The Southeast Maritime and Transportation (SMART) Center is one of 42 National Science Foundation Advanced Technology Education (NSF ATE) Centers in the United States and the only ATE center solely focused on increasing the number of middle-skill technicians in the maritime and transportation industry. The NSF ATE program endeavors to strengthen the skills of technicians, whose work is vitally important to the nation’s prosperity and security. In ATE centers and projects, community colleges have a leadership role and work with universities, secondary schools, businesses and industry, and government agencies to design and carry out model workforce development initiatives.

Launched in October 2010 at host partner Tidewater Community College with a $3 million NSF ATE grant, and renewed in September 2015 for an additional three years with $2.9 million in NSF ATE funding, the SMART Center’s three primary goals are:

- Developing effective career pathways and educational programs that align with maritime and transportation industry standards
- Increasing awareness of technician-level careers in the maritime and transportation industry
- Modeling and fostering effective partnerships between educators and industry employers

To achieve its goals, the SMART Center works closely with secondary school systems and community colleges across the southeastern U.S. as well as other ATE centers to provide unique professional development opportunities for Science, Technology, Engineering and Math (STEM) and Career Technical Education (CTE) educators in maritime and transportation-related disciplines. Our industry partners represent some of the largest employers in the U.S.

Through collaboration with 42 key educator and industry partners in its SMART Maritime Technologies Consortium the SMART Center formed the SMART Maritime Technologies pathway which features stackable, academic credentials as well as industry-valued certifications and credentials. The pathway has proven to increase enrollments and completions for targeted populations including first-generation college students, minorities, women, and veterans and is being scaled nationwide through the center’s renewal.

The SMART Center and its Executive Director and PI Barbara Murray has been recognized by leaders at the national, regional and state level for:

- Assisting the U.S. Department of Labor in revising its Transportation, Distribution, Logistics (TDL) Competency Model
- Providing innovative work in developing industry-recognized portable credentials
- Facilitating creation of a new, scalable A.A.S. degree in Maritime Technologies pathway which features stackable certificates and is built on the Registered Apprenticeship model, providing a way for students to earn an academic degree and industry-valued credentials upon graduation
- Undertaking primary research to identify critical workforce needs within industry
- Creating innovative, industry-aligned “on-ramps” to accelerate training for entry-level workers and meet employers’ workforce development needs
- Providing secondary and middle school STEM and CTE teachers, community college faculty, career coaches and guidance counselors with annual intensive professional development opportunities
- Creating “Make the SMART Choice,” a first-of-its-kind video series about maritime and transportation technical careers and industry career pathways

Learn more about the SMART Center website at www.maritime-technology.org and follow us on social media to keep up-to-date on the center’s work, resources and events!
To Future Leaders of the Maritime and Transportation Industry,

The maritime and transportation industry is pivotal to our national economy and global competitiveness. Every year the industry moves more than 2.3 billion tons of domestic and international cargo worth $2 trillion through 510 U.S. ports. Recreational boating, which nearly 40% of all Americans enjoy each year, contributes $12 billion to the U.S. economy. Our country’s 400,000 naval ships, which are built, repaired, and maintained by American workers, transport our nation’s military and protect our national interests.

However, this vital industry is facing a serious workforce gap. The majority of workers will reach retirement age within the next five years, and there is a lack of educated, trained workers or students to fill those positions. The technician-level segment of the industry is facing a particularly critical shortage of workers. Technicians play a vital role in STEM-related (science, technology, engineering, and math) fields. They are needed within each segment of the maritime and transportation industry:

- post operations and marine logistics
- ship maintenance and modernization
- vessel operations
- emerging maritime-based technologies

This guide is an important step toward filling the looming workforce shortage. In collaboration with our industry partners which are some of the largest employers in the U.S., the SMART Center is proud to provide a first-of-its-kind tool with information, resources, and electronic tools to help you – or the students you teach or counsel – determine if a career in the maritime and transportation industry is a good choice. Use this guide to learn about the jobs available within the industry as well as where to obtain the education and training you’ll need to obtain those jobs.

Take some time to explore the guide, career opportunities in the maritime and transportation industry, and the resources we offer education and industry partners. You can also access a digital version of this guide – as well as a huge assortment of our SMART Choice videos, tools, news, and tips – Visit us on our website at www.maritime-technology.org

Make maritime and transportation your career path today!

Sincerely,
Barbara R. Murray
Executive Director and Principal Investigator, the SMART Center

Executive Director and Principal Investigator, the SMART Center

A National Science Foundation National Technological Education Centers SMART Center focused on the Maritime and Transportation sectors worldwide

Brad Mason is Director of Maintenance, Modernization and Technical Service division at AMSEC, LLC, a wholly-owned subsidiary of Huntington Ingalls Industries - a global leader in the maritime and transportation industry. This division encompasses a world-wide presence with over 1,400 employees and $180M in business. Brad has been with AMSEC for over 17 years as a manager in both Bremerton, Washington and Virginia Beach. Brad joined AMSEC after ending a 23-year career in the U.S. Navy as a Captain. His more than 36-year career has been focused on Navy ship maintenance and modernization, and engineering and technical support services. Brad has a B.S. degree in Mechanical Engineering from the U.S. Naval Academy and a M.S. in Mechanical Engineering and Materials Science from the Naval Post Graduate School in Monterey, California. He has served as a board member on the Virginia Ship Repair Association. As SMART Center PI Mason is responsible for creating and maintaining industry relationships with a focus on the shipbuilding and ship repair sector of the industry, as well as creating crosswalks between industry credentialing and skilled trades courses. He is also assisting in scaling the SMART Maritime Technologies pathway in California and Washington and replicating professional development for technicians with college partners.

Dr. Sallie Kay Janes is Associate Vice Chancellor for Continuing and Professional Development at San Jacinto College in Pasadena, Texas. Dr. Janes serves on several boards including as Vice President for the Port of Houston Partners in Maritime Education program (PHIME) which is dedicated to educating the next generation of workers to fill critical positions in the maritime industry. She also serves as one of San Jacinto College’s campus directors of the academy programs in Houston-area school districts. She is widely recognized for her work in developing effective career pathways for students to move into the maritime and transportation industry, in 2013 she received the Paul Coffee Maritime Leadership Award from Texas Southern University (TSU) Maritime Industry Advisory Board for promotion of diversity within the maritime industry along the Gulf Coast. She earned her Ph.D. in Educational Psychology from Texas A&M University, and both her master’s and bachelor’s degree from Louisiana State University. As SMART Center co-PI Dr. Janes is responsible for the Seagoing/Vessel Operation courses for USCG certification to academic pathways using the basis of the Maritime Technologies A.A.S. degree at San Jacinto College and developing career pathways tools to increase educators’ industry career awareness.

George Hagerman is Senior Research Associate at Virginia Tech's Advanced Research Institute and Director of Research for the Virginia Coastal Energy Research Consortium. He earned his undergraduate and graduate degrees from University of North Carolina – Chapel. Hill. As SMART Center co-PI Hagerman is responsible for assessing offshore maritime technologies technician education, developing core skills for offshore wind manufacturing and production work for these technician positions utilizing current shipbuilding and ship repair competencies, and developing SMART Career pathways models for offshore marine maritime technicians.

Sincerely,
Brad Mason
Director of Maintenance, Modernization and Technical Service division at AMSEC, LLC.
Table of Contents

This guide helps to expand career opportunities for people with high school equivalency degrees or high school diplomas who want to gain entry-level positions with local maritime and transportation industry employers. It provides a variety of opportunities for rewarding careers in the maritime and transportation industry. This section includes information on schools and training providers that offer the education you may need to secure a job in the maritime and transportation industry. This section shows, step-by-step, the various ways you can enter the industry, the type of work available and the salaries each position commands to support your financial goals.

- 104 Port Operations & Marine Logistics
- 109 Registered Apprenticeship Programs
- 113 Table of Maritime Industry Information

CIP Index:

- Shipbuilding and Repairing
- Vessel Operations
- Engine Operations
- Marine Deck \& Resource
- Marine \\& Highway Transportation
- Water Transportation
- Production Occupations
- Construction and Extraction

For additional information on the maritime and transportation industry, see these resources:

- U.S. Department of Labor's Apprenticeship Programs
- National Marineline Association
- National Maritime College of the United States
- National Maritime University
- Maritime Industry Training Council
- Regional Maritime Councils

This section is intended to provide a general overview of the maritime and transportation industry and careers available in it. It is not meant to be a comprehensive guide to all aspects of the industry, and it does not provide detailed information on all the various careers and jobs available. For more information on specific careers and job opportunities, contact a maritime or transportation industry association or organization, or visit the websites of organizations such as the National Maritime College of the United States, the National Maritime University, or the Regional Maritime Councils. It is important to research the qualifications and training requirements for specific careers and jobs, and to keep up-to-date with industry trends and developments in order to be successful in the maritime and transportation industry.
MEGAN enrolled in community college after high school graduation and was then accepted into a registered apprenticeship program – today she has her Department of Labor (DOL) Journeyman card which ensures she can get great work in the maritime and transportation field at competitive pay anywhere in the U.S.

Community College → Registered Apprenticeship in Shipbuilding/Repair

After immigrating to the U.S. DAVID moved into a great, well-paying maritime and transportation career from the service industry and through a registered apprenticeship program now is a trained rigger, boiler mechanic and college student on the path to earn his A.A.S. degree in Maritime Technologies.

Other Work → Maritime Industry Work → Registered Apprenticeship in Shipbuilding/Repair

CATIE graduated from the U.S. Merchant Marine Academy with a B.S. in Marine Transportation and went to work on the Great Lakes as a third mate before moving into the classroom as a Simulator Instructor at MITAGS (Maritime Institute of Technology and Graduate Studies).

High School → 4-Year USMMA College → Vessel Operations Work

Captain CAROL Curtiss earned dual B.S. degrees from USMMA and became the first woman in the world to have earned both of the highest licenses available on merchant cargo ships and sailed the world for 30 years.

High School → 4-Year USMMA College → Vessel Operations Work

SARAH joined the Navy immediately after high school, and then began working in the service industry as a civilian when she heard about a registered apprenticeship program that has now provided her with a well-paying and personally rewarding career in building, repairing, maintaining and modernizing ships.

High School → Navy → Other Work → Registered Apprenticeship in Shipbuilding/Repair

DARIO transitioned into the civilian maritime and transportation workforce after serving our country in the U.S. Navy and today uses his military experience to ensure that our nation’s Naval and merchant marine ships are strong, safe and always ready for the water!

U.S. Navy → Maritime Industry Work → Registered Apprenticeship in Shipbuilding/Repair sector

“Through SMART Center has broken new ground for the industry by creating critically-needed career and academic pathways for producing maritime and transportation technicians.”

Brad Mason
Dir. of Operations, AMSEC LLC, Subsidiary of Huntington Ingalls Industries

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For Sarah Canclini going into the BAE Systems Registered Apprenticeship program should have been like a sort of homecoming. She joined the Navy straight out of high school but her experience was limited to working on ships’ decks. “I never went into the engine room the entire time I was a sailor!” she laughs. She had a series of jobs after she left the military but upon turning 25 she “felt like I hit that mark where I realized I hadn’t really done anything in my life,” says Sarah. “I needed to do something productive that could give me a long-term career.”

Sarah first heard about BAE Systems’ registered apprenticeship program eight years after graduating high school while she was working as a kitchen supervisor at Cinema Café. While she had seen a Northrop Grumman table at a career fair in high school, she never heard about shipyard work or apprenticeship programs until she was an adult. “My grandfather had worked for a shipyard and encouraged me to look into any type of apprenticeship. He said an apprenticeship program was a great way to learn a trade in any field and get a good, solid job.” When she looked into it and learned about the financial incentives and career opportunities that the ship repair company offered she decided to apply. “The fact that BAE Systems would pay for me to go to college and give me a job that would pay decent wages sealed the deal!” she laughs.

During the four-year program all apprentices work in a shop on the BAE Systems shipyard to learn a specific trade. Sarah is the only female working in BAE’s outside machine shop and applies what she’s learning under her mentor to “do a lot of prefabrication work on ships - installing and removing stuff so that ships can be repaired, maintained, and improved.” Sarah is most enthusiastic about the opportunity she has to learn a skill that will guarantee her a job both now and in the future. “It’s great to work somewhere that doesn’t hold your lack of direct experience against you – that’s the whole point of the apprenticeship program. I’m taught great skills, get a great education, and get to work every day doing work that’s really important.”

Sarah is confident about her future at BAE Systems Ship Repair. “There’s a lot of room for me to grow from where I am right now,” says Sarah. As an aging workforce begins to retire apprentice graduates are often quickly promoted after completing their program. However for Sarah opportunities for advancement aren’t limited to the workplace. “BAE has already paid for me to earn my Career Studies Certificate in Maritime Technologies at TCC and I’m the first person to earn the SMART A.A.S. Maritime Technologies degree at TCC. They’ve invested a lot of money already and I’ve got the opportunity to go on and do more in college if I want.”

Sarah encourages students to really seek out their own dreams. “Going straight into a four-year college after high school isn’t the right path for everyone. It might be the path your teachers or counselors or parents want but you might be made for something different and there’s a place for you in this industry.” She encourages students to “take as much math as you can because you’ll use it on the job every day. If you can get into some tech-ed classes in electrical, mechanical, welding – whatever – that will show the company that you’re serious about doing this type of work and that you take initiative, which they expect out of apprentices.”

Learn more about Sarah’s registered apprenticeship pathway and career in the “Make the SMART Choice: Matching Up with the Men” Career Awareness Video.
The maritime and transportation industry offers a wide variety of land-based and seagoing jobs in four different industry sectors:

- Shipbuilding, Ship Repair, Maintenance and Modernization
- Port Operations and Marine Logistics
- Vessel Operations
- Emerging Maritime-Based Technologies

In order to go as far as you would like within the industry you will need to get additional education and training beyond a high school diploma or GED. There are several different academic pathways you can take to obtain that experience, academic and industry credentials:

Let's look at each possible educational pathway.
Get on the SMART Career Pathway from High School to the Maritime and Transportation Industry!

**Certificate Program:**
- **Marine Welding**
  • 19 credits

**Certificate Program:**
- **Marine Electrical**
  • 19 credits

**Certificate Program:**
- **Marine Mechanical**
  • 19 credits

**Certificate Program:**
- **Marine Diesel**
  • 19 credits

**Certificate Program (CSC) Maritime Technologies**
(25-27 credits)

**STEP 1:** Take these High School or Dual Enrollment Courses

- **Science**
  - Biology
- **Math**
  - Algebra 1
- **Career and Technical Education**
  - Drafting/design

**STEP 2:** Graduate and Enroll in a Community College Academic Maritime-Related Certificate Program

**STEP 3:** Apply Academic Certificate Credits Toward:
- **Certificate Program (CSC) Maritime Technologies** (25-27 credits)

**STEP 4:** Apply Academic Certificate Credits Toward:
- **Associate degree (A.A.S.) Maritime Technologies** (67 credits)
- **Associate degree (A.A.S.) Maritime Logistics** (67 credits)

**STEP 5:** Continue Education or Enter the Workforce

- **B.A./B.S./B.A.S.**
- **M.A./M.S.**
- **PhD**

Enter workforce in one of four industry segments:
- **Seagoing - Ports and Logistics**
- **Shipbuilding and Ship Repair - Pleasure craft boating**
- **Pilot training**
- **Maritime logistics**

Did you know? Dual enrollment classes allow you to take one course that meets your graduation requirements and earn college credit. Talk with your guidance counselor about DE courses you may be able to take today.

**STEP 3:** Apply Academic Certificate Credits Toward:

**STEP 4:** Apply Academic Certificate Credits Toward:

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- **M.A./M.S.**
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**Career Pathways Maritime & Transportation Education Programs**

**Certificate Program:**
- **Marine Welding**
  • 19 credits

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**Certificate Program:**
- **Marine Mechanical**
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- **Maritime logistics**

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**Career Opportunities**

To determine

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**Military**

**college courses**

**Community**

**courses**

$60-92K/yearly

Inspector

Manager/

Engineer/

$17 - $28/hr

$14 - $18/hr

0-2 yrs

**Ports/Intermodal Transportation**

**Marine Logistics and Shipping**

**Seagoing/Engineers**

**Marinas/Pleasure Craft**

**CSC Marine Mechanical**

**CSC Maritime**

**A.A.S. Maritime Technologies**

**A.A.S. Business**

**A.A.S. Maritime Logistics**

**A.A.S. Maritime Transportation**

**ABYC – Certified Boat, Yacht, Marinas**

**DOL - Journeyman-Craftsmen Card**

**STEP 1: Consider Accelerated Training at Community College**

**STEP 2: Choose Industry Segment**

- Take courses at a 4-year college to earn a BA/BS/BAS degree in Applied Science, Engineering Technologies, or Leadership
- Continue taking community college coursework toward additional academic credentials (i.e. Career Studies Certificate or A.A., A.A.S. degree) in maritime and test for additional industry certifications
- Enter workforce full-time
- Take courses at a 4-year college to earn a MS/PhD degree in Applied Sciences
- Continue working full-time
- Take courses at your college to earn a BA/BS/BAS degree in Applied Sciences
- Engineering Technologies, or Maritime Logistics

**STEP 3: Consider Applying for Apprenticeship Program**

- Work full-time learning craft, earning salary and benefits
- Earn an academic credential
- Test for industry credential
- Enter workforce full-time
- Continue working full-time
- Take courses at TCC part-time to earn an academic credential
- Test to earn national industry credentials
- Enter maritime technician track
- Take courses at your college to earn a BA/BS/BAS degree in Maritime and test for additional industry certifications

**STEP 4: Consider Attending a State or Federal Maritime Academy**

- Continue working full-time
- Take courses at your college to earn a BA/BS/BAS degree in Applied Science, Engineering Technologies, or Maritime Logistics

**STEP 5:**

- Work full-time learning craft, earning salary and benefits
- Earn an academic credential
- Test for industry credential
- Enter workforce full-time
- Continue working full-time
- Take courses at TCC part-time to earn an academic credential
- Test to earn national industry credentials
- Enter maritime technician track
- Take courses at your college to earn a MS/PhD degree in Applied Sciences
- Continue working full-time
- Take courses at your college to earn a BA/BS/BAS degree in Maritime and test for additional industry certifications

**Military to Maritime Career Pathway**

Talk to your Transition Assistance Program or use www.careercor.com to determine how your military service may translate to academic credit and industry certification in the maritime and transportation industry.

**Your Maritime and Transportation Industry Career Pathway**

How your military service may translate to academic credit and industry certification in the maritime and transportation industry.
Career Pathways Maritime & Transportation Education Programs

1. Graduate high school or earn GED

2. Enroll in a Hampton Roads Maritime Trades Training course at a participating VCCS college

3. Start work at shipyard, military base or marina as Entry Level worker (earning avg. $14-18/hr.)

4. Earn Career Studies Certificate in a specific trade (maritime technologies, welding, electrical, diesel) at community college while working; test to earn industry certification and may be eligible for raise!

5. Take a few more courses to earn a Career Studies Certificate in Maritime Technologies at community college while working; may be able to earn Journeyman card and raise!

6. Take remaining courses to earn an A.A.S. Maritime Technologies from community college while working; may be able to earn Journeyman card and raise!

7. Get ready for promotion to Supervisor or Manager position (earning $60-92,000/yearly), and opportunity to pursue 4-year degree!

Fast-Tracking Your Career in the Maritime and Transportation Industry

- Step 1: Consider Accelerated Training at Community College
- Step 2: Choose Industry Segment
- Step 3: Consider Applying for Apprenticeship Program
- Step 4: Consider Attending a State or Federal Maritime Academy
- Step 5: Take additional training to raise!
- Step 6: Earn industry certification and may be able to earn Journeyman card and raise!
- Step 7: Get ready for promotion to a higher level position and opportunity to pursue 4-year degree!
Did You Know?...
- Marine welders are in high demand – there are not enough workers to meet the current need.
- The field provides high-wage positions for middle-skill technicians and full employer benefits (i.e. health insurance, paid vacations and holidays, etc.)
- Veterans can use paid training assistance benefits to learn maritime welding under the Veterans Retraining Assistance Program (VRAP)

Pathway to Building Your Career as a Marine Welder

1. Enroll at TCC
2. Take 2 courses in Maritime-Welding
3. Earn your Career Studies Certificate (CSC) in Maritime Welding
4. Prepare for test to take AWS certification as Entry-Level Welder with qualifications in (SMAW) and/or Metal Arc Welding (GMAW)
5. Get hired earning on avg. $25-50/hr. and full employer benefits!
6. Continue working
7. Take 3 additional courses at TCC
8. Earn second Career Studies Certificate - CSC in Maritime Technologies
9. Prepare for test to get AWS certification as Experienced Welder
10. Earn MSSC – Manufacturing Certificates and earn for promotion and possible raise to $60-92K/year!
11. Continue working
12. Take 3 additional courses at TCC

Career Pathways Maritime & Transportation Education Programs
SMART Center Key Partners

**SMART CENTER PI**
- Tidewater Community College (VA)

**PI**
- AMSC (VA)
- Arvon Acadian Community College (MD)
- San Jacinto College (TX)
- Virginia Tech (VA)

**KEY EDUCATION PARTNERS**
- Broward County Public Schools (Xerox, FL)
- Broward College (FL)
- Chesapeake Public Schools (VA)
- Davie County Public Schools (Cullowhee, NC)
- Hampton Public Schools (VA)
- Hillsborough County Public Schools (Tampa, FL)
- Newport News Public Schools (VA)
- Olympic College (Bremerton, WA)
- Portsmouth Public Schools (Portsmouth, VA)
- San Diego City College (CA)
- SCC Technical College & A
- South Broward HS (Hollywood, FL)
- University of Wisconsin-Madison (WI)
- VA Beach Public Schools (VA)

**PORT PARTNERS**
- Port of Baltimore
- Port of Galveston
- Port of Houston
- Port of Long Beach (CA)
- Port of New Orleans
- Port of Virginia

**FEDERAL AGENCIES**
- DOT
- DIT
- MARAD
- US Coast Guard

**KEY INDUSTRY PARTNERS**
- AMSC (VA, HI, CA, WA)
- BAE Systems (CA, FL, HI, WA)
- Bluewater Marine (Houston and Galveston, TX)
- Colonna’s Shipyard (VA)
- FedEx (Memphis)
- GB&T Toegi (Galveston, TX)
- Higman Marine (Houston, TX)
- Houston Maritime Museum (Houston, TX)
- Houston Pilots Association (Houston, TX)
- International Ship Repair & Marine Services, Inc. (Tampa, FL)
- Naval Shipyard (VA, WA)
- Oceaneering (TX, VA, WA)
- Port of Galveston (TX)
- Robert Terreba (Baltimore)
- Seafarer’s Center Houston (Houston, TX)
- SeaAnchors SeaBase Galveston (Galveston, TX)
- West Gulf Maritime Association (Houston, TX)

**Your Maritime and Transportation Industry Career Pathway**

1. **Conduct a Job Search**
   - Identify the right job for your skillset and career goals.

2. **Choose Industry Sector**
   - Select a sector that aligns with your interests and skills.
   - Consider industry certifications and training programs.

