

Marine and Outdoor Power Equipment Technician Level 1

Marine and Outdoor Power Equipment Technician

Unit: A1 Orientation I: Structure and Scope of Marine and Outdoor Power Equipment Technician Trade Learning

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Jobsite learning and teaching have long been fundamental to Marine and Outdoor Power Equipment Technician trade-practice, including its safety, health, and environmental implications. The chance to gain maximum benefit from workplace trade learning can be shaped by such complex factors as production schedules and jobsite politics. As adult trade-learners, Marine and Outdoor Power Equipment Technician apprentices at all levels of skill-development are encouraged to use their eyes, ears, prior knowledge, and interpersonal skills to encourage journeymen to teach as well as to supervise them. This requires understanding the trade's dynamics, including the roles and responsibilities that order jobsite activity. Unit content outlines the trade's skill-requirements and long-term career possibilities. It includes suggestions about trade-related learning styles/strategies. It also introduces the concept of skills stewardship, stressing the obligations that trainees incur in learning from journeymen to 'pay it forward' by assisting other newcomers who will follow them into the trade. The unit's purpose is to provide this essential information about learning to learn as a Manitoba Marine and Outdoor Power Equipment Technician trainee. Elsewhere in Technical Training, senior trainees explore the importance of learning to teach in trade workplaces – a central function of Marine and Outdoor Power Equipment Technician journeywork.

Objectives and Content:	Percent of Unit Mark (%)
1. Describe the structure and scope of the trade.	30%
a. Historical background, including apprentice experiences	
b. Structure/scope of the trade	
• International and national characteristics	
• Important features of practicing the trade in Manitoba	
• Trade and construction industry organizations	
c. Historical background, including trainee experiences	
• Generalists and specialists	
• Lead hands and other immediate supervisors	
• Geographic mobility	
• Job hierarchies and innovations	
2. Describe the Manitoba Marine and Outdoor Power Equipment Technician Apprenticeship Program.	30%
a. Concept and significance of skills stewardship	
• To the trade	
• To trainees	

- To journeypersons
- To employers
- b. Practical Training: on-site component of program
 - Roles/responsibilities of employer and journeyperson(s)
 - Roles/responsibilities of Apprenticeship Training Coordinator (ATC)
 - Roles/responsibilities of trainee, including record-keeping re: job experience
- c. Technical Training: off-site component of program
 - Roles/responsibilities of instructors (including Related'-area faculty)
 - Roles/responsibilities of trainees
- d. Attendance requirements
- e. Progression requirements
- f. Reporting of grades
- g. Trade Regulation and its significance
- h. Policies (e.g. re: personal conduct, "missed" units, fees, harassment, etc.)
 - Apprenticeship Branch
 - Training provider(s)

3. Describe special opportunities and challenges re: Marine and Outdoor Power Equipment Technician training. 40%

- a. Adapting personal learning goals to program contexts
 - Principles of adult learning (including importance of self-direction)
 - Description/recognition of learning and teaching styles
 - Significance of work culture and interpersonal skills re: trade-learning
 - Integrating Technical Training and Practical Training content
 - Possibilities and perils of peer learning
 - Budgeting and other necessary personal arrangements
 - Identifying sources of support (e.g. upgrading trade-related math skills)
- b. On-site learning challenges and opportunities
 - Significance of jobsite supervision roles and teaching styles (e.g. journey-level skills-coach vs. mentor)
 - Communication with journeypersons and employers
 - Coverage of prescribed tasks/subtasks that define the scope of trade, and the content of the certification exam administered to apprentices who are completing their program
 - Getting help and fixing mistakes
 - Maintaining personal record of trade-learning challenges/achievements (e.g. a learning journal, and/or a personal training plan, if possible, discussed with employers and others supporting the apprenticeship journey to certification)
 - Significance of jobsite supervision roles and teaching styles (e.g. journey-level skills-coach vs. mentor)
 - Communication with journeypersons and employers
- c. In-school opportunities/challenges
 - Personal arrangements that support progress in Technical Training
 - "Baggage-handling" – self-assessing potential impacts of previous experiences (favourable/unfavourable) on current learning; availability of supports
 - Techniques for note-taking, record-keeping, and review
 - Relations with instructors (including 'Related'-area faculty)
 - College resources (library, support services, etc.)

