Vendor Training Code Clinics Status Update

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NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

PROJECT OVERVIEW

- Team Members
  - Andrew Lo - NAVSEA
  - Jeremy Buller – Electric Boat
  - Richard Arn – American Welding Society
  - Lynn Showalter – Newport News Shipbuilding –Team Lead

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Project Plan _Overview

- Vendors in over 40 states for the various Private and Public Shipyards.
- The vendors need guidance in developing qualifying welding procedures.
- Weak to little or no welding SME's onsite
- This project is focused on Tech Pub 278 original revision and will incorporate Tech Pub 248 original revision
- Tech Pub 271 will also be referenced as needed for NDT

Project Plan – Overview-continued

- They also need guidance in writing procedures that are required to support their welding operations
  - For example :
  - - Control of filler metal
  - - Testing of filler metal
  - - Maintenance of welder qualification
- Team –Develop Training
- Once Developed the Training will be provided to the AWS to be delivered to the target audience through their training program

Steps

- Solicit existing training materials from Team Members (7/30/25)
  - Tech Pub 278
  - Tech Pub 248
  - Tech Pub 271
- Solicit areas of emphasis from TP 278 & 248. (8/8/25)
- Establish and Memorandum of Agreement/Understanding with AWS (8/25/25)
  - Contractual obligations
  - Formatting Training for Delivery
  - Marketing
  - Instructor Requirements
  - Administration
  - Testing and Certification

Steps –Continued

- Explain or Elaborate
- PQR and WPS development
  - Both 248 and 278 will both be used
    - Preheat /Interpass
    - Stress Relief
    - Mechanical properties requirements
    - Explaining the need for a General Requirements
      - How to apply Preheat Interpass
      - How and where check preheat/interpass
      - Heat Input
      - Cleaning prior to welding
      - Qualified Welding Positions
      - Qualified Thickness Ranges
      - Torch and Work Angles

Steps –Continued

- Essential Elements

TABLE V. Essential elements of a welding procedure.

	Arc-welding 1/			
	Manual	Semi-automatic	Automatic 3/ and machine	Fuel gas welding
Base material 5/ 7/ Specification and type or class or chemical analysis, thickness, and condition	X	X	X	X
Filler material Specification, type or chemical analysis, diameter, wire or powder	X	X	X	X
Flux Specification, size, type	-	X	X	X
Base material cleaning	X	X	X	X
Applicable joint designs (reference or sketches)	X	X	X	X
Process 8/	X	X	X	X
Machine, model or type	-	X	X	-
Electrical characteristics 6/ current, arc voltage range, polarity	X 2/	X	X	-
Travel speed	- 6/	- 6/	X	-
Position (including progression vertical up or down)	X	X	X	X
Torch type	X 4/	X	X	X Torch tip size only
Torch shielding gases Type and flow rates	X 4/	X	X	-
Purge gases Type and flow rates	X	X	X	-
Postheat treatments	X	X	X	X
Preheat and interpass temperature limits	X	X	X	X
Torch oscillation (amplitude, and frequency and dwell)	-	-	X	-
Torch position (relative off-set from vertical center-line in horizontal-rolled position)	-	-	X	-
Electrode lead or trail angle (wire feed angle)	-	-	X	-
Gas cup size	X (GTAW only)	X	X	-