3. **Consider Apprenticeship Program**
   - Apprenticeships provide hands-on training and real-world experience.
   - Learn more about apprenticeships and the requirements.

**Education and Training Options**
- **Associate Degree**
  - A.A.S. Maritime Technologies
  - Work full-time and attend TCC part-time, earning a degree in maritime technologies.

- **Technology Certificate**
  - Test to earn national industry credentials:
    - ABYC – Certified Boat, Yacht, Operators/Technicians
    - AMSEC (VA, HI, CA, WA)
    - CSC Marine Diesel
    - CSC Maritime
    - FedEx (Memphis)
    - Oceaneering (TX, VA, WA)
    - Port of Galveston (TX)
    - Robert Terreba (Baltimore)
    - Seafarer’s Center Houston (Houston, TX)
    - SeaAnchors SeaBase Galveston (Galveston, TX)
    - West Gulf Maritime Association (Houston, TX)

**Career Pathways**
- **Maritime Logistics or Leadership**
  - Community college to earn a MS/PhD degree in Applied Industry Certification and a:
    - $17 - $28/hr
    - Entry-Level Engineer/Chief
- **Seagoing/Engineers**
  - Work full-time and attend TCC part-time to earn a degree in maritime technologies.
  - Work full-time and take courses at a 4-year college to earn a degree in maritime technologies.
  - $60-92K/yearly
  - 15+ years
  - Engineer/Chief
Step 1: Consider Accelerated Training at Community College

Work full-time and attend TCC part-time to earn industry certification and a:

- Technician/Journeyperson
- Specialist/Operator

2-6 years
$17 - $28/hr

Step 2: Choose Industry Segment

Step 3: Consider Applying for Apprenticeship Program

Step 4: Consider Attending a State or Federal Maritime Academy

Military experience
Community college courses

Work full-time and take courses at a 4-year college to earn a BA/BS/BAS degree in Applied Science, Engineering Technologies, Maritime Logistics or Leadership

- Technician/Journeyperson
- Specialist/Operator
- Captain/Chief Engineer/Supervisor

15+ years
$120-190K/yearly

Work full-time and take courses at a 4-year college to earn a MS/PhD degree in Applied Science, Engineering Technologies, or Leadership

- Captain/Chief Engineer/Supervisor
- Manager/Supervisor/Engineer/Inspector

5-20 years
$60-92K/yearly

Maritime Transportation Employers

- Shipbuilding and ship repair (shipyards)
- Marine Logistics and Shipping
- Ports/Intermodal Transportation
- Marinas/Pleasure Craft
- Seagoing/Engineers

Career Pathways & Maritime Transportation Education Programs

COLLEGE PARTNERS
- Anne Arundel Community College
- Eastern Shore Community College
- Florida State College at Jacksonville
- Mississippi Gulf Coast Community College
- MITAGS-PMI (Maritime Institute of Technology and Advanced Graduate Studies)
- Paul D. Camp Community College
- Rappahannock Community College
- San Jacinto College
- Thomas Nelson Community College
- Tidewater Community College

INDUSTRY PARTNERS
- American Maritime Holdings
- AMSEC (a division of Huntington Ingalls Industries)
- Auxiliary Systems, Inc.
- BAE Systems
- CDI Business Solutions
- Collins Machine Works
- Colonna's Shipyard, Inc
- Earl Industries
- Higman Marine
- Houston Pilots Association
- Huntington Ingalls Industries
- JAXPort
- MARAD
- NAVSEA
- Newport News Shipbuilding
- Norfolk Naval Shipyard
- Oceaneering International, Inc.

K-12 Maritime Academies
Florida
Georgia
South Carolina
Mississippi
Maryland
Pennsylvania
Texas

Virginia public school districts including Newport News, Norfolk, and Virginia Beach

SMART Center Partners

•  Anne Arundel Community College
•  Eastern Shore Community College
•  Florida State College at Jacksonville
•  Mississippi Gulf Coast Community College
•  MITAGS-PMI (Maritime Institute of Technology and Advanced Graduate Studies)
•  Paul D. Camp Community College
•  Rappahannock Community College
•  San Jacinto College
•  Thomas Nelson Community College
•  Tidewater Community College

COLLEGE PARTNERS

SCHOOL DISTRICTS

Academic Pathway

Career Opportunities

H.S. STEM/CTE/Dual Enrollment courses

A.A.S. Maritime Logistics
A.A.S. Maritime Technologies
A.A.S. Business

CSC Marine Electrical
CSC Marine Mechanical
CSC Marine Diesel
CSC Marine Welding
CSC Maritime Technologies

Test to earn national industry credentials:

- DOL - Journeyman-Craftsmen Card
- AWS - Certified Welder
- ABYC – Certified Boat, Yacht, Marinas
- MSSC – Manufacturing Certificates

K-12 Maritime Academies

Florida
Georgia
South Carolina
Mississippi
Maryland
Pennsylvania
Texas

Virginia public school districts including Newport News, Norfolk, and Virginia Beach

SMART Center Partners

- American Maritime Holdings
- AMSEC (a division of Huntington Ingalls Industries)
- Auxiliary Systems, Inc.
- BAE Systems
- CDI Business Solutions
- Collins Machine Works
- Colonna’s Shipyard, Inc
- Earl Industries
- Higman Marine
- Houston Pilots Association
- Huntington Ingalls Industries
- JAXPort
- MARAD
- NAVSEA
- Newport News Shipbuilding
- Norfolk Naval Shipyard
- Oceaneering International, Inc.
Community colleges provide an excellent, cost-effective way to earn an academic certificate or even Associates degree in an area of specialty that is valued by maritime and transportation industry employers. This is not intended to be a comprehensive list of community college in the United States that offer an academic certificate or degree program in maritime and transportation industry-related areas. Some of these community colleges also offer non-credit technical training.

SOUTHEAST REGION
- Talkeetna Community College (AK) www.tcc.edu
- Eastern Shore Community College (VA) www.esc.edu
- Paul D. Camp Community College (VA) www.pdc.edu
- Rappahannock Community College (VA) www.rapphannock.edu
- Thomas Nelson Community College (VA) www.tncc.edu
- Anne Arundel Community College (MD) www.aacc.edu
- Cecil College (MD) www.cecil.edu
- Southwestern Community College (VA) www.fscj.edu
- Florida State College at Jacksonville (FL) www.fscj.edu
- Broward College (FL) www.broward.edu

NORTHEAST
- Kingsborough Community College (NY) www.kbcc.cuny.edu
- International Yacht Restoration School (RI) www.riys.com
- Massachusetts Bay Community College (MA) www.massbay.mass.edu
- Ocean County Vocational Technical School (NJ) www.ovcs.org
- Westmoreland Institute of Marine Technology (ME) www.westmarin.org

MIDWEST/GREAT LAKES
- Wisconsin Area Technical College (WI) www.watc.edu
- Macomb Community College (MI) www.macomb.edu
- University of Wisconsin, Marinette College (WI) www.marinettecollege.edu

PACIFIC NORTHWEST
- Everett Community College (WA) www.everettcc.edu
- Olympic College (WA) www.olympic.edu
- Renton Technical College (WA) www.rtc.edu
- Seattle Central Community College (WA) www.seattlecentral.edu
- Skagit Valley College (WA) www.skagitcollege.edu
- South Seattle Community College (WA) www.southseattle.edu

WEST
- Maritime Institute (CA) www.maritimeinstitute.com
- San Diego City College (CA) www.sdcity.edu
- University of Hawaii, Honolulu Community College (HI) www.honolulu.hawaii.edu

SOUTHWEST
- Cedar Valley College (TX) www.cedarvalleycollege.edu
- Delgado Community College (LA) www.dccc.edu
- Fletcher Technical Community College (LA) www.fletcher.edu
- San Jacinto College (TX) www.sanjac.edu
- South Central Louisiana Technical College (LA) www.sclt.edu
- Mississippi Gulf Coast Community College (NGCC) (MS) www.gogcc.com
Maritime academies are unique colleges that offer students of all ages undergraduate and, in some cases, graduate, degree programs. There are seven maritime academies in the U.S. – the federal U.S. Merchant Marine Academy (USMMA) and six state academies:

- California Maritime Academy
- Great Lakes Maritime Academy (Michigan)
- Maine Maritime Academy
- Massachusetts Maritime Academy
- SUNY Maritime College (New York)
- Texas Maritime Academy

While maritime academy students do wear uniforms, only one – the U.S. Merchant Marine Academy – is a military academy. Maritime academies provide students with unique college advantages such as:

- Low teacher-to-student ratio
- Opportunity for international travel
- Hands-on experience in state-of-the-art simulators
- At-sea training aboard a maritime academy training vessel
- Competitive sports teams
- On-campus clubs
- Opportunities for summer internships
- Extensive networking opportunities with maritime academy graduates

All maritime academy graduates earn a bachelor’s degree and a U.S. Coast Guard license which allows them to work as a maritime officer. USMMA graduates are commissioned as officers in the U.S. Armed Forces and are required to fulfill a service obligation after graduating. That means they must either:

- Serve five years in the U.S. maritime industry and serve as an officer in the armed forces reserve for eight years, or
- Serve five years active duty in any of the five branches of the U.S. Armed Forces – Army, Air Force, Navy, Coast Guard, Marines

State maritime academy graduates can choose any career path they would like after completing their undergraduate education such as:

- Serving in a branch of the U.S. military
- Working for a private company in the U.S. Merchant Marine either at sea or on land,
- Working for a public agency or private company in the maritime and transportation industry, or
- Working in virtually any industry in the U.S.

**U.S. MERCHANT MARINE ACADEMY (Kings Point, New York)**

The United States Merchant Marine Academy (USMMA) is a federal service academy that educates and graduates licensed Merchant Marine officers.

In addition to challenging classroom-based coursework, students (called "midshipmen") take a Sea Year experience, during which they acquire hands-on, real-world experiences aboard working commercial vessels sailing to ports around the world. Upon graduation students earn:

- A Bachelor of Science degree,
- A U.S. Coast Guard license, and
- An officer’s commission in the U.S. Armed Forces.

Academy graduates are highly sought after as officers in the military and the merchant marine. All graduates have a service obligation upon graduation. They can choose to work five years in the United States maritime industry with eight years of service as an officer in any reserve unit of the armed forces, or choose to serve five years active duty in any of the nation’s armed forces.

Website: www.usmma.edu  Phone: 516.726.5800
**CALIFORNIA MARITIME ACADEMY** (Hayward, California)
California State University Maritime Academy is a co-educational public college located on the northern end of the San Francisco Bay. It is one of 23 campuses in the California State University (CSU). The university has a total body enrollment of approximately 1,200 with an average class size of 23 students. Cal Maritime offers undergraduate degrees preparing students for careers in engineering, transportation, international relations, business, and global logistics. It also offers a master’s degree in Transportation and Engineering Management. All students travel abroad while taking courses and gain relevant real-world experiences to enhance their academic area of focus. In addition, all students are provided with a summer internship or co-op pertaining to their specific professional goal. Each year cadets enter corporations, graduate schools, the military, industry-leading companies, and public agencies upon graduation. A U.S. Department of Education study revealed that Cal Maritime graduates rank first in California and seventh in the nation for graduate earnings ten years after enrollment. Website: www.csum.edu Phone: 925.554.1000

**GREAT LAKES MARITIME ACADEMY** (Traverse City, Michigan)
The Great Lakes Maritime Academy is an accredited co-educational public college that admits 60 students each fall. Students, called cadets, can earn a Bachelor of Science in Maritime Technology, those who enter the academy with a bachelor’s degree are eligible for the accelerated three-year program. Academy graduates are civilian merchant marine officers who work on commercial ships either on the Great Lakes or at sea. Website: www.nlmc.edu/maritime Phone: 847.834.7447

**MAINE MARITIME ACADEMY** (Castine, Maine)
Maine Maritime Academy is a small, co-educational, accredited public college on the coast of Maine. It offers students 16 major options in Engineering and Technology and Operations, Marine Transportation, Business, Science, and Interdisciplinary Studies. Maine Maritime is an NCAA Division III school offering several men’s and women’s athletic teams. Students can also choose from 26 on-campus clubs, activities, and organizations. Website: www.mainemaritime.edu Phone: 207.227.8405

** MASSACHUSETTS MARITIME ACADEMY** (Buzzards Bay, Massachusetts)
Massachusetts Maritime Academy is a fully accredited, four-year, co-educational state university located on Cape Cod, Massachusetts. It offers undergraduate- and graduate-level degrees in environmental science, marine safety, maritime transportation, international maritime business, facilities or marine engineering, emergency management, marine biology, and energy management. While the academy’s campus life reflects certain aspects of a military academy in order to grow effective leaders, only cadets who choose to go through commissioning programs have military obligation following graduation. The academy offers a wide variety of national and travel courses that are authorized by the NAVEDTRA 14166A and CAC Division three athletics programs.
Website: www.maritime.edu Phone: 508.380.3000

**SUNY MARITIME COLLEGE** (Throggs Neck, New York)
SUNY Maritime College is a four-year, co-educational college located at historic Fort Schuyler in Throggs Neck, New York and is the first maritime school in the country. It offers undergraduate degree programs in engineering, naval architecture, marine transportation/business administration, maritime studies, marine environmental science, humanities, international transportation and trade, as well as a graduate degree in international transportation management. Every summer, students travel across the world on the school’s 565-foot training ship Empire State VI, gaining hands-on experience to complement their classroom learning. Students can take part in the school’s 20 varsity athletic teams and numerous on-campus clubs and activities. Website: www.sunymaritime.edu Phone: 718.595.7200

**TEXAS MARITIME ACADEMY** (Galveston, New York)
The Texas Maritime Academy is part of the Texas A&M University at Galveston, a 130 acre campus in Galveston, Texas. It is a co-educational program that offers undergraduate degrees in marine biology, marine fisheries, marine engineering technology, marine sciences, marine transportation, maritime administration, maritime studies, maritime systems engineering, oceans and coastal resources, and university studies. The school’s graduate programs include a masters degree in marine resources management and a masters or Ph.D. in marine biology. Academy cadets get hands-on training onboard the school’s training ship – the General Ruddell. Website: www.tamar.edu Phone: 877.337.4443
Career Opportunities

CSC Marine Welding

The majority of our country’s maritime and transportation workforce is, or will be, retirement age within the next five years. Major employers are eager to attract and train veterans for critical positions in the industry. Employers and educators are eager to help veterans transition from military service to the civilian sector. They can help veterans determine how their experience translates to academic credit and/or industry credentials.

Step 1: Learn about Career Opportunities

The first step is to learn what opportunities there are in each of the four main segments of the maritime and transportation industry:

- Shipbuilding and Ship Repair
- Ports and Marine Logistics
- Seagoing
- Pleasurecraft and Marinas

Employers in each segment are actively recruiting and hiring veterans for rewarding, well-paying careers. There are seagoing jobs and land-based jobs. You can learn more about both seagoing and land-based jobs in the Career Index and by reviewing the following information:

Seagoing Jobs

As described in the “Land or Sea” section of this Career Guide, people who work on boats for a living are called “mariners.” They work on tugboats, ferry ships, cargo ships, cruise ships, commercial fishing boats, and scientific research vessels. These privately-owned, U.S. registered merchant ships and vessels are called the “U.S. merchant marine.” As a member of the merchant marine you could be part of important waterborne transportation for passengers and cargo moving in domestic and international commerce. You could work on ships in the tropical U.S. or in adjacent oceans, or in seas around the world. Mariners help advance our global economy and keep our country secure and successful.

There are three main types of mariner jobs. Inland service means working on rivers and inland waterways. Near coastal service means working on or near the ocean but staying close to the coast. Offshore service means working in the open sea. Mariners are licensed by the U.S. Government and must have a U.S. Merchant Marine License.

There are three main career pathways that allow mariners to earn wages and move up in the industry. These are:

- opting for a direct entry position
- attending a trade school
- enrolling in a college program

A direct entry position can be entry-level, skilled, or professional. The majority of these positions require seven to ten years of experience and the following educational requirements:

- High School Graduate or equivalent
- Courses in Science, Mathematics, English, Social Studies, and History
- B.S. Degree in Engineering, Marine, or Transportation

Entry-Level positions are low in skill, require little experience, and offer the highest starting wages. Examples of entry-level positions include:

- Steward/hotel jobs fall into food services, sanitation, and entertainment categories
- Deck jobs involve navigation, cargo handling, and management of the ship
- Engineering jobs deal with propulsion, maintenance and management of the ship
- Steward/hotel jobs fall into food services, sanitation, and accommodation-related positions

Some vessels will also have a “Supply Department” which is typically a combination of the steward department and those crewmembers who perform storekeeping duties. Additionally some vessels carry communications and/or medical personnel. A sampling of the seagoing careers available in the maritime and transportation industry includes the following:

<table>
<thead>
<tr>
<th>SKILLED TRADE</th>
<th>ENTRY-LEVEL POSITIONS</th>
<th>PROFESSIONAL POSITIONS</th>
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</thead>
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<tr>
<td>Shipfitter</td>
<td>Electrician</td>
<td>Carpenter</td>
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<td>Pipelayer</td>
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<td>Machinist</td>
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<tr>
<td>Assistant Cook</td>
<td>Able-Bodied Seaman</td>
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<tr>
<td>Attendant-Dining</td>
<td>Chef</td>
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</tr>
<tr>
<td>Room</td>
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<td>Steward, Mate</td>
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<tr>
<td>Transportation</td>
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<tr>
<td>Deckhand</td>
<td>Deckhand</td>
<td>Deckhand</td>
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<tr>
<td>Entertainer</td>
<td>Fisherman</td>
<td>Master Mariner</td>
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<tr>
<td>Steward Assistant</td>
<td>Junior Engineer</td>
<td></td>
</tr>
<tr>
<td>Utilityman</td>
<td>Photographer</td>
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</tr>
</tbody>
</table>

Former members of the military are highly sought after for work as a licensed or unlicensed member of the merchant marine. Unlicensed members of the merchant marine are either entry-level or skilled workers. Entry-level mariners do not need previous time at sea, while skilled unlicensed mariners do. To work as a merchant marine officer you need to be licensed, in the same way that surgeons or pilots or other skilled professionals require licensing from a professional overseeing body to work. The regulatory agency that awards licenses for people to work as officers in the merchant marine is the U.S. Coast Guard. Your experience in the military may translate to USCG credentialing toward officer status.
LAND-BASED JOBS

If you are more interested in a land-based position over a seagoing career, there are numerous positions needing former members of our nation’s military. Land-based jobs across all four segments of the industry can be divided into three main categories:

• skilled trade positions
• dock and warehouse positions
• professional positions

Land Based Jobs → Skilled Trade Positions

There is a critical need for skilled craftsmen and women in every segment of the maritime and transportation industry. While some experience is preferred, employers are willing and eager to train veterans who have a strong work ethic and who take pride in their work. Skilled trade positions are needed in docks, ports, shipyards, and marinas. Career opportunities include:

Skilled Trade Positions

• Shipyard Electrician
• Pipefitter Steamfitter Welder
• Machinist Rigger Mechanic

As you gain experience you will have the opportunity to move into supervisory positions, training other skilled tradesmen and women. Eventually you may want to continue your education and move into a managerial/professional track.

LAND-BASED JOBS → Dock and Warehouse Positions

With 39 ports in the U.S., veterans are needed to fill a wide range of dock and warehouse positions. Most of these positions require some education and training beyond high-school and the higher the position/pay grade, the more education you’ll need.

Dock and Warehouse Positions

• Crane and Tower Operator
• Vessel Operations Supervisor
• Port Security Officer
• Port Capstans
• Vessel Operations Supervisor
• Crane and Tower Operator
• Port Security Officer
• Port Capstans

Learn more about each of these positions in the Career Index.

LAND-BASED → Professional Positions

One of the best things about the maritime and transportation industry is that there is great opportunity for advancement. Whether you come in as an entry-level worker or after working in another field you can use the skills and knowledge you gained in the military.

Professional-level jobs typically require a college degree and experience. Some of these include:

Professional Positions

• Analyst
• Purchasing Agent
• Accounts Payable
• Project Manager
• Sales

Step 1: Consider Accelerated Training at Community College

With 3-5 years experience, you may qualify to have the costs of credentialing paid from your service pay. While the average certification or credentialing cost is $225, that is a small cost to qualify for employment in the maritime and transportation industry, or to qualify for a higher pay rate for a position.

In the military you learn valuable skills and earn military-based credentials which can directly translate to other professional credentials that can help you when seeking employment as a civilian. In fact for U.S. Navy veterans there are more than 5,000 civilian certifications and licenses tied to specific Navy enlist- ed ratings, classifications, and even duties that many sailors may qualify for or be able to by passing an exam.

There are often costs associated with credentialing but you may qualify to have the service branch pay for these costs. While the average certification or credentialing cost is $225, that is a small cost to qualify for employment in the maritime and transportation industry, or to qualify for a higher pay rate for a position.

Both the Army and Navy offer on-line services that enable you to determine what maritime and industry credentials you may qualify for based on your military service.

A ll branches of the military provide three types of education, training, and experience documentation: two official military forms and a military transcript.

• Joint Service Transcript (JST) – is a computerized transcript system that produces official transcripts for eligible personnel upon request by combining a Service member’s military education, training and experience with descriptions and credit recommendations developed by ACE. Eligible sailors or veterans can access the JST/SmarTable website and active duty Navy personnel can request a transcript through the Navy College Office. Eligible Army personnel can access the Joint Services Transcript website, and active duty soldiers can request a transcript following the instructions on the JST Official Transcript page.

Career Pathways Maritme & Transportation Education Programs

• CSC Maritime
• MACS Maritime
• AWS - Certified Welder
• DOL - Journeyman-Craftsmen Card

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• Verification of Military Experience and Training (VMET) (DD Form 2586) – The DD Form 2586 is created from a Service member’s automated records on file. It lists military job experience and training history, recommended college credit information, and civilian equivalent job titles. Verification documents are provided to transitioning Service members from the Transition GPS Defense Manpower Data Center web site.

• Certificate of Release or Discharge from Active Duty (DD Form 214) – The DD Form 214 is a source of significant authoritative information used by civilian and governmental agencies to validate veteran eligibility for benefits. It is issued to every Service member at time of discharge. The National Archives and Records Administration provides information on DD Form 214.

Step 3: Determine Your Pathway into the Maritime and Transportation Industry

There are several possible pathways into the maritime and transportation industry from the military:

• You could go to work full-time for a new employer after retiring from the military or transitioning from another employer after your military career ends.

• You could attend a Maritime Academy to earn an undergraduate or graduate degree and become a licensed merchant marine officer.

• You could apply for an employer-sponsored Registered Apprenticeship program. Employers in nearly all segments of the maritime and transportation industry offer apprenticeship programs. If you are still serving in the military, you should consult with the Education Services Officer at your installation and tell them that you’re interested in learning about registered VA-approved Apprenticeship Programs. Ask for the VA Form 22-1990, “Application for Education Benefits.” When you enroll in a VA-approved Apprenticeship Program you can use your Montgomery G.I. Bill benefits to receive monthly income in addition to pay from your employer during your training. Your VA monthly benefits are determined by the number of years you were enlisted.