Marine and Outdoor Power Equipment Technician

Unit: A2 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Insulator apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about Insulator safety hazards and precautions presented in the appropriate contexts of discussion and study. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

Objectives and Content:	Percent of Unit Mark (%)
<p>1. Identify safety and health requirements.</p> <ul style="list-style-type: none"> a. Overview of The Workplace Safety and Health Act <ul style="list-style-type: none"> • Rights and responsibilities of employees under the Act • Rights and responsibilities of employers under the Act • Rights and responsibilities of supervisors under the Act b. Fourteen (14) regulations c. Codes of practice d. Guidelines e. Right to refuse <ul style="list-style-type: none"> • Explanation of right to refuse process • Rights and responsibilities of employees • Rights and responsibilities of employers • Rights and responsibilities of supervisors under the Act 	n/a
<p>2. Identify personal protective equipment (PPE) and procedures.</p> <ul style="list-style-type: none"> a. Employer and employee responsibilities as related to personal protective equipment. b. Standards: ANSI (U.S.A. standards), etc. c. Work protective clothing and danger if it fits poorly. d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, 	n/a

- slivers, etc.)
 - e. Headwear – appropriate protective headwear when required and the approved type of headwear.
 - f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
 - g. Foot protection – when required according to safety standards
 - h. Hearing protection
 - Hazards of various noise levels (hearing protection must be worn)
 - Laws
 - Types of hearing protection
 - i. Respiratory protection – types, overview of proper selection
 - j. Fall protection – Manitoba requirements standards guidelines
 - ANSI (U.S.A. standards), etc.
 - k. Ladders and scaffolding
 - l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)
- 3. Identify electrical safety.** **n/a**
- a. Effects of electric current on the human body
 - b. Three factors that affect the severity of an electric shock
 - c. The effects of ARC and blast on the human body and equipment
 - d. Work with energized equipment
- 4. Identify fire safety.** **n/a**
- a. Types of fires
 - b. Types of fire fighting equipment
 - c. Classifications of fire extinguishers (A, B and C)
 - d. Location of fire extinguishers and fire exits
 - e. Fire alarms and drills
- 5. Identify ergonomics.** **n/a**
- a. Definition of ergonomics and conditions that may affect the body
 - Working postures
 - Repetition
 - Force
 - Lifting
 - Tools
 - Identify tool and safety equipment
 - Causes of hand tool accidents
 - Equipment
- 6. Hazard recognition and control.** **n/a**
- a. Safe work practices
 - b. Basic risk assessment
 - c. Injury prevention and control measures
 - d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
- 7. Hazard of confined space entry:** **n/a**
- a. Identification of a confined space
 - b. Hazards of a confined space
 - Physical

- Biological
- c. Working in a confined space
- d. Emergency response plan
- e. Self contained breathing apparatus (SCBA)

8. Identify First Aid/CPR: n/a

- a. Overview of First Aid Regulation
- b. Obligations of employers regarding First Aid
 - Who is certified to provide First Aid?
 - What to do while waiting for help?
 - Where is First Aid kit?
- c. Describe basic First Aid requirements and techniques
 - Scope and limits of First Aid intervention
 - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - What is it?
 - Interface with other services and agencies (eg. Workers Compensation claims)
- d. Describe basic CPR requirements and techniques
 - How do you get certified?
 - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify the safety requirements as they apply to WHMIS with emphasis on: n/a

- a. WHMIS is a system
- b. Provincial Regulation under the Safety and Health Act
 - Each province has a WHMIS regulation
- c. Federal Hazardous Products Act
- d. WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace
 - Information found on supplier and workplace labeling using WHMIS
 - Hazardous materials in accordance with WHMIS
 - Compliance with government safety standards and regulations
- e. Description of WHMIS (include varieties of WHMIS Certification)
 - Typology of WHMIS labels, symbols, and classifications
 - Scope and use of Materials Safety Data Sheets (MSDS)

10. Identifying and controlling hazards: n/a

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Explanation of how to protect the worker and others when working in traffic paths

Marine and Outdoor Power Equipment Technician

Unit: A4 Tools and Equipment

Level: One

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the tools and equipment used when working with today's marine and outdoor power equipment. Beginning with the use of safety and first aid equipment, this unit covers measuring devices, diagnostic and testing tools, hand tools, pneumatic and power tools, cutting/heating tools, shop tools, and the correct usage of these tools. There is a trend towards more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and safety requirements have become more stringent. There is more access to trade information through new information technologies such as CD-ROMs and the Internet. With these developments, future marine and outdoor power equipment technicians must be familiar and comfortable with the use of the wide array of tools and equipment available to them.

