



How Smart Projects Review Welding Procedure Specifications



February 9, 2022



Communication



The Project Management Institute's (PMI's) report *The Essential Role of Communication* states: *ineffective communication has a negative impact on project success >50% of the time.*

Communication and understanding are key to project success





WPS Applications



Welding procedure specifications (WPSs) are used for:

- Instrumentation
- Pressure piping
- Pressure vessels
- Structures.

Service conditions may be:

- As-welded or post weld heat treatment (PWHT) condition
- Standard or low temperature
- Sweet or sour service.





Certified WPSs Are Required

Certified WPSs are required per the code of construction, regulations, standards, or a combination.



WPSs may be reviewed by a project to ensure production welding meets additional requirements; owner specifications, if any.





Ask these Questions about WPSs

A project that does not answer these questions risks inadequate or inappropriate WPS reviews:

1. Which WPSs should be reviewed?
2. How WPSs should be reviewed?
3. Who should review WPSs?

Miscommunication and misunderstanding frustrate project success





A WPS is a Recipe

A WPS is a recipe that addresses essential, non-essential, and supplementary essential variables for production welding.

Like any recipe, a WPS identifies the ingredients (e.g., base metals, consumables, and processes).





A WPS is Like a Cake Recipe

A WPS is like a cake recipe. A cake recipe may make a great cake - but what about appropriateness and context?

The next table lists recipes for two cakes.

Birthday Cake to Serve 12	Wedding Cake to Serve 500
1 cup white sugar	16.7 kg white sugar
½ cup butter	9.4 kg butter
2 eggs	166 eggs
2 teaspoons vanilla extract	818 mL vanilla extract
1½ cups all-purpose flour	15.6 kg all-purpose flour
1¾ teaspoons baking powder	0.65 kg baking powder
½ cup milk	9.82 L milk





A WPS is Like a Cake Recipe

The occasion and cake recipient determine if the cake is appropriate. Delivering a race car birthday cake to a wedding is neither appropriate nor a success!

WPS review is similar. Success may only be achieved by first acquiring adequate information and detailed requirements.





1. Which WPSs Should be Reviewed?

Requirements for WPS review may be identified by:

- A corporate or project instruction
- Best practices, experience, and knowledge
- What other similar projects have used
- A combination – which is recommended.





1. Which WPSs Should be Reviewed?

For effective and efficient WPS reviews, a project should provide clear instructions determined by equipment:

- Complexity – standard or non-standard
- Cost – equipment value
- Criticality – consequence of failure.



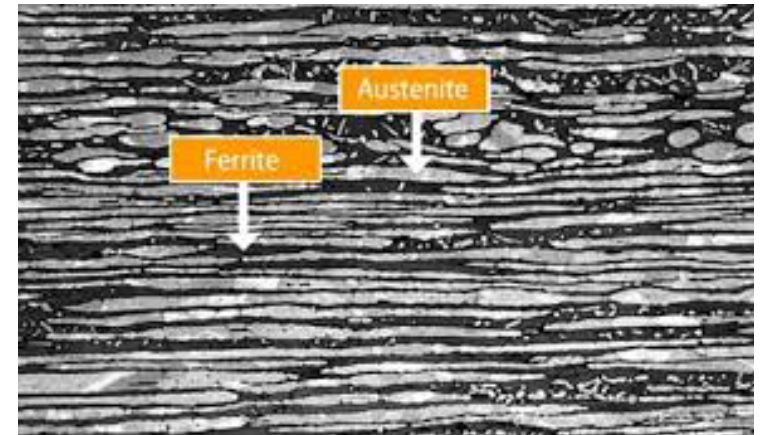


1. Which WPSs Should be Reviewed?

Other considerations may include the project and supplier personnel's expertise and their understanding of project equipment.

Ask: Are there project-specific welding requirements or specifications?

- If no: all or some WPS reviews may be omitted to save money and time
- If yes: all or some WPSs may need to be reviewed.

