Marine Service Technology I

8750 36 weeks / 140 hours

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Acknowledgments

The components of this instructional framework were developed by the following:

   Eric Anderson, Marine Service Technology Instructor, Northern Neck Technical Center
   Abraham Arispe, Professor, Marine Technology, Tidewater Community College
   Donald McCann, Virginia Marine Trades Association, Deltaville, VA
   Louis Muse, Garrett's Marina, Center Cross, VA
   Scott Stinchcomb, Nauti-Marine, Tappahannock, VA

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Course Description

Suggested Grade Level: 10 or 11

In this introduction to service and repair of watercraft and marina operations, students learn marine trade skills in areas including shop and boating safety, inboard and outboard systems, carpentry, electricity, and vessel storage/handling. The course is based on the National Marine Trades Curriculum, developed by the American Boat and Yacht Council (ABYC).

As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials Table

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

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<td>Secure boat to a dock, mooring, and/or anchor.</td>
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<td>Maneuver a small boat on water in close quarters.</td>
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<td>Describe common composite construction/fiberglass-reinforced plastics (FRP) and equipment used in fiberglass construction and repair.</td>
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<td>Maintaining and Repairing Inboard and Inboard/Outboard Engine Systems</td>
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<td>Identify basic engine systems, subsystems, and components.</td>
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<td>Follow correct procedures in the installation of marine components in compliance with the U.S. Coast Guard Code of Federal Regulations (CFR) and standard-compliant installations.</td>
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<td>Maintaining and Repairing Outboard Engine Systems</td>
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<td>Describe basic maintenance procedures for a marine electrical system, using appropriate marine electrical connectors, according to ABYC standards.</td>
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<td>Describe the procedures for preparing a boat for seasonal storage or usage by using manufacturer recommendations or best industry practice.</td>
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<td>Describe the process for stepping/unstepping a spar.</td>
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<td>Describe the procedure for shrink-wrapping an object, according to best industry practice, identifying problems that can arise during the process.</td>
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<td>Research the diverse career opportunities available in the marine trades and the training, education, and other credentials required for each.</td>
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<td>Research job openings.</td>
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Legend: ☀ Essential ☐ Non-essential ☐ Omitted

**Curriculum Framework**

**Ensuring Lab Safety**

**Task Number 39**

**Explain the importance of workplace safety.**

**Definition**
Explanation should focus on the importance of workplace safety as it applies to the work environment and the natural environment. It should also emphasize environment-related health issues, as well as appropriate and safe storage and disposal of materials.

Process/Skill Questions

- Why should loose clothing not be worn in marine lab/workshop areas?
- Why should safety glasses always be used in marine lab/workshop areas?
- Why should you check the condition of your tools before beginning a task?
- How can improper storage and disposal of materials adversely affect the environment?

American Boat and Yacht Council (ABYC) Standards

T-5 Safety Signs and Labels

Task Number 40

Follow general workplace safety procedures.

Definition

Following workplace safety procedures should include

- complying with federal, state, and local safety guidelines or procedures relevant to assigned duties
- adhering to organizational and manufacturer safety requirements for operation of equipment and machinery, including electrical equipment and connectors
- demonstrating appropriate safety precautions when storing, handling, and transporting tools and equipment.

Process/Skill Questions

- What safety guidelines are important to follow when disposing of materials? What government agencies define and enforce these guidelines?
- What safety considerations are associated with electrical equipment?
- Why is it important to avoid horseplay in the workplace?

American Boat and Yacht Council (ABYC) Standards

T-5 Safety Signs and Labels
Task Number 41

Practice ergonomically correct work methods.

Definition

Ergonomically correct work methods should reflect compliance with OSHA, state, federal, and worksite ergonomic guidelines, such as those for practicing proper lifting techniques.

