

# PORTSMOUTH NAVAL SHIPYARD POP-UP STEM EVENT



## DEMONSTRATIONS DESCRIPTIONS:

- 1. Non-Destructive Testers:** A non-destructive tester (metals inspector) identifies physical and mechanical properties or defects of a piece of material or structure without altering its end use capabilities. PNS volunteers provide demonstrations of each inspection method used in the Naval Ship repair industry: Visual, Liquid Penetrates, Magnetic Particle, Ultrasonic, Radiographic and Eddy Current.
- 2. Riggers:** A Rigger selects, installs, and uses cables, ropes, shackles, beam clamps, strongbacks and other weight handling gear to lift, move, and position heavy loads. Riggers use complex multipoint suspension techniques to maneuver over, under, and around obstacles by tilting, dipping and turning the suspended load. Riggers direct the operation of cranes and similar equipment and plan for clearance and safety factors. PNS volunteers demonstrate how they gain mechanical advantage using a large scale rigging cube and pulley systems. Students will have the opportunity to throw heavies and test their accuracy.
- 3. Shipfitter Lofters (Mold Loft):** A shipfitter lofters primary purpose is the conversion of engineering designs, offsets and other design criteria into 3D models, templates, shapes and Computer Numerical Control (CNC) programs, for the fabrication of structural components. Shipfitter lofters perform 3D coordinate measurement and alignment using a variety of Coordinate Measuring Machines (CMM) and provide reports of data to applicable tech codes. PNS volunteers demonstrate an Artec Eva, which is a hand-held small area scanner. PNS volunteers will scan a small object to show the 3D representation on screen, and discuss how it would be reverse engineered for analysis or manufacturing.
- 4. Shipfitters:** A shipfitter plans, manufactures, installs, removes, and repairs structural assemblies aboard U.S. Navy vessels. These assemblies vary in size from less than 100 pounds to over several tons and consist of ferrous or non-ferrous metals. PNS volunteers provide an overview of their trade and provide students the opportunity to explore examples of different metals used in the trade.
- 5. Sheet Metal Mechanics:** A sheet-metal mechanic fabricates, modifies, repairs, assembles, and installs sheet metal items in buildings and aboard U.S. Navy vessels. Sheet metal items may include HVAC duct, lockers, protective covers, and metal or plastic laminate paneling. PNS volunteers provide students with an interactive exercise of reading blueprints and assembling a sheet metal race car per the blueprints. This activity illustrates a simple introduction in blueprint reading and fabrication construction.
- 6. Welders:** A welder cuts and joins all types of industrial and marine metals aboard U.S. Navy vessels and in facility buildings using complex welding and thermal cutting processes. This demonstration provides students with a hands-on welding experience using a virtual welder.