• You could use your G.I. Bill Benefits to take courses at a community college that offers a maritime technology academic pathway, equipping you with an industry-validated academic credential that demonstrates to employers your initiative and important knowledge.

Step 4: Consider Your Educational Options

There are a number of maritime academies, community colleges and four-year colleges that offer maritime technologies academic pathways. Through these schools you could earn an academic certificate, associate’s degree, four-year undergraduate or even graduate degree. Employers look favorably upon applicants who have pursued an academic credential and your certificate or degree will most likely translate into a higher pay rate and opportunity for advancement.

The Servicemembers Opportunity Colleges (SOC) Degree Network System maintains lists of approximately 1,900 two-and four-year colleges across the U.S. that offer associate and bachelor’s degrees to military servicemembers, their spouses, and adult children worldwide.
ADARIO AGUILELA was a Navy electrician stationed at Little Creek Amphibious Base in Norfolk, Virginia, working on small boats when he retired in 2008. “I met several AMSEC employees doing service work on our ships when I was in the Navy,” recalls Aguilela. “Roger Adams, one of AMSEC’s supervisors, told me that the firm had a small boat shop at Little Creek. Since I had 22 years of experience, I felt my experience would be attractive to the company.”

A year after joining AMSEC, Aguilela heard about the company launching a new apprenticeship program. Brad Mason, Director of Operations at AMSEC LLC, championed the program. “The apprenticeship program enables us to grow employees who make meaningful contributions to our work and who have the ability to rise to positions of leadership and responsibility more quickly,” explains Mason. “Our program also demonstrates our corporate strengths to the government when we bid on projects. It’s a win-win for the company and our workers.”

As a member of the first AMSEC apprenticeship class, Aguilela has helped the program coordinator, Ross Leach, learn what works and what doesn’t work. Leach explains that each apprentice is aware that their involvement in the program makes them more desirable candidates for promotion. “We want to motivate these employees to grow into leaders. Our hope is that apprentices like Dario will earn their Associate of Applied Science (A.A.S.) degree in Maritime Technologies, their journeyman’s card, and maybe even another degree. We want to help these individuals advance and become supervisors, project and program managers. We have a low attrition rate for people in supervisory positions, but as our workforce ages, we’re going to look to apprentices – people who have taken the effort to complete the program, continue their education, and work above expectation – we’re going to hire them to be our next wave of leaders.”

After making some initial adjustments to better serve the apprentices and build on academic coursework already completed, Aguilela is now on track to graduate with two industry certificates, and is well on his way to an A.A.S. in Maritime Technologies from Tidewater Community College (TCC). In addition, he will receive an industry-recognized journeyman’s card from the State of Virginia which guarantees competitive wages whenever he is employed.

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After making some initial adjustments to better serve the apprentices and build
Carpenter
43
Electrician
44
Estimator/Planner
45
Heating & Air Conditioning (HVAC) Mechanic and Installer
46
Human Factors Engineer and Ergonomist (Making Work Environments Safer and Work Healthier)
47
Industrial Engineering Technician
48
Industrial Painter
49
Inside Machinist
50
Marine Diesel Mechanic
51
Outside Machinist
52
Pipelayer
53
Rigger
54
Sheet Metal Worker
55
Shipbuilder
56
Welder
57

Information Sources
onetonline.org and Bureau of Labor Statistics

Carpenter

Related Positions
Shipwright, Assembler, Stage Builder, Framer, Finish Carpenter or Construction Worker, Custom Yacht Carpenter/Cabinet Maker

Occupation Description
A carpenter will construct, erect, install and repair structures and fixtures of wood, plywood, wallboard for boats and ships using carpenter’s hand tools and power tools.

Daily Tasks
- Study specifications in blueprints, sketches, or building plans to prepare project layout and determine dimensions and materials required
- Measure and mark cutting lines on materials, using a ruler, pencil, chalk, and marking gauge
- Shape or cut materials to specified measurements, using hand tools, machines, or power saws
- Install structures or fixtures, such as frames, floorings, trim, or hardware, using hand or power tools
- Verify trueness of structure, using plumb bob and level
- Build or repair cabinets, doors, frameworks, floors, or other wooden fixtures used in buildings, using woodworking machines, carpenter’s hand tools, or power tools

Education and Credentials
This occupation usually requires a high school diploma or GED with a strong background in technical education/shop, mechanical drawing, carpentry and basic math including geometry. The next educational step is participating in a four-year, registered apprenticeship program you will learn the trade under the supervision of an experienced carpenter, gain hands-on experience while earning a salary and benefits and possibly earn academic certificates or degrees through required classroom work. You will also earn a national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Did you know
There are 2,386 shipyards in the U.S., spread across 46 states, which are classified as active shipbuilders and there are more than 500,000 shipyard workers employed in the U.S. For more information, visit shipbuildinghistory.com

Did you know
Shipbuilding is one of the oldest industries in the U.S., with roots in the earliest colonial settlements.

Salary
Median hourly wage: $19.63
Median annual salary: $40,820

Carpenter

Related Positions
Shipwright, Assembler, Stage Builder, Framer, Finish Carpenter or Construction Worker, Custom Yacht Carpenter/Cabinet Maker

Occupation Description
A carpenter will construct, erect, install and repair structures and fixtures of wood, plywood, wallboard for boats and ships using carpenter’s hand tools and power tools.

Daily Tasks
- Study specifications in blueprints, sketches, or building plans to prepare project layout and determine dimensions and materials required
- Measure and mark cutting lines on materials, using a ruler, pencil, chalk, and marking gauge
- Shape or cut materials to specified measurements, using hand tools, machines, or power saws
- Install structures or fixtures, such as frames, floorings, trim, or hardware, using hand or power tools
- Verify trueness of structure, using plumb bob and level
- Build or repair cabinets, doors, frameworks, floors, or other wooden fixtures used in buildings, using woodworking machines, carpenter’s hand tools, or power tools

Education and Credentials
This occupation usually requires a high school diploma or GED with a strong background in technical education/shop, mechanical drawing, carpentry and basic math including geometry. The next educational step is participating in an employer-sponsored Registered Apprenticeship program or accredited training program, or taking post-secondary courses in carpentry at a community college toward a certificate, a few community colleges in the U.S. offer associate degree programs in Marine Industry Technology. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for carpenters include:

- Department of Labor (DOL) Journeyworker credential – by completing a two-four year registered apprenticeship program you will learn the trade under the supervision of an experienced carpenter, gain hands-on experience while earning a salary and benefits and possibly earn academic certificates or degrees through required classroom work. You will also earn a national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Next Career Steps
Learn more about what a Marine Carpenter does. Watch the video “Career - Marine Carpenter” on our website:
https://www.maritime-technology.org/students-videos/

Did you know
Shipbuilding is one of the oldest industries in the U.S., with roots in the earliest colonial settlements.
https://www.nps.gov/subjects/heritagetravel/maritime.htm

Did you know
24 tons of scrap steel from the fallen World Trade Center Towers would be used to produce the bow stem of the USS NEW YORK warship and with the name, motto (Never Forget) and symbolic casting, the USS NEW YORK became a monument that would fight back.
www.ussnewyork.com

Did you know
There are 124 shipyards in the U.S., spread across 26 states, which are classified as active shipbuilders and there are more than 500,000 shipyard workers employed in ship repair or capable of building ships but not actively engaged in shipbuilding. www.shipbuildinghistory.com
**Related Position**
Marine, Deck, Control, and Industrial Electricians can work in the Shipbuilding, Ship Repair, or Off the Pleasure Craft and Marine sectors and industries.

**Salary**
- Median hourly wage: $24.37
- Median annual salary: $50,100

**Electronic Systems Workers**

- An electronic installer, maintainer, and repairer installs and repairs electrical wiring, equipment, or fixtures. They may install and service lighting systems, Intercom systems, or electrical control systems. An electrician will connect wires to circuit breakers, transformers, or other components. An electrician will use testing devices such as ammeters, voltmeters or oscilloscopes, to ensure compatibility and safety of the system.

**Daily Tasks**
Plan layout and installation of electrical wiring, equipment, or fixtures. Ensure that work is in accordance with relevant codes. Connect wires to circuit breakers, transformers, or other components. Test the continuity of circuits in electrical wiring, equipment, or fixtures. Test electrical systems or components for proper operation. Prepare estimates for labor or materials for projects in electrical wiring and electrical systems. Conduct or assist in the diagnosis of malfunctioning systems, apparatus, or components. Advise management or front line supervisors on whether continued operation of electrical equipment could be hazardous. Diagnose malfunctioning systems, apparatus, or components. Use testing equipment and hand tools to locate the cause of a break-down and correct the problem. Maintain current electrical license or identification card to meet governmental regulations.

**Education and Credentials**
The occupation requires a high school diploma or GED, training in vocational schools, related on-the-job experience, or an associate degree. The next educational step is completing an accredited employer-sponsored training, related exam, or associate degree.

**Salary**
- Hourly wage: $24.37
- Annual salary: $50,100

**Electronic Technician**

- An electronic technician will connect wires to circuit breakers, transformers, or other components. They may install and service lighting systems, Intercom systems, or electrical control systems. An electrician will use testing devices such as ammeters, voltmeters or oscilloscopes, to ensure compatibility and safety of the system.

**Daily Tasks**
Plan layout and installation of electrical wiring, equipment, or fixtures. Ensure that work is in accordance with relevant codes. Connect wires to circuit breakers, transformers, or other components. Test the continuity of circuits in electrical wiring, equipment, or fixtures. Test electrical systems or components for proper operation. Prepare estimates for labor or materials for projects in electrical wiring and electrical systems. Conduct or assist in the diagnosis of malfunctioning systems, apparatus, or components. Advise management or front line supervisors on whether continued operation of electrical equipment could be hazardous. Diagnose malfunctioning systems, apparatus, or components. Use testing equipment and hand tools to locate the cause of a break-down and correct the problem. Maintain current electrical license or identification card to meet governmental regulations.

**Education and Credentials**
The occupation requires a high school diploma or GED, training in vocational schools, related on-the-job experience, or an associate degree. The next educational step is completing an accredited employer-sponsored training, related exam, or associate degree.

**Salary**
- Hourly wage: $24.37
- Annual salary: $50,100
HEATING VENTILATION AND AIR CONDITIONING MECHANIC AND INSTALLER

Related Position
Air Conditioning Specialist

OCCUPATION DESCRIPTION
An HVAC technician specializes in the installation, maintenance, and repairs of all kinds of heating, ventilation, and air conditioning systems and equipment.

DAILY TASKS
- Identify heating or cooling system malfunctions, isolate problems and verify that repairscorrectmalfunctions
- Test or troubleshooting units or connections for leaks, using pressure gauge or other detection methods
- Test electrical circuits or components for continuity, using electrical test equipment
- Repair or replace defective equipment, components, or wiring
- Repair or replace heating, ventilating, and air conditioning (HVAC) systems to improve efficiency, such as by changing filters, cleaning ducts, or replacing non-refrigerant refrigerants

EDUCATION AND CREDENTIALS
This occupation usually requires a high school diploma or GED with a strong background in math, physics and technical education. The next educational step is taking post-secondary courses in HVAC at a community college or trade school.

North American Technician Excellence (NATE) certification—technicians must pass a knowledge-based exam to earn NATE certification in one or more specialty areas including A/C, gas furnaces and air distribution.

HVAC Excellence certification—offered at both the professional level and master specialist level. To earn the professional-level credential technicians must have two years experience and pass a written exam. The master specialist credential requires technicians to have at least three years field experience and passing score on HVAC Excellence professional level exam.

EPA Section 608 certifications—Individuals who open systems or containers with controlled refrigerants (like HVAC techs) must have EPA Section 608 Certifications. There are four types of certifications (Types I-IV) that HVAC technicians need before they can begin doing HVAC work.

DOL Journeyworker credential—by completing a two- to four-year apprenticeship program you will learn the trade under the supervision of an experienced HVAC craftsman, gain hands-on experience while earning a salary and benefits and possibly earn academic certifications or degrees through required classroom work. You will also earn a DOL Journeyworker Heating & Air Conditioning national, portable credential which will help you secure employment and advance in your field and acquire certificate salary anywhere in the U.S.

HUMAN FACTORS ENGINEER AND ERGONOMIST (Modeling and Simulation)

Related Positions
Ergonomist; Human Factors Advisor; Cognitive Engineer; Research Associate; Principal Engineer; Modeling and Simulation Team Lead

OCCUPATION DESCRIPTION
A Human Factors Engineer and Ergonomist designs objects, environments, and systems to optimize human well-being and overall system performance, applying theory, principles, and data regarding the relationship between humans and respective technology. He or she will investigate and analyze characteristics of human behavior and performance and adjust the environment and other factors to optimize human performance.

A Human Factors Engineer and Ergonomist must pass a knowledge-based exam to earn NATE certification—technicians must pass a knowledge-based exam to earn NATE certification in one or more specialty areas including A/C, gas furnaces and air distribution.

Salary
Median hourly wage: $39.68
Median annual salary: $82,490

Board of Certification in Professional Ergonomics (BCPE) – there are four certifications offered by the BCPE for human factors engineers and ergonomists in the workplace. These certifications are for those who have specific competencies; they can also significantly increase your salary. Industry-valued credentials for human factors engineers and ergonomists include:

1. Board of Certification in Professional Ergonomics (BCPE) – this certification is for those who have specific competencies; they can also significantly increase your salary. Industry-valued credentials for human factors engineers and ergonomists include:

Salary
Median hourly wage: $39.68
Median annual salary: $82,490
INDUSTRIAL ENGINEERING TECHNOICIN

Related Positions
Industrial Engineering Technologist, Engineer Technician, Planning Analyst or Specification Writer

Occupation Description
An Industrial Engineering Technician spends time learning waterfront trades, such as outside machinist, including rotations in planning, material, controls, or other advanced shipyard disciplines. He or she will provide documentation, detailed instructions, material control, quality assurance and other advanced shipyard disciplines. He or she will provide documentation, detailed instructions, material control, quality assurance and other advanced shipyard disciplines. He or she will provide documentation, detailed instructions, material control, quality assurance and other advanced shipyard disciplines. He or she will provide documentation, detailed instructions, material control, quality assurance and other advanced shipyard disciplines. He or she will provide documentation, detailed instructions, material control, quality assurance and other advanced shipyard disciplines.

Did you know
American Society for Quality – the Quality Technician Certification (QT) is for individuals who have four years work experience or an academic credential (i.e. certificate or degree) from a technical school, community college or four-year college.

Association of Technology, Management, and Applied Engineering (ATMAE) – the Certified Technical Professional (CTP) credential is for industrial painters and coaters prior to painting and it is also used to determine the desired color or consistency. The emergence of new coatings and technology requires an increased awareness of painting techniques and processes.

Daily Tasks
An Industrial Painter or worker involved in surface preparation and paint, will paint walls, steel decks, bulkheads, equipment, buildings, bridges, and other structural surfaces, using brushes, rollers, and spray guns. He or she may remove old paint to prepare surfaces prior to painting and it is also used to determine the desired color or consistency. The emergence of new coatings and technology requires an increased awareness of painting techniques and processes.

Salary
Median hourly wage: $25.66
Median annual salary: $53,370

INDUSTRIAL PAINTER

Related Positions
Surface Preparation and Coatings Technician, Blast and Coating Technician, Painter or Insulator working in the Shipbuilding, Ship Repair, Pleasure Craft and Marina sectors.

Occupation Description
An Industrial Painter or worker involved in surface preparation and paint, will paint walls, steel decks, bulkheads, equipment, buildings, bridges, and other structural surfaces, using brushes, rollers, and spray guns. He or she may remove old paint to prepare surfaces prior to painting and it is also used to determine the desired color or consistency. The emergence of new coatings and technology requires an increased awareness of painting techniques and processes.

Education and Credentials
This occupation typically requires a high school diploma or equivalent with strong background in science, technology, education, engineering, and math. The next educational step is to take a post-secondary course in marine technology to earn an academic certificate which may be stacked toward an associate degree. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for industrial painter and coaters include:

American Boat & Yacht Council (ABYC) Standards Certification – this is one of eight ABYC certifications; upon completion of three ABYC certifications an individual is considered an ABYC Master Technician. This four-day course requires a passing grade for certification. ABYC certifications renew every five years.

American Society for Quality – the Quality Technician Certification (QT) is for individuals who have four years work experience or an academic credential (i.e. certificate or degree) from a technical school, community college or four-year college.

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Daily Tasks
An Industrial Painter or worker involved in surface preparation and paint, will paint walls, steel decks, bulkheads, equipment, buildings, bridges, and other structural surfaces, using brushes, rollers, and spray guns. He or she may remove old paint to prepare surfaces prior to painting and it is also used to determine the desired color or consistency. The emergence of new coatings and technology requires an increased awareness of painting techniques and processes.

Salary
Median hourly wage: $17.29
Median annual salary: $35,950

Salary
Median hourly wage: $49.66
Median annual salary: $103,970

Salary
Median hourly wage: $29.72
Median annual salary: $62,990

Did you know
Industrial painters are trained to specialize in the painting process, including proper preparation techniques and monitoring of environmental conditions such as dew point and relative humidity.

Did you know
Mariners are trained to work aboard a ship, aircraft, or small watercraft. They are responsible for operating and maintaining the ship or aircraft, and for ensuring the safety of passengers, crew, and cargo.

Next Career Step
First Class Mechanics – Supervisor/leadman

Listen to Greenspan’s Leith’s story in the video “Make the SMART Choice – Swimmer, Lee (McCullar)” at http://www.maritime-technology.org/students-videos/
Did you know

The Inside Machinist job has changed dramatically due to the modern technological advancement of the Computer Numerical Control (CNC) machine.

INSIDE MACHINIST

Related Positions

Computer Numerical Control (CNC) Machinist, Practical Machinist

Occupation Description

A Machinist set up and operate a variety of machine tools to produce precision parts and instruments. He or she may also fabricate and modify parts to make or repair industrial machines. Machinists apply knowledge of machine-shop mathematics, metal properties, layout, and machining procedures.

Daily Tasks

Set up, adjust, or operate basic or specialized machine tools used to perform precision machining and assure adequate production.

Align and secure holding fixtures, cutting tools, attachments, and accessories onto machines.

Study sample parts, blueprints, drawings, or engineering information to determine methods or sequences of operations, machine parts to specifications or tolerances, using machine tools.

Maintain machine tools in proper operational condition.

Monitor the feed and speed of machines during the machining process.

Machine parts to specifications or tolerances, using machine tools and measuring instruments such as micrometers or vernier calipers.

Calculate dimensions or tolerances, using instruments such as coordinate measuring machines or reference standards.

Use relevant information and individual judgment to determine methods or sequences of operations, dimensions or tolerances, use of machines, or parts to be machined.

Inspect equipment, structures, or materials to identify the cause of errors or other problems or defects.

Study sample parts, blueprints, drawings, or engineering information to determine methods or sequences of operations, as well as dimensions or tolerances, and equipment to be used.

Train and instruct other workers in proper methods of operation.

Use relevant information and individual judgment to determine methods or sequences of operations, dimensions or tolerances, use of machines, or parts to be machined.
**Ship Maintenance & Modernization**

**Occupation Description**

Machinists work in a variety of industries including shipbuilding, ship repair, transportation, and manufacturing. They design and fabricate parts using an array of tools and equipment. Their work is critical in maintaining and modernizing ships, ensuring they are safe and efficient. They may specialize in electrical or mechanical equipment; installing, aligning, and balancing. An Outside Machinist may perform work involving the installation, repair, and maintenance of machinery and equipment. This occupation requires a strong foundation in mathematics, technical skills, and manual dexterity to ensure precision in their work. Individuals in this field may work in shipyards, manufacturing plants, or other industrial environments.

**Salary**

<table>
<thead>
<tr>
<th>Median hourly wage</th>
<th>Median annual salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>$23.92</td>
<td>$49,670</td>
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</table>

**Did you know?**

Outside Machinists in this occupation can earn a high school diploma or GED with a strong background in science, math, and technical education. The median educational level is to take post-secondary courses in machinist-related areas like welding, CAD (computer-aided design), and computer-aided manufacturing (CAM). The next educational step is to take post-secondary courses in machinist-related areas like welding, CAD (computer-aided design), and computer-aided manufacturing (CAM). The next educational step is to take post-secondary courses in machinist-related areas like welding, CAD (computer-aided design), and computer-aided manufacturing (CAM).
Sheet Metal Worker

Related Positions
Sheet Metal Mechanic, Sheet Metal Installer with career opportunities in the Shipbuilding, Ship Repair, Pleasure Craft and Marina sectors of the maritime and transportation industry.

Occupation Description
A Sheet Metal Worker may make, assemble, install, and repair sheet metal products and equipment, such as ducts, fume hoods, drywall panels, and metal roofing equipment. They may install or remove parts, such as metal ducts, registers, and louver to enable proper ventilation of rooms or buildings. They may also repair leaky ducts of sheet metal in order to prevent drafts and improve indoor air quality.

Next Career Step
First Class Mechanic – Supervisor/Leadman

Listen to Geneva Duffy’s story in the video “Make the SMART Choice – Rigger – Geneva Duffy” at:
http://www.maritime-technology.org/students-videos/

Education and Credentials
This occupation usually requires a high school diploma or GED. The next educational step is to apply for an employer-sponsored registered apprenticeship program or take post-secondary courses at a technical school or community college toward an academic certificate or associate degree in sheet metal technologies to earn an academic certificate or associate degree. The next educational step is applying for an employer-sponsored registered apprenticeship program or taking post-secondary courses at a technical school or community college toward an academic certificate or associate degree. By completing a two- to four-year registered apprenticeship program you will learn the trade under the supervision of an experienced sheet metal worker, gain hands-on experience while earning a salary and benefits and possibly earn academic certifications or degrees through required classroom work. You will also earn a DOL Journeyworker national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Salary
Median hourly wage: $26.56
Median annual salary: $55,170

RIGGER

Related Positions
Naval Rigger, Heavy Lift Rigger, Ship Rigger who can work in these industries: Shipbuilding, Ship Repair, Pleasure Craft and Marina sectors.

Occupation Description
A Rigger may set up or repair rigging for construction projects, ships, ship yards, or manufacturing plants.

Daily Tasks
Select gear such as cables, pulleys, and winches, according to load weights and sizes, facilities and work schedules
Attach pulleys and blocks to fixed overhead structures such as beams, columns, and girders to hold up heavy loads
Use signal devices to communicate with crane operators
Control the movement of heavy equipment through narrow openings
Move heavy objects, using hand and power tools
Attach loads to rigging to provide support or prepare them for moving
Test rigging to ensure safety and reliability

Education and Credentials
This occupation usually requires a high school diploma or GED. The next educational step is applying for an employer-sponsored registered apprenticeship program or taking post-secondary courses at a technical school or community college toward an academic certificate or associate degree in crane operations and rigging. By completing a two- to four-year registered apprenticeship program you will learn the trade under the supervision of an experienced rigger, gain hands-on experience while earning a salary and benefits and possibly earn academic certifications or degrees through required classroom work. You will also earn a DOL Journeyworker national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Salary
Median hourly wage: $26.56
Median annual salary: $55,170

Department of Labor (DOL) Journeyworker national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Sheet Metal Worker

Related Positions
Sheet Metal Mechanic, Sheet Metal Installer with career opportunities in the Shipbuilding, Ship Repair, Pleasure Craft and Marina sectors of the maritime and transportation industry.