Steps –Continued

- Explain and Elaborate
  - Grouping of Base Materials

TABLE I. Grouping of base materials (welding). 1/ - Continued

Letter number	Applicable document	Class or type
S-3A	Alloy steels (Cr content not to exceed 3/4 percent; total alloy not to exceed 2 percent)	
	ASTM A 302	MnMo grade B (plate)
	MIL-S-23194	NiCrMo Comp. A (forgings)
	MIL-S-24238	NiMnMo Comp. A (plate)
S-4	Alloy steels (Cr content 3/4 - 2 percent, total alloy not to exceed 2-3/4 percent)	
	AMS 6530	CrNiMo, type 8630 (tube)
	MIL-T-6736	CrMo, type 4130 (tube)
	MIL-S-8699	CrMoV, type 4330 (bar, forging)
	MIL-S-15464	CrMo class 1 (casting)
	ASTM A 182	F11
	ASTM A 213	Grade T11 (tube)
	DOD-F-24669/1	CrMo type 4130 (bar)
	MIL-P-24691/2	CrMo, grade P11 (tube and pipe)
	DOD-F-24669/2	CrMo, class a (forgings)
	MIL-C-24707/2	ASTM, A217, grade WC6 (casting)
	MIL-S-18728	CrNiMo, type 8630 (plate)
	MIL-S-18729	CrMo, type 4130 (plate)

- If not listed here, will need a Grouping approval from NAVSEA

Steps –Continued

- Explain and Elaborate
  - Grouping of Filler Material

TABLE II. Grouping of filler materials (welding). 1/

Group	Applicable document	Filler material type
A-1A	Low and medium carbon steel (covered electrodes)	
	AWS A5.1	6010 6011 6012 2/ 6013 2/ 6020 6027 7024 2/
A-1B	Low and medium carbon steel (bare rod)	
	AWS A5.2	Class RG-60 Class RG-65
A-2A	Carbon and low alloy steel (covered electrode)	
	MIL-E-22200/1	MIL-7018
	MIL-E-22200/6	MIL-7015 MIL-7016
	MIL-E-22200/7	MIL-7010-A1 MIL-7011-A1 MIL-7018-A1 MIL-7020-A1
	MIL-E-22200/10	MIL-7018M
A-2B	Carbon and low alloy steel (bare electrode, rod and inserts)	
	MIL-E-23765/1	MIL-70S-1 MIL-70S-2 MIL-70S-3 MIL-70S-4 MIL-70S-5 MIL-70S-6
	MIL-I-23413 (inserts)	MIL-MS-1 MIL-MS-2
A-2C	Carbon and low alloy steel (bare electrode and flux)	
	MIL-E-23765/1	MIL-70S-1 (wire) 3/ MIL-70S-2 (wire) 3/ MIL-70S-3 (wire) 3/ MIL-70S-4 (wire) 3/ MIL-70S-5 (wire) 3/ MIL-70S-6 (wire) 3/ MIL-70S-7 (wire) 3/ MIL-70S-8 (wire) 3/ MIL-70S-9 (wire) 3/ MIL-70S-F (flux) 3/
	MIL-E-23765/4	MIL-F6A2-EL12 (flux/wire) 3/ MIL-F6A2-EM12K (flux/wire) 3/ MIL-F7AZ-EM12K (flux/wire) 3/ MIL-F7A2-EM12K (flux/wire) 3/

- Others can be added- w/NAVSEA approval

Steps –Continued

- Explain and Elaborate
  - Cross Qualification for WPS

TABLE III. Grouping of base/filler materials for welding procedure cross-qualification. 1/ 2/ 7/ - Continued

Category	Base material 3/		Filler material 11/	Qualified for categories 4/
	A	B		
Ferritic materials/shielded metal-arc process (continued) 5/ 14/ 17/				
13	S-11A-2 S-11A-1	S-2 S-1	10/ A-5A (MIL-12018 or 10018); or A-3A or A-2A electrodes specifically permitted by MIL-STD-1688 or MIL-STD-1689	13, 17 through 19 and 24
14	S-11D	S-11D	A-5A (MIL-12018 only)	14 through 19 and 24
15	S-11D	S-11C	A-5A (MIL-12018 or 10018)	15 through 19 and 24
16	S-11C	S-11C	A-5A (MIL-10018)	16 through 19 and 24
17	S-11D S-11C	S-2 S-1	10/ A-5A (MIL-12018 or 10018); or A-3A or A-2A electrodes specifically permitted by MIL-STD-1689	17 through 19 and 24
18	S-2	S-2	10/ A-3A or A-2A (MIL-7018A1 or 7018 or 7016)	18, 19 and 24
19	S-2	S-1	10/ A-3A or A-2A (MIL-7018A1 or 7018 or 7016)	19 and 24
20	S-3A	S-3A	10/ A-3A or A-2A (MIL-7018A1)	20 through 24
21	S-3A	S-3 S-1	10/ A-3A or A-2A (MIL-7018A1 or 7018 or 7016)	21 through 24
22	S-3	S-3	10/ A-3A or A-2A (MIL-7018A1 or 7018 or 7016)	22 through 24

