	mm
Trade Name of Flux	
Manufacturer of Flux	
Consumable Insert	
POSITION (QW-405)	
Position of Groove	
Weld Progression	Upward / Downward
PREHEAT (QW-406)	
Preheat Temp.	°C Min.
Interpass Temp.	°C Max.
Preheat Maintenance	
POSTWELD HEAT TREATMENT (QW-407)	
Temperature	
Time Range	
SHIELD GAS (QW-408)	
Shielding Gas (es)	
Percent Composition	(%)
Flow Rate	lit. / min
Gas Backing	
Trailing Shield Gas Composition	(%)
Remarks	

ELECTRICAL CHARACTERISTICS (QW-409) & TECHNIQUE (QW-410)			
Current & Polarity			
Initial & Interpass Cleaning			
Back Gouging			
Oscillation	No / Yes	mm Width	Cycle/min. Frequency / Sec. Dwell Time
Electrode Wire feed Speed Range			
Mode of Metal Transfer for GMAW			
Tungsten Electrode Size & Type			
Orifice or Gas Cup Size			mm
Contact Tube to Work Distance			mm
Electrode	Multiple / Single		
Pass (per side)	Multiple / Single		
Bead	Stringer / Weave		
Welder Name			
Stamp No.	Date Welded		

Pass	Filler Metal	Dia. mm	Amps	Volts	Travel Speed cm/min	H.I. KJ/cm

Groove Sketch (mm)

JOINTS (QW-402)	
Backing	



PROCEDURE QUALIFICATION RECORD (PQR) - II

PQR No. _____ Date _____

TENSILE TEST (QW-150)

Specimen No.	Type	Dimensions mm Width	Dimensions mm Thick.	Area mm²	Ultimate Load kN	Tensile Strength (N/mm²)	Location of Fracture

GUIDED BEND TEST (QW-462. 3)

Specimen No.	Type	Result	Specimen No.	Type	Result

CHARPY IMPACT TEST (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp. C°	Impact Value Joule	Average Joule	L.Expansion mm

NON-DESTRUCTIVE EXAMINATION

Visual Examination :

Dye Penetrant Examination (PT) :

Radiographic Examination (RT) :

OTHER TESTS

All-weld Metal Tension Test :

Macro Examination :

Hardness Test (Vickers 10 kg) :

The present tests are conducted by _____

And recorded in our Laboratory Test No. _____

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

Date _____ by _____

Remarks	PREPARED	

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WPS を レビューする

Welding Variables

WELDING PROCEDURE QUALIFICATIONS

QW-255
WELDING VARIABLES PROCEDURE SPECIFICATIONS (WPS)
Gas Metal-Arc Welding (GMAW and FCAW)

Paragraph			Brief of Variables	Essential	Supplementary Essential	Nonessential
QW-402 Joints	.1	ϕ	Groove design			×
	.4	−	Backing			×
	.10	ϕ	Root spacing			×
	.11	±	Retainers			×
QW-403 Base Metals	.5	ϕ	Group Number		×	
	.6		*T* Limits		×	
	.7		*T*/*t* Limits > 8 in. (200 mm)	×		
	.8	ϕ	*T* Qualified	×		
	.9		*t* Pass > ½ in. (13 mm)	×		
	.10		*T* limits (S. cir. arc)	×		
	.11	ϕ	P-No. qualified	×		
	.13	ϕ	P-No. 5/9/10	×		
QW-404 Filler Metals	.4	ϕ	F-Number	×		
	.5	ϕ	A-Number	×		
	.6	ϕ	Diameter			×
	.12	ϕ	Classification		×	
	.23	ϕ	Filler metal product form	×		
	.24	± ϕ	Supplemental	×		
	.27	ϕ	Alloy elements	×		
	.30	ϕ	*t*	×		
	.32		*t* Limits (S. cir. arc)	×		
	.33	ϕ	Classification			×
QW-405 Positions	.1	+	Position			×
	.2	ϕ	Position		×	
	.3	ϕ	↑↓ Vertical welding			×
QW-406 Preheat	.1		Decrease > 100°F (55°C)	×		
	.2	ϕ	Preheat maint.			×
	.3		Increase > 100°F (55°C) (IP)		×	
QW-407 PWHT	.1	ϕ	PWHT	×		
	.2	ϕ	PWHT (T & T range)		×	
	.4		*T* Limits	×		