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A Sheet Metal Worker may make, assemble, install, and repair sheet metal products and equipment, such as ducts, fume hoods, drywall panels, and metal roofing equipment. They may install or remove parts, such as metal ducts, registers, and louver to enable proper ventilation of rooms or buildings. They may also repair leaky ducts of sheet metal in order to prevent drafts and improve indoor air quality.

Next Career Step
First Class Mechanic – Supervisor/Leadman

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Education and Credentials
This occupation usually requires a high school diploma or GED. The next educational step is to apply for an employer-sponsored registered apprenticeship program or take post-secondary courses at a technical school or community college toward an academic certificate or associate degree in sheet metal technologies to earn an academic certificate or associate degree. The next educational step is applying for an employer-sponsored registered apprenticeship program or taking post-secondary courses at a technical school or community college toward an academic certificate or associate degree in sheet metal technologies to earn an academic certificate or associate degree. By completing a two- to four-year registered apprenticeship program you will learn the trade under the supervision of an experienced sheet metal worker, gain hands-on experience while earning a salary and benefits and possibly earn academic certifications or degrees through required classroom work. You will also earn a DOL Journeyworker national, portable credential which will help you secure work in your field and a competitive salary anywhere in the U.S.

Salary
Median hourly wage: $26.56
Median annual salary: $55,170

Sheet Metal Mechanic – Sheet Metal Mechanic

Want to know about what a Sheet Metal Worker does? Aaron Post tells you! Watch the video “Make the SMART Choice – Sheetmetal Apprentice Aaron Post” on our website:
http://www.maritime-technology.org/students-videos/
Ship Fitter

Related Positions
- Welder, Fitter, or Welder Fitter

Description
A Ship Fitter, Welder, or Welder Fitter fabricates, positions, aligns, and fits parts of structural metal products. Ship fitters and welders work with metal parts or components to form complete units or subassemblies. The job of a welder is to join components or to fill holes, indentations, or seams of fabricated metal products. Welders use a variety of welding techniques, including oxy-acetylene, gas welding, electric arc welding, or electron-beam welding. A welder may use hand-welding or flame-cutting equipment to weld or repair jobs where they can move between land-based jobs and sea-based jobs doing welding in ship construction and repair. Welding technicians can easily move between land-based jobs and sea-based jobs doing welding in ship construction and repair. Welding technicians can easily move between land-based jobs and sea-based jobs doing welding in ship construction and repair.

Department of Labor (DOL) Shipfitter credential – by completing a two- to four-year registered apprenticeship program you will learn how to fabricate ship components and subassemblies. The program requires related on-the-job training and classroom work. Students will be assessed on specific competencies; they can also significantly increase your salary. Industry-valued credentials for ship fitters include:

- American Welding Society (AWS) Certified Welder (CW) certification – AWS offers seven renewable welding certifications that are relevant and valued by maritime and transportation industry employers, the CW credential is the first for a ship fitter to pursue. The credential is earned with a passing grade on a written and demonstration exam. The credential is earned with a passing grade on a written and demonstration exam.
- AWS offers seven renewable welding certifications that are relevant and valued by maritime and transportation industry employers, the CW credential is the first for a ship fitter to pursue. The credential is earned with a passing grade on a written and demonstration exam.

Next Career Step
First Class Mechanic – Supervisor/Leadman

Education and Credentials
This occupation requires a high school diploma or GED with a strong background in math, science and technical education. The most educational step is to take post-secondary courses in marine welding, blueprint reading or training in vocational schools, related to the job. Canvas skirts are still worn; certain persons may have a special training or associate degree. Precision work related skill, knowledge, or experience is required. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for ship fitters include:

- Department of Labor (DOL) Shipfitter credential – by completing a two- to four-year registered apprenticeship program you will learn how to fabricate ship components and subassemblies. The program requires related on-the-job training and classroom work. Students will be assessed on specific competencies; they can also significantly increase your salary. Industry-valued credentials for ship fitters include:
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- AWS offers seven renewable welding certifications that are relevant and valued by maritime and transportation industry employers, the CW credential is the first for a ship fitter to pursue. The credential is earned with a passing grade on a written and demonstration exam.

Welder

Occupation Description
A Welder may use hand-welding or flame-cutting equipment to weld or repair jobs where they can move between land-based jobs and sea-based jobs doing welding in ship construction and repair. Welding technicians can easily move between land-based jobs and sea-based jobs doing welding in ship construction and repair.
A World-Changing Woman on the Water. Profile of Captain Carol Curtiss

Growing up with a father in the Air Force, Carol Curtiss saw a lot of the world as a young child. When she heard about the opportunity to earn a college degree at the U.S. Merchant Marine Academy (USMMA) and continue exploring the globe she said “sign me up! I wanted to learn, I wasn’t afraid to work hard, and there’s nothing more attractive than a job where you get to experience the lure of the sunset at sea every night.”

While Carol enjoyed spending half of her sophomore year and all of her junior year traveling the world by sea as a cadet with her USMMA classmates she had a difficult time deciding between work on the deck (top side of a ship) or below in the engine room. So she didn’t. “I took 21 credits each semester to get two B.S. degrees – Marine Transportation (to be able to work on the deck) and eventually captain a ship and Marine Engineering so I could work below and become a chief engineer.”

The workload was grueling but Carol was tougher. She graduated with honors in 1980 to become the first ever woman to graduate from the USMMA with a dual degree. She also graduated with valuable industry credentials, namely licenses as a third mate (for deck side work) and third engineer (for below deck work).

Once a school work was done, Carol set sail. “I sailed for 30 years on every type of ship imaginable,” laughed Carol. “I was on container ships, grain ships, car carrier (Roll-On/Roll-Off or “Ro/Ro”) ships, and landed in virtually every port in every country in the world.”

While it takes a minimum of five-six years of working on the water before a mate can rise to the rank of captain, it took Carol 13 years at chief mate before she got captain’s job. “I knew that I was breaking new ground as only the third woman to ever graduate from USMMA and the first ‘dualie’ with B.S. degrees in engineering and deck departments. I had to work a little harder and wait a little longer but I’m glad I was able to shatter an important glass ceiling for women who would come into the industry after me.”

Carol rose to be one of the highest ranking deck or engineer officers in U.S. In 2002 she earned her Unlimited Chief Engineer and Unlimited Master credentials; she embarked her first day as Master/Chief Engineer January 2005, and loved taking the helm. She is one of only three people in the world to have earned both of the highest licenses available for mariners: Captain and Chief Engineer.

Today as a retired Captain and Chief Engineer Carol is educating the next generation of vessel operations technicians at San Jacinto College in Houston, Texas. “Most of my students are focusing on inland and near-coastal shipping work and I’m educating and equipping them to be mates and captains.”

Carol sees great opportunities for students just starting on their college and career pathways as well as people looking to transition from other industries. “What could be greater than being able to spend weeks or even months on the water, operating big machinery and enjoying all excitement of travel?”

She points out that high school students should consider the salary and flexibility vessel operations jobs offer. “The average American earns $42,000. If you graduate from the federal or a state Merchant Marine Academy you can start work at $60,000 for ocean-going work. In many cases those students are making more than their parents right off the bat,” says Carol. “Even students taking a community college and pre-apprenticeship pathway into the industry and sailing on inland or near-coastal waters can make an excellent salary early in their career.”

Listen to Carol’s story when you watch the video “Make the SMART Choice: Women at the Helm” at http://maritime-technology.org/video-gallery/
DECK POSITIONS
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Did you know

The Able Seaman Rating was made legal and the requirements standardized in Britain in 1894, and in the U.S. in 1915.

Salary

Low wage $37,289
Median wage $54,903
High wage $101,982

Able Seaman

Deck department

Occupation Description

An Able Seaman stands watch at the bow or on the wing of the ship’s bridge to look for obstructions in the vessel’s path and is responsible for measuring water depth as well as turning the wheel on the bridge or using emergency equipment as directed by a Mate.

Daily Tasks

- Measuring depth of water in shallow or unfamiliar waters, and communicating to bridge
- Overhauling and stowing cargo-handling gear, stationary rigging, and running gear
- Steering ship and maintaining visual communication with other ships
- Steering ship under direction of ship’s commander or navigating officer, or direct helmsman to steer, following designated course

Education and Credentials

Able Seaman (AB) is a Merchant Mariner Credential (MMC) deck rating equal to a journeyman’s license. It requires qualifying experience, exams and approved training. There are several AB rating levels which depend on qualifying sea service (time at sea) experience; with additional sea service you can move to a higher AB rating:

- AB Unlimited – requires 1080 days of deck service on oceans or Great Lakes
- AB Limited – requires 540 days of deck service on vessels of 100 gross tons or more
- AB Special – requires 360 days of deck service on U.S. navigable waters
- AB OSV (offshore supply vessel) – requires 180 days of deck service on U.S. waters
- AB Sail – requires 180 days of deck service on sailing school or sail powered vessels
- AB Fishing – requires 180 days of deck service in any U.S. navigable waters

An Able Seaman must be at least 18 years old, have a high school diploma or equivalent, and also complete an approved “Proficiency in Survival Craft” course, Basic Safety Training (BST) course which consists of CPR/Fist Aid, Personal Safety and Social Responsibilities, Personal Survival and Basic Firefighting. He or she must have enough sea service time and/or complete a U.S. Coast Guard-approved Lifesavingman routine to qualify as a Lifesavingman or Lifesavingman Limited. An Able Seaman must hold a Transportation Worker Identification Credential (TWIC) and pass a routine physical and drug screening.

Next Career Step

Higher AB Ratings, Third Mate

Find out more about what an Able Seaman does, click on the “Career: Able Seaman” video on our website: http://www.maritime-technology.org/video-gallery/
BOATSWAIN (Bosun)

Deck department

Occupation Description

The Boatswain (Bosun) is the highest-ranking non-officer/unlicensed position in the deck department. The Boatswain is the chief of the deck crew and is responsible for a ship’s interior and exterior under the direction of the Chief Mate.

Daily Tasks

- Supervising Able Seamen as well as Deckhands engaged in cleaning decks, lifeboats, chipping, scraping, wire brushing, and painting decks, sides, and superstructure.
- Examining cargo-handling gear plus cleaning equipment & supervising crews engaged in repairing or replacing defective gear equipment.
- Rigging cargo, managing winch operations, working aloft, and other duties required during deck operations.
- Handling and caring for lines, assisting with mooring a vessel.
- Inspecting the vessel and performing a variety of routine, skilled, and semi-skilled duties to maintain all areas of the ship not maintained by the engineering department.

Education and Credentials

- A Boatswain/Bosun must hold a high school diploma or equivalent and/or relevant work experience as well as credentialing as an Able Seaman (AB).
- This occupation requires a U.S. Coast Guard Merchant Marine Credential (MMC). A Boatswain/Bosun must be at least 18 years old and have completed as approved “Proficiency in Survival Craft” course, plus a “Proficiency in Personal Survival” course, and hold a Transportation Worker Identification Credential (TWIC) and pass a routine physical and drug screening.

Next Career Step: Mate

Check out what a Boatswain Mate of the Watch does in the U.S. NAVY. Watch the video at our web site at: http://www.maritime-technology.org/video-gallery/
Did you know
$6 billion worth of goods move to and from overseas markets every day through America's ports.

Check out more information on US Ports at:
http://www.aapa-ports.org/Industry/con-
tent.cfm?ItemNumber=1032

Did you know
95% of U.S. foreign trade is carried to and from the U.S. by ship.

CHIEF MATE (Officer)
Deck department

Occupation Description
The Chief Mate (Officer) is the “second in command” behind a Captain/Officer on board a vessel. The Chief Mate is responsible for supervising the Second Mate, Third Mate, and other key deck positions. The Chief Mate monitors all third party personnel as they work on the deck. In addition, the Chief Mate advises the Captain/Officer on necessary operational control over marine operations with appropriate regard for the protection of the environment, maintenance of equipment and personnel safety.

Daily Tasks
Ensuring that all local and international laws related to vessel operation are being met. Overseeing maintenance of life saving, fire fighting, deck and lifting equipment in addition to maintaining the exterior of the vessel. Ensuring that the equipment and materials are all loaded and safely stowed away onboard, labeled and secured according to regulations. Overseeing loading and storing all of the consumables, making sure the watertight integrity of the vessel is maintained, securing supply vessels and overseeing the safe operation of cargo as well as many other related tasks to ensure the safety of the vessel crew and any cargo or equipment it may be carrying. Carrying out Captain’s orders and assisting in navigation.

Education and Credentials
The Chief Mate must be at least 21 years old, hold a high school diploma or equivalent, and U.S. Coast Guard issued Chief Mate License as well as at least one year experience on motor or steam vessels and hold Second Mate endorsements on their Merchant Mariner Credential (MMC). Many Chief Mates graduate from a four year Merchant Marine Academy with a B.S. degree and the Chief Mate License and then rise through the ranks. A Chief Mate must earn the Standards of Training Certification and Watchkeeping (STCW) certificates which include completing U.S. Coast Guard approved management level training courses and a Basic Safety Training course. A Chief Mate must have a Transportation Workers Identification Credential (TWIC). A Chief Mate’s salary ranges from $105,440 for the high wage to $24,520 for the low wage.

Next Career Step: Captain/Officer

Find out what it takes to be a Chief Mate. Click on the “Mate-Chief” video on our website:
http://www.maritime-technology.org/video-gallery/
MATE
Deck department

Occupation Description
A Third Mate is the lowest-ranking officer on a civilian ship and is responsible for the safety of the ship and crew, including maintaining lifeboats, fire fighting and signal equipment. The Third Mate works on a bridge team and under the supervision of the Second Mate and Chief Mate.

Daily Task
Making timely and frequent inspection of all lifesaving equipment onboard the vessels including lifeboats, life rafts and associated securing devices, and any other equipment
Docking and undocking, managing a mooring station, bow or stern, supervising the deck on cargo evolutions, conducting inspections on all ships emergency safety equipment (including, firefighting, damage control, flooding, lifeboats and rafts)
Serving as a Deck Watch Officer responsible for safe navigation of the vessel
Assisting Senior Deck Officers in carrying out their responsibilities

Education and Credentials
A Third Mate must be 18 years or older, have a U.S. Passport and Merchant Mariner Credential (MMC). Third Mates typically either have six years or more experience on board a ship (rising up through the non-licensed/officer ranks) and completing required training and testing or graduate from a state or federal Merchant Marine Academy. For example, for Unlimited Tonnage credentialing, a Third Mate must have 1080 days deck and engine department service or graduation from Maritime Academy or completion of three-year apprentice mate training program. In addition a Third Mate must complete U.S. Coast Guard-approved Basic Safety Training, First Aid, CPR, Firefighting, and Radar Observer courses. They must have relevant Standards of Training, Certification and Watchkeeping (STCW) certificates. All Third Mates must have a Transportation Workers Identification Credential (TWIC).

Next Career Step: Second Mate
Find out what it takes to be a Mate. Click on the "Mate - Chief" video on our website: http://www.maritime-technology.org/video-gallery/

Did you know
At any given moment there are roughly 20 million containers crossing the world by ship.
Check out more information on Container Ships at: http://www.worldshipping.org/about-the-industry/liner-ships/container-ship-design

MATE
Deck department

Related Job Titles: Lead Deckhand

Occupation Description
A Mate is a deckhand with work experience on board a vessel and has leadership duties in addition to preparing barges for vessels for loading and unloading cargo, performing basic vessel maintenance and housekeeping duties.

Daily Tasks
Making timely and frequent inspection of all lifesaving equipment onboard the vessels including lifeboats, life rafts and associated securing devices, and any other equipment when directed/designated by the Chief Mate,
Docking and undocking, managing a mooring station, bow or stern, supervising the deck on cargo evolutions, conducting inspections on all ships emergency safety equipment (including, firefighting, damage control, flooding, lifeboats and rafts)
Serving as a Deck Watch Officer responsible for safe navigation of the vessel
Assisting Senior Deck Officers in carrying out their responsibilities

Education and Credentials
A Mate must be 18 years or older (for 200 ton ship), 19 or older (for 500-1000 ton ship) or 21 or older (for Unlimited tonnage ship), have a high school diploma or equivalent, and hold a Merchant Mariner Credential (MMC). A Mate must have required sea service, exam certification, and/or education for each rating level - Great Lakes and/or Inland Waters, Near Coastal Waters, or Oceans. In addition a Mate must be qualified as an Able Seaman (AB) and complete U.S. Coast Guard-approved Basic Safety Training, CPR, Firefighting, Medical Care or First Aid Provider and Radar Observer courses, and Officer in Charge of Navigational Watch (OICNW) Training and related assessments. All Mates must have a Transportation Workers Identification Credential (TWIC).

Next Career Step: Higher Levels of Mate Ratings, Third Mate
Find out what it takes to be a Mate. Click on the "Mate - Chief" video on our website: http://www.maritime-technology.org/video-gallery/

Did you know
Over 4.5 million sailors are employed in the shipping industry worldwide.

Salary
Low wage $58,563
Median wage $73,760
High wage $139,443

Mate - Chief

Deck department

Related Job Titles: Lead Deckhand

Occupation Description
A Mate is a deckhand with work experience on board a vessel and has leadership duties in addition to preparing barges for vessels for loading and unloading cargo, performing basic vessel maintenance and housekeeping duties.

Daily Tasks
Making timely and frequent inspection of all lifesaving equipment onboard the vessels including lifeboats, life rafts and associated securing devices, and any other equipment
Docking and undocking, managing a mooring station, bow or stern, supervising the deck on cargo evolutions, conducting inspections on all ships emergency safety equipment (including, firefighting, damage control, flooding, lifeboats and rafts)
Serving as a Deck Watch Officer responsible for safe navigation of the vessel
Assisting Senior Deck Officers in carrying out their responsibilities

Education and Credentials
A Mate must be 18 years or older (for 200 ton ship), 19 or older (for 500-1000 ton ship) or 21 or older (for Unlimited tonnage ship), have a high school diploma or equivalent, and hold a Merchant Mariner Credential (MMC). A Mate must have required sea service, exam certification, and/or education for each rating level - Great Lakes and/or Inland Waters, Near Coastal Waters, or Oceans. In addition a Mate must be qualified as an Able Seaman (AB) and complete U.S. Coast Guard-approved Basic Safety Training, CPR, Firefighting, Medical Care or First Aid Provider and Radar Observer courses, and Officer in Charge of Navigational Watch (OICNW) Training and related assessments. All Mates must have a Transportation Workers Identification Credential (TWIC).

Next Career Step: Higher Levels of Mate Ratings, Third Mate
Find out what it takes to be a Mate. Click on the "Mate - Chief" video on our website: http://www.maritime-technology.org/video-gallery/

Did you know
Over 4.5 million sailors are employed in the shipping industry worldwide.

Salary
Low wage $58,563
Median wage $73,760
High wage $139,443
A container ship travels the equivalent of three-quarters of the way to the moon and back in one year during its regular ocean travel.

Check out more information on 
http://www.worldshipping.org/about-the-industry/liner-ships/

Did you know
A seagoing Tankerman’s primary job is to move liquid cargo in tank barges or vessels and standing watch on a vessel to ensure that the ship is safe from any potential collisions. Tankermen are unlicensed positions and may be required to move and/or repair equipment as directed by the captain, mate or pilot in certain situations.

Next Career Step:
Tankerman

Education and Credentials
Tankermen must hold a Merchant Marine Credential (MMC) with U.S. Coast Guard Tankerman endorsement. To qualify for Tankerman endorsement a worker must meet service requirements:

- Tankerman-Assistant: requires successful completion of Tankerman course, exam and 90 days’ service as deck or engineering officer on tank ship to carry dangerous liquids (DL) or liquefied gas (LG) or go days rating of cadet service on deck or engine department on tank ship
- Tankerman-Engineer: requires 90 days’ service as deck or engineering officer on tanker to vessel certified to carry DL or LG or go days rating of cadet service in engine department on tanker
- Tankerman-PIC (Barge): requires 60 days’ service on tank vessels certified to carry DL or LG or 90 days related service directly involved on tank barges
- Tankerman-Engineer-Assistant: requires successful completion of Tankerman course, exam and go days’ service on tank ship or vessel certified to carry DL or LG to qualify for Tankerman-Engineer
- Tankerman-Engineer-Assistant: requires 90 days’ service in engineering officer on tanker to vessel certified to carry DL or LG or go days rating of cadet service in engine department on tanker
- Tankerman-PIC (Barge): requires 60 days’ service on tank vessels certified to carry DL or LG or 90 days related service directly involved on tank barges

A seagoing Tankerman’s primary job is to move liquid cargo in tank barges or vessels and standing watch on a vessel to ensure that the ship is safe from any potential collisions. Tankermen are unlicensed positions and may be required to move and/or repair equipment as directed by the captain, mate or pilot in certain situations.

Did you know
A seagoing Tankerman’s primary job is to move liquid cargo in tank barges or vessels and standing watch on a vessel to ensure that the ship is safe from any potential collisions. Tankermen are unlicensed positions and may be required to move and/or repair equipment as directed by the captain, mate or pilot in certain situations.

Next Career Step:
Able Seaman
Chief Engineer
Engineering department

Occupation Description
The Chief Engineer is the head of a vessel's engineering department/engine room and crew. He or she is responsible for operating and maintaining a ship's propulsion system including the engine, boilers, generators, pumps and other machinery. The Chief Engineer reports to the Captain/Master.

Daily Tasks
Ensuring that a safe and proper engine room watch is maintained at all times and that all automated alarms and warning devices are properly monitored and attended.
Managing efficient operation, maintenance and repair of all machinery, electrical equipment, piping and structural steel including but not limited to deck machinery, refrigeration machinery, galley and domestic and other equipment as necessary.
Closely supervising activities of the Engineering Department and being aware of the following at all times:
- Conduct and ability of engine department personnel
- Consumption and stock of fuel oil, water, and lubricants
- Condition of main propulsion machinery and auxiliaries, including performance, repairs required, planned maintenance and the stock control and consumption of engine department spare parts
- Condition of boilers, boiler water and treatment required
- Ensuring that all work performed by the Engineering Department crew is done in a safe and competent manner.
- Ensuring all safety precautions are observed
- Reporting to the Engineering Superintendent on matters of maintenance and issues affecting the vessel schedule, certification, dry-docking and maintenance.

Preparing Engineering Department budget as requested by the company engineering superintendent, and monitoring departmental expenditures in line with this budget.
Maintaining engineering files of ship's drawings, manufacturers' instructions and records pertaining to machinery and equipment, and copies of all correspondence and reports pertaining to these responsibilities.
Making frequent inspections of machinery spaces.

Education and Credentials
Many Chief Engineers graduate from a four-year or state Merchant Marine Academy with a B.S. degree and Third Mate license and then accrue relevant sea service for the type of vessel on which they intend to work. However, engineers can enter the industry from high school (with a diploma or equivalent), work their way up from an entry-level Oiler/Wiper position, moving through the ranks as they pass U.S. Coast Guard courses and exams and accrue needed sea service.

