

Shipbuilding Craftworkers



Occupational Brief Title Codes:

- D.O.T.: 806., 860., 921.663-010, 623.281-030, 810.384-014
- G.O.E.: 05.05, 05.11.04
- S.O.C.: 51-4192, 47-2031, 53-7021, 51-4041, 51-4121
- O*NET™: 51-4192.00, 47-2031.05, 53-7021.00, 51-4041.00, 51-4121.02
- N.A.I.C.S.: 336611, 332312
- H.O.C.: No Code

Occupational Subtitles:

- Crane Operators
- Engine Outfitters
- Joiners
- Marine Architects
- Marine Engineers
- Pipe Fitters
- Riggers
- Shipfitters
- Shipwrights
- Welders

Work Classification Based Related

D.O.T. Occupations:

- Automobile-Accessories Installers
- Boatbuilders, Wood
- Carpenters
- Precision Assemblers
- Riveting Machine Operators, Automatic

Interests Based Related

G.O.E. Occupations:

- Blacksmiths
- Boilermakers
- House Builders
- Millwrights
- Pneumatic-Tool Operators

Skills Based Related

O*NET Occupations:

- Aircraft Rigging Assemblers
- Drywall Installers
- Metal Fabricators, Structural Metal Products
- Patternmakers, Metal and Plastic
- Sheet Metal Workers

Shipbuilding craftworkers (Ship-build-ing Wafts-work-ers) work on the construction and repair of naval and commercial vessels or ships that are more than 122 meters in length. They are involved in every aspect of building the ship from making or fabricating the individual parts of the ship and putting the parts together to putting the finishing touches on the ship such as plumbing, electrical wiring, and building the furniture on the ship.

The United States shipbuilding industry is a complex organization. According to the 2003 survey conducted by the Maritime Administration (MARAD) there are around 350 shipbuilding and repair facilities engaged in the building and repairing of ships, barges, and lighters. This industry also includes the conversion, overhaul, and alteration of ships, as well as the manufacture of off-shore oil and gas well drilling and production platforms.

Although 24 of these are major shipbuilding facilities, only 9 make up the Active Shipbuilding Base of the United States. These nine facilities are actively involved in the construction and repair of large military and commercial ocean-going vessels, including submarines, aircraft carriers, guided missile destroyers, containerships, oil tankers, and large cruise ships.

Most of the remaining facilities are second-tier shipyards consisting of small and medium-sized facilities. They engage mainly in the construction and repair of inland and coastal vessels, including tugboats, supply boats, ferries, fishing vessels, barges, small passenger dining and gaming vessels, and small government-owned vessels such as those used by the U.S. Coast Guard.

Work Performed

In order to build a ship, it takes many different types of skilled craftworkers. Many of these workers have the skills common in any heavy steel fabricating and



Shipbuilding craftworkers work on the construction and repair of naval and commercial vessels or ships.
Photo by "Shipbuilding Pictures Database, NSnet.com"

construction industry. Others have special skills that are practiced mainly in shipyards.

The building of a ship begins with the design. A number of teams composed of *customer managers*, *key component suppliers*, *marine architects* and *designers*, *marine engineers*, and *construction supervisors* work together to draw up the plans for a vessel. In designing the ship, these teams consider the customer's request and purpose of the vessel, the kind of water it will sail on, the cargo it will carry, the distance it will have to travel between ports, and construction costs. From the plans that they make, *drafters* make working drawings.

Work on the actual construction of the ship starts with the cutting of the first plates. *Shipfitters* in plate shops cut, bend, and shape their materials into parts or modules that will be welded together later.

In fabricating shops, *welders* assemble and weld parts to make sections that will form the hull (the main body) of the ship, frames, connecting plates, and decks. These sections, called subassemblies, go to the ways, where construction of the hull takes place. The ways is a kind of huge inclined cradle that holds the ship as it takes shape.

Before the construction of the hull can begin, however, shipfitters lay the keel, which is the backbone of the ship. To do this, they use reference points established by the *shipwrights*. Shipwrights build and place blocks, cradles, and shoring for supporting ships during construction. They set reference points and lines on the hull to show where machinery and other equipment should go with reference to the shape and alignment of the ship. Shipwrights also build the scaffolding and walkways other workers use while constructing the ship, and direct dry docking operations.

After shipfitters lay the keel, they build the hull of the ship. They assemble the hull by putting the subassemblies from the fabrication shop together. In shipyards, modular construction technology permits the construction and pre-outfitting of very large subassemblies and components. *Crane operators* control and maneuver extensive heavy-lift cranes to lift and position these large preassembled sections into place. One shipyard, for instance, has a floating crane with a lifting capacity of 800 tons. It is actually a twenty-three story skyhook.

Since ships are now constructed by building large pieces or components that are later put together on the ways, shipbuilding craftsmen can be working on the same ship in several different locations at the same time. This has made the construction of large ships much faster. In addition to cranes, a rail network is used to move large ship sections and other structures from fabrication shops to dry docks.