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WPS を レビューする

Welding Variables

2004 SECTION IX

QW-255
WELDING VARIABLES PROCEDURE SPECIFICATIONS (WPS)
Gas Metal-Arc Welding (GMAW and FCAW) (Cont'd)

Paragraph			Brief of Variables	Essential	Supplementary Essential	Nonessential
QW-408 Gas	.1	±	Trail or ϕ comp.			X
	.2	ϕ	Single, mixture, or %	X		
	.3	ϕ	Flow rate			X
	.5	±	or ϕ Backing flow			X
	.9	−	Backing or ϕ comp.	X		
	.10	ϕ	Shielding or trailing	X		
QW-409 Electrical Characteristics	.1	>	Heat input		X	
	.2	ϕ	Transfer mode	X		
	.4	ϕ	Current or polarity		X	X
	.8	ϕ	I & E range			X
QW-410 Technique	.1	ϕ	String/weave			X
	.3	ϕ	Orifice, cup, or nozzle size			X
	.5	ϕ	Method cleaning			X
	.6	ϕ	Method back gouge			X
	.7	ϕ	Oscillation			X
	.8	ϕ	Tube-work distance			X
	.9	ϕ	Multiple to single pass/side		X	X
	.10	ϕ	Single to multiple electrodes		X	X
	.15	ϕ	Electrode spacing			X
	.25	ϕ	Manual or automatic			X
	.26	±	Peening			X
	.64		Use of thermal processes	X		

Legend:
+ Addition > Increase/greater than ↑ Uphill ← Forehand ϕ Change
− Deletion < Decrease/less than ↓ Downhill → Backhand

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WPS 作成の流れ

溶接の基本設計 → (Preliminary) WPS

↓

溶接施工法認定試験 → (Supporting) PQR

↓

溶接施工法の決定 → (Qualified) WPS

WPS REVIEW の基本

- Manufacturerのロゴがあるか？
- 作成者の責任体系がわかるか？
- Applicationが明確か？
- Supporting PQRが refer されているか？
- 内容が指示書、仕様書になっているか？

↓

これだけでベンダーの技術レベルがわかる！

WPS レビューのポイント

知っておきたいASME IX 独特な考え方(1)

Backing （裏当て）QW-402 Joints

- 両側開先溶接(**Double-welded groove welds**)
  は“**Backing**有り”とみなす
  “**Backing**無し”は裏波溶接の時のみ

注) 溶接士の認定では、**Essential Variable**

Welding Variables

QW-402

WELDING PROCEDURE QUALIFICATIONS

QW-255
WELDING VARIABLES PROCEDURE SPECIFICATIONS (WPS)
Gas Metal-Arc Welding (GMAW and FCAW)

Paragraph			Brief of Variables	Essential	Supplementary Essential	Nonessential
QW-402 Joints	.1	⌀	Groove design			×
	.4	–	Backing			×
	.10	⌀	Root spacing			×
	.11	±	Retainers			×
QW-403 Base Metals	.5	⌀	Group Number		×	
	.6		*T* Limits		×	
	.7		*T/t* Limits > 8 in. (200 mm)	×		
	.8	⌀	*T* Qualified	×		
	.9		*t* Pass > ½ in. (13 mm)	×		
	.10		*T* limits (S. cir. arc)	×		
	.11	⌀	P-No. qualified	×		
	.13	⌀	P-No. 5/9/10	×		
QW-404 Filler Metals	.4	⌀	F-Number	×		
	.5	⌀	A-Number	×		
	.6	⌀	Diameter			×
	.12	⌀	Classification		×	
	.23	⌀	Filler metal product form	×		
	.24	± ⌀	Supplemental	×		
	.27	⌀	Alloy elements	×		
	.30	⌀	*t*	×		
	.32		*t* Limits (S. cir. arc)	×		
	.33	⌀	Classification			×
QW-405 Positions	.1	+	Position			×
	.2	⌀	Position		×	
	.3	⌀	↑↓ Vertical welding			×
QW-406 Preheat	.1		Decrease > 100°F (55°C)	×		
	.2	⌀	Preheat maint.			×
	.3		Increase > 100°F (55°C) (IP)		×	
QW-407 PWHT	.1	⌀	PWHT	×		
	.2	⌀	PWHT (T & T range)		×	
	.4		*T* Limits	×		

Welding Variables (QW-402)

QW-402 Joints

QW-402.1 A change in the type of groove (Vee-groove, U-groove, single-bevel, double-bevel, etc.).