Steps –Continued

- Explain and Elaborate
  - PQR Test Assembly Requirements

TABLE VII. Welding procedure qualification assembly test requirements.

Material types	S number group	Destructive testing 1/ 2/ 3/ 4/ 5/ 14/ 15/			Nondestructive testing 15/ 16/ 19/ 21/			
		Tensile 6/	Guided bends 7/	Macro-etch 8/ 13/	Radio-graphic	Liquid pene-trant	Magnetic particle	Ultra-sonic 20/
Carbon-steel	S-1	2	3	-	X	-	X	X
Quenched and tempered carbon-steel	S-2	2	3	-	X	-	X	X
	S-3/3A	2	3	-	X	-	X	X
	S-4	2	3	-	X	-	X	X
Alloy steel	S-5	2	3	-	X	-	X	X
High alloy steels	S-6	2	3	-	X	-	X	X
	S-6A	2	2	-	X	-	X	X
	S-7	2	3	-	X	-	X	X
	S-8	2	3	-	X	X	-	-
	S-10H 23/	2	3	-	X	X	-	X
Quenched and tempered alloy steel	S-11A	2	3	-	X	-	X	X
	S-11B	2	3 9/	-	X	-	X	X
Age hardening alloy steels	S-11C	2	2	-	X	-	X	X
Aluminum and aluminum base alloys	S-21	2	3	-	X	X	-	-
	S-22	2	3	-	X	X	-	-
	S-25	2	3	-	X	X	-	-
	S-26	2	-	2	X	X	-	-
Copper and copper base alloys	S-31	2	3	-	X	X	-	-
	S-32	2	-	2	X	X	-	-
	S-33	2	-	2	X	X	-	-
	S-34	2	3	-	X	X	-	-
	S-35	2	-	2	X	X	-	-
	S-36A	2	3	-	X	X	-	-
	S-36B	2	-	2	X	X	-	-
	S-37A	2	-	2	X	X	-	-
	S-37B	2	-	2	X	X	-	-
	S-38	2	-	2	X	X	-	-
	S-39	2	3	-	X	X	-	-
Nickel and nickel base alloys	S-42	2	3	-	X	X	-	-
	S-43	2	3	-	X	X	-	-
	S-44	2	3	-	X	X	-	-
Titanium and titanium alloys	S-51	2	3 17/	2	X	X	-	-
	S-52	2	3 17/	2	X	X	-	-
	S-53	2	3 17/	2	X	X	-	-
Dissimilar metals	-	2	1 10/	2	X	X	-	-
Weld/cladding, corrosion-resisting 11/ 22/	-	-	2	2	-	X	-	-

See footnotes at end of table.

Steps –Continued

- Explain and Elaborate
  - Causes for Requalification
    - Level 1
    - Level 2
  - Performance Qualifications

Adding in Contract Specific requirements

- Interpretation letters

- Using AI to Develop Training
  - AWS has a version they have named AWStin based on Betty Bott .

Steps –Continued

- Training will be provided to the AWS to be delivered to the target audience through their training program
- Communications
  - Conduct as much as possible electronically
    - Email
    - Teams, WEBEX or Zoom
- Training Development schedule
  - Provide to AWS by 7/21/26
  - Budget
    - On track

- Questions or Comments