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7. **Machinists:** A machinist manufactures new and repairs parts using lathes, milling machines, boring mills, drills and CNC operated equipment. PNS volunteers demonstrate the use of a lathe and how additive manufacturing (3D printing) is used to increase efficiency in the field.
8. **Marine Machinery Mechanics:** A marine machinery mechanic installs, removes, optically aligns, tests, overhauls and repairs ship's main propulsion machinery including turbine generators, internal combustion engines, reduction gears, propeller shafts, pumps, valves, auxiliary engines, nuclear reactor components, ordnance machinery and other shipboard components. PNS volunteers demonstrate use of Grimsley portable machining equipment.
9. **Marine Electricians and Electronic Mechanics:** Marine electricians and Electronic Mechanics install, repair, manufacture and test nuclear and nonnuclear shipboard electrical systems and electronic equipment and systems. Work is performed in shop and onboard the submarine. In this demonstration, participants gain an understanding of DC Theory, and PNS volunteers provide a demonstration of electromagnetism and how to build a simple motor generator.
10. **Shipboard Pipefitters:** A shipboard pipefitter removes, repairs, manufactures, installs and tests piping systems aboard U.S. Navy vessels. PNS volunteers demonstrate precision measuring through use of a romer arm device.
11. **Air Conditioning Equipment Mechanics:** An Air Conditioning Equipment Mechanic removes, repairs, overhauls, aligns, installs, tests, and adjusts ship's air conditioning and refrigeration systems and components including compressors, pumps, valves, heat exchangers, switches, electrical and pneumatic system controls. PNS volunteers highlight their work through use of a refrigeration model and demonstrate pressure systems with marshmallows in a vacuum.
12. **Production Machinery Mechanics:** A production machinery mechanic installs, repairs, inspects, aligns, analyzes and rebuilds industrial plant equipment and machinery. This process includes operating and maintaining ultra-high-pressure water jetting and high-pressure air systems as well as maintaining, inspecting and rebuilding nuclear support equipment facilities. PNS volunteers present an overview of their responsibilities while demonstrating types of equipment they support using a STEM Robotic Arm.
13. **Insulators:** An insulator applies a variety of insulation materials on hulls, steam turbines, distillation plants, refrigeration plants, ventilation ducts and other piping systems and equipment to prevent loss of heat or cold, prevent condensation and reduce noise levels aboard ship and noise transfer to the sea. This presentation provides a basic understanding of shipboard insulation, how it works, and demonstrations of acoustic insulation and hot/cold insulation techniques.
14. **Painters/Blasters:** A painter-blaster prepares surfaces and applies coatings on interior and exterior surfaces, tanks and voids aboard ships and as shop applications to meet specific preservation requirements. The demonstration includes displayed items (blast hose line with trigger, various power tools, and Inspection tools) and examples of types of surface prep and samples of blast media.
15. **Plastic Fabricators:** A plastic fabricator builds, modifies and repairs plastic, fiberglass and rubber components using techniques such as casting, laminating, thermoforming, vacuum bag molding, compression molding and spray coating. PNS volunteers provide an overview of the work of a Plastic Fabricator - assemble, rework, repair, and fabricate from scratch various materials such as rubber, fiberglass, and plastic products for multiple applications.

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16. **Shipwrights:** A shipwright's duties include erecting, maintaining and removing scaffolding in both nuclear and non-nuclear applications. Woodworking duties include building temporary enclosures, plenums, shipping skids, mock-ups and pipe templates. A shipwright also uses optical instruments to provide reference points and alignment services during docking evolutions and overhauls. PNS volunteers provide an overview of shipwrights (staging, cradles, woodworking, surveying) and introduction into various tools used for in this trade. Demonstrations include: inclinometers, fall protection harnesses, and laser measuring devices.
17. **Temporary Services Pipefitter:** A temporary services pipefitter installs, tests, maintains and removes temporary services to U.S. Navy vessels during overhaul and repair operations. PNS volunteers provide a basic understanding of a pipefitter's duties, demonstrate basic pipefitting techniques and challenge participants with a one-of-a-kind pipefitting puzzle!
18. **Fabric Workers:** A fabric worker plans, designs, lays out, constructs and installs containments of various sizes and configurations for radiological, environmental and cleanliness controls shipboard, in dry-docks and in facilities. PNS volunteers provide an overview of the Sail Loft and various samples of tools and materials used.
19. **Dry Dock:** PNS volunteers demonstrate procedures for operating and maintaining dry dock systems for the purpose of flooding, dewatering, docking, and undocking evolutions.
20. **Service Electricians:** A service electrician provides temporary electrical distribution services to U.S. Navy vessels during overhaul I repair operations. PNS volunteers Identify services provided by Temporary Services Electrical and showcase various tools and equipment used in the trade.
21. **Engineers:** Portsmouth Naval Shipyard employs several engineering disciplines include: Chemical, Civil, Computer Electronics, Electrical, General, Industrial, Mechanical, Materials, Naval Architecture and Welding. PNS volunteers define engineering and how it differs from the trades. Participants engage in an active engineering challenge and gain an understanding of the unique challenges engineers face at the Shipyard.