Process/Skill Questions

• What is the meaning of the term ergonomics? Why are ergonomic precautions important in the workplace?
• How can a worker protect himself/herself from injury when lifting or moving objects?
• What are common safe lifting techniques? Why should they be used?
• What ergonomic problems may be associated with working in confined spaces?

Task Number 42

Practice safety when working on and around docks and ramps.

Definition

Safety around docks and ramps should include precautions to prevent slipping, falling, drowning, and other injuries. Safety should also be a concern when operating boats and trailers around such structures.

Process/Skill Questions

• What aids can assist a vehicle operator when launching a boat from a trailer on a boat ramp?
• What hazards should be avoided when entering or exiting a boat from or onto a dock?

Task Number 43

Follow emergency safety procedures.
Definition

Performance should display understanding of and adherence to emergency safety procedures in situations such as those involving accident, illness, fire, severe weather conditions, mechanical difficulty, and other potentially dangerous circumstances. It should include identifying sources of assistance, exit plans, and steps to follow until help arrives.

Process/Skill Questions

• Why are emergency exit plans important?
• What different emergency situations may be encountered in the marine technology workplace? What safety procedures should be used in each case?

Task Number 44

Maintain safe work area.

Definition

Maintenance should include keeping clean, well-organized, and manageable work station(s), as well as identifying and reporting hazardous and unsafe conditions.

Process/Skill Questions

• What are the advantages of maintaining a safe work area?
• What is the relationship between an organized work area and safety?
• What procedures should be followed to identify and report hazardous and unsafe conditions?

Task Number 45

Identify, use, and store hazardous materials.

Definition

Performance should include selecting, handling, and recycling/disposing of hazardous and toxic materials such as paints, chemicals, and fiberglass compounds according to federal, state, and local regulations, as well as interpreting and using safety data sheets (SDS).

Process/Skill Questions

• What are some hazardous and toxic materials commonly used in the marine industry?
• What procedures for usage, storage, and disposal should be followed for each?
• What is an SDS? Where can this information be found?
• Why are SDS important?

American Boat and Yacht Council (ABYC) Standards

T-5 Safety Signs and Labels

Task Number 46

Use personal protective equipment.

Definition

Using appropriate personal protective equipment (PPE) should include wearing protective clothing (including personal flotation devices) and using foot, eye, hearing, and respiratory protection according to OSHA regulations and company policy.

Process/Skill Questions

• What types of PPE are commonly used or required in a marine shop environment? Why?
• What personal flotation devices are considered acceptable for the marine industry? Why?
• Who regulates personal flotation devices? In what ways are these devices regulated?
• What conditions in the marine workplace require respiratory protection? Why?

Task Number 47

Operate fire suppression equipment.

Definition

Operating fire suppression equipment should include both selecting and operating the appropriate type of extinguisher for a fire emergency.

Process/Skill Questions

• What are the different types of fire extinguishers? How is each operated?
• Why is it important to select the appropriate fire extinguisher for different types of fires?
• Why is periodical inspection of a fire extinguisher important?
• How can an extinguisher be recharged?

American Boat and Yacht Council (ABYC) Standards
Task Number 48

Achieve recognized first aid/CPR certification.

Definition

Certification includes successful completion of first aid/emergency response training, such as that offered by the American Red Cross or the American Heart Association.

Process/Skill Questions

- Why is first aid/CPR important?
- Who may administer first aid and in what situations?
- What is the basic content of first aid/CPR training?
- What organizations provide recognized first aid/CPR training and certification? What procedures should be followed to obtain first aid/CPR training and certification from these organizations?

Task Number 49

Practice safe work procedures with ladders and scaffolds.

Definition

Practicing safe work procedures includes securing ladders, erecting scaffolds, and disassembling scaffolds according to government and industry accepted procedures.

Process/Skill Questions

- What risks are involved when safe ladder and scaffolding practices are not followed?
- What are different types of fall protection devices and their intended uses?
- What federal and state government agencies define safe and appropriate use of ladders and scaffolds?
- What safety considerations should be applied when using ladders and scaffolds?