Limited (Oceans) – 1800 days of engine room service (including 720 days as an engineer officer and 900 days as a Qualified Member of the Engine Department (QMED)
Limited (Near Coastal) – 1440 days of engine room service including 360 days as an engineer officer and 720 days as QMED
Steam/Motor/Gas Turbine – 360 days of service as first assistant engineer
In addition, Chief Engineers must have completed U.S. Coast Guard approved First Aid, CPR and First-Aiding Course (Basic and Advanced) as well as meet Standard Training Certification Watchkeeper (STCW) Requirements including U.S. Coast Guard approved Basic Safety Training, PSC Qualification and Medical Care Provider (Medical First Aid) Provider courses. Chief Engineers must have a Merchant Marine Credential (MMC), Transportation Worker Identification Credential (TWIC) and pass a routine physical and drug screening.

Learn more information about ship engineers at: http://www.bls.gov/oes/current/oes535031.htm.

Salary
Low wage $40,360
Median wage $74,540
High wage $114,810

A container ship engine is nearly 1,000 times more powerful than the standard family car and some have the horsepower of nearly 90 formula one racing cars.

Check out more information on Container ships at:
http://www.worldshipping.org/about-the-industry/liner-ships/container-ship-design
DUTY DESIGNATED ENGINEER

Engineering department

Occupation Description
The Duty Designated Engineer is responsible for the safe operation of all engines, auxiliary machinery and related systems in the motor vessels and related facilities and ensuring compliance with all federal regulations. He or she reports to the Chief Engineer.

Daily Tasks

- Contributing to the safe operation of vessels and equipment
- Responding decisively and effectively to emergency situations
- Maintaining familiarity with individual vessel characteristics
- Assisting in the engine room during vessel operations
- Maintaining responsibility for recording records including official machinery logs and reporting data to the Chief for maintenance logs and repair requests
- Maintaining effective knowledge of the Engine Room Standard Operating Manual monitoring machinery and auxiliary systems and equipment throughout the vessel with an eye toward early identification of problems
- Feeling of responsibility in accordance with all applicable rules and regulations
- Responsible for the primary maintenance of vessel engines, auxiliary machinery and related systems underway and ashore
- Diagnosing malfunctions and providing recommendations for course of action to the Chief Engineer
- Performing maintenance and repair of vessels and related machinery while scheduled ashore under the direction of the Port Engineer's designee

Education and Credentials

Designated Duty Engineers must be age 18 or older (for 1000 horsepower vessels), 19 or older (for 4000 horsepower vessels) or 21 or older (for unlimited horsepower vessels), hold a high school diploma, Merchant Mariner Credential (MMC) and have relevant sea service.

Designated Duty Engineers must also have completed U.S. Coast Guard-approved courses in First Aid, CPR, and Firefighting (Basic and Advanced); they must also hold a Transportation Worker Identification Credential (TWIC).

1000 Horsepower – 360 days service in engine room with 180 days as QMED
4000 Horsepower – 720 days service in engine room with 360 days as QMED
Unlimited Horsepower – 1080 days service in engine room with 540 days as a Qualified Member of the Engine Department (QMED)

Next Career Step: Higher Duty Designated Engineer Ratings, Third Assistant Engineer

FIRST ASSISTANT ENGINEER

Engineering department

Occupation Description

The First Assistant Engineer is one of the most important positions in maritime management with responsibility of looking after entire operations of a ship's engine room and other technical aspects of the ship. He or she reports directly to the Chief Engineer.

Daily Tasks

- Providing utmost assistance to the Chief engineer for running the ship efficiently
- Supervising all of the operational engineers and the crew of the engine room
- Ensuring personal safety procedures
- Planning overall maintenance of the machinery in the engine room
- Overseeing all pollution prevention equipment on board of the ship
- Managing the engine room staff and carrying out duties of the engine room
- Serving in charge of the engine room in the absence of the Chief Engineer
- Maintaining all the engine room and deck machinery
- Ensuring all machinery and safety systems are working safely, efficiently and within the provided parameters
- Providing utmost assistance to the Chief engineer for running the ship efficiently
- Managing record keeping, inventory and other pertinent document procedures

Education and Credentials

First Assistant Engineers typically graduate from a state or federal Merchant Marine Academy with a B.S. in Marine Engineering Technology and U.S. Coast Guard license as Third Assistant Engineer. However, students can enter the industry at the entry level from high school (with a diploma or equivalent) as an Oiler/Wiper and then rise through the ranks to First Assistant Engineer, acquiring enough sea service time and passing rigorous U.S. Coast Guard exams and exams as an Standards Training Watchkeeping Credentials (STWC-95) requirements. All Second Assistant Engineers must hold a Transportation Worker Identification Credential (TWIC).

Next Career Step: Chief Engineer

Salary

Low wage $24,610 Medium wage $68,000 High wage $114,720

See more facts on shipping at: http://www.thewire.com/global-you-can-imagine/67566/

Check out more about the cruise industry at: http://www.aapa-ports.org/1016/cruise-industry-overview-1007.html

It will always be a demand for people to work on cruise lines and in the shipping and oil industry – some of the largest maritime employers.
SECOND ASSISTANT ENGINEER
Engineering department

Occupation Description
The Second Assistant Engineer is responsible for overseeing vessel equipment operation, making log entries and reporting problems to the Chief Engineer. He or she assists with the primary level of maintenance and repair of the vessel while underway. The Second Assistant Engineer is responsible for engine-room duties, to the Captain for emergency duties underway and to the delegated Yard Supervisor when working ashore.

Daily Tasks
- Ensuring the safe operation of all engines, auxiliary machinery and related systems in the motor vessels and related facilities
- Ensuring compliance with all federal regulations
- Contributing to the safe operation of vessels and equipment
- Responding decisively and effectively to emergency situations
- Maintaining familiarity with individual vessel characteristics
- Assisting in the engine-room during vessel operation
- Maintaining responsibility for recording records including official machinery logs and reporting data to the Chief for maintenance logs and repair requests
- Maintaining effective knowledge of the Engine Room Standard Operating Procedure (SOP) including the location and configuration of auxiliary systems and equipment throughout the vessel
- Refueling of vessels in accordance with all applicable rules and regulations safely
- Monitoring machinery and auxiliary systems and equipment throughout the vessel with an eye toward early identification of problems
- Ensuring cleanliness of vessel engine room and other machinery spaces
- Diagnosing malfunctions and providing recommendations for course of action to the Chief Engineer
- Ensuring cleanliness of engine-room and other machinery spaces
- Performing maintenance and repair of vessels and related machinery while scheduled ashore under the direction of the Port Engineer's designee
- Performing maintenance and repair requests
- Assisting in the engine room during vessel operation
- Maintaining responsibility for the primary maintenance of vessel engines, auxiliary machinery and related systems while underway and ashore
- Ensuring cleanliness of vessel engine room and other machinery spaces
- Maintaining the responsibility for the primary maintenance of vessel engines, auxiliary machinery and related systems while underway and ashore
- Assisting in the engine room during vessel operation
- Maintaining responsibility for recording records including official machinery logs and reporting data to the Chief for maintenance logs and repair requests
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- Ensuring cleanliness of engine-room and other machinery spaces
- Performing maintenance and repair of vessels and related machinery while scheduled ashore under the direction of the Port Engineer's designee

Did you know
https://www.statista.com/
Median wage $68,100
See more statistics at:

High wage $110,630
Low wage $25,690

Education and Credentials
Second Assistant Engineers typically graduate from a state or federal Merchant Marine Academy with a B.S. in Marine Engineering Technology and U.S. Coast Guard license as Third Assistant Engineer and then rise to Second Assistant Engineer. However students can enter the industry at the entry level from high school (with a diploma or equivalent) as an Oiler/Wiper and then rise through the ranks to Second Assistant Engineer, accruing enough sea service time and passing rigorous U.S. Coast Guard courses and exams as well as Standards Training Watchkeeping (STCW-95) requirements. All Second Assistant Engineers must hold a Transportation Worker Identification Credential (TWIC).

Next Career Steps: First Assistant Engineer
Learn more information about ship engineers at: http://www.bls.gov/oes/current/oes535031.htm

THIRD ASSISTANT ENGINEER
Engineering department

Occupation Description
The Third Assistant Engineer is typically the most junior marine engineer on board a ship. This position assists with basic maintenance and vessel repair while underway. He or she is responsible for overseeing vessel equipment operation, making log entries and reporting problems to the Chief Engineer. The Third Assistant Engineer is responsible to the Chief Engineer for engine-room duties, to the Captain for emergency duties underway and to the delegated Third Engineer when working ashore.

Daily Tasks
- Maintaining the responsibility for the safe operation of all engines, auxiliary machinery and related systems in the motor vessels and related facilities and ensuring compliance with all federal regulations
- Contributing to the safe operation of vessels and equipment
- Responding decisively and effectively to emergency situations
- Maintaining familiarity with individual vessel characteristics
- Assisting in the engine-room during vessel operation
- Maintaining responsibility for recording records including official machinery logs and reporting data to the Chief for maintenance logs and repair requests
- Maintaining effective knowledge of the Engine Room Standard Operating Procedure (SOP) including the location and configuration of auxiliary systems and equipment throughout the vessel
- Refueling of vessels in accordance with all applicable rules and regulations safely
- Monitoring machinery and auxiliary systems and equipment throughout the vessel with an eye toward early identification of problems
- Ensuring cleanliness of vessel engine room and other machinery spaces
- Diagnosing malfunctions and providing recommendations for course of action to the Chief Engineer
- Ensuring cleanliness of engine-room and other machinery spaces
- Performing maintenance and repair of vessels and related machinery while scheduled ashore under the direction of the Port Engineer's designee
- Performing maintenance and repair requests
- Assisting in the engine room during vessel operation
- Maintaining responsibility for the primary maintenance of vessel engines, auxiliary machinery and related systems while underway and ashore
- Assisting in the engine room during vessel operation
- Maintaining responsibility for recording records including official machinery logs and reporting data to the Chief for maintenance logs and repair requests
- Maintaining effective knowledge of the Engine Room Standard Operating Procedure (SOP) including the location and configuration of auxiliary systems and equipment throughout the vessel
- Refueling of vessels in accordance with all applicable rules and regulations safely
- Monitoring machinery and auxiliary systems and equipment throughout the vessel with an eye toward early identification of problems
- Ensuring cleanliness of vessel engine room and other machinery spaces
- Diagnosing malfunctions and providing recommendations for course of action to the Chief Engineer
- Ensuring cleanliness of engine-room and other machinery spaces
- Performing maintenance and repair of vessels and related machinery while scheduled ashore under the direction of the Port Engineer's designee

Did you know
Engineer Officer assignments range from 30-120 days onboard followed by commensurate time off the vessel (most are on a 75-120 day rotation followed by a 75-120 day vacation).
Did you know
The Jones Act requires that only American flagged ships can carry cargo and passengers between American ports.

Learn more about the Jones Act: http://www.marad.dot.gov/resources/policy-papers-and-fact-sheets/

MARINE PILOT

Deck Department

Occupation Description
A pilot’s task is to guide ships in harbors, rivers, port channels and other confined waterways. They are not part of a ship’s regular crew but come on board a ship to guide it through a particular waterway in which they have expertise in guiding vessels. They have a high degree of familiarity with local tides, currents and hazards.

Daily Tasks
Boarding an unfamiliar ship from a small boat in open water, often using a ladder and frequently in difficult weather or sea conditions
Conferring with a ship’s captain about the vessel’s destination and any special requirements the vessel may have
Establishing a positive relationship with the vessel’s captain and deck officers
Taking over control of a vessel from a commercial captain to safely guide the ship into the designated waterway
Receiving and following mooring instructions from onshore dispatchers

Education and Credentials
A Marine Pilot must hold a high school diploma or equivalent and most go on to attend a Merchant Marine Academy graduating with B.S. degree and licensing as a Third Mate. Without an Academy degree (or comparable B.S. degree in Marine Transportation) a Marine Pilot will need five-eight years experience as a sailor; typically non-Academy Marine Pilots start out as a Deckhand/Ordinary Seaman and rise through the ranks. All Marine Pilots hold a Merchant Mariner Credential (MMC) and Transportation Worker Identification Credential (TWIC).

Spend a day in the life of a Marine Pilot, watch our videos “Career: Pilot – Captains” and “Career: Port – Pilot” at http://www.maritime-technology.org/video-gallery/

Masters of Towing (CAPTAIN)

Occupation Description
The Master of Towing (Captain) is the master in charge of a tug or towing vessel. They are in charge of the Navigation Watch, are responsible for all vessel operations and leading a vessel on a tow. They are in charge of the Navigation Watch, are responsible for all vessel operations and leading a vessel on a tow.

Daily Tasks
Serving as Officer in Charge of the Navigation Watch
Ensuring all manned spaces and equipment are seaworthy
Ensuring the availability and serviceability of required life-saving equipment
Verifying the condition of all installed firefighting and life-saving equipment
Requiring accommodations to be maintained in safe, clean condition at all times
Maintaining vessel and crew readiness for emergency responses
Conducting and reporting the results of periodic vessel audits and inspections
Operating and monitoring assigned vessel in accordance with the quality, safety, security and environmental protection policies and procedures
Organizing and conducting required training, drills and exercises
Completing, submitting and maintaining required records, logs and reports
Ensuring adequate vessel manning and watches

Education and Credentials
A Master of Towing must hold a high school diploma or equivalent and current U.S. Coast Guard license for Master of Towing Vessels, with appropriate tonnage rating and radar endorsement as well as previous experience as a Mate of Towing. Many Mariners of Towing graduate from a four-year state or federal Maritime Academy with the B.S. degree and licensing as a Third Mate and rising through the ranks, acquiring needed sea service time and passing U.S. Coast Guard exams and courses. However Masters of Towing can enter the industry as an Ordinary Seaman and rise through the ranks, earning their licensing and Merchant Mariner Credential (MMC) and Ship Towing Certification and Watchkeeping (STCW) for offshore towing. All Masters of Towing must hold a Transportation Worker Identification Credential (TWIC).

Vessel Operations

Did you know
The average tug boat moves 15 barges at a time and the average river tow moving 15 barges tied together would require 7-8 miles long train or a line of tractor trailer trucks stretching more than 35 miles if moved by rail or road instead.

Learn more about opportunities on the water: http://www.maritime-technology.org/video-gallery/

Salary
Low wage $25,460
Median wage $72,945
High wage $110,630

Did you know
The average tug boat moves 15 barges at a time and the average river tow moving 15 barges tied together would require 7-8 miles long train or a line of tractor trailer trucks stretching more than 35 miles if moved by rail or road instead.

Learn more about opportunities on the water: http://www.maritime-technology.org/video-gallery/

Salary
Low wage $25,460
Median wage $72,945
High wage $110,630

79
OILER

Engine department

Related Job Titles: Wiper, Pumpman

Occupation Description

Oilers are entry-level engine room positions; they assist engineers in keeping a vessel’s propulsion system in working order. New oilers are called wipers or pumpmen if the vessel is carrying liquid cargo.

Daily Tasks

- Filling moving parts or wearing surfaces including gears, shafts, and bearings
- Reading pressure and temperature gauges and recording data
- Cleaning floors around machine, using broom or vacuum cleaner
- Connecting hoses, operating pumps and cleaning tanks
- Cleaning screen on lint vacuum system or replacing worn screen
- Painting exposed surfaces of machines to prevent rust

Education and Credentials

An Oiler must be age 16 or older, have a high school diploma or GED, and Merchant Mariner Credential (MMC) and pass a physical if applying for a position on a seagoing ship of more than 200 tons. There is no previous sea service or experience required. An Oiler must obtain a Transportation Worker Identification Credential (TWIC). In addition, QMEDs must pass a QMED General Knowledge Exam and at least one of the following rating exams: Fireman/Watertender, Oiler, Deck Engineer, Junior Engineer, Refrigeration Engineer, Electrician, Pumpman

Next Career Step: Junior Engineer/Qualified Member of the Engine Department (QMED)

OILER

Engine department

Related Job Titles: Wiper, Pumpman

Occupation Description

Oilers are entry-level engine room positions; they assist engineers in keeping a vessel’s propulsion system in working order. New oilers are called wipers or pumpmen if the vessel is carrying liquid cargo.

Daily Tasks

- Filling moving parts or wearing surfaces including gears, shafts, and bearings
- Reading pressure and temperature gauges and recording data
- Cleaning floors around machine, using broom or vacuum cleaner
- Connecting hoses, operating pumps and cleaning tanks
- Cleaning screen on lint vacuum system or replacing worn screen
- Painting exposed surfaces of machines to prevent rust

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Next Career Step: Junior Engineer/Qualified Member of the Engine Department (QMED)

UNLICENSED JUNIOR ENGINEER/QUALIFIED MEMBER OF THE ENGINE DEPARTMENT (QMED)

Engineering department

Occupation Description

An Unlicensed Junior Engineer/Qualified Member of the Engine Department serves the engineering room staff and is primarily responsible for assisting with engine room maintenance.

Daily Tasks

- Maintaining and repairing equipment in a vessel’s engine room, fire room, machine shop
- Inspecting equipment including pumps, turbines, distilling plants, condensers
- Completing on-board records to note condition of equipment
- Lubricating and maintaining machinery and equipment including generators, steering systems, lifeboats, and sewage systems
- Cleaning and maintaining tools and equipment

Education and Credentials

An Unlicensed Junior Engineer or QMED must be at least 18 years old, have a high school diploma or GED and a valid U.S. Coast Guard-issued Merchant Mariner Credential (MMC) and a Transportation Worker Identification Credential (TWIC). In addition, QMEDs must pass a QMED General Knowledge Exam and at least one of the following rating exams: Fireman/Watertender, Oiler, Deck Engineer, Junior Engineer, Refrigeration Engineer, Electrician, Pumpman

In addition QMEDs must have relevant sea experience for U.S. Coast Guard endorsements:

- General – 180 days service in rating at least equal to wiper
- Deck Engine Mechanic – hold rating as Junior Engineer and 180 days sea service or completion of required training on relevant vessel or completion of U.S. Coast Guard approved deck engine mechanic course
- Engineer – hold rating as Oiler, Fireman/Watertender, Junior Engineer and at least 50 days sea service or completion of required training on relevant vessel or completion of U.S. Coast Guard approved engine mechanic course

Next Career Step: Designated Duty Engineer

Learn more information about ship engineers at: http://www.bls.gov/oes/current/oes535031.htm

OILER

Engine department

Related Job Titles: Wiper, Pumpman

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Next Career Step: Designated Duty Engineer

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Did you know

The National Maritime Center (NMC) is the official licensing authority for all waterborne transportation.

Learn more at: http://www.uscg.mil/nmc/
which are reviewed by captains and chief mates at the academy. Students will have earned 18 academic credits through completion of projects at sea before graduation to get your industry credentials,” says Catie.

The coursework is regimented so that between your sophomore year and graduation the entire school is essentially split in half, with time divided up between time in the classroom and time at sea. “The coursework is regimented so that between your sophomore year and graduation the entire school is essentially split in half, with time divided up between time in the classroom and time at sea. “Starting with a student’s second year, instruction is split between time in the classroom (think “eng” and time) and time for students who want to work on the engineering side (think “engine”),” explains Catie. You also end up knowing the people of your major and you end up taking all of your classes with that same section.”

At the end of their freshman year students select their major and at that point to focus: deck or engine,” explains Catie. “From that point on you decide on one of four majors.” At the end of their freshman year students select their major and at that point to focus: deck or engine,” explains Catie. “From that point on you decide on one of four majors.”

During your freshman year you take a core curriculum and then pick where you’re going to focus: deck or engine. “During your freshman year you take a core curriculum and then pick where you’re going to focus: deck or engine.”

After three years of commuting between Maryland and the Upper Midwest, she decided to move to Baltimore, Maryland. “They needed administrative department help so I began working part-time and then the position grew from there.”

Eager to get on the water, Catie eventually found work “in one of the most under looked areas of the industry,” she says. “I was working on the Great Lakes. I immediately got the job and sailed on a 100 foot long bulk carriers including the Roger Blough and Edwin H. Gott on the Great Lakes for three years.”

Due to severe winter weather, the Great Lakes are only open 10 months of the year which slowed Catie down a little bit, she says, but “it was a good introduction to industry.” She got along well with everyone my jobs were extended every time.”

In the shipping industry people rotate on and off positions on vessels,” explains Catie. “In the shipping industry people rotate on and off positions on vessels.”

Students who want to work on a ship’s deck side (think “top of the ship”) and three mates so they typically bring on one open ocean mate per ship,” explains Catie. “Since I got along well with everyone my jobs were extended every time.”

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Catie explains that there are five academic pathways at a merchant marine academy: two for students who want to work on a ship’s deck (think “top of the ship”) and time at sea. “The coursework is regimented so that between your sophomore year and graduation the entire school is essentially split in half, with time divided up between time in the classroom and time at sea. “Starting with a student’s second year, instruction is split between time in the classroom (think “eng” and time) and time for students who want to work on the engineering side (think “engine”),” explains Catie. You also end up knowing the people of your major and you end up taking all of your classes with that same section.”

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CARGO AND FREIGHT AGENT

Occupation Description
A Cargo and Freight Agent may arrange for and track incoming and outgoing shipments of cargo, according to its destination. He or she may determine shipping rates and other charges that apply to freight. To import or exported freight, the Cargo and Freight Agent may verify that the proper customs paperwork is in order.

Daily Tasks
- Check import/export documentation to determine cargo content, and classify goods into different fee or tariff groups, using a tariff coding system
- Contact vendors and/or claims adjustment departments in order to resolve problems with shipments, or contact service agents to arrange for repairs
- Determine method of shipment, and prepare bills of lading, invoices, or other shipping documents
- Enter shipping information into a computer by hand or by using a hand-held scanner
- Determine freight or postal rates, and record shipment costs and weight
- Review and route the movement of incoming and outgoing cargo shipments to train and trucking terminals and shipping docks
- Inspect import items received and check them against invoices or other documents, recording shortages and rejecting damaged goods
- Negotiate and arrange for the transport of goods with shipping or freight companies
- Prepare and examine bills of lading to determine shipping charges and tariffs
- Take orders from customers and arrange pickup of freight and cargo for delivery to loading platforms

Education and Credentials
This occupation usually requires a high school diploma or GED with computer proficiency and on-the-job training. The next educational step is taking post-secondary courses in transportation, distribution and logistics at a community college toward an academic certificate which may “stack” toward an associate degree in transportation and logistics. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for cargo and freight agents include:

- National Customs Brokers & Forwarders Association of America (NCBFAA)'s Certified Customs Specialist (CCS) and Certified Export Specialist (CES) renewable credentials are earned with at least one year relevant workplace experience and a passing grade on the NCBFAA exam
- International Import-Export Institute (I2I) credential is earned with a passing grade on the Certified International Trade Documentation Specialist (CIDDS) exam and renewed with completion of at least 10 continuing education units (CEUs) every five years
- American Production and Inventory Control Society (APICS) Certified in Logistics, Transportation and Distribution (CLTD) certification, Global Logistics Associate (GLA) certification or Professional designation in Logistics and Supply Chain Management (PLS) can be earned with relevant industry workplace experience and a passing grade on the APICS exam
- The International Society of Logistics (SOL) Certified Senior Logistician (CSL) or Demonstrated Master Logistician (DML) credentials do not require formal exams but require submitting an application reflecting the necessary education and performance requirements as well as supporting documents including transcripts, references, endorsements and copies of awards or citations

Next Career Step
Freight Forwarder

Salary

<table>
<thead>
<tr>
<th>Occupation/Industry</th>
<th>Low wage</th>
<th>Median wage</th>
<th>High wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo and Freight Agent</td>
<td>$30,160</td>
<td>$35,160</td>
<td>$46,762</td>
</tr>
<tr>
<td>Port Operations &amp; Marine Logistics</td>
<td></td>
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</tbody>
</table>
A Crane and Tower Operator may work at major ports, loading and unloading containers on and off ships. He or she may work a mechanical boom and cable or tower and cable equipment to lift and move cargo containers. An operator may extend and retract horizontally, rotate, and lower and raise hooks attached to load lines. An operator is guided by other workers using hand signals or a radio.