Objectives and Content:

**Percent of
Unit Mark (%)**

- | | |
|--|---------------|
| 1. Describe the use of safety and first aid equipment. | 8% |
| a. Safety and first aid equipment as listed in Appendix "A", such as: | |
| <ul style="list-style-type: none">• Dust mask• Ear protectors• Eye wash station• Goggles• Personal protective clothing | |
|
2. Describe the use of measuring devices. |
7% |
| a. Measuring devices as listed in Appendix "A", such as: | |
| <ul style="list-style-type: none">• Air pressure gauge• Caliper• Coolant tester• Oil pressure gauge• Vernier caliper | |
|
3. Describe the use of diagnostic and testing tools. |
7% |
| a. Diagnostic and testing tools as listed in Appendix "A", such as: | |
| <ul style="list-style-type: none">• Alignment tool• Multimeter• Stethoscope• Load tester | |

- Timing light
4. **Describe the use of hand tools.** 7%
 - a. Hand tools as listed in Appendix "A", such as:
 - Allen wrenches
 - Circlip pliers
 - Lock wrench
 - Mechanics fingers
 - Sockets and adapters

 5. **Describe the use of pneumatic and electric power tools.** 7%
 - a. Pneumatic and electric power tools as listed in Appendix "A", such as:
 - Compressed air gun
 - Hydraulic jack
 - Impact tool
 - Riveting equipment
 - Valve spring compressor

 6. **Describe the use of cutting/heating tools and equipment.** 7%
 - a. Cutting/heating tools and equipment as listed in Appendix "A", such as:
 - Electric arc welding equipment
 - Heat gun
 - Oxyacetylene welding and cutting equipment
 - Propane torch
 - Soldering equipment

 7. **Describe the use of shop tools.** 7%
 - a. Shop tools and other equipment as listed in Appendix "A", such as:
 - Air chuck
 - Battery terminal cleaner
 - Carbon scraper
 - Crankshaft puller
 - Dynamometer

 8. **Demonstrate safe and correct use of safety and first aid equipment.** 8%
 - a. Safety and first aid equipment as listed in Appendix "A", such as:
 - Dust mask
 - Ear protectors
 - Eye wash station
 - Goggles
 - Personal protective clothing

 9. **Demonstrate safe and correct use of measuring devices.** 7%
 - a. Measuring devices as listed in Appendix "A", such as:
 - Air pressure gauge
 - Caliper
 - Coolant tester
 - Oil pressure gauge
 - Vernier caliper

 10. **Demonstrate safe and correct use of diagnostic and testing tools.** 7%

- a. Diagnostic and testing tools as listed in Appendix “A”, such as:
 - Alignment tool
 - Multimeter
 - Stethoscope
 - Load tester
 - Timing light

11. Demonstrate safe and correct use of hand tools. 7%

- a. Hand tools as listed in Appendix “A”, such as:
 - Allen wrenches
 - Circlip pliers
 - Lock wrench
 - Mechanics fingers
 - Sockets and adapters

12. Demonstrate safe and correct use of pneumatic and electric power tools. 7%

- a. Pneumatic and electric power tools as listed in Appendix “A”, such as:
 - Compressed air gun
 - Hydraulic jack
 - Impact tool
 - Riveting equipment
 - Valve spring compressor

13. Demonstrate safe and correct use of cutting/heating tools and equipment. 7%

- a. Cutting/heating tools and equipment as listed in Appendix “A”, such as:
 - Electric arc welding equipment
 - Heat gun
 - Oxyacetylene welding and cutting equipment
 - Propane torch
 - Soldering equipment

14. Demonstrate safe and correct use of shop tools. 7%

- a. Shop tools and other equipment as listed in Appendix “A”, such as:
 - Air chuck
 - Battery terminal cleaner
 - Carbon scraper
 - Crankshaft puller
 - Dynamometer

Marine and Outdoor Power Equipment Technician

Unit: A5 Communication and Computer Skills

Level: One

Duration: 9 hours

Theory: 9 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the communication skills needed when working in today's marine and outdoor power equipment industry. Beginning with the types of customers encountered, this unit covers the importance of the customer, the effective techniques in communicating with customers and fellow workers. There is a trend towards more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and safety requirements have become more stringent. There is more access to trade information through new information technologies such as CD-ROMs and the Internet. With these developments, future marine and outdoor power equipment technicians must be able to communicate clearly with customers and fellow workers regarding the operation, service and repair of outdoor power equipment.

Objectives and Content:

**Percent of
Unit Mark (%)**

- | | |
|---|------------|
| 1. Describe the communication skills/modes used in the workplace. | 10% |
| a. Verbal communications | |
| • Face to face contact | |
| • Telephone | |
| b. Written communications | |
| • Letters and memos | |
| • Fax | |
| • Email | |
| 2. Describe the importance of the customer. | 20% |
| a. Costs and benefits of retaining a customer | |
| b. Costs and benefits of gaining new customers | |
| c. Value of repeat business | |
| d. Techniques for recovering 'lost' customers | |
| 3. Describe effective techniques for addressing customer complaints. | 25% |
| a. Written complaints | |
| b. Difficult situations with customers | |
| • Angry customers | |
| • Impatient customers | |
| • Indecisive customers | |
| • Other situations | |