In constructing the ship, shipfitters start with the lower center sections, which form the base. Then they add the upper, outer, and bow sections. Working from blueprints, they position and align units and structural members

assisted by *riggers*. Riggers assemble, install, and handle the lines, chains, ropes, nets, pulleys, slings, and weight-handling gear on ships. They attach hoists and pulling gear to preassembled sections, machinery, equipment, and other heavy loads for movement to or on board the ship.

After they secure a load, riggers signal the crane operator to move it. Riggers control the movement of heavy loads through narrow openings or tight spaces by using rollers, jacks, pulleys, and chainfalls. They also help the shipwrights in ship dry docking operations by handling lines.

Once units and structural members are in place, shipfitters use wedges, mauls, turnbuckles, and temporary fasteners to hold and brace subassemblies for welders to fasten. *Pneumatic tool operators* then grind, chip, rivet, or remove scale from welds or other sections.

When the ship is about 80 percent completed, workers launch it. At launching, shipwrights release the blocks that hold the ship in the ways, enabling it to slide down into the water and float to dry dock. Dry docking consists of placing the ship in a floating structure that allows access to the part of the ship that is underwater for inspection, cleaning, and repairs. The ship is outfitted and completed in dry dock.

A staff of engineers, technicians, and *engine outfitters* install and test propulsion equipment. This is the equipment that propels the ship. It includes boilers, engines, generators, reactors, condensers, shafting rudder, propellers, pumps, and motors. They assemble and repair propulsion equipment, pressure vessels, tanks, and vats. Crane operators lift and position the parts, while engine outfitters line them up and weld them together.

Engine outfitters install valves, gauges, and other parts, and watch the dials or meters to make sure the equipment is working correctly. With the help of *pipe fitters*, engine outfitters lay out and install pipes for steam, power, hot water, air pressure, and oil lines. They cut and bore holes in bulkheads and decks, and cut, bend, and thread pipe. They hook pipe to radiators, laundry and galley equipment, pumps, the desalination plant, and tanks.

Electricians, *electronics* and *information technology technicians*, *carpenters*, *painters*, *plumbers*, and other specialists then outfit the ship with its remaining internal systems. They install plumbing and electrical equipment, and finish the interiors, cabins, and other spaces.

Joiners, for example, make, assemble, install, and repair the wooden furnishings on ships. Following drawings or specifications, they lay out, cut, and install wooden units such as deckhouses, doors, panels, and other interior furnishings. They may make cabinets, desks, chairs, and other furnishings of oak, mahogany, and teak. They also install the hardware, lay floor covering on decks, and cut and fit glass in skylights, cabins, and doors.

After the launching and outfitting, the ship undergoes a series of tests at sea. This is the shakedown cruise. Any problems are then found and corrected. All-in-all, a small ship may take several months to complete. A supertanker or a large naval vessel, such as a warship or aircraft carrier, on the other hand, may take more than a year to complete.

Working Conditions

Most shipbuilding craftworkers work outdoors year-round. They are required to work in all kinds of weather. Many work on scaffolds high above the ground. Others do their work in cramped spaces within the ship, or in the heat of fabricating and plate shops. All keep a watchful eye on moving cranes, loads, and moving machinery. Working on the construction of a large ship can be very dangerous. All shipyards have active safety programs to make workers aware of the dangers and to help them avoid accidents.

Hours and Earnings

Most shipbuilders work five, eight-hour shifts a week. However, overtime is common, including work over eight hours a day or over forty hours a week, and for working on Saturdays, Sundays, and holidays. According to the Bureau of Labor Statistics, shipbuilding and repairing production workers averaged 43.3 hours a week in 2003, and worked an average of 6.5 hours of overtime a week.

Pay for shipbuilders and repairers reflects the workers skills, experience, and time on the job. Unions generally negotiate the pay rates of skilled craftworkers such as shipwrights, shipfitters, pipe fitters, electricians, boilermakers, and machinists. Overall, the average wage in 2003 for shipbuilding and repairing production workers was just under \$17.50 an hour. Weekly earnings averaged around \$755. Workers with special skills, such as marine engineers and shipwrights, however, get premium pay.

Benefits may vary for workers in some private shipyards. Generally, shipbuilders and repairers receive health insurance, paid sick leave and vacation time, and a pension plan.

Education and Training

Most of the employees in this industry are highly skilled men and women with crafts and professions that enable them to do the demanding work.

Shipyards prefer high school graduates with some work experience. The shipbuilding industry cooperates with the unions to offer formal apprenticeship programs to qualified workers. All the skilled crafts require four or five years of apprenticeship training. Most apprenticeships combine on-the-job training with a specific number of hours of classroom instruction.

Once employed, apprentices begin as helpers to a master craftworker. They learn basic tasks and gradually progress to more difficult work. Those who successfully complete the three or four-year apprenticeship qualify as journeyworkers.

High school students interested in shipbuilding work should take courses related to their special interest (electricity, machinery, carpentry, computer-aided drafting and design). A few technical schools also offer courses on shipbuilding construction and repair. Although this education is helpful, it is not acceptable as a replacement for an apprenticeship, or for skills and experience.

