Navy Training Opportunities

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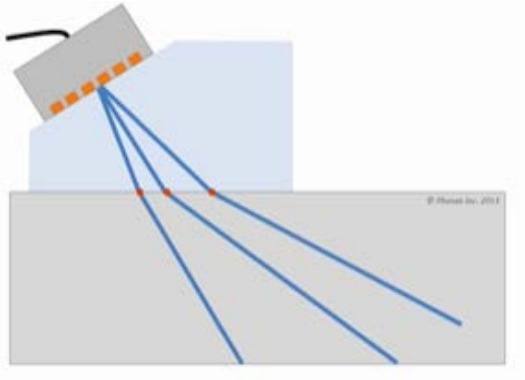
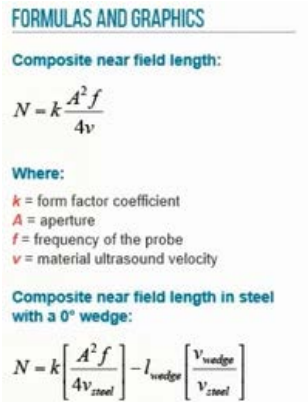
PhaseX Phased Array Ultrasonic Testing and Time of Flight Diffraction Training

About the Company

PhaseX is a company dedicated to conceiving online Conventional Ultrasonic Testing (UT), Phased Array Ultrasonic Testing (PAUT) and Time of Flight Diffraction Training (ToFD). This training is offered to maximize the learning of all students though an efficient, convenient, and flexible blended approach.



Beam exit point theory diagram



Detailed theory with formulas offered in training

Navy Use

The Navy purchased a license for all Navy nondestructive testing personnel to have unlimited access to take this training ($400K).

The training will provide Navy personnel with 80 hours of online training. They would then get 40 hours of hands on classroom training with their local NDT Examiner.

Puget Sound and Pearl Harbor Naval Shipyards are working with Phase to make sure this training has Naval specific requirements

Robotic Welding Operator Performance Qualification
– Training Requirements –
Proposed Additions to NAVSEA Technical Publication S9074-AQ-GIB-010/248, Rev 1

New Section, 5.2.3.2 Robotic Welding Operator Requirements

These personnel shall conform to the Robotic Arc Welding Operator requirements and recommendations of AWS D16.4 for Skills and Abilities, Experience and Education, and Training, except as follows:

The AWS CRAW-O certification is not required.

A high school diploma or equivalent is not required.

Demonstrate the use of a teach pendant and/or robot control station.

Receive instruction on the use of any closed loop feedback adaptive control technologies, such as weld seam tracking, adaptive planning bead placement algorithms, active robot calibration tools, audio aids, and weld puddle cameras.

AWS D16.4M/D16.4:2015

Specification for the Qualification of Robotic Arc Welding Personnel

Table 1
Performance Qualifications for Robotic Arc Welding Operator—Level 1

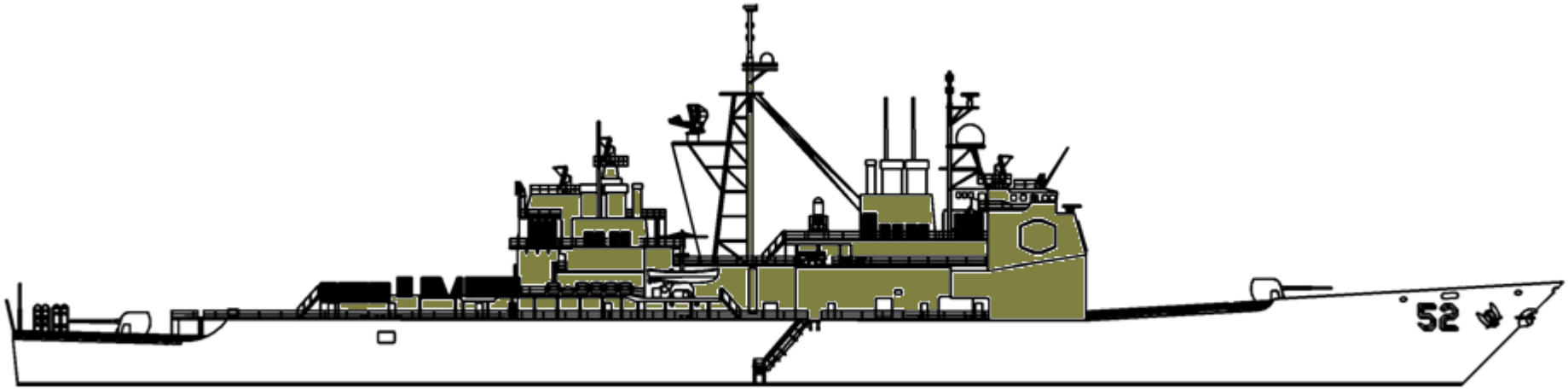
To qualify as a Robotic Arc Welding Operator (O), the applicant shall meet the requirements in Sections A and B of Table 1. Section C lists training recommendations.