- 4. Describe techniques for maintaining good communications in the workplace. 15%**
- a. Internal communications
 - Support staff
 - Fellow staff (colleagues)
 - Supervisors
 - Management
 - b. External communications
 - Tradespeople
 - Retail customers
 - Wholesale customers
 - Suppliers
 - Authorities (insurance appraisers, safety inspectors)
- 5. Describe basic reading strategies for using and interpreting technical literature. 30%**

Marine and Outdoor Power Equipment Technician

Unit: A6 Fluids and Lubricants

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the fluids and lubricants used when working with today's marine and outdoor power equipment. Beginning with the terminology for oils, greases and other lubricants, this unit covers lubrication and the role of oil, the lubrication requirements of bearings, gears and sliding parts, the lubrication requirements for marine and outdoor power equipment, the types and grades of oils, greases and lubricants, the use of viscosity ratings and lubrication techniques. There is a trend towards more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and safety requirements have become more stringent. There is more access to trade information through new information technologies such as CD-ROMs and the Internet. With these developments, future marine and outdoor power equipment technicians must be familiar and comfortable with the use of the wide array of fluids and lubricants available to them.

Objectives and Content:	Percent of Unit Mark (%)
1. Define terminology associated with oils, greases and other lubricants.	10%
2. Describe lubrication and the role of oil.	20%
a. Cooling	
b. Removal of wear particles	
3. Describe the lubrication requirements of bearings, gears and sliding parts.	15%
a. Plain bearings	
b. Bearings	
• Ball	
• Roller	
• Needle	
c. Gear teeth	
d. Pistons, cylinders	
4. Describe the lubrication requirements for marine and outdoor power equipment.	15%
a. Two stroke crankcase induction engines	
b. Four stroke engines	
c. Transmissions/gear cases/differentials	
d. Suspensions	
e. Drive components	
f. Auxiliary drive components	

- g. Cables, control rods, etc.
- 5. Identify types and grades of oils, greases and other lubricants. 15%**
 - a. API classification
 - b. SAE classification
- 6. Describe the meaning of viscosity ratings and oil service conditions and classifications. 15%**
- 7. Demonstrate lubrication techniques for marine and outdoor power equipment. 10%**
 - a. Two stroke crankcase induction engines
 - b. Four stroke engines
 - c. Transmissions/gear cases/differentials
 - d. Suspensions
 - e. Drive components
 - f. Auxiliary drive components
 - g. Cables, control rods, etc.

Marine and Outdoor Power Equipment Technician

Unit: A7 Fasteners, Bearings and Sealants

Level: One

Duration: 14 hours

Theory: 10 hours

Practical: 4 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the fasteners, bearings and sealants used when working with today's marine and outdoor power equipment. Beginning with coverage of the properties of threaded fasteners, this unit covers operating characteristics, types and properties of bearings, the operating characteristics and types of gaskets and seals, and the installation and removal procedures for fasteners, bearings and sealants. There is a trend towards more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and safety requirements have become more stringent. There is more access to trade information through new information technologies such as CD-ROMs and the Internet. With these developments, future marine and outdoor power equipment technicians must be familiar and comfortable with the use of the wide array of fasteners, bearings and sealants available to them.

Objectives and Content:

**Percent of
Unit Mark (%)**

- | | |
|---|------------|
| 1. Describe the properties of metric and U.S. standard threaded fasteners. | 20% |
| a. Identification | |
| • Thread type and class | |
| • Thread pitch | |
| • Length and diameter | |
| • Head types | |
| b. Thread locking methods | |
| • Lock nuts | |
| • Lock washers | |
| • Anaerobic thread lockers | |
| • Cotter pins, etc. | |
| 2. Describe the operating characteristics and types of bearings. | 20% |
| a. Plain bearings | |
| b. Bushings | |
| c. Insert/shell | |
| d. Thrust washers | |
| e. Plain bearing materials/brass bronze white metal | |
| f. Roller or antifriction bearings | |
| • Ball | |
| • Roller | |
| • Needle | |

- Tapered roller
- Thrust bearings

- 3. Describe the properties of bearings. 20%**
- Lubrication requirements
 - Adjustments
 - Tapered roller bearings (e.g., wheel bearings)
 - Inspection for common bearing faults
- 4. Describe the operating characteristics and types of gaskets and seals. 10%**
- Gaskets
 - Paper
 - Neoprene
 - Composite
 - Metal
 - Rings
 - O rings
 - Quad rings
 - X rings
 - Sealants (gasket compounds)
 - Lipped seals
 - Labyrinth seals
 - Piston rings
 - Ceramic seals
 - Other seal types
- 5. Demonstrate installation and removal procedures for fasteners. 10%**
- Manufacturer or industry torque tables and tightening patterns
 - Removal and replacement of non threaded fasteners such as snap rings
- 6. Demonstrate installation and removal procedures for bearings. 10%**
- Manufacturers' specifications
 - Procedure for anti friction bearings
 - Procedure for finish size plain bearings
- 7. Demonstrate installation and removal procedures for gaskets and seals. 10%**