American Boat and Yacht Council (ABYC) Standards

H-41 Reboarding Means, Ladders, Handholds, Rails, and Lifelines
Practicing Boating Safety, Handling, and Basic Navigation Skills

Task Number 50

Pass Virginia boating safety course.

Definition

Performance consists of passing a Virginia-recognized boating safety course, such as the Boat Owners Association of the United States course training and test offered online (BoatU.S. Foundation) at http://www.boatus.org/courses.

Process/Skill Questions

- What are the advantages of completing a boating safety course?
- What are the key components of a boating safety course?
- What boating safety courses are recognized by Virginia? How can one locate information about these courses?
- What Virginia agency monitors boater safety? What resources does this agency provide?

Task Number 51

Select, coil, throw, and handle the lines used for securing, lashing, and towing vessels.

Definition

Performance should include selecting appropriate type and size of line for the application (e.g., braided vs. twisted), then coiling, throwing, and handling the line(s) according to accepted industry practice.

Process/Skill Questions
What are the breaking strength differences between twisted and braided lines?
What are safety considerations when towing watercraft?
What is the importance of matching line strength with watercraft displacement?

American Boat and Yacht Council (ABYC) Standards
H-40 Anchoring, Mooring, and Strong Points

Task Number 52
Secure boat to a dock, mooring, and/or anchor.

Definition
Securing a boat should include attaching a line to a cleat, bollard, piling, anchor chain, and/or mooring float, using standard mooring techniques.

Process/Skill Questions
- What are the differences among a bollard, piling, anchor chain, and mooring float?
- What techniques are commonly used for securing watercraft to a cleat, bollard, piling, anchor chain, and mooring float?

American Boat and Yacht Council (ABYC) Standards
H-40 Anchoring, Mooring, and Strong Points

Task Number 53
Maneuver a small boat on water in close quarters.

Definition
Demonstration should include starting the engine, untethering the lines, getting underway in a safe manner, keeping the vessel under control at all times, and safely returning to dock.

Process/Skill Questions
- What is the order of operations for getting a boat safely underway?
• What is the importance of tidal movement when operating a watercraft in close quarters?
• How does wind speed affect maneuvers in close quarters?
• How does an engine in reverse affect watercraft steering?

American Boat and Yacht Council (ABYC) Standards

H-1 Field of Vision From the Helm Position

H-26.8.3 Powering of Boats, Test Procedures, Performance Tests

P-14.5 Propulsion Control Systems, Requirements - In General

P-14.6 Propulsion Control Systems, Requirements - Location of Controls

P-14.7 Propulsion Control Systems, Requirements - Installation of Controls

P-23.3 Steering and Propulsion Controls for Jet Boats, Definitions

P-24.5 Electric/Electronic Propulsion Control Systems, Requirements - In General

Task Number 54

Create knots used for securing, lashing, and towing vessels.

Definition

Knot types should include bowline, clove hitch, half hitch, and square knot.

Process/Skill Questions

• What type of knot is typically used when towing a watercraft?
• What is the most frequently used marine knot, and why?
• To what should a mariner tie off when securing the watercraft to a dock?
• What are the typical applications and advantages of each knot type?
• How can injuries occur when using ropes or lines? How can they be prevented?

American Boat and Yacht Council (ABYC) Standards

H-40 Anchoring, Mooring, and Strong Points
Understanding the Fundamentals of Boat Design and Construction

Task Number 55

Identify various hull types and their intended uses.

Definition

Identification should focus on planing, hard and soft chine, displacement, beam, length, draft, flare, dead rise, and stability.

Process/Skill Questions

• How is the appropriate outboard engine horsepower determined?
• What is the relationship between center of gravity and center of buoyancy?
• What are some of the deciding factors in determining boat design?
• How do volume and weight affect boat design?
• How is volume measured in relation to boat construction?