QW-402.2 The addition or deletion of a backing.

QW-402.3 A change in the nominal composition of the backing.

QW-402.4 The deletion of the backing in single-welded groove welds. Double-welded groove welds are considered welding with backing.

QW-402.5 The addition of a backing or a change in its nominal composition.

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WPS レビューのポイント

<u>知っておきたいASME IX 独特な考え方(2)</u>

Deposited Weld Metal Thickness QW-404 Filler Metals

（溶接金属厚さ）

- 母材の板厚だけでなく、出来上がった溶接金属の厚さ（デポ厚）もVariableになる
- コンビネーションの溶接方法の場合、それぞれの溶接方法のデポ厚を確認すること

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Welding Variables

QW-404.30

QW-450 SPECIMENS

QW-451 Procedure Qualification Thickness Limits and Test Specimens

QW-451.1
GROOVE-WELD TENSION TESTS AND TRANSVERSE-BEND TESTS

Thickness T of Test Coupon, Welded, in. (mm)	Range of Thickness T of Base Metal, Qualified, in. (mm) [Notes (1) and (2)] Min.	Max.	Maximum Thickness t of Deposited Weld Metal, Qualified, in. (mm) [Notes (1) and (2)]	Type and Number of Tests Required (Tension and Guided-Bend Tests) [Note (2)] Tension, QW-150	Side Bend, QW-160	Face Bend, QW-160	Root Bend, QW-160
Less than 1/16 (1.5)	T	$2T$	$2t$	2	...	2	2
1/16 to 3/8 (1.5 to 10), incl.	1/16 (1.5)	$2T$	$2t$	2	Note (5)	2	2
Over 3/8 (10), but less than 3/4 (19)	3/16 (5)	$2T$	$2t$	2	Note (5)	2	2
3/4 (19) to less than 1 1/2 (38)	3/16 (5)	$2T$	$2t$ when $t < 3/4$ (19)	2 [Note (4)]	4	...	...
3/4 (19) to less than 1 1/2 (38)	3/16 (5)	$2T$	$2T$ when $t \geq 3/4$ (19)	2 [Note (4)]	4	...	...
1 1/2 (38) and over	3/16 (5)	8 (200) [Note (3)]	$2t$ when $t < 3/4$ (19)	2 [Note (4)]	4	...	...
1 1/2 (38) and over	3/16 (5)	8 (200) [Note (3)]	8 (200) [Note (3)] when $t \geq 3/4$ (19)	2 [Note (4)]	4	...	...

NOTES:
(1) The following variables further restrict the limits shown in this table when they are referenced in QW-250 for the process under consideration: QW-403.9, QW-403.10, QW-404.32, and QW-407.4. Also, QW-202.2, QW-202.3, and QW-202.4 provide exemptions that supersede the limits of this table.
(2) For combination of welding procedures, see QW-200.4.
(3) For the welding processes of QW-403.7 only; otherwise per Note (1) or $2T$, or $2t$, whichever is applicable.
(4) See QW-151.1, QW-151.2, and QW-151.3 for details on multiple specimens when coupon thicknesses are over 1 in. (25 mm).
(5) Four side-bend tests may be substituted for the required face- and root-bend tests, when thickness T is 3/8 in. (10 mm) and over.

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WPS レビューのポイント

知っておきたいASME IX 独特な考え方(3)

Welding Position と Test Position QW-405 Positions

（溶接姿勢とテスト姿勢）

Welding Position :