Marine and Outdoor Power Equipment Technician

Unit: A8 Unit Assembly and Seasonal Preparation

Level: One

Duration: 25 hours

Theory: 9 hours

Practical: 16 hours

Overview:

This unit is designed to provide the apprentice with the knowledge of unit assembly and seasonal preparation when working with today's marine and outdoor power equipment. Beginning with the procedure for receiving goods, this unit the operation of lifting and towing equipment; uncrating, assembly and PDI procedures; the process for storing power equipment; and the opportunity to demonstrate correct performance of these procedures. The unit also covers the types of pumps, tanks and water systems with respect to general plumbing maintenance procedures for marine and outdoor equipment. In general, manufacturers have moved towards shipment of marine and outdoor power equipment that is nearly ready for use. More accessories are becoming standard or optional equipment. Although units come almost fully assembled, the availability of an expanding selection of both OEM and aftermarket accessories means that technicians must be knowledgeable about the applications and installations of these accessories. With these developments, along with higher expectations from consumers, future marine and outdoor power equipment technicians must be familiar and conversant in both the marine and outdoor power equipment products themselves and their assembly/pre-delivery. Plumbing on marine equipment has benefited from engineering enhancements originating from the plumbing industry. For example, the use of the latest lighter-weight PVC-type materials are used for plumbing applications on marine products. Consumer demand for higher levels of amenities has resulted in the marine and outdoor power equipment technician's need for knowledge on plumbing applications.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the procedure for receiving goods.	5%
2. Describe the operation of lifting and towing equipment.	5%
a. Hoisting equipment	
b. Lifting equipment	
c. Securing equipment	
3. Describe the uncrating and assembly procedures.	5%
a. Inspection	
b. Ensure all parts are accounted for	
c. Assemble according to instructions	
d. Ensure cables and wires are properly routed	
e. Ensure all required fluids are at proper levels	
f. Ensure batteries and related items are prepared for service if applicable	
g. Adjust all belts, chains and control cables as required	
h. Ensure wheels and steering are properly installed, tightened and adjusted	

- | | |
|--|------------|
| 4. Describe repair procedures for minor cosmetic damage. | 5% |
| 5. Describe the PDI procedure. | 5% |
| a. Manufacturers' specifications | |
| 6. Describe the preparation of power equipment for long term storage. | 5% |
| a. Cleaning | |
| b. Batteries | |
| c. Fuel, fuel tanks and fuel systems | |
| d. Oil | |
| e. Cooling systems | |
| f. Fogging | |
| 7. Define terminology and concepts associated with plumbing applications on marine and outdoor power equipment. | 5% |
| 8. Describe the types of pumps and their related components. | 5% |
| 9. Describe the types of tanks and their related components. | 5% |
| 10. Describe the types of water systems and their related components. | 5% |
| 11. Describe general plumbing maintenance procedures. | 5% |
| a. Manufacturers' specifications | |
| b. Flushing | |
| c. Sanitizing | |
| d. Off-season storage | |
| e. Pre-season preparation | |
| 12. Demonstrate correct operation of lifting and towing equipment. | 15% |
| a. Hoisting equipment | |
| b. Lifting equipment | |
| c. Securing equipment | |
| d. Forklifts | |
| 13. Perform uncrating and assembly procedures. | 15% |
| a. Inspection | |
| b. Ensure all parts are accounted for | |
| c. Assemble according to instructions | |
| d. Ensure cables and wires are properly routed | |
| e. Ensure all required fluids are at proper levels | |
| f. Ensure batteries and related items are prepared for service if applicable | |
| g. Adjust all belts, chains and control cables as required | |
| h. Ensure wheels and steering are properly installed, tightened and adjusted | |
| 14. Perform PDI procedure. | 15% |
| a. Manufacturers' specifications | |

Marine and Outdoor Power Equipment Technician

Unit: A9 Trade Related Documents

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about trade related documents used in today's marine and outdoor power equipment industry. Beginning with the uses of the service and parts manuals, this unit covers the use of service manuals, parts manuals, the parts ordering procedure and the information required to prepare a work order. There is a trend towards more access to trade information through new information technologies such as CD-ROMs and the Internet. With these developments, future marine and outdoor power equipment technicians must be readily able to use service and parts manuals to find service procedures and parts numbers, and be able to take and complete work orders for the repair and service of marine and outdoor power equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Access the correct service manual and parts manual for outdoor power equipment.	30%
a. Use of model and serial number identification	
b. Use of print materials	
c. Use of digital media	
d. Use of computer terminal, internet, or other online systems	
e. Use of microfiche	
2. Identify the uses of service manuals.	10%
a. Maintenance intervals	
b. Maintenance procedures	
c. Capacities	
d. Service and repair procedures	
e. Specifications	
3. Identify the uses of parts manuals.	10%
a. Part numbers for parts	
b. Part numbers for components	
4. Describe parts ordering procedures for marine and outdoor power equipment.	10%
a. Manufacturers' ordering systems	
b. Typical dealer ordering systems	
5. Describe information required in a typical work order.	20%