Task Number 56

Describe fundamental elements of boat design.

Process/Skill Questions

• Why is a boat that is built from a male mold built upside down?
• What are three advantages for using the following building materials for boat building: composite (FRP), wood, steel, aluminum?
• What are the differences and similarities between production and custom boat construction?

American Boat and Yacht Council (ABYC) Standards

H-26.1 Powering of Boats, Purpose

H-26.2 Powering of Boats, Scope
H-26.3 Powering of Boats, Referenced Organizations

H-26.4 Powering of Boats, Definitions

H-26.5 Powering of Boats, Requirements - In General

H-26.6 Powering of Boats, Determination of Maximum Power Capacity

H-26.7 Powering of Boats, Requirements - Maneuvering Speed

H-29 Canoes and Kayaks

H-4 Cockpits and Scuppers

H-5 Boat Load Capacity

T-1 Aluminum Applications for Boats and Yachts

Demonstrating Woodworking Skills

Task Number 57

Use squares, measuring tapes, or rules to measure materials or distances.

Definition

Performance should include using squares, measuring tapes, and rules as appropriate to measure materials and distances accurately to 1/16".

Process/Skill Questions

- To joint a piece of wood using the jointer, what is the minimum length the wood can be? Why?
- How is sandpaper grit measured?
- What precautions must be taken when cutting wood in the middle using a circular saw? Why?
Task Number 58

Perform mathematical calculations related to woodworking.

Definition

Performance should include making calculations that involve fractions, measuring angles, determining area, and computing board feet.

Process/Skill Questions

- What determines the minimum curve for radius on the band saw?
- What is the formula for determining board feet? When would this formula be used in marine woodworking?

Task Number 59

Describe the types and characteristics of wood used for various kinds of boat construction and repair.

Definition

Description should include the wood types common to the marine environment (i.e., oak, teak, mahogany, fir, cedar, yellow pine, and engineered wood products). Characteristics important in marine woods should include resistance to water and decay, ability to bend, durability, cost, and compatibility with other materials.

Process/Skill Questions

- What are ten characteristics that differentiate wood species? [e.g., weight]
- By what characteristic(s) is plywood graded? Why?
- What environmental factors should be considered when using imported or exotic boat lumber? Why?
- Decay is almost always caused by which of the following: fresh water, lack of U.V. protection, fungi, termites and other pests? Why?

Task Number 60

Select correct fastener for a specific application.
Definition

Fasteners should include bronze, stainless, and monel screws, nuts, bolts, and staples, as well as installation of bungs.

Process/Skill Questions

- "For fasteners (including nails) in hardwood, a drill's pilot hole generally increases holding power." Is this statement true, false, or does it not give enough information to answer? Explain.
- What are the special corrosion-resistant factors to consider when selecting fasteners for marine applications?

American Boat and Yacht Council (ABYC) Standards

T-1 Aluminum Applications for Boats and Yachts

Applying Finishes

Task Number 61

Select finishing materials, identifying precautions for their use.

Definition

Selection of materials should include oil finish, gel coat, primer and paint, wax, epoxy, and varnish. It should also include the amount of each finishing material required and the precautions necessary for each type of material.

Process/Skill Questions

- What precautions should the finish technician take when safely using finish chemical products? Why?
- What factors should the finish technician consider when selecting finish types for various surfaces?

American Boat and Yacht Council (ABYC) Standards
T-19 Fabrication Equipment, Procedures, and Materials Quality Control

Task Number 62

Prepare surface.

Definition

Performance should consist of preparing the surface according to industry standards and manufacturers’ instructions.

Process/Skill Questions

- What are the most common sandpaper grits and the uses of each?
- What are the special products, processes, and safety considerations involved in finishing repaired fiberglass-reinforced plastic (FRP)?

American Boat and Yacht Council (ABYC) Standards

T-19 Fabrication Equipment, Procedures, and Materials Quality Control

Task Number 63

Prepare/apply primer.