① **Groove** と **Fillet** の区別

② 製品の溶接姿勢は ４種類のみ

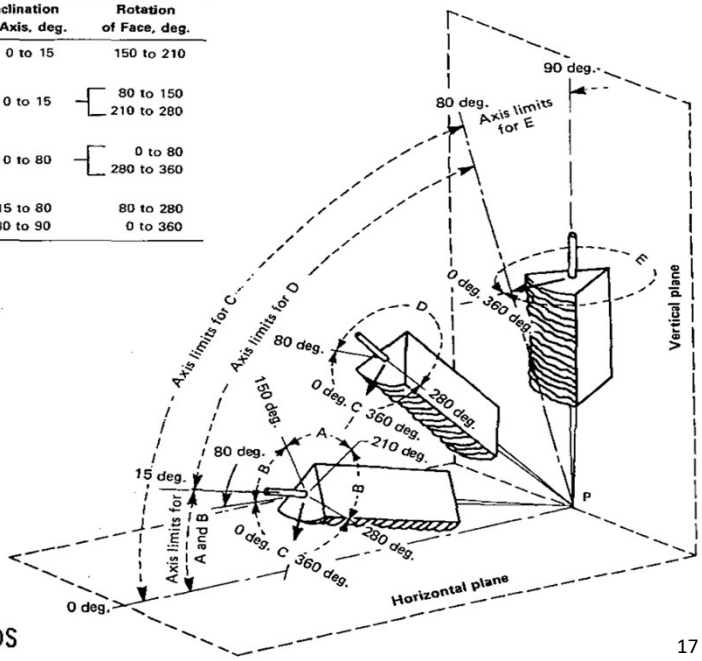
Flat, Horizontal, Vertical, Overhead

Welding Variables

QW-405
製品の溶接
姿勢

Tabulation of Positions of Welds

Position	Diagram Reference	Inclination of Axis, deg.	Rotation of Face, deg.
Flat	A	0 to 15	150 to 210
Horizontal	B	0 to 15	80 to 150 210 to 280
Overhead	C	0 to 80	0 to 80 280 to 360
Vertical	D	15 to 80	80 to 280
	E	80 to 90	0 to 360



QW-461.1 POSITIONS OF WELDS — GROOVE WELDS

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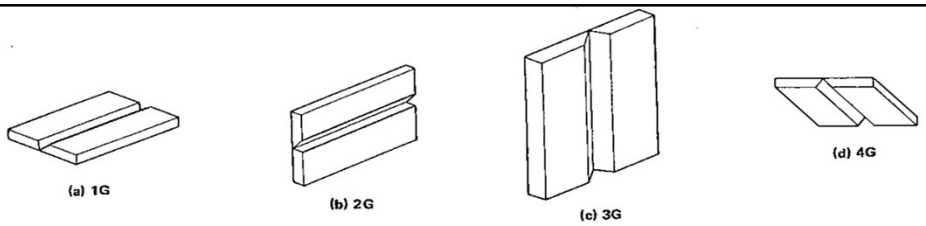
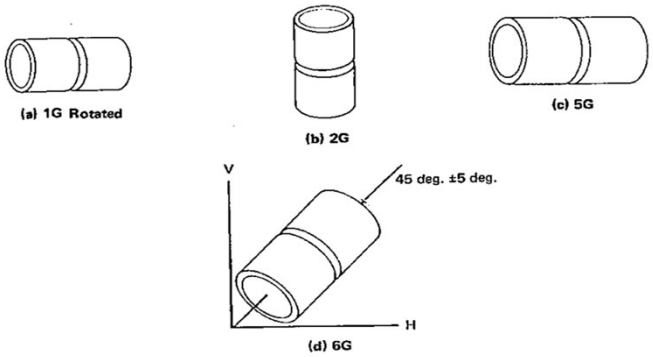
Welding Variables

QW-405
テスト姿勢

1G, 2G など
はWPSには用
いない



QW-461.3 GROOVE WELDS IN PLATE — TEST POSITIONS



QW-461.4 GROOVE WELDS IN PIPE — TEST POSITIONS

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WPS レビューのポイント

知っておきたいASME IX 独特な考え方(4)

予熱とパス間温度　**QW-406 Preheat**

- **Preheat Temperature:**
  各パスの直前の溶接部の最低温度
  *予熱をするしないは、**variable**ではない
- **Interpass Temperature:**
  各パスの直前の溶接部の最高温度

Welding Variables

QW-406

preheat temperature — the minimum temperature in the weld joint preparation immediately prior to the welding; or in the case of multiple pass welds, the minimum temperature in the section of the previously deposited weld metal, immediately prior to welding

interpass temperature — the highest temperature in the weld joint immediately prior to welding, or in the case of multiple pass welds, the highest temperature in the section of the previously deposited weld metal, immediately before the next pass is started

ASME Section IX, QG-109 Definitions

WPS レビューのポイント

知っておきたいASME IX 独特な考え方(5)