- a. Required information
- b. Work completed
- c. Parts installed
- d. Estimate for repairs
- e. Service procedures
- f. Equipment evaluation

6. Prepare various types of work orders.

20%

- a. Required information
- b. Work completed
- c. Parts installed
- d. Estimate for repairs
- e. Service procedures
- f. Equipment evaluation

Marine and Outdoor Power Equipment Technician

Unit: B1 Trade Mathematics I

Level: One

Duration: 18 hours

Theory: 18 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to use mathematics with precision, resourcefulness and confidence. This unit is intended to help make the world of numbers and ratios work for, rather than against, the marine and outdoor power equipment apprentice. Beginning with an overview of the importance of math to the trade, the unit covers strategies to address math anxiety, a review of general mathematical concepts including the use of calculators, and an overview of trade-related mathematics. The trend in the marine and outdoor power equipment industry is towards more efficient tools, methods of repair and more sophisticated diagnostic techniques. Workplaces have become safer and safety requirements have become more stringent. There is more access to trade information through new information technologies such as CD-ROMs and the Internet. Along with these developments, it follows that a solid foundation in mathematics will greatly benefit the future marine and outdoor power equipment technician.

Objectives and Content:

**Percent of
Unit Mark (%)**

- | | |
|---|------------|
| 1. Describe the practical importance of math disciplines to the Marine and Outdoor Power Equipment Technician trade. | 10% |
| a. Definition and scope of relevant math disciplines | |
| b. Time-sheets, wages, and personal budgeting | |
| c. Engineering of tools and equipment | |
| d. Manufacture and packaging of transport trailer materials and products | |
| e. Trade documents, including manufacturers' specifications | |
| f. Computer technology/applications | |
| g. Design/technical drawing | |
| h. Work order preparation | |
| i. Machinery and equipment set-up | |
| j. Measurement and related test readings | |
| • Temperatures | |
| • Pressures | |
| • Other measured quantities | |
| k. Customer relations/perceptions (e.g. schedules, timetables, etc.) | |
| l. Business management | |
|
 | |
| 2. Describe "math anxiety" and its remedies. | 10% |
| a. Definition | |
| b. Recognition | |
| c. Options, resources, and techniques for overcoming math anxiety | |

- d. Other common problems
 - Importance of adult learner's recognition of existing math strengths and weaknesses
 - Importance of early resolution during term of apprenticeship
 - Options/resources for remedial math instruction and other assistance

3. Review general math concepts and use of electronic calculators.

40%

- a. Basic operations
 - Addition
 - Subtraction
 - Multiplication
 - Division
 - Order of operations
 - Fractions and decimals
- b. Ratio and proportion
- c. Percentage calculations
- d. Constructing/solving simple equations
- e. Trigonometry functions
- f. Units of measure
 - Imperial
 - Metric (SI)
 - Conversion factors
- g. Calculator use
 - Basic operation keys/functions
 - Percentage keys/functions
 - Trig keys/functions
 - Keys/functions re: memory and constants

4. Demonstrate trade-related calculations as specified by instructor.

40%

- a. Linear measurement
- b. Area and volume
- c. Ratio/proportion
 - Ratios
 - Percentages
 - Rates
- d. SI/Metric Units (including Conversions)

Marine and Outdoor Power Equipment Technician

Unit: C1 Fundamentals of Engines

Level: One

Duration: 35 hours

Theory: 20 hours

Practical: 15 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the principles of engines and related components found in today's marine and outdoor power equipment. Beginning with an overview of related engine terminology, this unit covers basic engine principles, the main components of a typical engine, the operation of those main components and the engine identification and inspection process. There is a trend towards larger displacement, higher output and lighter components. Manufacturers' tolerances are tighter and engines have benefited from better engineering and design, better lubricants and new materials and technologies.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with engines and related components.	10%
2. Describe basic engine principles and combustion theory.	10%
a. Types of energy and its characteristics	
b. Motion	
c. Conversion process of energy into rotary motion	
d. Engine displacement	
e. Compression ratios	
f. Operation of two-stroke cycle engines	
g. Operation of four-stroke cycle engines	
3. Identify the main components of an engine.	10%
a. Cylinder heads and subcomponents	
b. Valve systems and subcomponents	
c. Pistons and subcomponents	
d. Crankshaft/crankshaft assemblies and subcomponents	
e. Cooling systems and subcomponents	
f. Lubrication systems and subcomponents	
4. Describe the operation of the main components of an engine.	10%
a. Cylinder heads and subcomponents	
b. Valve systems and subcomponents	
c. Pistons and subcomponents	
d. Crankshaft/crankshaft assemblies and subcomponents	
e. Cooling systems and subcomponents	