Definition

Performance should consist of preparing and applying primer according to industry standards and manufacturer’s instructions.

Process/Skill Questions

- Which primer should be used beneath topcoats over steel? Why?
- Which primer should be used beneath topcoats over fiberglass? Why?
- What is flash time? Why is it important?

American Boat and Yacht Council (ABYC) Standards

T-19 Fabrication Equipment, Procedures, and Materials Quality Control
Task Number 64

Apply masking and pull tapes.

Definition

Performance should consist of applying masking and pull tapes according to industry standards and manufacturers’ instructions.

Process/Skill Questions

- Why should newspaper not be used as a masking medium?
- How can the quality of masking tape affect the finished product?
- How does 10-day pull tape work? What advantages does it provide?

American Boat and Yacht Council (ABYC) Standards

T-19 Fabrication Equipment, Procedures, and Materials Quality Control

Task Number 65

Apply finish by hand.

Definition

Performance should consist of applying finish by hand, as appropriate, according to industry standards and manufacturers’ instructions.

Process/Skill Questions

- What is the procedure for aligning brush selection with type of finish being used?
- What factors should be considered when selecting thinners for hand application? For spray application? Why?
- What is the difference between long stroke and short stroke techniques? In what situations should each type of technique be used?

American Boat and Yacht Council (ABYC) Standards
Task Number 66

Apply finish with spray equipment.

Definition

Performance should consist of applying finish with spray equipment, as appropriate, according to industry standards and manufacturers’ instructions.

Process/Skill Questions

- What is the main advantage of using high volume/low pressure (HVLP) spray equipment over traditional spray equipment?
- What is the importance of spray gun to target distance?
- What is the importance of gun travel speed in finish applications?

American Boat and Yacht Council (ABYC) Standards

Performing Fiberglass Construction and Repair

Task Number 67

Describe common composite construction/fiberglass-reinforced plastics (FRP) and equipment used in fiberglass construction and repair.

Definition

Description should include plastics and equipment such as resin types, catalysts, filler powders, solvents, cloth types, core materials, appropriate tools of the trade, and gel coats.
Process/Skill Questions

- What are the most common hazards of solvents?
- How does the repair of materials for fiberglass differ from the repair of materials for FRP?
- What role does a catalyst play in working with fiberglass and FRPs?
- Why is fiberglass used so often in marine construction?

American Boat and Yacht Council (ABYC) Standards

T-19 Fabrication Equipment, Procedures, and Materials Quality Control

Maintaining and Repairing Inboard and Inboard/Outboard Engine Systems

Task Number 68

Identify basic engine systems, subsystems, and components.

Definition

Basic engine systems, subsystems, and components should include electrical, cooling, ignition, and fuel systems and subsystems; power trim; stern drive; jet drive; engine controls/rigging; inboard drive system; and lubricating.

Process/Skill Questions

- What are the basic engine systems, subsystems, and components?
- What are the differences between an inboard engine system and an outboard engine system?
- What is the procedure for troubleshooting different marine engine systems?

American Boat and Yacht Council (ABYC) Standards

E-10 Storage Batteries

E-11 AC and DC Electrical Systems on Boats

H-24 Gasoline Fuel Systems
Task Number 69

Follow correct procedures in the installation of marine components in compliance with the U.S. Coast Guard Code of Federal Regulations (CFR) and standard-compliant installations.

Definition

Following correct procedures includes compliance with the U.S. Coast Guard Code of Federal Regulations and with professional industry standards, including those of the American Boat and Yacht Council (ABYC) and the National Fire Protection Association (NFPA).

Process/Skill Questions

- What components must be inspected in accordance with procedures for compliance with the Code of Federal Regulations (CFR)?
- Who develops professional industry standards?
- Why are standards important to an industry?