**Daily Tasks**
- Directs, operates, and maintains machinery or equipment.
- Operates and maintains machinery or equipment.
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**Education and Credentials**
This occupation does not require a high school diploma or GED but completion of a post-secondary education in crane operation and leadership is a desirable attribute. Candidates with associate degrees in crane operation and leadership have an advantage in securing employment.

**Salary**
- Median hourly wage: $23.42
- Median annual salary: $48,720

**Did you know**
If you stacked up the containers on just one ship they would reach the equivalent height of almost 7,500 Empire State Buildings. If you unloaded their cargo onto trucks the traffic would stretch for 6 miles.

**Next Career Step**
- Crane Inspector

**Related Positions**

**Occupation Description**
This occupation requires a high school diploma or GED with a strong background in applied math and science, physics and technical education. The educational requirements for this occupation vary by state. In most states, it is necessary to complete an approved apprenticeship program, associate degree or technical school.

**Salary**
- Median hourly wage: $15.42
- Median annual salary: $31,960

**Did you know**
If you lined up the containers on just one ship they would stretch nearly halfway around the globe on an average day.

---

**CRANE TOWER AND OPERATOR**

**Occupation Description**
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**CRANE MECHANIC**

**Related Positions**

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Did you know

Customs Brokers are licensed and regulated by the U.S. Treasury.

Learn more at http://www.cbp.gov/trade/programs/administrative/customs-brokers/becoming-customs-broker

Salary

Low wage $52,682
Median wage $59,903
High wage $66,940

Did you know

The standard credential for a Diesel Service Technician is a certification from the National Institute for Automotive Service Excellence.

Learn more at http://www.maritime-technology.org/video-gallery/

Salary

Low wage $57,662
Median wage $69,345
High wage $74,190

CUSTOMS BROKER

Occupation Description
A Customs Broker is licensed to help importing and exporting clients meet government trade regulations. He or she may file the appropriate paperwork, monitor international shipments, code goods and make sure all required duties, taxes and payments are made. A Customs Broker typically works with freight forwarders to arrange for outgoing or incoming shipments of goods.

Daily Tasks
- Prepare and submit required documents
- Track shipments and use the tariff coding system to classify shipments

Education and Credentials
This occupation requires a high school diploma or GED. The next educational step is taking post-secondary courses in transportation and marine logistics at a community college toward a certificate or associate degree in diesel mechanics. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for customs brokers include:

- National Customs Broker & Forwarders Association of America (NCBFAA) Certified Customs Specialist (CCS) renewable credential requires one year of practical experience as a broker, completion of the required online course and passing grade on the CCS exam.
- International Trade Certification (ICT) Certified Exporter (IE) renewable credential requires a passing grade on a two-hour exam and completing 24 continuing education units (CEU) every five years to maintain certification; 11 additional designations are available with additional workplace experience.

- National Customs Broker & Forwarders Association of America (NCBFAA) Certified Customs Broker (CCB) requires passing grade on a five year registered apprenticeship program.

- American Society of Custom Brokers (ASC) is a certification from local or foreign governments.

- Customs Brokers are typically required to hold a broker license or other required certification from local or foreign governments.

Next Career Step
- Customs Manager

DIESEL SERVICE TECHNICIAN AND MECHANIC

Occupation Description
A Diesel Service Technician and Mechanic may repair and maintain the diesel engines that power transportation equipment at the port and in transportation companies that support the port. He or she may work on trucks, cranes, cranes and forklifts.

Daily Tasks
- Repair and maintain diesel engines
- Repair or adjust parts that do not work properly and remove or replace parts that cannot be fixed

Education and Credentials
This occupation requires a high school diploma or GED with a strong background in math, physics and technical education (automotive repair, electronics). The next educational step is taking post-secondary courses in diesel mechanics at a community college toward a certification in diesel mechanics and an associate degree, taking an accredited employer-sponsored formal training program or applying for a registered apprenticeship program. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for diesel mechanics include:

- Certified Diesel Engine Diagnosis Specialist (CDEDS) credential from the National Institute for Automotive Service Excellence.

Next Career Step
- Machinery Maintenance Mechanic

Get a real life glimpse of a Diesel Service Technician and Mechanic’s work in ports and on the water -- click on the “Career: Marine Diesel Mechanic” video on our website: http://www.maritime-technology.org/video-gallery/
Did you know

Some ship and shore equipment are controlled by Programmable Logic Controllers (PLC)? As an electronic technician you may be required to work on PLCs.

Did you know

Forklifts are also known as powered industrial trucks and their operation and training is regulated by the Occupational Safety and Health Administration (OSHA).

Check out more information on OSHA Forklift Requirements at:

https://www.osha.gov/SLTC/poweredindustrialtrucks/standards.html

ELECTRONICS TECHNICIAN

Related Positions
Critical Systems Technician, Electronic Bench Technician, Electronic Technician, Electronics Mechanic, Journey Electrician, Marine Electrician, Mechanical Electrical Plumbing Supervisor (M/E Supervisor), Radio Technician, Troubleshooter

Occupation Description
An Electronic Technician may install, adjust, or maintain mobile electronic communication equipment, including radio, swept, security, navigation, and surveillance systems on tanks, watercraft, or other mobile equipment.

Daily Tasks
Import and test electrical systems and equipment to locate and diagnose malfunctions, using visual inspections, testing devices, and computer software. Reassemble and test equipment after repairs. Splice wires with knives or cutting pliers, and solder connections to fixtures, outlets, and equipment.

Education and Credentials
This occupation requires a high school diploma or GED with a strong background in math and technical education including electrical and mechanical systems. The next educational step is taking post-secondary courses at a community college in electronics technology toward an academic certificate which may be “stacked” toward an associate degree in electronics technology toward an academic certificate which may be “stacked” toward an associate degree in electronics technology.

Salary
Median hourly wage: $26.93
Median salary: $56,400

Did you know

Forklift OPERATOR

Occupation Description
A Forklift Operator may drive and control industrial trucks and forklifts equipped to move materials around warehouses, storage yards, factories, construction sites, or other work sites. A typical forklift has a hydraulic lifting mechanism and forks for moving heavy and large objects. A Forklift Operator may drive and control industrial trucks and forklifts equipped to move materials around warehouses, storage yards, factories, construction sites, or other work sites. A typical forklift has a hydraulic lifting mechanism and forks for moving heavy and large objects. Industrial truck and forklift operators may also operate tractors that pull trailers loaded with materials, goods, or equipment within factories and warehouses or around outdoor storage areas.

Daily Tasks
Manually or mechanically load and unload materials from pallets, skids, platforms, cars, lifting devices, or other transport vehicles. Move controls to drive gasoline or electric powered trucks, cars, or tractors and transport materials between loading, processing, and storage areas. Maneuver trucks or move equipment using hand controls. Position lifting devices under, over, or around loaded pallets, skids, boxes, and other containers for transport to designated areas. Signal other workers with hand signals, horns, or lights.

Education and Credentials
This occupation may require a high school diploma or GED but a hiring employer may only require an applicant to be at least 18 years old, physically able to perform the work, and pass a drug test. The next educational step is to take post-secondary courses at a community college in transportation, distribution and logistics toward an academic certificate which may be “stacked” toward an associate degree in transportation, distribution and logistics. Credentials and professional certifications demonstrate to employers that you have specific competencies, they can also significantly increase your salary. Industry-valued credentials for forklift operators include:

- Materials Handling and Management Society (MHMS) Certified Associate in Materials Handling renewable credential is earned with a passing grade on a written exam.

Certified Associate in Materials Handling renewable credential is earned with a passing grade on a written exam.

Next Career Step
Warehouse Manager

Take a virtual tour of the Virginia Port. Watch the video “SMART Partner: Port of Virginia at http://www.maritime-technology.org/video-gallery/
First-Line Supervisor of Transportation & Material-Moving Machine and Vehicle Operators

Did you know

This occupation requires a high school diploma or GED and a strong background in math and business and office management skills. The next educational step is taking post-secondary courses at a community college in transportation, distribution and logistics toward an academic certificate which may be “stackable” toward an associate degree in transportation, distribution and logistics. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for First-Line Supervisors include:

- American Production and Inventory Control Society (APICS) Logistics, Transportation and Distribution (CLTD) certification, Global Logistics Associate (GLA) certification or professional designation in Transportation and Distribution (CLTD)
- Certified Purchasing Professional (CPP) certification
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- Certified Supply Chain Professional (CSCP) certification
- Certified Professional in Supply Chain Management (CPSM) certification
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- Professional in Customs and International Trade (PCIT) certification

For more information, visit the APICS website: http://www.apics.org

Did you know

This occupation has a specialized agency called the International Maritime Organization (IMO).

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Salaries

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Salary Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight Forwarder</td>
<td>Median salary: $59,451, Low wage: $40,981, High wage: $77,920</td>
</tr>
<tr>
<td>Marine Logistics and Transportation Manager</td>
<td>Median salary: $54,930, Low wage: $26.41</td>
</tr>
</tbody>
</table>

Learn more about the wide variety of exciting, well-paying careers in the marine and transportation industry. Click on the “Make the SHRM Choice: Maritime Careers Hands-On & Tech Driven” video on our website: http://www.maritime-technology.org/video-gallery/


**INDUSTRIAL ENGINEER**

**Related Positions**
- Engineering Technician, Industrial Engineering Analyst, Industrial Engineering Technician, Manufacturing Technician, Methods Engineer, Process Design and Analysis, Methods Analyst, Process Engineer, Process Technician, Production Staff Worker, Quality Control Engineering Technician (QC Engineering Technician)

**Occupation Description**
An Industrial Engineer applies engineering theory and principles to problems of production and operations. They perform studies in material handling, layout, and design. This occupation requires a high school diploma or GED but employers may simply require workers to be at least 18 years old and physically able to perform the work. The next educational step is taking post-secondary courses at a community college in transportation, distribution and logistics toward an academic certificate which may be “stackable” toward an associate degree in transportation, distribution and logistics.

**Education and Credentials**
This occupation typically requires a high school diploma or GED but employers may simply require workers to be at least 18 years old and physically able to perform the work. The next educational step is taking post-secondary courses at a community college in transportation, distribution and logistics toward an academic certificate which may be “stackable” toward an associate degree in transportation, distribution and logistics. Industry-valued credentials for freight, stock and material movers include:
- Materials Handling and Management Society (MHMS) Professional Logistics Associate (PCMH) written exam.
- MHMS Certified Associate in Materials Handling renewable credential is earned with a passing grade on a written exam.
- Institute for Supply Management (ISM) Certified Professional in Supply Management (CPSM) renewable credential requires five years experience (or three and a bachelor’s degree) and a passing grade on three CPSM exams.
- Society for Manufacturing Engineers (SME) Certified Manufacturing Engineer (CMfgE) credential requires a minimum of eight years of combined manufacturing-related education and/or work experience, including a minimum of four years of work experience. A Certified Manufacturing Technician (CMfgT) credential has a minimum of four years of combined manufacturing-related education and/or work experience and/or education also qualifies.

**Next Career Steps**
- Operations Manager
- Maritime and Transportation Career Center

For more information on American ports visit: http://www.aapa-ports.org/Industry/content.cfm?ItemNumber=1022&navItemNumber=901

**Salary**

| Low: $46,160 | Median: $52,649 | High: $65,037 |

**Did you know**

- Did you know $6 billion worth of goods moves in and from overseas markets every day through American ports.
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A logistics analyst uses analytical and quantitative methods to understand, predict, and enhance logistics processes. Analysts are responsible for assembling data, analyzing performance, identifying problems, and developing recommendations to support the management of logistics. Maritime transportation analysts are employed by carriers, logistics service providers, manufacturers, or other supply chain members.

**Daily Tasks**
- Gather and interpret relevant data (costs, productivity, demand patterns, etc.)
- Investigate problems, find root causes, and develop solutions
- Develop periodic performance reports and distribute to stakeholders
- Monitor contract compliance of carriers and other logistics service providers
- Provide analytical support for projects, new business opportunities, and other supply chain activities

**Education and Credentials**
This occupation requires a bachelor’s degree in logistics, production or operations management, or supply chain management. Additional courses in quantitative analysis, production planning and project management, and information technology are desirable. Certifications and professional designations demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for logistics analysts include:

- The American Production and Inventory Control Society (APICS) Professional Designation in Logistics and Supply Chain Management (CSCP) or Certified in Logistics, Transportation and Distribution (CLTD), or Certified Supply Chain Professional (CSCP) credentials can be earned with relevant industry workplace experience and a passing grade on the APICS exam.
- Manufacturing Skills Standards Council (MSSC) Certified Logistics Technician (CLT) credential consists of two parts, the Certified Logistics Associate (CLA) certificate and the mid-level technical CLT certification. CLT certification is attained after obtaining a CLA certificate and passing the written exam.
- The International Society of Logistics (SOLE) Demonstrated Logistician (DL), Demonstrated Senior Logistician (DSL) or Demonstrated Master Logistician (DML) credentials do not require formal exams but require submitting an application reflecting the necessary education and performance requirements, as well as supporting documents including transcripts, certificates, endorsements and copies of awards or citations.
- The American Society for Quality (ASQ) Certified Reliability Engineer (CRE) renewable credential requires a passing CRE exam grade and meeting re-certification requirements every three years.
- The Council of Supply Chain Management Professionals (CSCMP) SCPro renewable credential is a three-year certification achieved through passing exams and maintained by meeting recertification requirements every three years.
- The American Society for Quality (ASQ) Certified Reliability Engineer (CRE) renewable credential requires a passing CRE exam grade every three years and eight years relevant workplace experience—a portion may be waived with an undergraduate or graduate academic degree.

**Salary**

| Low salary: $59,482 | Median salary: $75,395 | High salary: $143,449 |

**Next Career Step**
- **Senior Logistics Analyst**
  - Ever wonder what logistics is all about? Find out by clicking on the "What is Logistics" video on our website: [http://www.maritime-technology.org/video-gallery/](http://www.maritime-technology.org/video-gallery/)

- **Logistics Engineer**
  - A Logistics Engineer designs logistics processes, technology, and/or infrastructure to support the efficient and effective management of products from point of origin to point of consumption. A Logistics Engineer works closely with customers, logistics service providers, logistics managers, and other supply chain members to develop innovative solutions to ongoing operating problems.

**Occupation Description**
A Logistics Engineer designs logistics processes, technology, and/or infrastructure to support the efficient and effective management of products from point of origin to point of consumption. A Logistics Engineer works closely with customers, logistics service providers, logistics managers, and other supply chain members to develop innovative solutions to ongoing operating problems.

**Daily Tasks**
- Coordinate delivery schedules and other supply chain activities
- Analyze costs and pricing
- Investigate and implement new technologies and information systems
- Develop standard operating procedures and performance standards
- Assess the effectiveness of current logistics and/or transportation processes, determine improvements, and coordinate institutional change
- Design/facilitate layouts to maximize space utilization, productivity, and safety
- Develop standard operating procedures and performance standards
- Investigate and implement new technologies and information systems
- Analyze costs and pricing

**Education and Credentials**
This occupation requires a bachelor’s degree in business or logistics and a strong background in project management, computer-based design and modeling. Certifications and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for logistics engineers include:

- American Production and Inventory Control Society (APICS) Distinguished Logistics Professional (DLP), or Certification in Logistics, Transportation and Distribution (CLTD) or Certified Supply Chain Professional (CSCP) credentials can be earned with relevant industry workplace experience and a passing grade on the APICS exam.
- The International Society of Logistics (SOLE) Demonstrated Logistics (DL), Demonstrated Senior Logistics (DSL) or Demonstrated Master Logistics (DML) credentials do not require formal exams but require submitting an application reflecting the necessary education and performance requirements as well as supporting documents including transcripts, certificates, endorsements and copies of awards or citations.
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**Salary**

| Low salary: $59,482 | Median salary: $75,395 | High salary: $143,449 |

**Next Career Step**
- **Senior Logistics/Project Engineer**
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**LONGSHOREMAN**

**Related Positions**
Sweederson, Dishwasher

**Occupation Description**
Longshoremen are the men and women who handle cargo at a port. They load and unload cargo ships and rail cars or trucks. Some of the important port duties that are part of that process. There are different kinds of Longshoremen:
- **Clerks/Checkers**
- **Crate Operators**
- **Lashing**
- **Straddle Carrier Operators**

Longshoremen use different types of mechanical technologies to unload containers from cargo ships. This is an example of how a ship is unloaded in a few hours. A ship with 5,000 containers can be loaded onto the ship and placed on the dock, so they can be loaded onto rail cars or trucks. What used to take up to two weeks to unload the cargo ship can now be done in a few hours. A ship with 5,000 containers, for example, can be unloaded in 15 hours.

**Daily Tasks**
- **Clerks/Checkers** make sure the code on each container matches the manifest documents that correspond to the container.
- **Crate Operators** take orders from the control tower and off-load containers from the cargo ship and place them on the dock, so they can be loaded onto rail cars or trucks. What used to take up to two weeks to unload from a ship can now be done in a few hours. A ship with 5,000 containers, for example, can be unloaded in 15 hours.

**Salary**
- **Low wage**: $20/hr
- **High wage**: $32/hr

**Occupation Description**
Longshoremen load and unload ships and also complete other important port duties that are part of that process. There are different kinds of Longshoremen:
- **Clerks/Checkers**
- **Crate Operators**
- **Lashing**
- **Straddle Carrier Operators**

**Daily Tasks**
- **Clerks/Checkers** make sure the code on each container matches the manifest documents that correspond to the container.
- **Crate Operators** take orders from the control tower and off-load containers from the cargo ship and place them on the dock, so they can be loaded onto rail cars or trucks. What used to take up to two weeks to unload from a ship can now be done in a few hours. A ship with 5,000 containers, for example, can be unloaded in 15 hours.

**Salary**
- **Low wage**: $20/hr
- **High wage**: $32/hr

**MARITIME STATISTICIAN**

**Occupation Description**
Maritime Statisticians work with numerical information, collecting, organizing, interpreting and summarizing data to provide information for the maritime industry.

**Daily Tasks**
- Create software programs to help analyze data.
- Identify and collect information from a variety of sources.
- Identify important principles and facts by analyzing and separating information into distinct parts.
- Apply all branches of mathematical principles, including arithmetic, algebra, geometry, calculus, and statistics.
- Report information and findings to supervisors, project teams and others in clear and concise terms.

**Salary**
- **Low wage**: $20/hr
- **High wage**: $32/hr

**Education and Certification**
This occupation requires a bachelor’s and advanced degree, such as a master’s degree or Ph.D. in mathematics, statistics, economics, or a similar concentration. Credentials and professional certifications demonstrate to employers that you have specific competencies, and can also significantly increase your salary. Industry-valued credentials for maritime statisticians include:
- American Statistical Association (ASA) – there are two levels of ASA accreditation: Graduate Student (GStat) and Accredited Professional Statistician (PStat). To apply you will need to belong to the ASA and submit a cover letter and resume (GStat) or a comprehensive application (PStat).
- Materials Handling and Management Society (MHMS) Certified Materials Handling and Management Practitioner (CMMP) – by completing four online courses (12 credit hours) you can earn the college’s industry-valued academic certificate.
- Certificate in Applied Statistics (Texas A&M University) – by completing four online courses (12 credit hours) you can earn the college’s industry-valued academic certificate.

**Tasks**
- **Graduate Statistician (GStat) and Accredited Professional Statistician (PStat). To apply you will need to belong to the ASA and submit a cover letter and resume (GStat) or a comprehensive application (PStat).**
- **Materials Handling and Management Society (MHMS) Certified Materials Handling and Management Practitioner (CMMP) – by completing four online courses (12 credit hours) you can earn the college’s industry-valued academic certificate.**
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**Salary**
- **Low wage**: $20/hr
- **High wage**: $32/hr

**Did you know**
- Jeff Davis (Port of Baltimore native and International Longshoremen’s Association (ILA) leader) coined the phrase “ILA: means ‘I Love America” during World War I.
- Straddle Carrier Operators operate the vehicles that pick up the container from below the crane and stack them in numbered rows that run perpendicular to the berth. Another Straddle Carrier Operator then takes that container from the stack and delivers it to the car or onto the back of a truck, for transport.

**Did you know**
- Some of the information a Maritime Statistician may examine includes cargo at sea, pollution levels, and data about weather conditions and operational ships.

**Learn more at**
- http://www.maritime-technology.org/video-gallery/
**PORT ENGINEER**

**Occupation Description**

The Port Engineer is a skilled engineer who is responsible for estimating, planning, and performing short and long-term maintenance, repairs, and modifications on vessels for a specific region.

**Daily Tasks**

- Ensure all vessel engineers are properly trained, qualified, and comply with regulatory training and/or certification requirements.
- Assist in the development and adherence of the maintenance and repair budget.
- Supervise the timely and cost-effective maintenance, repair, modifications, and refurbishment projects of existing fleet.
- Develop dry-docking specifications, vendor bid packages, and evaluation projects.
- Monitor the contractor and/or shipyard during maintenance and repair projects.
- Conduct on-site surveys of vessels and equipment to determine maintenance and repair needs.
- Make recommendations to General Manager.
- Analyze problems and interface with appropriate operations personnel.

**Education and Credentials**

- This occupation typically requires a bachelor’s degree in marine engineering, which most port engineers typically earn from a Merchant Marine Academy.
- Port Engineers must also have significant experience as an engineer on board a vessel and a U.S. Coast Guard Marine Engineer license.

**Next Career Step**

Senior Port Engineer – General Manager/Port Director

Do you enjoy working outdoors in an ever-changing environment? Working at a port could be the job for you! See behind the scenes work at the Port of Virginia by clicking on the “SMART Partner: Port of Virginia” video on our website: [http://www.maritime-technology.org/video-gallery/](http://www.maritime-technology.org/video-gallery/)

**PORT MAINTENANCE TECHNICIAN**

**Occupation Description**

A Maintenance Technician keeps machines and mechanical equipment at port facilities, including buildings and roadways, in good repair.

**Daily Tasks**

- Assemble and install wiring, pipe systems, and plumbing, and repair when necessary.
- Clean and lubricate all working parts of machines, including shafts, bearings, and gears.
- Estimate repair costs if outside help is required to make repairs.
- Maintain the exterior of buildings, including painting and repairs.
- Order parts for repairs and maintain records of repair costs.
- Regularly inspect facilities to prevent problems from occurring.