- f. Lubrication systems and subcomponents

- 5. Describe the applications of two-stroke cycle engines. 5%

- 6. Describe the applications of four-stroke cycle engines. 5%

- 7. Describe engine identification and inspection processes. 10%

- 8. Perform an engine inspection. 20%

- 9. Perform checks and measurements on main components of an engine. 20%
 - a. Valve timing and operation
 - b. Pressure check
 - c. Evaluate component conditions.

Marine and Outdoor Power Equipment Technician

Unit: D1 Primary Drive Systems

Level: One

Duration: 50 hours

Theory: 25 hours

Practical: 25 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the principles of primary drive systems, including clutches, found in today's marine and outdoor power equipment. Beginning with an overview of primary drive systems terminology, the unit covers the components of primary drive systems and the principles of operation of drive belts, chain drives, drive clutch and driven clutch. The unit ends by covering procedures related to the troubleshooting and repair of primary drive systems. Drivetrains on both marine and outdoor power equipment have benefited from engineering enhancements, from improved piston design to the use of new lighter-weight components using carbon fiber. Increasingly, units come standard with digital operator controls and digital throttle and shift (DTS).

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with primary drive systems.	5%
2. Identify components associated with primary drive systems.	5%
a. Drive belts	
b. Chain drives (silent, detachable)	
c. Drive clutch	
d. Driven clutch	
3. Describe the principles of operation of drive belts.	5%
a. Installation and removal procedures	
b. Failure avoidance	
c. Relationship to the transmission	
d. Alignment	
4. Describe the principles of operation of chain drives.	5%
a. Installation and removal procedures	
b. Failure avoidance	
c. Relationship to the transmission	
d. Alignment	
5. Describe the principles of operation of a drive clutch.	5%
a. Installation and removal procedures	
b. Failure avoidance	

- Clutch wear
 - Clutch lubrication and cleaning
- c. Power theory and relationship to the driven clutch
- d. Adjustment
- 6. Describe the principles of operation of a driven clutch. 5%**
- a. Installation and removal procedures, including disassembly and reassembly
 - b. Failure avoidance
 - c. Power theory and relationship to the driven clutch
 - d. Adjustments
 - Adjusting offset
 - Adjusting centre distance
 - Adjusting parallelism
- 7. Describe the applications of types of clutches. 5%**
- a. Applications used on marine and outdoor power equipment
 - Automatic clutches
 - Manual clutches
 - b. Operation of belt tensioning clutches
 - c. Operation of disk/plate clutches
 - d. Operation of electromagnetic clutches
 - e. Operation of cone clutch
 - f. Operation of jaw clutch
 - g. Troubleshooting and repair
 - Types of clutch damage
- 8. Describe troubleshooting and repair procedures on primary drive systems. 15%**
- 9. Demonstrate installation and removal procedure on primary drive systems. 15%**
- a. Drive belts
 - b. Chain drives (silent, detachable)
 - c. Drive clutch
 - d. Driven clutch
 - e. Gear housing
 - f. Drive unit
- 10. Perform troubleshooting and repair procedures on primary drive systems. 35%**
- a. Drive belts
 - b. Chain drives (silent, detachable)
 - c. Drive clutch
 - d. Driven clutch
 - e. Gear housing
 - f. Drive unit

Marine and Outdoor Power Equipment Technician

Unit: E1 Fuel Systems I

Level: One

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the fundamentals of fuel systems and components found in today's marine and outdoor power equipment. Beginning with an overview of fuel systems terminology, the unit covers the principles of operation of fuel systems and associated components, and the diagnostic and repair procedures for these systems. Fuel systems on both marine and outdoor power equipment have benefited from engineering enhancements such as the use of advanced fuel management systems. These computer-controlled fuel management systems provide better fuel economy and quieter operation. Consumer demand for ATVs and similar multi-wheeled vehicles with higher performance have resulted in the availability of superchargers on select units.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with fuel systems and components.	10%
2. Identify components of fuel systems.	10%
3. Describe the principles of operation of fuel systems and associated components.	15%
a. Carburetors and subcomponents	
b. Fuel tanks and subcomponents	
c. Fuel pump	
d. Air delivery systems	
4. Describe the diagnostic procedures for fuel systems.	15%
a. Sensory inspection	
b. Manufacturers' specifications	
c. Common causes of failure	
5. Describe the repair procedures for fuel systems.	15%
6. Perform inspection and evaluation of fuel systems and related components.	15%
a. Measurements	
• Carburetors: calibration, synchronization and float height	
• Fuel tank and components: pressure and volume	
• Air delivery systems: air flow test and vacuum test	
b. Evaluation of component conditions	

c. Determine causes of component failure

7. Perform repair procedures on fuel systems and related components.

20%

- a. Measurements
- b. Removal and replacement of components
- c. Correct causes of component failure