American Boat and Yacht Council (ABYC) Standards

E-10 Storage Batteries

E-11.5 AC and DC Electrical Systems on Boats, Requirements

E-11.6 AC and DC Electrical Systems on Boats, System Voltage
Maintaining and Repairing Outboard Engine Systems

Task Number 70

Identify basic engine systems (two-and four-cycle), subsystems, and components.

Definition

Identification should include systems such as electrical, cooling, ignition, and fuel, as well as jet drive, power trim, gear cases, and engine controls/rigging. In the case of fuel, identification should emphasize scavenging and appropriate refueling applications.

Process/Skill Questions

- What is the difference between a propeller and an impeller?
- What are the differences between a 2- and 4-cycle engine?
- What are the procedures for troubleshooting different outboard engine systems?

American Boat and Yacht Council (ABYC) Standards

E-10 Storage Batteries

E-11 AC and DC Electrical Systems on Boats

H-24 Gasoline Fuel Systems

H-26 Powering of Boats
Understanding Marine Systems

Task Number 71

Explain basic electrical theory.

Definition

Explanation should include Ohm’s Law, voltage drop, amperage draw, and AC and DC circuits.

Process/Skill Questions

- What is Ohm’s Law? Why is it important?
- How is voltage drop calculated?
- What is the difference between AC and DC? How is each used on vessels?
- How is amperage draw determined in AC and DC circuits? What is its importance?

American Boat and Yacht Council (ABYC) Standards

E-11 AC and DC Electrical Systems on Boats

Task Number 72

Describe basic maintenance procedures for a marine electrical system, using appropriate marine electrical connectors, according to ABYC standards.
Definition

Maintenance should include checking battery chargers and power inverters, as well as using appropriate marine electrical connectors.

Process/Skill Questions

- What is the procedure for load testing a battery?
- What factors should be considered when replacing a battery?
- What is the difference between a parallel and a series circuit? How does this difference relate to maintenance of a marine electrical system?

American Boat and Yacht Council (ABYC) Standards

A-27 Alternating Current (AC) Generator Sets

E-11 AC and DC Electrical Systems on Boats

H-22 Electrical Bilge Pump Systems

H-23 Installation of Potable Water Systems for Use on Boats

Task Number 73

Identify various components of a fuel system and their uses and the process of rigging a fuel system according to ABYC standards.

Definition

Identification should include the components of a fuel system (e.g., fuel supply, fuel tank, fill vent, lines/hoses, filters, pump, carburetor, electronic/electro-mechanical components) and the uses of each. It should also include the process of rigging a fuel system according to ABYC standards.

Process/Skill Questions

- What is the difference between an electrical fuel pump and a mechanical fuel pump?
- Why should a fuel filter be replaced? How often?
- What should be added to fuel when it is stored for long periods of time? Why?
- What is meant by “rigging a fuel system”? Why is it important?
- Under what circumstances should the fuel be emptied from a fuel system? Why?
American Boat and Yacht Council (ABYC) Standards

H-2 Ventilation of Boats Using Gasoline

H-24 Gasoline Fuel Systems

H-32 Ventilation of Boats Using Diesel Fuel

H-33 Diesel Fuel Systems

Task Number 74

Explain basic plumbing practices and maintenance related to marine use, according to ABYC installation standards.

Definition

Explanation should include plumbing practices for seacocks and installations, hose types, and pumps.

Process/Skill Questions

- What is the purpose of a seacock?
- What are the different types of pumps used in a boat? What is the purpose of each?
- What plumbing systems are used on boats that contain a head, shower, and galley sink? Briefly, how does each of these systems function? What routine maintenance do they require?

American Boat and Yacht Council (ABYC) Standards

H-22 Electrical Bilge Pump Systems

H-23 Installation of Potable Water Systems for Use on Boats

H-27 Seacocks, Thru-Hull Connections, and Drain Plugs

Practicing Safe Vessel Transportation on Land
Task Number 75

Describe the techniques for safely launching and recovering a boat from/onto a trailer.