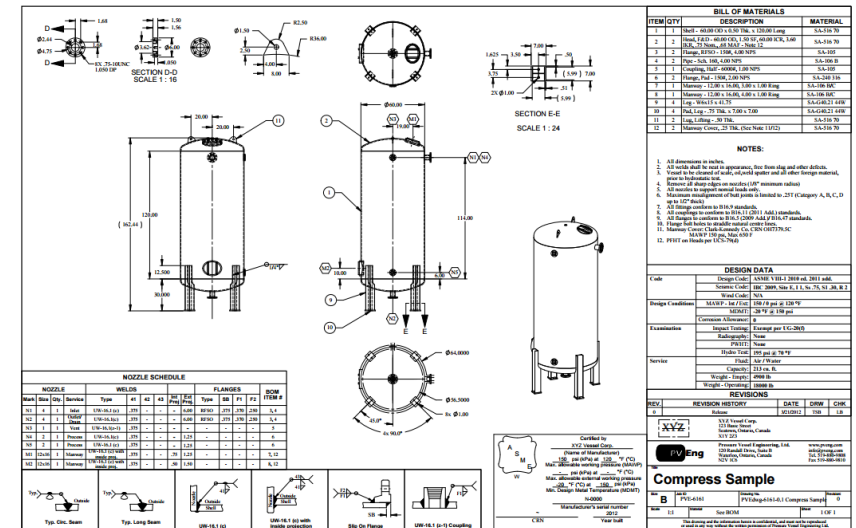


2. How Should WPSs be Reviewed?

A project may have dozens or hundreds of WPSs that require review. Each WPS may comprise a few or dozens of pages.

To properly review a WPS, the reviewer needs details about the application, code of construction, and other information including:

- Procurement documents
- Production drawings
- Specifications and standard drawings.



NOZZLE SCHEDULE

NOZZLE	WELDS	FLANGES	SHOP										
Mark	Qty	Service	Type	AT	42	48	60	66	74	77	PTW	P	
W1	1	Weld	W1-W1.1	205	-	-	-	-	-	-	-	-	-
W2	1	Weld	W2-W2.1	205	-	-	-	-	-	-	-	-	-
W3	1	Weld	W3-W3.1	205	-	-	-	-	-	-	-	-	-
W4	1	Weld	W4-W4.1	205	-	-	-	-	-	-	-	-	-
W5	1	Weld	W5-W5.1	205	-	-	-	-	-	-	-	-	-
W6	1	Weld	W6-W6.1	205	-	-	-	-	-	-	-	-	-
W7	1	Weld	W7-W7.1	205	-	-	-	-	-	-	-	-	-
W8	1	Weld	W8-W8.1	205	-	-	-	-	-	-	-	-	-
W9	1	Weld	W9-W9.1	205	-	-	-	-	-	-	-	-	-
W10	1	Weld	W10-W10.1	205	-	-	-	-	-	-	-	-	-
W11	1	Weld	W11-W11.1	205	-	-	-	-	-	-	-	-	-
W12	1	Weld	W12-W12.1	205	-	-	-	-	-	-	-	-	-

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MATERIAL
1	1	Shell - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
2	1	Head - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
3	1	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
4	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
5	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
6	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
7	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
8	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
9	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
10	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
11	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304
12	2	Flange - 205 SS - 1.5" Thick - 120" Dia - 120" Long	S.S. 304

DESIGN DATA

Design Code	ASME VIII-1 2001 ed. S11.4.4
System Code	ME 2001, Para. 1.1.1, 1.1.1.1, 1.1.1.2, 1.1.1.3, 1.1.1.4, 1.1.1.5, 1.1.1.6, 1.1.1.7, 1.1.1.8, 1.1.1.9, 1.1.1.10, 1.1.1.11, 1.1.1.12, 1.1.1.13, 1.1.1.14, 1.1.1.15, 1.1.1.16, 1.1.1.17, 1.1.1.18, 1.1.1.19, 1.1.1.20, 1.1.1.21, 1.1.1.22, 1.1.1.23, 1.1.1.24, 1.1.1.25, 1.1.1.26, 1.1.1.27, 1.1.1.28, 1.1.1.29, 1.1.1.30, 1.1.1.31, 1.1.1.32, 1.1.1.33, 1.1.1.34, 1.1.1.35, 1.1.1.36, 1.1.1.37, 1.1.1.38, 1.1.1.39, 1.1.1.40, 1.1.1.41, 1.1.1.42, 1.1.1.43, 1.1.1.44, 1.1.1.45, 1.1.1.46, 1.1.1.47, 1.1.1.48, 1.1.1.49, 1.1.1.50, 1.1.1.51, 1.1.1.52, 1.1.1.53, 1.1.1.54, 1.1.1.55, 1.1.1.56, 1.1.1.57, 1.1.1.58, 1.1.1.59, 1.1.1.60, 1.1.1.61, 1.1.1.62, 1.1.1.63, 1.1.1.64, 1.1.1.65, 1.1.1.66, 1.1.1.67, 1.1.1.68, 1.1.1.69, 1.1.1.70, 1.1.1.71, 1.1.1.72, 1.1.1.73, 1.1.1.74, 1.1.1.75, 1.1.1.76, 1.1.1.77, 1.1.1.78, 1.1.1.79, 1.1.1.80, 1.1.1.81, 1.1.1.82, 1.1.1.83, 1.1.1.84, 1.1.1.85, 1.1.1.86, 1.1.1.87, 1.1.1.88, 1.1.1.89, 1.1.1.90, 1.1.1.91, 1.1.1.92, 1.1.1.93, 1.1.1.94, 1.1.1.95, 1.1.1.96, 1.1.1.97, 1.1.1.98, 1.1.1.99, 1.1.1.100