	A. Skill and Ability Requirements
1.	Identify sources of input power and demonstrate a working knowledge of how to power up the robot and robot ancillary equipment along with peripheral devices such as wire feeders, coolant pumps, and torch cleaner, etc.
2.	Demonstrate routine maintenance of the robotic welding torch including but not limited to demonstrating changing the contact tips, welding electrode feeding equipment, gas diffusers, insulators, and nozzles.
3.	Demonstrate a familiarity with and demonstrate working knowledge of the robot teaching pendant and any robot ancillary control device that is required for the startup, operation, maintenance, and supervision of the robot system.
4.	Identify all safeguarding devices consistent with D16.2 that are incorporated into the robot system. Identification of the safeguards also includes an explanation of their purpose, activation, and recovery.
5.	Demonstrate a working knowledge of the robot system and welding process equipment and a familiarity with the operating instructions.
6.	Demonstrate good mechanical aptitude through the use of tools to maintain the robot system and tooling.
7.	Demonstrate good verbal and written communication skills.
8.	Exhibit knowledge required to create, adjust, and modify robot system programs.
	B. Experience and Education Requirements
X	Have a minimum of 1000 hours arc welding. Note: hours consist of time on the job employed as a welder, student, engineer and not actual arc on time while under the hood.
X	High school diploma or equivalent.
	C. Training Recommendations
1.	Receive instruction in the safe use of an arc welding robot system.
2.	Receive instruction in visual weld inspection.
3.	Receive training to include information and knowledge required to create, adjust, and modify robot system programs.

- 5.3.1.3 Automatic, Mechanized , and Robotic Welding.
  - Welding operators shall qualify using equipment possessing control features similar to those of the equipment which will be used to make the production welds and shall be required to set the equipment with regard to adjustments and settings which affect the welding characteristics and weld-bead placement. Welders qualified to a multiple position semi-automatic process shall be qualified to mechanized, automatic, or robotic weld multiple positions by performing a single position performance test using the mechanized, automatic, or robotic process equipment as applicable.

CG 47 Class Superstructure Mod, Alt & Repair Manual Roadshow

- Roadshow provides training to Regional Maintenance Centers (RMCs) that are homeports for CG-47 Class
- Training is intended to educated both government and contractor personnel on specific requirements and recently transitioned technology for repair of aluminum
- Roadshow is a collaborative training effort that is

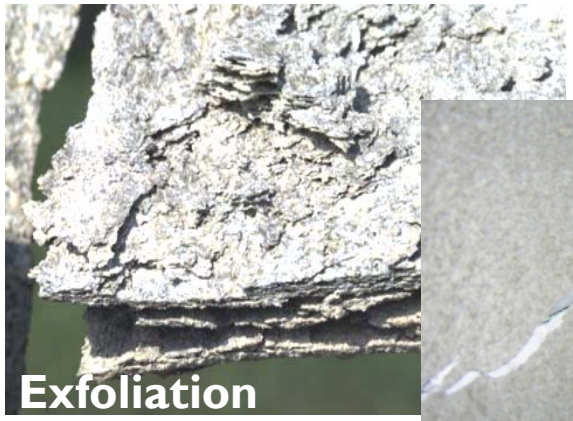


CG 47 Class Superstructure Mod, Alt & Repair Manual Roadshow

- Roadshow has been presented to all homeports
  - Mid Atlantic Regional Maintenance Center (MARMC)
  - Southeast Regional Maintenance Center (SERMC)
  - Southwest Regional Maintenance Center (SWRMC)
  - Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF)
  - Ship Repair Facility – Japan Regional Maintenance Center (SRF-JRMC)
- Training well received by Navy and Contractor personnel
  - Littoral Combat Ship (LCS) Class program office has provided similar training for repair of aluminum on LCS Class at SWRMC
- Future plans to conduct refresher training at each homeport

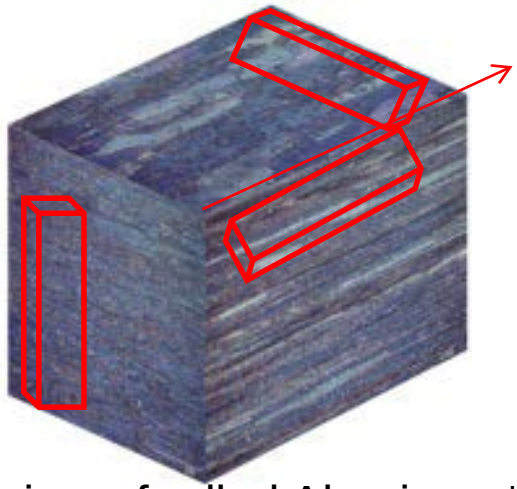
Sensitization 101

- Background on sensitization
- Importance of sensitization for 5XXX alloys
- Sensitization and intergranular corrosion
- Why sensitization matters to the Navy