Definition

Description should include techniques such as putting plug in boat before launching, attaching safety chains on trailer, and wearing personal flotation device.

Process/Skill Questions

- What are the basic safety considerations when launching a watercraft?
- What are the hazards when backing a trailer into the water prior to the launch?
- What are the safety considerations for the tow vehicle when launching and recovering a watercraft?

American Boat and Yacht Council (ABYC) Standards

Ty-28 Boat Lifting and Storage

Performing Marina Operations and Yard Services

Task Number 76

Describe the procedures for preparing a boat for seasonal storage or usage by using manufacturer recommendations or best industry practice.

Definition

Description should include procedures for winterizing/recommissioning the engine and equipment (e.g., head, tanks, plumbing, batteries, pump-out system, and LPG system).
Process/Skill Questions

- What are the procedures for winterizing the engine and equipment?
- What are the procedures for recommissioning the engine and equipment?
- What is an LPG system? How is it winterized?

American Boat and Yacht Council (ABYC) Standards

Ty-28 Boat Lifting and Storage

Task Number 77

Describe the process for stepping/unstepping a spar.

Definition

Description should include rigging the boom, disassembling the stays and shrouds, and lowering the mast.

Process/Skill Questions

- What is the most common spar that is stepped and un-stepped?
- What is the purpose of a fore and back stay?
- What is the purpose of the shrouds?

Task Number 78

Describe the procedure for shrink-wrapping an object, according to best industry practice, identifying problems that can arise during the process.

Definition

Description should reflect industry practices studied or observed by students. Potential problems with shrink wrapping include overheating and melting.

Process/Skill Questions

- What is the purpose of shrink wrap?
- What happens when shrink wrap gets too hot? What are the resulting problems?
Task Number 79

Explain the purposes and safe operation of yard equipment.

Definition

Explanation should include the purposes and safe operation of yard equipment such as the following: oil changer, come-along, hydraulic jack, boat stands, boat blocking.

Process/Skill Questions

- What is the purpose of a boat stand? When is it used?
- What is the safest and cleanest way to change the oil in an inboard system?
- What certifications are required for forklift operators? How are they acquired?

American Boat and Yacht Council (ABYC) Standards

Ty-28 Boat Lifting and Storage

Preparing for a Career

Task Number 80

Research the diverse career opportunities available in the marine trades and the training, education, and other credentials required for each.

Definition

Explanation should include a range of career opportunities such as marina service technicians, marine technicians, and marine engineers, as well as careers in vessel operation, retail, and the military.

Process/Skill Questions

- What career pathways are available in the marine trades? How does marine service technology fit into one or more of these pathways?
- What are the personal advantages of being a marine industry employee?
Task Number 81

Research job openings.

Definition

Research should include a variety of resources including print (e.g., newspaper), electronic (e.g., Internet), and in-person (e.g., on-site signage, bulletin boards, and industry personnel).

Process/Skill Questions

• What types of marine industry job openings exist for entry-level employees in your locality? in Virginia? in other states? internationally?
• What are the strengths and weaknesses of the Internet as a job resource? Of the newspaper? Of in-person job searches and networking?