**Education and Credentials**

- This occupation requires a high school diploma or GED with a strong background in math and technical education.
- The next educational step is applying for a Registered Apprenticeship program for Marine Services Technicians or taking courses at a community college toward an academic certificate or Associate Degree in Marine Technology.

**Next Career Step**

Marine Mechanic

Machines and equipment need to be maintained in order to run properly. Mechanics are essential to keeping things running smoothly. See what they do at: [http://www.maritime-technology.org/video-gallery/](http://www.maritime-technology.org/video-gallery/)

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**Salary**

**Low wage** $26,792  
**Median wage** $39,096  
**High wage** $46,572  

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**Did you know**

A Port Engineer may be required to investigate the causes of mechanical, equipment, or power systems failures.

**Occupation Description**

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**Daily Tasks**

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**Salary**

**Low wage** $65,422  
**Median wage** $87,386  
**High wage** $108,278  

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**Did you know**

A Maintenance Technician is sometimes referred to as a "Jack of all Trades".

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**Education and Credentials**

- This occupation requires a high school diploma or GED with a strong background in math and technical education. The next educational step is applying for a Registered Apprenticeship program for Marine Services Technicians or taking courses at a community college toward an academic certificate or Associate Degree in Marine Technology.

**Next Career Step**

Marine Mechanic

Machines and equipment need to be maintained in order to run properly. Mechanics are essential to keeping things running smoothly. See what they do at: [http://www.maritime-technology.org/video-gallery/](http://www.maritime-technology.org/video-gallery/)

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**Salary**

**Low wage** $65,422  
**Median wage** $87,386  
**High wage** $108,278  

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**Did you know**

A Port Engineer may be required to investigate the causes of mechanical, equipment, or power systems failures.
STEERING, RECEIVING, AND TRAFFIC CLERK

Occupation Description
A Shipping, Receiving, and Traffic Clerk may verify and keep records on incoming, and outgoing shipments at warehouses.

Daily Tasks
Arrange for transportation of products
Assemble, address, stamp, and ship merchandise or materials
Prepare items for shipment
Receive, unpack, verify and record incoming merchandise or material

Education and Credentials
This occupation typically requires a high school diploma or GED. The next educational step is taking courses in maritime transportation or logistics toward an academic certificate or associate degree. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for shipping, receiving, and traffic clerks include:

- International Warehouse Logistics Association (INLGA) offers three tiers of credentials: Qualified Warehouse Logistics Professional (QWLP) for new industry workers, Certified Logistics Professional (CWLP) for professionals with more experience, and Executive Warehouse Logistics Professional (EWLP) for officer-level workers. This renewable credential requires an application, resume and annual continuing education or continuing professional development work.

- National Customs Brokers & Forwarders Association of America (NCBFAA)’s Certified Customs Specialist (CCS) and Certified Export Specialist (CES) renewable credentials demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for storage and distribution managers include:

- American Production and Inventory Control Society (APICS) Certified in Production and Inventory Management (CPIM) renewable credential is earned with at least one year relevant workplace experience and a passing grade on the CPIM exam.

- North American Transportation Management Institute (NATMI) Certified Cargo Security Professional renewable credential requires educational transcript, completed application, relevant work experience, passing grade on a two-hour written exam and continuing professional development.

- American Productivity and Inventory Control Society (APICS) Certified in Production and Inventory Management (CPIM) renewable credential is earned with a passing grade on the CPIM exam.

Next Career Step
Logistics

> Did you know

The largest ships can store nearly 750 million bananas in 15,000 containers? That’s about one for every person in Europe and North America.

> Did you know

A Storage and Distribution Manager plans, directs, or coordinates the storage or distribution operations within an organization or the activities of organizations that are engaged in storing or distributing materials or products.

> Daily Tasks

- Prepare or direct preparation of correspondence, reports, and operations, maintenance, and safety manuals
- Interview, select, and train warehouse and supervisory personnel
- Plan, develop, or implement warehouse safety and security programs and activities
- Interview, select, and train warehouse and supervisory personnel
- Plan, develop, or implement warehouse safety and security programs and activities

> Education, Skills, Training and Credentials

This occupation typically requires an associate or bachelor’s degree in transportation, distribution and logistics. Credentials and professional certifications demonstrate to employers that you have specific competencies; they can also significantly increase your salary. Industry-valued credentials for storage and distribution managers include:

- American Society of Transportation & Logistics (ASTL) offers four tiers of credentials: Qualified Transportation and Logistics Professional (QTLP) for new industry workers, Certified Transportation and Logistics Professional (CTL) for professionals with more experience, and Executive Transportation and Logistics Professional (ETLP) for officer-level workers. This renewable credential requires an application, resume and annual continuing education or continuing professional development work.

- American Society for Transport and Logistics (ASTL) offers four tiers of credentials: Qualified Transportation and Logistics Professional (QTLP) for new industry workers, Certified Transportation and Logistics Professional (CTL) for professionals with more experience, and Executive Transportation and Logistics Professional (ETLP) for officer-level workers. This renewable credential requires an application, resume and annual continuing education or continuing professional development work.

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> Salary

Low wage: $39,282, Median wage: $56,250, High wage: $76,962

> Storage and Distribution Manager

> Related Positions

- Cold Storage Supervisor, Customer Service Manager, Distribution Center Manager
- Distribution Manager, Distribution Operation Manager, Lead Out Supervisor, Shipping Manager, Shipping Supervisor, Storehouse Manager, Warehouse Manager

> Occupation Description

A Storage and Distribution Manager plans, directs, or coordinates the storage or distribution operations within an organization or the activities of organizations that are engaged in storing or distributing materials or products.

> Daily Tasks

- Prepare or direct preparation of correspondence, reports, and operations, maintenance, and safety manuals
- Interview, select, and train warehouse and supervisory personnel
- Plan, develop, or implement warehouse safety and security programs and activities
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> Salary

Low wage: $39,282, Median wage: $56,250, High wage: $76,962
Emerging Technologies

INTRODUCTION TO OFFSHORE WIND ENERGY CAREERS

An important emerging sector of the U.S. maritime and transportation industry is offshore wind energy, particularly in the Mid-Atlantic region. By the end of 2015, the U.S. Bureau of Ocean Energy Management (BOEM) had awarded ten leases for commercial offshore wind project development in open ocean waters off Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, and Virginia. These commercial leases cover a total underwater area of 1.15 million acres, and represent a market demand for nearly 4,300 offshore wind turbines, and their steel foundation substructures.

The skilled workforce needed for fabrication, delivery, on-shore assembly, port staging, ocean installation, and reliable operation of an offshore wind project over its 20- to 30-year service life involves all three of the core maritime industry sectors: (1) shipbuilding & ship repair; (2) ports & logistics; and (3) vessel operations.

This EMERGING TECHNOLOGIES section provides guidance and information on how existing credentials in each of the above three maritime sectors match the needs of the offshore wind industry and what additional specialized training is needed to "bridge the gap" between existing careers in any one of the three core sectors and a career in the emerging U.S. offshore wind industry.

The first part of this section is organized to lead off with a general description of the offshore wind supply chain element that primarily require skills from the shipbuilding & ship repair sector, which is Manufacturing. It then describes two elements that primarily require skills from the ports & logistics sector, which are Delivery and Port Staging. Finally, it describes two supply chain elements that primarily require skills from the vessel operations sector, which are Ocean Installation and Reliable Operation.

The second part of this section identifies the job skills that are needed to embark on a career in offshore wind. This follows the same organization as the first part, presenting information in the following order:

- Manufacturing
- Delivery and Port Staging
- Ocean Installation and Reliable Operation.
In order to understand the skills and trades needed to fabricate and assemble the various components of an offshore wind turbine, a diagram of the major components is provided on the left. Travel lifts and other specialized transport equipment are needed to move such heavy pieces around the yard.

In addition to the nacelle assembly, a complete wind turbine also requires fabrication of the rotor blades. This offshore wind manufacturing creates more shipyard trade jobs than all five of the different types of offshore wind manufacturing facilities. In fact, this study shows that fabrication of foundation substructures has the greatest requirement for skilled shipyard trade workers among the six trades that are found at any major port. Managing these deliveries also requires logistics planning skills on a global scale.

OCEAN INSTALLATION
The first step in erecting an offshore wind turbine is to install its jacket foundation substructure. This involves driving a pile through each of the manlegs of the jacket. Supporting the ship is a “Feeder barge” that brings onto the jacket structure sections for installation. Once the foundation is completed, a larger turbine installation vessel is used to erect the tower sections, which are lifted into place and bolted together. Once the tower is complete, the same vessel installs the nacelle and rotor.

RELIABLE OPERATION
Offshore wind service technicians are needed to inspect, maintain, and repair the mechanical and electrical equipment inside the nacelle, to inspect and repair the turbine rotor blades, and to inspect and refurbish the steel substructure foundation.
OVERVIEW OF JOB SKILLS NEEDED IN THE OFFSHORE WIND SUPPLY CHAIN

Manufacturing

Tower Fabrication: The skills and trades needed to fabricate tower sections are the most directly transferable from shipbuilding & ship repair. The specific certifications needed to qualify for hire at a tower fabrication facility will be listed and referenced to the appropriate job description in the shipbuilding & ship repair section of this SMART Career Guide.

Foundation Jacket Substructure Fabrication: Fabrication of foundation jacket substructures and offshore substation platforms requires some additional qualifications related to the fitting up of frames and welding together the main legs and braces. Secondary steel fabrication, such as ladders, railings, platform gratings, hatches, and doors uses exactly the same skill set as required for these same structures on ships. Specific certifications needed to qualify for hire at a foundation jacket substructure fabrication facility will be listed and referenced to the appropriate job description in the shipbuilding & ship repair section of this SMART Career Guide.

Wind Turbine Blade Fabrication: Manufacturing of wind turbine blades requires composite fabrication skills, some of which are transferable from the fiberglass boatbuilding and repair industry. Additional training is available from the American Composites Manufacturers Association. Specific certifications needed to qualify for apprenticeship and hire at a blade fabrication and repair facility may vary and will be determined by that facility.

Wind Turbine Nacelle Production: Manufacturing of wind turbine nacelles utilizes steel fabrication skills but also specialized assembly line training from the turbine manufacturer.

Delivery and Port Staging

Working in this part of the offshore wind supply chain is a matter of identifying companies that already are active in logistics for land-based wind projects, particularly if they have experience in the waterborne transport of tower sections, blades, and nacelles.

Ocean Installation and Reliable Operation

The personnel who captain and crew the vessels used to deploy components offshore and install them in the ocean must meet U.S. Coast Guard mariner certification requirements. Certain fabrication trades, such as welding and grouting, are also required for offshore installation, and these workers must have basic offshore safety and survival training, in addition to the certifications of their trade.

Wind turbine service technicians who already are certified to work up-tower on land-based wind turbines likewise must have basic offshore safety and survival training, in addition to their wind energy technician certifications. Some offshore wind turbines are accessible by helicopter and service technicians for these turbines also must have helicopter underwater egress training (HUET). The SMART Center is participating in an offshore wind health and safety working group that will define the specific offshore safety and survival training requirements, including HUET, which will be required for any land-based wind service technician that wants to work offshore.
BAE Systems Ship Repair Apprentice Profile: Megan McCullar

Like many students, Megan McCullar didn’t know what she wanted to do after high school. “I was always told the goal was to go to college so I figured that was what I’d do,” says Megan. After graduating from Grassfield High School in Chesapeake, Virginia she enrolled at Tidewater Community College (TCC) but “wasn’t sure why I was going.”

Megan was 19 and working as a restaurant when she heard about the registered apprenticeship program at BAE Systems from a friend. “I didn’t know anything about the program or shipyards but when he said I could do hands-on work there I was interested.”

After submitting an online application Megan was invited to take a placement test at TCC and then complete a physical exam. Alan Walker, Manager of the Apprentice Program at BAE Systems Norfolk Ship Repair explains, “The placement test allows us to determine if apprentice applicants meet the minimum requirements we have for math, reading, and writing, and the physical ensures they’re ready for the physical environment they’ll be working in.”

During BAE’s four-year Registered Apprenticeship program Megan works a regular shift learning a trade at the shipyard and then takes classes at TCC at night. She has taken four classes at TCC already and is currently taking AutoCAD. Going through the program guarantees that Megan will earn a Career Studies Certificate in Maritime Technologies from TCC as well as a Journeyman Mechanic card, which is a registered credential from the Department of Labor and Industry (DOLI) that is recognized by industry employers nationwide. “Having a journeyman card means I can move and work anywhere in the U.S. and get paid a competitive salary,” explains Megan. As an apprentice BAE will also pay for her to continue schooling if she wants to take additional courses to complete her A.A.S. degree, bachelor’s degree, or even graduate degree.

Megan sees her future as filled with possibility. “Every day I see people at the shipyard moving up quickly to positions of greater responsibility and pay. I know I have the same opportunity.” Alan notes that within the last four years more than 50% of apprentices program graduates have been promoted within a year of their graduation. “It’s really a career path that Megan’s on, and apprenticeship graduation is just the beginning,” he says.

Megan encourages students to look into the maritime and transportation industry and registered apprenticeship programs. “It used to be that getting a four-year college degree guaranteed you a job, but now it’s a gamble,” she says. “You invest a lot of time and money but after graduation you might not have anything to show for it.” She encourages students, teachers, and parents to expand their thinking about career pathways. “Too many kids think that you’re not going anywhere in life if you don’t go to four-year college straight out of high school, but that’s not the truth. Becoming a registered apprentice means you have a job, earn a paycheck, and have your education paid for. It’s a great path for a lot of students and workers looking for better opportunities.”
**Registered Apprenticeship Programs**

Apprenticeship is a centuries-old method where employers provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are apprenticeship programs officially registered with the U.S. Department of Labor’s (DOL) Employment and Training Administration (ETA), sponsored by employers and administered through state agencies. For more than 75 years, U.S. companies have sponsored Registered Apprenticeship programs to provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are also highly-valued national credentials. Apprenticeship is a centuries-old method where employers provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are apprenticeship programs officially registered with the U.S. Department of Labor’s (DOL) Employment and Training Administration (ETA), sponsored by employers and administered through state agencies. For more than 75 years, U.S. companies have sponsored Registered Apprenticeship programs to provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are also highly-valued national credentials. Apprenticeship is a centuries-old method where employers provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are apprenticeship programs officially registered with the U.S. Department of Labor’s (DOL) Employment and Training Administration (ETA), sponsored by employers and administered through state agencies. For more than 75 years, U.S. companies have sponsored Registered Apprenticeship programs to provide workers with the opportunity to learn a specific skill or craft through on-the-job training while earning pay and often company benefits. Registered apprenticeships are also highly-valued national credentials.

*Value of Participating in a Registered Apprenticeship Program*

There are numerous benefits for workers to participate in a registered apprenticeship program. First, you will earn a salary and possibly benefits while you work. On average workers who complete a registered apprenticeship program earn an average hourly wage of $19.30. This wage benefit can extend well beyond program completion, according to the DOL, workers who complete an apprenticeship program earn an average of $29,000 over their careers compared to other job seekers – that's an enormous benefit since through the program you're going to make in excess of $300,000! In addition to learning hands-on skills on the job you are required to take classroom instruction to learn the theory behind the practical skills you're focused on. Some companies have partnerships with community colleges so that you can earn academic (college) credit for the apprenticeship-related instruction (AAB) you're required to complete during the program. That's an enormous benefit since through the program you're going to make in excess of $300,000.

*Registered Apprenticeship Programs in the Maritime and Transportation Industry*

Registered apprenticeship is the "gold standard" of education and training for middle-skill technician careers in the maritime and transportation industry, particularly within the shipbuilding, ship repair, maintenance and modernization sector. Skilled craft workers in this industry sector who complete a registered apprenticeship program earn a Department of Labor (DOL) Journeyworker card which ensures they can qualify for a similar position and pay with any employer across the U.S. There are numerous benefits for workers to participate in a registered apprenticeship program. First, you will earn a salary and possibly benefits while you work. On average workers who complete a registered apprenticeship program earn an average hourly wage of $19.30. This wage benefit can extend well beyond program completion, according to the DOL, workers who complete an apprenticeship program earn an average of $29,000 over their careers compared to other job seekers – that's an enormous benefit since through the program you're going to make in excess of $300,000. In addition to learning hands-on skills on the job you are required to take classroom instruction to learn the theory behind the practical skills you're focused on. Some companies have partnerships with community colleges so that you can earn academic (college) credit for the apprenticeship-related instruction (AAB) you're required to complete during the program. That's an enormous benefit since through the program you're going to make in excess of $300,000.

*Is this an official registered apprenticeship program or an informal apprenticeship program?*

Not all apprenticeship programs are the same. Many companies offer informal apprenticeship programs where they train new, entry-level workers on the job while paying a percentage of their future full-time salary if they complete the program. These programs do not result in a national industry-valued credential or potential college credit. Before applying for an apprenticeship program ask the sponsor: Is this an official registered apprenticeship program or an informal program run in-house? How long does the program last? Will I be required to pay for any of my own training through this program? What topics of care are associated with the program if any? I.e. Transportation Worker Identification Credential (TWIC) card, uniforms, etc. Will I receive credit for previous experience toward the requirements for this program? Will I earn full-time or part-time pay through this apprenticeship program? Will I be eligible for benefits and if so, which ones? Is there a related classroom instruction component to the program or is the training done on-site under the supervision of an experienced craftsman? Will I receive a DOL Journeyworker card upon completion of the program? Will I have enough hands-on time in a specific craft area to be eligible for program and in the federal national credentialing exams upon completion of the program? Are there progressive wage increases throughout the apprenticeship program or is there specific skill benchmarks? Are workers who complete your company's apprenticeship program more likely to be eligible for advancement over other workers or new hires? Learn more about registered apprenticeship programs at the Department of Labor’s ApprenticeshipUSA website: www.21stcenturyapprenticeship.org. You can also learn about local registered apprenticeship programs in your area through your state’s Department of Labor; click here for a list of all state labor department offices: http://www.dol.gov/whd/contacts/state_of.htm

“Most of the Apprentices here, just working a marginal amount of overtime and all like that, they’re going to make in excess of $500 – $600 over four years.”

Al Alan Walker

BAE Systems, Apprenticeship Program Director

“Registered Apprenticeship can take you anywhere you want to go.”

Aaron Post

BAE Systems, Lead Supervisor Sheet Metal Shop

“With the majority of skilled tradesmen retiring in the next 5-10 years we need people to fill those positions and we want them to come up through the ranks.”

John Moore

Auxiliary Systems, Director of Training
Value of Registered Apprenticeship Programs for Employers

A registered apprenticeship program is a standards-based program which ensures both apprentices and employers have a clear understanding of the training and measuring requirements of the program. These programs provide the employer with a training program which will ensure they have a highly skilled workforce that meets their demands. This not only benefits the employer but the employee as well. Not only does the employee receive the benefits of engaged employees in an apprenticeship program but also enhances work place camaraderie with other employees. Other employer benefits include:

- Skilled workers trained to industry/employer specifications to produce quality results
- Reduced turnover
- Pipeline for new skilled workers
- Reduced worker compensation costs due to an emphasis on safety training
- Greater productivity
- Better service to customer
- Some states allow tax credits for apprenticeship training
- Reduced training costs

Exploring and Establishing a Registered Apprenticeship Program

There are many questions an employer may find themselves asking as they begin to explore the possibility of establishing an apprenticeship program. How do we determine if we need an apprenticeship program? Who do we turn to for help? These are only a few questions that may be of concern to an employer when exploring the option to start an apprenticeship program. Going it alone is never easy and working with local business and educational partners help make the transition a smooth one.

The United States Department of Labor is a great starting point for answering these and other questions as they pertain to a registered apprenticeship program. For building an apprenticeship program they have “A Quick-Start Toolkit” which is available online to help employers begin the process. This process has five steps and helps walk the employer through them. The five steps are:

1. Explore—explore apprenticeship as a strategy to meet your needs for skilled workers.
   a. Identify your workforce challenges
   b. High turnover rate
   c. Difficulty finding workers with the right skills
   d. Retiring highly skilled workforce
   e. High turnover rate
   f. Difficulty attracting new or more diverse employees

2. Partner with key players in your region to develop an apprenticeship
   a. Business Partners – (consortium of business, or similar businesses with in place programs)
   b. Workforce Intermediaries – (e.g. industry associations, labor department organizations, or community-based organizations)
   c. Educational Institutions – (four-year colleges, community colleges, or career and technical education centers)
   d. Build the core components of your apprenticeship program
      a. Business Involvement
      b. On-the-job Training
      c. Related Training and Instruction
      d. Rewards for Skill Gains
      e. National Occupational Credential (Department of Labor)
   e. Technician Assistance and Support
   f. National Credentials
   g. Quality Standards
   h. Tax Credits
   i. Federal Resources

3. Build—build the core components of your apprenticeship program
   a. Business Involvement
   b. On-the-job Training
   c. Related Training and Instruction
   d. Rewards for Skill Gains
   e. National Occupational Credential (Department of Labor)
   f. Technician Assistance and Support
   g. National Credentials
   h. Quality Standards
   i. Tax Credits
   j. Federal Resources

4. Register—register your program to become part of the national Registered Apprenticeship Network
   a. Technical Assistance and Support
   b. National Credentials
   c. Quality Standards
   d. Tax Credits
   e. Federal Resources

5. Launch—launch your new Registered Apprenticeship Program
   a. Conduct marketing and outreach
   b. Recruit candidates for the program
   c. Keep in contact with your state apprenticeship office
   d. Begin training apprentices
   e. Access and continuously improve
   f. Share your success

Although these steps may seem daunting at first, but as you establish your registered apprenticeship program they will become easier to accomplish. State and Federal assistance is available to help get your program off to a good start. Many businesses who want to start an apprenticeship program partner with local community and four-year colleges which have experience in the apprenticeship program. Below are a few links which may help you determine and implement your program:

List of Applicable Occupations: http://www.doleta.gov/oa/occupations.cfm
Apprenticeship/AA initiative: http://www.doel.gob/featured/apprenticeship

Area College or Community College join the RACC (Registered Apprenticeship College Consortium) http://www.doleta.gov/oa/raa.cfm
Pre-apprenticeship Toolkit Available: https://www.doleta.gov/oa/preapp/}
Pre-Apprenticeship Pathways for Women into High-Wage Careers, A Guide for Community-Based Organizations and Workforce Providers offers information and resources to help community-based organizations and other workforce intermediaries build and sustain quality pre-apprenticeship programs: http://www.doleta.gov/oa/pdf/preapp/pdf/Pre_Apprenticeship_GuideForWomen.pdf

The apprenticeship program enables us to grow employees who make meaningful contributions to our work and who have the ability to rise to positions of leadership and responsibility more quickly."
Brad Mason
NHCC LLC Director of Business Intergalactic, Industry, Training, Maintenance, Modernization and Technical Services

Markita Murphy
AET-Systems, Associate Apprentice

“Am I a success story? Yes. I applied, got accepted, and currently a Shipfitter.”