Sensitization Measurements

- ASTM G67 Determining the Susceptibility to Intergranular Corrosion of 5XXX Series Aluminum alloys by Mass Loss After Exposure to Nitric Acid (NAMLT Test)
- In-situ metallography
  - nondestructive method to determine if aluminum plate area of interest has been sensitized
  - This method incorporates field equipment to grind, polish, etch and image an area of interest for indications of sensitization; this requires small areas of coating removal at the test sites to be touched-up following the inspection
- Degree of Sensitization Probe
  - Electrochemical Methodology
  - Non-Destructive (coating removal):
  - Robust design for in-situ measurement
  - Fast – 1-2 measurements/hour
    - No material cutout necessary



3-D view of rolled Aluminum* and G67 samples

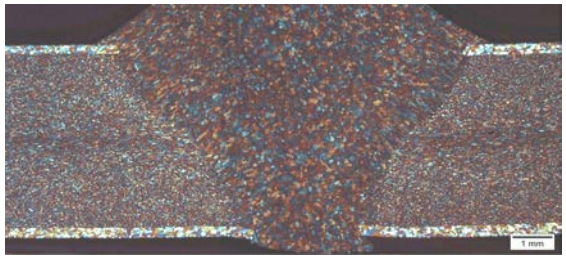
Alternative Repair Methods

- Ultrasonic impact technology
  - Peening process used in conjunction with repair of sensitized material
  - UIT imparts compressive residual stresses offsetting welding residual tensile stresses
- Composite Patch
  - Temporary repairs designed to stop the propagation of cracks while sealing the area from moisture intrusion
  - Used for known sensitized aluminum plating, low stress deck and bulkhead locations
- Bonded Aluminum Patch
  - Temporary patch for stress corrosion cracks.
  - Restores water-tight integrity.
  - Capable of being easily applied while underway by ship's force with minimal training

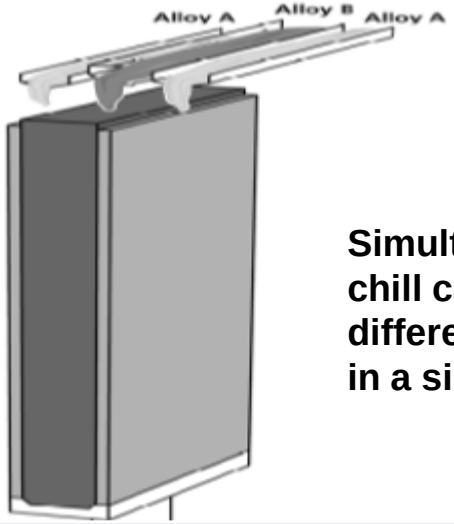
Bonded aluminum patch

New Materials

- Novelis Fusion
  - Novelis fusion is a technology that enables the production of aluminum sheet comprised of multiple alloy layers
  - An ingot is co-cast, having an outer layer and core layer with distinct chemistries that are metallurgically bonded. The ingot is subsequently rolled into a plate of a specified thickness for each layer
- Sensitization Resistant Aluminum
  - Alcoa has developed an experimental temper of 5456 that will provide enhanced resistance to sensitization
  - The temper is registered for 5083 as H-128. For 5456 it remains an Alcoa in-house temper, E-61
  - 5456 E-61 is being designed to be sensitization resistant to a laboratory thermal exposure of 100°C for 7 days. This test represents the thermal exposure affecting 5456 alloys during a CG's service life.



Surface layer intact up to weld bead



Simultaneous direct chill casting of different alloy layers in a single ingot

Crack Repair Manual History

- **S9CG0-BP-SRM-010/CG-47 CL REV-A 0910-LP-788-8700** Technical Manual for CG -47 Class *INSPECTION, TESTING, TEMPORARY AND PERMANENT REPAIR OF SUPERSTRUCTURE CRACKS (draft currently in review process)*
- Original Tech Manual (S9CG0-BP-SRM-010) was issued in 1995
  - Did not include considerations for stress-corrosion cracking
- Revised manual
  - Adds Sensitization/SCC to the discussion
  - Includes clarification of Critical regions
  - Separates Critical/Non-Critical from Sensitization discussion
  - Allows for in-process NDT
  - Refines the definition of a repair cycle
  - Reduces non-value added Gov't check points
  - Adds and updates ship alt links
  - Removes the requirement to submit a PCP for non-critical welds