Postweld Heat Treatment　QW-407 PWHT

- **PWHT**（溶接後熱処理）：

  Any heat treatment subsequent to welding

  Stress Relief（応力除去焼鈍）,

  Solution Annealing（溶体化処理）など

  ***Postheating, Postweld hydrogen bakeout** などは

  Preheat maintenance として記載する

Welding Variables

QW-407

postheating — the application of heat to an assembly after welding, brazing, soldering, thermal spraying, or thermal cutting

postweld heat treatment — any heat treatment subsequent to welding

postweld hydrogen bakeout — holding a completed or partially completed weld at elevated temperature below 800°F (425°C) for the purpose of allowing hydrogen diffusion from the weld

preheat maintenance — practice of maintaining the minimum specified preheat temperature, or some specified higher temperature for some required time interval after welding or thermal spraying is finished or until post weld heat treatment is initiated

WPS レビューのポイント

知っておきたいASME IX 独特な考え方(6)

自動溶接？- ASMEの分類

- **Manual:** 操作、管理をすべて手動
- **Semi-automatic:** ワイヤ送給が機械、運棒は手動
- **Machine:** オペレーターが溶接を目視で管理しながら
  手動で機械を操作 = いわゆる自動溶接
- **Automatic:** オペレーターの微調整なしに、機械が自動的に
  溶接 = 溶接ロボット

WPS レビューのまとめ

設計エンジニアとしてWPS/PQRをレビューする

ベンダーが製作する溶接構造物には…

(1) どんな材料（母材）が用いられるのか？

(2) どんな溶接法が用いられるのか？

(3) どんな溶接材料が使われるのか？

(4) 設計条件は満たしているか？

e.g.: MDMT, 開先, 硬さ, PWHT, RT, etc.

設計の**Output !**

海外WELDERの管理と教育

Welder と Welding Operator の定義

- **“Welder”**

  Manual or Semi-automatic welding

- **“Welding Operator”**

  Machine or Automatic welding

溶接士の技量認定

Performance Qualification とは？

溶接士が健全な溶接部を作る能力があるか
どうかを試験を行って確認する

= Performance Qualification Test
（技量認定試験）

① 外観目視検査

＋ ② 機械試験（曲げ試験2本）

or ③ RT/UT（試験材150mmL or 製品）

溶接士の技量認定

WPQ とは？

= Welder/Welding Operator
Performance Qualification Record
（溶接士技量認定記録）

(1) WPQ は License, Diploma ではない
(2) ASME の Welder は自社認定
(3) WPQ は品質記録
(4) Certification （サイン）が必要
(5) 溶接士ひとりひとりに作成（ID）

溶接士の技量認定

WPQ（技量認定記録） の内容

(1) Welder Identification
（Name, Stamp No., etc.）
(2) Essential Variables Used for Test
（デポ厚、裏当て、パイプ径、姿勢、etc.）
(3) Type of Test and Test Results
（Visual & RT or Bend）
(4) Work Ranges Qualified for Production Welding
(5) Certification（サイン、社名、ロゴ）

溶接士の技量認定

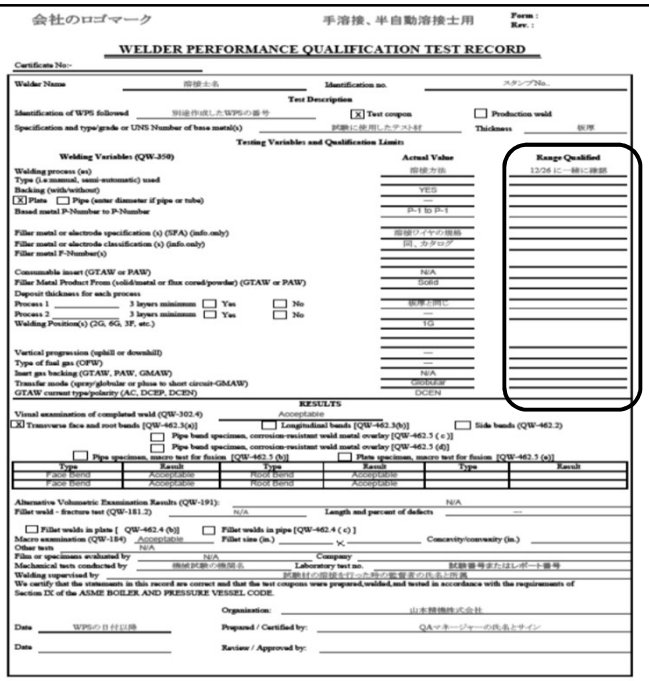
WPQ の書式

(1) ASME IX に Sample Format あり
(2) 表形式が原則
(3) Attachment は望ましい
- 生データ（開先形状、溶接条件等）
- ラボのテストデータ（Bend Test）
- RT Report, Film
- Welders Log, etc.