“IT’s a great opportunity that’s changed my career.”
David Tong
Assistant Engineer, American Apprentice

http://www.doleta.gov/OA/preapp/pdf/Pre_Apprenticeship_Collegs_and_Planner.pdf
Pre-Apprenticeship: Pathways for Women into High-Wage Careers, A Guide for Community-Based Organizations and Workforce Providers offers information and resources to help community-based organizations and other workforce intermediaries build and sustain quality pre-apprenticeship programs.
Maritime and Transportation Industry Apprenticeship Programs

Following is a partial list of some maritime and transportation industry employers that offer registered apprenticeship programs:

BAS Systems
(757) 454-6399
www.bas-systems.com
Four-year ship repair program leading to a Master Journeyworker's License, with a focus on the following specialties: Sheet Metal Worker, Carpenter, Deck Master, Electrician, Machinist, Outside Machinist, Pipefitter, Rigger, Shipfitter, and Welder.

Newport News Shipbuilding/Huntington Ingalls Industries
(757) 534-4249
www.apprenticeschool.com
Apprentices begin their careers in one of 27 waterfront trades and complete foundational coursework taught by highly qualified Apprenticeship School faculty. Apprentices then become eligible for optional academic and occupational programs based on their performance in the first year. These programs include Advanced Shipyard Operational Yearly Training, Photographic Imaging, Modeling and Simulation Analyst, Nuclear Test Technician and Cost Estimation. Criteria for selection includes: academic grades, professional (CCP), or experienced mid- to late-career professionals who are working to advance their cost engineering skills. The CST is designed for credentialing journeyworker level II, III or IV professionals who are working to gain the requisite years of experience, to become a certified Planning & Scheduling Professional.

Columna Shipyard Inc.
(757) 545-2400
http://www.columnashipyard.com/
Four-year ship repair program leading to a journeyworker’s License and Maritime Technologies certification within the following trades: Inside and Outside Machinist, Welder, Pipefitter, Electrician, Rigger, Carpenter, and Painter.

Collins Machine
(757) 977-9800
www.collinsmachine.net
Four-year program in ship repair and alterations leading to journeyworker's license in the trade of marine electrical and mechanical contracts.

Oceaneering International, Inc.
(757) 456-2300
www.oceaneering.com/careers
The Oceaneering International, Inc. Apprentice Program is a four-year program which will culminate in a four-year college training and academic related instruction to graduate (journeyworker level) craftsmen (journeyworker's License and maritime trade certification) in the following trades: Electrician, Inside Machinist, Outside Machinist, Pipefitter, Shipfitter and Welder.

American Maritime Holdings
(757) 286-9115
AMH is a four-year, Maritime Ship Building and Repair Industry Apprenticeship Program leading to journeyworker level II certification in the following trades: Shipfitter, Pipefitter, Marine Electrician, Machinist, Rigger, Painter and Sheetmetal Worker. This includes GED, English, Math, Drafting, Safety and other related training.

Hunter Navy Yard
(757) 961-9311
www.navy.gov/OC/Maritime/NavalFacilitiesEngineeringCommand
Four-year program to credential maritime journeyworker level II, III or IV professionals who are working to gain the requisite years of experience, to become a certified Planning & Scheduling Professional.

“Instead of out-of-pocket expenses of going to college, they can, if they wish, get an associate’s degree, they can get transferable credits to go to your home college. We’re seeing of apprentices students that are going on to get an associate’s degree at your home college. It’s an opportunity in both financially and educationally for them.”

Megan McCuller believes her job and experience can lead to being a certified Planning & Scheduling Professional.

“We want to help these individuals advance and become supervisors, project and program managers.”

“We want to help these individuals advance and become supervisors, project and program managers.”

“We bring you in, we train you, we send you to school, we pay for the school and in four years you’re a Certified Journeyman Mechanic making well in excess of $23 an hour.”

“We want to help identify the companies that are willing to employ these apprentices at this point in time. So the opportunity is both financial- and educational-enhancing purposes such as planning, organizing, and scheduling work.

Risk Management Specialists, Market Research Analysts and Cost Estimator/planners consult with clients, vendors, personnel or process information.

Workers who are dedicated to learning not just the ‘how’ of doing a job but also the ‘why’ are valuable to a company. These employees work hard on the job and are able to move to other departments or construction foremen to discuss and apply what they learned in

Naval Facilities Engineering Command
(757) 445-4485
www.navfacs.navy.mil/
Four-year program to credential maritime journeyworker level II, III or IV professionals who are working to gain the requisite years of experience, to become a certified Planning & Scheduling Professional.

Naval Auxiliaries
(757) 226-1274
www.navaux.com
Auxiliary Systems offers a four-year program to journeyworker level II, III or IV professionals who are working to gain the requisite years of experience, to become a certified Planning & Scheduling Professional.

Paul Hall Center for Maritime Training and Education
(301) 994-0010
http://www.sksolers.org/paulhallcenter/jphc.asp
The Paul Hall Center for Maritime Training and Education offers the largest registered apprenticeship program in the U.S. for entry-level seafarers. The Center offers more than 70 U.S. Coast Guard-approved courses for Merchant Marine careers aboard all types of vessels.

“Tell young guys here all the time – guys that are coming in just sweeping the floor – that they should apply for the program, use what they learn in the Navy, and of course the fact that they’ll get a higher pay rate doesn’t hurt either!”

Dario Aguilera
AMSEC LLC of Huntington Ingalls Industries, Registered Apprenticeship Coordinator
Beginning in 2013 the SMART Center has created two-three minute videos featuring different sectors and high-demand STEM-based careers in the maritime and transportation industry. The “Make the SMART Choice” video series is intended to provide secondary and college-level educators, faculty, guidance counselors and career coaches with a valuable tool to educate high school and community college students, re-careering workers, veterans and underrepresented minorities about the pathways into the industry and the benefits of working in this vital national industry. Following are descriptions of the current video segments in the “Make the SMART Choice” series.

**SHIP MAINTENANCE AND MODERNIZATION REGISTERED APPRENTICESHIP PROGRAM PATHWAYS**

**Maritime Apprenticeships Lead to Broad Opportunities On & Off the Water**

Colter Chambers, Jennifer Gilbert and Cheryl Smith have found a home in ship modernization and maintenance, thanks to registered apprenticeship programs. Colter, who loves to work on cars, is now learning how to be an outside machinist. Jennifer, who did five years in Navy, has discovered a talent as a technical writer. And Cheryl, who is also a veteran, has taken her love of woodworking into skilled training as a marine carpenter. All are earning valuable credentials and degrees and are being paid while they do so by their employers who are also covering the cost of their education.

**Opportunity Abounds in Maritime**

Where there’s water, there’s ships and ports. Careers in ship maintenance and modernization offer great opportunities. Employers are anxious to bring new blood into the field so the experienced pros can pass on their knowledge to the next generation. They are setting up registered apprenticeship programs and financing education so young people can earn the credentials and degrees they need to start and advance in what can be a very lucrative career path. Hear what employers in maritime and transportation have to say in this SMART Choice video.

**Three on the Perch**

Chris Swagert got a finance degree at Virginia Tech, but he hated the desk job that followed. Gwendolyn Lee graduated from Virginia State University and learned the ins and outs of ship repair and working quickly with a team. "I had to run a hundred sea watches. I had to take them all out and put them back in. I had a crew of five-six people and it got down to the wire." Her employer, who covered the cost of obtaining her associate's degree, has her on a management track. Now she's bought a new house, car and motorcycle, thanks to making a SMART Choice.

**Small Town Boy Is Success at Big City Shipyard**

Aaron Post had never been around so many people. "I'm used to small towns and I come here and everything's so big and busy." But he liked working with his hands, first as a cabinet maker back home and then as an apprentice sheetmetal worker, learning his skills and earning credentials and a degree, paid for by his employer. "There are spots open for everybody," says his supervisor. "If you have to do to go to work every day, do your job, and there's always going to be something for you." Little Brody Post, Aaron's son, admires his Dad and wants to follow him into a career with good potential and pay.

**From Counselor to Soldier to Apprenticeship Mechanic**

Alec Molive followed a typical course, graduating from Longwood College with a degree in counseling. But office work wasn’t for him. He joined the National Guard and served a tour in Iraq, returning home afterwards but still wanting to help his country. He found that opportunity at a Norfolk shipyard, becoming an apprentice blacksmith and working on his nation's ships. "I'm still helping the military out so I pride myself on that." He's taking classes, paid for by his employer, and earning nationally recognized credentials and certificates that he can take anywhere, making him always employable.

Maritime Careers: Hands-On and Technology-Driven

If a desk job is not for you, but you like technology and the satisfaction that comes from keeping our nation's ships safe at sea, then the Maritime Technologies Career Pathway may be a great career choice. Many young people are finding their riches in this fast-paced, well-paying field where advancement can come quickly to those with the right attitude and aptitude. Meet fast learners Gary Green and Markita Murphy in this maritime and transportation video overview.
Beginning in 2013 the SMART Center has created 2-3 minute videos featuring different sectors and high-demand STEM-based jobs. These videos show young people such as Chris S., a marine electrician, Gwendolyn a painter, Megan a shipfitter and all are moving up in their companies. They made SMART Choices.

Thanks to registered apprenticeship programs young people like Chris, Gwendolyn and Megan succeeded in transforming their lives. They made SMART Choices.

Where there's water, there's ships and ports. Careers in ship maintenance and modernizations offer great opportunities. By participating in apprenticeships in these fields, gleaning information they can take home to share with their students, they come smart and leave SMARTER.

The Port of Houston, one of the nation's busiest ports, faces retirements of skilled workers. It is the most congested port in the nation and a major point of entry for containers from all over the world. Many of its male colleagues at the U.S. Merchant Marine Academy were not always supportive of female cadet Carol Curtis. But the young woman survived that experience to become a star graduate and an officer on a container vessel, rising to the post of captain. Over a 30-year career, this dynamic sailor saw the world, piloting commercial ships into ports on every continent. Today Captain Curtis is teaching, writing a book on her career and inspiring a new generation of young women to consider following her lead.

Two Guys and a Tig

Blake Snapp and Colton Hendrick landed a great internship, especially for two young guys who love being on the water. They were onboard barges and tugs that ply the harbor in Houston, ensuring that vessels move safely through the channel that connects the city and the Gulf of Mexico. When they are not on the water, they’re in the classroom learning, charting and plotting, as well as working on signing and offloading and the other skills necessary for long careers in this fast-paced, well-paying field. “As soon as I got out of school,” says Blake, “I should be looking to $55,000 a year or so with upward advancement very quickly.” That’s not a bad starting place and signs up for one of three weeklong institutes in Virginia, Texas and Maryland where they are exposed to jobs in transportation, port operations, vessel ops, logistics, and ship maintenance and modernization along with experts in those fields, giving information they can take home to share with their students. They come smart and leave SMARTER.

Maritime Careers: Hands-On and Technology-Driven

If a desk job is not for you, but you like technology and the satisfaction that comes from keeping our nation’s ships safe at sea, then the Maritime Technologies Career Pathway may be a great career choice. Many young people are finding their niche in this fast-paced, well-paying field where advancement can come quickly to those with the right attitude and aptitude. West fast learners Gary Green and Marinha Murphy in this maritime and transportation video overview.

PLEASURE CRUISE AND MARITAINS

He Works on Yachts

Scott Hawkins likes to be outdoors and working with his hands and head. He found his calling in a registered apprenticeship program in Virginia, then took his well-honed welding skills to nearby employer Ocean Marine, one of the largest yacht repair firms on the East Coast. Having skilled and credentialed professionals like Scott on the team allows yard owner Jim Bento to compete for top contracts from around the world. “It made my resume look good and it made them look good,” said Scott Hawkins, “when they can bid work and use my qualifications to get the jobs and contracts.”
To best serve our educator partners, we have included resources to utilize with students and in the classroom. Included in this section are:

Pre-Career Guide Survey
Post-Career Guide Survey
Terms/Acronyms, Glossary

Schools and colleges which collect data using the SMART Center surveys and submit the results to the SMART Center (through email to bmurray@tcc.edu) will be recognized by the National Science Foundation and will be included in the SMART Center’s digital repository.

Instructions: Complete the following questions by circling the appropriate answers or filling in the blanks where indicated.

1. I know what the maritime and transportation industry is. a. Yes ___ b. No ___
2. If yes to #1, write what you know about the industry below:
3. I am familiar with job titles in the maritime and transportation industry. a. Yes ___ b. No ___
4. If yes to #3, please list 1-2 industry jobs below:
1. 
2. 
5. I know someone who works in the maritime and transportation industry. a. Yes ___ b. No ___
6. I know the four main sectors of the maritime and transportation industry. a. Yes ___ b. No ___
7. If yes to #6, please list the four main sectors of the maritime and transportation industry below:
1. 
2. 
3. 
4. 
8. I think people who work on ships have to be away from their families for at least:
   a. A year at a time
   b. 6-12 months at a time
   c. 3-6 months at a time
   d. 3-5 weeks at a time
   e. It can vary
   f. I don’t know
9. I think most people in maritime and transportation careers use math…  a. Every day
   b. Once in a while
   c. Hardly ever
10. I think it’s possible to get a job in the maritime and transportation industry without a 4-year college degree. a. Yes ___ b. No ___
11. I think most people with jobs in the maritime and transportation industry are required to go out to sea frequently. a. Yes ___ b. No ___
12. I know what education or experience I would need after high school to get a job in maritime and transportation. a. Yes ___ b. No ___
13. I’m familiar with some of the credentials or certifications I would need to work in maritime and transportation. a. Yes ___ b. No ___
14. I understand what a registered apprenticeship position is. a. Yes ___ b. No ___
15. If yes to #14, please describe a registered apprenticeship position below:
16. I know what types of jobs are available as you move up within the maritime and transportation industry from an entry-level position. a. Yes ___ b. No ___
17. If yes to #16, please list 1-3 advanced positions (i.e. non-entry level positions) within the industry below:
   1. 
   2. 
   3. 

Please submit survey to SMARTCenter@tcc.edu
SMART Center, SHC College Crescent H-140, Virginia Beach, VA 23453

For more information see our website at: http://www.maritime-technology.org/
Post-Career Guide Survey for Educators/Counselors/Career Coaches to Use with Students

Instructions: Complete the following questions by circling the appropriate answers or filling in the blanks where indicated.

1. I know what the maritime and transportation industry is. a. Yes___ b. No___
2. If you answered “no” to #1, write what you know about the industry below:

3. I am familiar with job titles in the maritime and transportation industry. a. Yes___ b. No___
4. If you answered “yes” to #3, please list 1-2 industry jobs below:

   1. 
   2. 

5. I know someone who works in the maritime and transportation industry. a. Yes___ b. No___
6. I know the four main sectors of the maritime and transportation industry. a. Yes___ b. No___
7. If you answered “yes” to #6, list the four main sectors of the maritime and transportation industry below:

   1. 
   2. 
   3. 
   4. 

8. I think people who work on ships have to be away from their families for at least: a. A year at a time b. 6-12 months at a time c. 3-6 months at a time d. 1-3 months at a time e. 3-5 weeks at a time f. It can vary g. I don’t know
9. I think most people in maritime and transportation careers use math… a. Every day b. Once in a while c. Hardly ever
10. I think it’s possible to get a job in the maritime and transportation industry without a 4-year college degree: a. Yes___ b. No___
11. I think most people with jobs in the maritime and transportation industry are required to go out to sea frequently: a. Yes___ b. No___
12. I know what education or experience I would need after high school to get a job in maritime and transportation: a. Yes___ b. No___
13. I’m familiar with some of the credentials or certifications I would need to work in maritime and transportation: a. Yes___ b. No___
15. If you answered “yes” to #14, please describe a registered apprenticeship position below:

   1. 
   2. 
   3. 
   4. 

16. I think what types of jobs are available as you move up within the maritime and transportation industry from an entry-level position: a. Yes___ b. No___
17. If you answered “yes” to #5, please list 1-3 advanced positions (i.e., non-entry level positions) within the industry below:

   1. 
   2. 
   3. 

18. If I were to consider a job in the maritime and transportation industry, I would most likely be interested in (list job title(s) below):

   1. 
   2. 
   3. 

19. I think the maritime and transportation industry would provide good career opportunities for people who like (fill in the blanks below):

   1. 
   2. 
   3. 

Please submit survey to SMART@tcc.edu
SMART Center, ovs╧ĳCollege Crescent H-140, Virginia Beach, VA 23453
For more information see our website at: http://www.maritime-technology.org/
Terms, Glossary and Acronyms

- able-bodied seaman: A member of the deck crew who is able to perform all the duties of an experienced seaman; certificated by examination; must have three years sea service. Also called Able Seaman and A.B.
- aft: In, near, or toward the stern of the vessel.
- anchorage: Port charge relating to a vessel moored at approved anchorage site in a harbor.
- apron: The area immediately in front of or behind a wharf shed on which cargo is loaded. On the "front apron," cargo is unloaded from or loaded onto a ship. Behind the shed, cargo moves over the "rear apron" into and out of railroad cars.
- American Waterway Operators: the national trade association for the barge and towing industry and the shipyards employed in the repair and construction of these craft.
- amidships: the middle portion of a vessel.
- astern: Backward direction in the line of a vessel’s fore and aft line; behind. If a vessel moves backwards it is said to move astern; opposite to ahead.
- at sea: A ship which is free from its moorings and ready to sail.

- barge: A large, flat-bottomed boat used to carry cargo from a port to shallow-draft waterways. Barges have no locomotion and are pushed by towboats. Barges carry dry bulk (grain, coal, lumber, gravel, etc.) and liquid bulk (petroleum, vegetable oils, molasses, etc.).
- beam: The width of a ship. Also called breadth.
- berth: (verb) To bring a ship to a berth. (noun) The wharf space at which a ship docks. A wharf may have two or three berths, depending on the length of incoming ships.
- berth cargo: When a liner cargo vessel accepts extra cargo to fill up the empty space remaining.
- bill of lading: A contract between a shipper and carrier listing the terms for moving freight between specified points.
- black cargo: Cargo banned by general cargo workers for some reason. This ban could be because the cargo is dangerous or hazardous to health.
- breakbulk vessel: A general, multipurpose cargo ship that carries cargoes of nonuniform sizes, often on pallets, resulting in labor-intensive loading and unloading. Calls at various ports to pick up different kinds of cargo.
- breakbulk cargo: Non-containerized general cargo stored in boxes, bales, pallets or other units to be loaded onto or discharged from ships or other forms of transportation. (See also: bulk and container.) Examples include iron, steel, machinery, iron and steel scrap, and iron and steel railcars.
- breakbulk vessel: A general, multipurpose cargo ship that carries cargoes of nonuniform sizes, often on pallets, resulting in labor-intensive loading and unloading. Calls at various ports to pick up different kinds of cargo.
- bridge: Used loosely to refer to the navigating section of the vessel where the wheelhouse and chart room are located, recording or observing of information, and control of the propulsion of the ship to accommodate the wheelhouse.
- bonded warehouse: A building designated by U.S. Customs authorities for storage of goods without payment of duties or duties paid in advance.
- bollard: A line-securing device on a wharf around which mooring and berthing lines are fastened.
- bow thrusters: A propeller at the lower seaward part of the bow of the ship which turns at right angles to the fore and aft line and thus provides transverse thrust as a maneuvering aid.
- breakbulk cargo: Non-containerized general cargo stored in boxes, bales, pallets or other units to be loaded onto or discharged from ships or other forms of transportation. (See also: bulk and container.) Examples include iron, steel, machinery, iron and steel scrap, and iron and steel railcars.
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trucking fees.

An individual, partnership or corporation carrier:

The available space for, or ability to handle, freight.

A specialized facility where cargoes on passenger ships.

A box made of aluminum, steel or fiberglass used to transport cargo by ship, rail, truck or barge.

A double or treble-hulled vessel with a hull configuration ends.
cables, floating cranes and lift trucks may also be installed aboard specialized equipment to move the products to and from warehouses or storage areas. Very heavy cargoes that require specialized equipment include transformers, boats, heavy machinery, etc. These cargoes are now mostly made of steel. Large strong rope used for towing purposes and for securing or mooring ships. Hawsers are also used in the construction of ships to prevent them from shifting in the water. An opening, generally rectangular, in a ship’s shell or body of a ship. Shell or body of a ship. The sum of container, breakbulk and general cargo that make up the ship’s cargo. The ship captain’s list of individual goods that make up the ship’s cargo. A craft more or less similar to the lifeboat, but remains in contact with the surface through supporting legs. Under acceleration it rises above water line and hangs. The master of every vessel is bound by international law to make the officers, crew and passengers adequately acquainted with the procedures of lowering and the use of lifeboats in case of emergency. Full use of the ship, rail, truck and towboat/barge companies, including those involved in the continuous production of, subsea oil and gas. Special vessels designed for the carriage of oil in bulk. Liquefied Natural Gas, or a carrier of LNG. A specially constructed double ended lifeboat. Any of the licensed members of the ship’s officer complement. Any of the licensed members of the ship’s officer complement. Sensory organs that provide tactile sense to the body.barn- An opening, generally rectangular, in a ship’s hull. Under acceleration it rises above water line and hangs. Every vessel is required to carry a lifeboat capable of carrying all the people on board in the event of a case of emergency. Full use of the ship, rail, truck and towboat/barge companies, including those involved in the continuous production of, subsea oil and gas. Special vessels designed for the carriage of oil in bulk. Liquefied Natural Gas, or a carrier of LNG. A specially constructed double ended lifeboat. Any of the licensed members of the ship’s officer complement. Any of the licensed members of the ship’s officer complement. Sensory organs that provide tactile sense to the body. 

-barn- An opening, generally rectangular, in a ship’s hull. Under acceleration it rises above water line and hangs. Every vessel is required to carry a lifeboat capable of carrying all the people on board in the event of a case of emergency. Full use of the ship, rail, truck and towboat/barge companies, including those involved in the continuous production of, subsea oil and gas. Special vessels designed for the carriage of oil in bulk. Liquefied Natural Gas, or a carrier of LNG. A specially constructed double ended lifeboat. Any of the licensed members of the ship’s officer complement. Any of the licensed members of the ship’s officer complement. Sensory organs that provide tactile sense to the body.
A wharf, which parallels the waterline. Quay:

Accommodations.

An able-bodied sea-quartermaster/helmsman:

- Q - oil tanker.

- P - port at which cruise ship makes a stop along its itinerary. Calls may range from five to 24 hours. Sometimes referred to as “transit port.”

- R - port authority, which administers use of public wharves and port properties.

- P - a working who tends to the tasks of an officer.

- S - a ship’s officer who is in charge of affairs, especially in a passenger ship.

- Q - qualified member of the engine department.

- R - railhead: A place in which cargo is loaded and unloaded. The place at which ships tie up to unload and load.

- S - wharfage fee: a charge assessed by a port or wharf owner for handling incoming or outgoing cargo.

- Y - a system of tracks within a certain area used for making up trains, storing cars, planning cars to be loaded or unloaded, etc.
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Project Contributions by:
Katie Adams
Diann Holt
Sallie Kay Janes
Sue Lowthian
George Mason
Freda Shaver
Kipp Snow
Guy St John
Alan Walker
Primary photography by Ann Wernikoff

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Tidewater Community College / Advanced Technology Center
1800 College Crescent, Suite H140
Virginia Beach, VA 23453
SMART@tcc.edu
757 822 7485
Principal Investigator: Barbara Murray (bmurray@tcc.edu)
www.maritime-technology.org