Unions

Unions dominate this industry. Craftworkers in shipbuilding usually belong to a union representing their trade. Unions which represent shipbuilding workers include the International Association of Machinists and Aerospace Workers, the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, and the United Steelworkers of America.

Personal Qualifications

Employers look for workers who are self-motivated, hardworking, and enthusiastic. Physical fitness, agility, a good sense of balance, and the ability to tolerate an outdoor work environment are important. Shipbuilding workers should be detail-oriented in order to work to precise measurements and specifications. They should also be able to work well with others.

Occupations can be adapted for workers with disabilities. Persons should contact their school or employment counselors, their state office of vocational rehabilitation, or their state department of labor to explore fully their individual needs and requirements as well as the requirements of the occupation.

Where Employed

According to the Bureau of Labor Statistics the average total employment in U.S. private and public (Navy) shipyards was 95,000 in 2002. Based on MARAD's 2003 survey, roughly 59 percent of the industry's total workforce was employed by the 9 Active Shipbuilding Yards located in Bath, Maine; Groton, Connecticut; Philadelphia, Pennsylvania; Newport News, Virginia; Mobile, Alabama; New Orleans, Louisiana; Pascagoula, Mississippi; and San Diego, California. Around 7 percent of the workforce was employed by the 15 major shipyards with inactive build positions located mostly in the Great Lakes, Gulf Coast, and Northwest regions. The remaining 44 percent of the workforce were employed by the nearly 300 small and mid-tier shipyards located throughout the U.S. inland river and coastal waterway systems that operate in 33 states.

Employment Outlook

For many years the American shipbuilding industry was in a depressed state. However, over time the need for new ships to replace aging merchant vessels and bulk vessels has grown tremendously. The Oil Pollution Act, for example, that mandates the phasing out of single-hull tank vessels has spurred a demand for new double-hulled vessels. According to an industry profile supplied by the Occupational Safety & Health Administration, as of December 31, 2002, ships (1,000 tons and larger) on order or under construction in U.S. private shipyards totaled 39 naval and 16 commercial vessels. The U.S. Navy shipbuilding plan for fiscal years 2003-2008 includes the construction of 42 new ships, an average of 7 new ships per year.

America's prime shipbuilders continue to make major ongoing investments in state-of-the-art, cutting-edge machines, processes, and techniques including computer-controlled machines such as robotic welders, lasers, water-jet cutters, and pipe benders; automated steel fabrication facilities; enhanced pre-erection outfitting capabilities, dry docks, and cranes; as well as optimum efficiency layouts of production facilities. Repair work will also continue to be an important source of income for all United States shipyards. Much of the work in shipyards will consist of conversions and repairs.

Small or medium-sized shipyards have the best outlook. They are filling orders for new casino boats, tow-boats, drug interdiction craft, ferries, research vessels, fireboats, petroleum barges, and a wide range of smaller craft. The enactment of legislation permitting riverboat gambling, for example, has generated projects involving the design and construction of passenger cruise, dining, and gaming vessels for sailing on inland and coastal waterways. In fact, according to the Shipbuilders Council of America more than 2,000 commercial vessels are built each year.

Entry Methods

The number of workers in this industry is fairly small and requirements are high. Skilled craftworkers may apply through their union office. Unskilled workers may apply to private shipyards through a state employment office, or directly to the shipyard personnel office.

Advancement

Most private firms prefer to promote their own workers rather than fill advanced positions with outsiders. Advancement depends on skills, seniority, and education. Most advancement consists of progression in individual crafts according to union policies.

For Further Research

American Shipbuilding Association, 600 Pennsylvania Avenue, S.E., Suite 305, Washington, DC 20003. Web site: www.americanshipbuilding.com.

Shipbuilders Council of America, 1455 F Street, N.W., Suite 225, Washington, DC 20005. Web site: www.shipbuilders.org.

Acknowledgments

Chronicle Guidance Publications appreciates the cooperation of the individuals who reviewed the information in this brief.

O*NET™ is a trademark of the U.S. Department of Labor, Employment and Training Administration.

H.O.C. codes adapted and reproduced by special permission of the publisher, Psychological Assessment Resources, Inc., Odessa, FL 33556, from the *Dictionary of Holland Occupational Codes-Third Edition*, by Gary D. Gottfredson, Ph.D., and John L. Holland, Ph.D. Copyright 1982, 1989, 1996 by PAR, Inc.

Briefs Related to This Title

Carpenters. Brief 86.
Construction Equipment Operators. Brief 171.
Construction Ironworkers. Brief 359.
Construction Laborers. Brief 392.
Electricians, Construction. Brief 21.
Longshore Workers. Brief 484.
Marine Engineers. Brief 163.
Naval Architects. Brief 585.
Pleasure Craft Boatbuilders. Brief 661.
Structural Movers. Brief 472.
Welders. Brief 27.

For a complete list of brief and reprint titles with current pricing information call:

Chronicle Guidance Publications, Inc.
66 Aurora Street
Moravia, New York 13118-3569
Phone 1 800 622-7284 FAX (315) 497-3359
Visit our Web Site at
www.ChronicleGuidance.com