WPQの実例

試験板の溶接記録
Essential Variables

確認試験の記録
RT or 曲げ試験



会社のロゴマーク　手溶接、半自動溶接士用　Form : Rev. :

WELDER PERFORMANCE QUALIFICATION TEST RECORD

Certificate No:-

Welder Name 溶接士名　Identification no. スタンプNo.

Test Description

Identification of WPS followed 別途作成したWPSの番号　[X] Test coupon　[ ] Production weld

Specification and type/grade or UNS Number of base metal(s) 試験に使用したテスト材　Thickness 板厚

Testing Variables and Qualification Limits

Welding Variables (QW-350)	Actual Value	Range Qualified
Welding process (es)	溶接方法	12/26 に一緒に溶接
Type (i.e manual, semi-automatic) used		
Backing (with/without)	YES	
[X] Plate [ ] Pipe (enter diameter if pipe or tube)	—	
Based metal P-Number to P-Number	P-1 to P-1	
Filler metal or electrode specification (s) (SFA) (info.only)	溶接ワイヤの規格	
Filler metal or electrode classification (s) (info.only)	同、カタログ	
Filler metal F-Number(s)		
Consumable insert (GTAW or PAW)	N/A	
Filler Metal Product Form (solid/metal or flux cored/powder) (GTAW or PAW)	Solid	
Deposit thickness for each process		
Process 1 _____ 3 layers minimum [ ] Yes [ ] No	板厚と同じ	
Process 2 _____ 3 layers minimum [ ] Yes [ ] No	—	
Welding Position(s) (2G, 6G, 3F, etc.)	1G	
Vertical progression (uphill or downhill)	—	
Type of fuel gas (OFW)	—	
Inert gas backing (GTAW, PAW, GMAW)	N/A	
Transfer mode (spray/globular or pluse to short circuit-GMAW)	Globular	
GTAW current type/polarity (AC, DCEP, DCEN)	DCEN	

RESULTS

Visual examination of completed weld (QW-302.4) Acceptable

[X] Transverse face and root bends [QW-462.3(a)] [ ] Longitudinal bends [QW-462.3(b)] [ ] Side bends (QW-462.2)

[ ] Pipe bend specimen, corrosion-resistant weld metal overlay [QW-462.5 (c)]

[ ] Pipe bend specimen, corrosion-resistant weld metal overlay [QW-462.5 (d)]

[ ] Pipe specimen, macro test for fusion [QW-462.5 (b)] [ ] Plate specimen, macro test for fusion [QW-462.5 (e)]

Type	Result	Type	Result	Type	Result
Face Bend	Acceptable	Root Bend	Acceptable		
Face Bend	Acceptable	Root Bend	Acceptable		

Alternative Volumetric Examination Results (QW-191): N/A

Fillet weld - fracture test (QW-181.2) N/A　Length and percent of defects —

[ ] Fillet welds in plate [QW-462.4 (b)] [ ] Fillet welds in pipe [QW-462.4 (c)]

Macro examination (QW-184) Acceptable　Fillet size (in.) ____ x ____　Concavity/convexity (in.) ____

Other tests N/A

Film or specimens evaluated by N/A　Company ____

Mechanical tests conducted by 機械試験の機関名　Laboratory test no. 試験番号またはレポート番号

Welding supervised by 試験材の溶接を行った時の監督者の氏名と所属

We certify that the statements in this record are correct and that the test coupons were prepared,welded,and tested in accordance with the requirements of Section IX of the ASME BOILER AND PRESSURE VESSEL CODE.

Organization: 山本精機株式会社

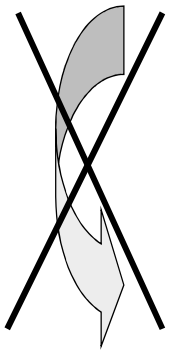
Date WPSの日付以降　Prepared / Certified by: QAマネージャーの氏名とサイン

Date ____　Review / Approved by: ____

溶接士の技量認定

WPQ の Essential Variable (1)

QW-402.4 Backing



WPQ with Backing

- 裏当て付き片側溶接継手
- 両側溶接継手（裏はつり）
- 部分溶け込み溶接継手
- 隅肉溶接継手

WPS without Backing – 裏波出し溶接

⇨ 裏波溶接士は技量試験も裏波出しで行なう

溶接士の技量認定

WPQ の Essential Variable (2)

QW-403.18 Base Metal の区分 (P-No.)