SOL Correlation by Task

| Explain the importance of workplace safety. | English: 10.5, 11.5 |
| Follow general workplace safety procedures. | History and Social Science: GOVT.9, GOVT.15 |
| Practice ergonomically correct work methods. |                                  |
| Practice safety when working on and around docks and ramps. |                                  |
| Follow emergency safety procedures. | History and Social Science: GOVT.9, GOVT.15 |
| Maintain safe work area. | History and Social Science: GOVT.9, GOVT.15 |
| Identify, use, and store hazardous materials. | History and Social Science: GOVT.9, GOVT.15 |
| Use personal protective equipment. | History and Social Science: GOVT.9, GOVT.15 |
| Operate fire suppression equipment. |                                  |
| Achieve recognized first aid/CPR certification. |                                  |
| Practice safe work procedures with ladders and scaffolds. | History and Social Science: GOVT.9, GOVT.15 |
| Pass Virginia boating safety course. |                                  |
| Select, coil, throw, and handle the lines used for securing, lashing, and towing vessels. |                                  |
| Secure boat to a dock, mooring, and/or anchor. |                                  |
| Maneuver a small boat on water in close quarters. |                                  |
| Create knots used for securing, lashing, and towing vessels. |  |
| Identify various hull types and their intended uses. |  |
| Describe fundamental elements of boat design. |  |
| Use squares, measuring tapes, or rules to measure materials or distances. |  |
| Perform mathematical calculations related to woodworking. |  |
| Describe the types and characteristics of wood used for various kinds of boat construction and repair. | English: 10.5, 11.5 |
| Select correct fastener for a specific application. |  |
| Select finishing materials, identifying precautions for their use. |  |
| Prepare surface. |  |
| Prepare/apply primer. |  |
| Apply masking and pull tapes. |  |
| Apply finish by hand. |  |
| Apply finish with spray equipment. |  |
| Describe common composite construction/fiberglass-reinforced plastics (FRP) and equipment used in fiberglass construction and repair. | English: 10.5, 11.5 |
| Identify basic engine systems, subsystems, and components. |  |
| Follow correct procedures in the installation of marine components in compliance with the U.S. Coast Guard Code of Federal Regulations (CFR) and standard-compliant installations. | English: 10.5, 11.5 History and Social Science: GOVT.15 |
| Identify basic engine systems (two-and four-cycle), subsystems, and components. |  |
| Explain basic electrical theory. | English: 10.5, 11.5 |
| Describe basic maintenance procedures for a marine electrical system, using appropriate marine electrical connectors, according to ABYC standards. | English: 10.5, 11.5 |
| Identify various components of a fuel system and their uses and the process of rigging a fuel system according to ABYC standards. | English: 10.5, 11.5 |
| Explain basic plumbing practices and maintenance related to marine use, according to ABYC installation standards. | English: 10.5, 11.5 |
| Describe the techniques for safely launching and recovering a boat from/onto a trailer. | English: 10.5, 11.5 |
| Describe the procedures for preparing a boat for seasonal storage or usage by using manufacturer recommendations or best industry practice. | English: 10.5, 11.5 |
| Describe the process for stepping/unstepping a spar. | English: 10.5, 11.5 |
Describe the procedure for shrink-wrapping an object, according to best industry practice, identifying problems that can arise during the process.  

Explain the purposes and safe operation of yard equipment.  

Research the diverse career opportunities available in the marine trades and the training, education, and other credentials required for each.  

Research job openings.  

American Boat and Yacht Council (ABYC)  
Information

The Marine Services framework is based on the National Marine Trades Curriculum, developed by the American Boat and Yacht Council (ABYC). Successful completers are entitled to receive a certificate of recognition from the ABYC. Teachers are encouraged to make arrangements by contacting the ABYC at:

American Boat and Yacht Council  
613 Third Street, Suite 10  
Annapolis, MD 21403  
Phone: (410) 990-4460  
Fax: (410) 990-4466  
http://www.abycinc.org/contact.cfm  
info@abycinc.org
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- Marine Service Technician (Inland and Coastal-Core) Assessment
- Marine Service Technology Examination
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Marine Service Technology II (8751/36 weeks, 280 hours)

Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
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<tbody>
<tr>
<td>Facility and Mobile Equipment Maintenance</td>
<td>Marine Watercraft Repair and Maintenance Worker</td>
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<tr>
<td></td>
<td>Motorboat Mechanic</td>
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<tr>
<td></td>
<td>Service Technician</td>
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<td></td>
<td>Small Engine Mechanic</td>
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<tr>
<td>Transportation Operations</td>
<td>Motorboat Operator</td>
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<td></td>
<td>Ship Engineer</td>
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