REVISIONS

REV	REVISION	DATE	DRW	CHK
1	Issue for Approval	10/20/11	MDR	MDR
2	Approved for Fabrication	10/20/11	MDR	MDR

Compress Sample

Material	304 SS
Spec	ASTM A312
Size	1.5" Thick
Temp	1200 F
Time	1200 F
Pressure	1200 F



2. How Should WPSs be Reviewed?

Acceptable methods for reviewing WPSs include the following:

- *For record only* obtains WPSs for information and no review is required
- A *summary review* verifies the WPS is appropriate for the application, and is complete and correct (e.g., 1-hour review)
- A *comprehensive review* is a line-by-line review for verification of all WPS details and variables, including procedure qualification records (PQRs) and attachments, to verify compliance for all code of construction, project specification, and other requirements (e.g., 4- to 8-hour review)
- An *inspection review* is performed by the third-party inspector as a quality verification point (QVP) in lieu of or with a project review.





2. How Should WPSs be Reviewed?

A weld map or WPS summary is a useful matrix that together with WPSs:

- Details how and where each WPS will be used
- Verifies the supplier understands their scope of supply and welding requirements.

Production drawings may include this information.

Sr No.	Joint Description	Type of Joint	Joint ID	Welding Process	WPS No	PQR No	P No	Consumable
1.	Long Seam of Shell	Butt Double Side Welded	A	SMAW	S-001	001	1 # 1	E 7018
2.	Long Seam of Skirt	Butt Double Side Welded	G	SMAW	S-001	001	1 # 1	E7018
3.	Circ Seam of Shell # Head	Butt Double Side Welded & Butt Single Side Welded	B & D	SMAW & GTAW +SMAW	S-001 & GS-001	001	1 # 1	E7018 & E 7018 + ER70S-2
4.	Circ Seam of Shell # Skirt	Seal Weld	C	SMAW	S-001	001	1 # 1	E7018
5.	Circ Seam of Pipe# Elbow/Flange (3" Nozzle)	Butt Single Side Welded	H&I	GTAW	G-001	002	1 # 1	ER70S-2
6.	Circ Seam of Pipe #Flange/Shell(5" & 10" Nozzle)	Butt Double Side Welded	E&F	SMAW	S-001	001	1 # 1	E7018





3. Who Should Review WPSs?

A qualified WPS reviewer has:

- A diploma in material or welding engineering technology
- A post-graduate degree in material or welding engineering
- Certification as a welding engineer, inspector, or procedure reviewer
- Experience and knowledge
- Training for welding inspection or standards
- A combination of the above.

Third-party services may be obtained if there are inadequate resources.





Conclusion

A smart project ensures that WPS reviews are completed with a documented process that establishes:

- Which WPSs should be reviewed
- How WPSs should be reviewed
- By whom WPSs should be reviewed.

Communication and understanding are key to project success





Conclusion

Established processes avoid confusion, misunderstanding, rework, and waste associated with WPSs that are reviewed ad hoc or randomly.

Too many projects have informal, disjointed WPS review processes that rely on the very unscientific *hope* that the reviews will meet project needs.

Leaving important details to chance is always a bad idea.

Chance favors the prepared. Prepare a plan. Then, execute the plan.

Planning without action
is futile, action without
planning is fatal.

- Cornelius Fichtner





Learn More

To learn more about project success, see these resources:

- ebook: [*The Key to Project Success*](#)
- Article: [*How Smart Projects Review Welding Procedure Specifications*](#)
- Fact sheet: [*Top Five Challenges and Solutions for Reviewing WPSs \(document\)*](#)
- Fact sheet: [*Top Five Challenges and Solutions for Reviewing WPSs \(graphic\)*](#)





Q&A

- Questions?
- Comments?
- Concerns?





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Supplemental

Glossary of Common Industry and Project Terminology
Guidelines for Successful Projects

Project name	Knowledge Transfer (KT) Project
Project number	KT-001
Document number	KTP-GEN-002
Date	January 15, 2022
Revision	3.1
Draft status	Complete

The first glossary written specifically for capital projects in energy, industrial, mining, petrochemical, pipeline, power, and other sectors!

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The KT Project glossary (see inset) reduces the risk of miscommunication and misunderstanding in project settings.

To learn more, see: [Successful Projects Need Effective Communication.](#)