技量試験では３区分のみ

区分１：**Steel, Ni-Alloy, Cu-Ni** ⇦ 同じ区分

区分２：**Al-Alloy**

区分３：**Ti-Alloy, Zr-Alloy**

⇨ 技量試験では母材の種類は問わない！

注）母材の板厚は**WPQ**では**Essential Variable**ではない！

溶接士の技量認定

WPQ の Essential Variable (3)

QW-403.16 Pipe Diameter

O.D. in WPQ	⇨ O.D. Qualified in WPS
D ＜ 25 mm	D ≦ QD ≦ No Limit
25 ≦ T ≦ 73 mm	25 mm ≦ QD ≦ No Limit
T ＞ 73 mm	73 mm ≦ QD ≦ No Limit

N.B., D : Outside Diameter of Test Coupon
QD : Qualified O.D. for Production

73mm O.D. = NPS 2½ (DN65)

溶接士の技量認定

WPQ の Essential Variable (4)

QW-404.15 Filler Metal の区分 (F-No.)

(1) SMAWの場合は、**F-No.**の大きいものは
それ以下の **F-No.**をカバーできる
（ただし、**F-No.5** は別区分）

(2) SMAW以外の場合は、**Steel**用溶接材料
の **F-No.**はすべて“６”

⇨ 技量試験では**SMAW**以外では溶材の種類は問わない！

溶接士の技量認定

WPQ の Essential Variable (5)

QW-405.30 Depo. Weld Metal Thick.

WPQ	⇨	WPS
t = all		**Qt ≦ 2t**
t ≧ 13 mm (Min. of 3 Layers)		**Max. to be Welded**

N.B., **t** : Depo. Weld Metal Thickness of Test Coupon
Qt : Qualified Thickness for Depo. Weld Metal

Groove Weld Test ⇨ **Fillet with All Thick. & Pipe Dia.**

溶接士の技量認定

WPQ の Essential Variable (6)

QW-405.1 Positions (1)

Test Position in WPQ	⇨	Position Qualified	
Plate - Groove		**Groove**	**Fillet**
1G		**F**	**F**
2G		**F, H**	**F, H**
3G		**F, V**	**F, H, V**
4G		**F, O**	**F, H, O**
3G and 4G		**F, V, O**	**All**
2G, 3G and 4G		**All**	**All**

溶接士の技量認定

WPQ の Essential Variable (6)

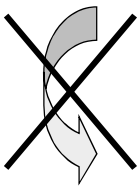
QW-405.1 Positions (2)

Test Position in WPQ	Position Qualified	
Pipe - Groove	Groove	Fillet
1G	F	F
2G	F, H	F, H
5G	F, V, O	All
6G	All	All
2G and 5G	All	All

溶接士の技量認定

WPQ の Essential Variable (7)

QW-405.1 Gas Backing



WPQ with Inert Gas Backing

WPS without Gas Backing

除く
- 裏当て付き片側溶接継手
- 両側溶接継手（裏はつり）
- 隅肉溶接継手

溶接士の技量認定

Retest (ASME IX)

不合格の試験項目	**Retest**の条件
Visual Exam.	**2**セットの試験で外観合格、 その後、**1**セットのみ曲げ試験
Mech. Test (Bend)	**2**セットの試験で曲げ試験合格
RT（試験材）	**2**セットの試験材で**RT**合格
RT（製品）	規定の**2**倍の長さで**RT**合格、 その後、不合格部は自分で補修可
不合格後に**Training**	新規に**Test**をやり直し可

溶接士の技量認定

Expiration and Renewal of Qualification (ASME IX)

Expiration（資格の失効）

あるWelding Processについて、６ヶ月以上作業をしなかった場合、そのProcessは失効

Renewal（資格の更新）

失効したWelding Processを使って1セット試験をして合格すれば、すべての資格が更新（鋼種、板厚、パイプ径、姿勢は問わない）

溶接士の技量認定

Revoke and Restoration of Qualification
(ASME IX)

Revoke（資格の取り消し）
　ある溶接士のWelding Processについて、その技量が疑問視される場合（管理者の義務）

Restoration（資格の復活）
　資格を取り消された溶接士は、必ず実機に近い試験材を使って技量試験を受けなければならない。
合格後 資格は復活（管理者の義務）