Marine and Outdoor Power Equipment Technician

Unit: E3 Exhaust Systems I

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the fundamentals of exhaust systems and components found in today's marine and outdoor power equipment. Beginning with an overview of exhaust systems terminology, the unit covers the principles of operation of exhaust systems and associated components, the types of exhaust systems, and the diagnostic and repair procedures for these systems. Exhaust systems on both marine and outdoor power equipment have benefited from engineering enhancements such as the use of advanced exhaust management systems. These computer-controlled exhaust management systems provide better fuel economy and quieter operation. Consumer demand for ATVs and similar multi-wheeled vehicles with higher performance have resulted in the availability of turbochargers on select units.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with exhaust systems and components.	10%
2. Describe the various types of exhaust systems.	10%
3. Identify components of exhaust systems.	10%
a. Muffler	
b. Spark arrestor	
c. Header pipe	
d. Expansion chamber	
e. Exhaust variable valve	
f. Exhaust hoses	
g. Reversion valves	
h. Exhaust plates and housings	
i. Wet sleeves	
j. Manifolds	
k. Elbows	
4. Describe the principles of operation of exhaust systems and associated components.	10%
a. Fuel system operation	
5. Describe the diagnostic procedures for exhaust systems.	20%
a. Sensory inspection	
b. Manufacturers' specifications	

c. Common causes of failure

6. Describe the repair procedures for exhaust systems. 20%

7. Perform repair procedures on exhaust systems and related components. 20%

a. Measurements

b. Removal and replacement of components

c. Correct causes of component failure

Marine and Outdoor Power Equipment Technician

Unit: F2 Steering Systems I

Level: One

Duration: 10 hours

Theory: 5 hours

Practical: 5 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the manual steering systems found in today's marine and outdoor power equipment. Beginning with an overview of terminology associated with manual steering systems, the unit covers the types of manual steering systems used, their operation, their components, and the repair procedures for manual steering systems. Chassis, steering, suspension, brakes and tires on units have benefited from engineering enhancements. Marine products have incorporated improvements to hull design and components; ATVs and similar multi-wheeled vehicles have incorporated improved suspension technologies for enhanced handling and rider comfort. In addition to use of new tire compounds, the industry has begun to apply nanotechnologies.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with manual steering systems.	10%
2. Identify the types of manual steering systems used for marine and outdoor power equipment.	10%
3. Describe the operation of the types of manual steering systems.	10%
4. Identify the components of manual steering systems.	10%
a. Steering heads	
b. Shafts	
c. Bearings	
d. Seals	
e. Cables	
f. Pulleys	
5. Identify manual steering linkage types.	10%
6. Describe the diagnostic procedures for exhaust systems.	10%
a. Sensory inspection	
b. Adjustments according to manufacturers' specifications	
• Caster	
• Camber	
• Toe in/out	
• Other adjustments	

c. Common causes of failure (stress, water damage, shock load)

7. Perform inspection and evaluation of manual steering systems and their components. 20%

- a. Measurements
 - Adjustment checks
 - Preload
- b. Evaluation of component conditions
- c. Determine causes of component failure

8. Perform repair procedures on manual steering systems and their components. 20%

- a. Measurements
- b. Adjustments according to manufacturers' specifications
 - Caster
 - Camber
 - Toe in/out
 - Other adjustments
- c. Removal and replacement of components
 - Shafts, bearings, seals, cables and pulleys
- d. Correct causes of component failure

Marine and Outdoor Power Equipment Technician

Unit: F6 Wheels/Tracks and Undercarriages

Level: One

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about the wheels/tracks and undercarriages found in today's marine and outdoor power equipment. Beginning with an overview of terminology associated with wheels/tracks and undercarriages, the unit covers the types of wheels, industry conventions for labeling, track selection, and repair and service procedures for wheels/tracks and undercarriages. Chassis, steering, suspension, brakes and tires on units have benefited from engineering enhancements. Marine products have incorporated improvements to hull design and components; ATVs and similar multi-wheeled vehicles have incorporated improved suspension technologies for enhanced handling and rider comfort. In addition to use of new tire compounds, the industry has begun to apply nanotechnologies.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with wheels/tracks and undercarriages.	5%
2. Describe the types of wheels common to the outdoor power equipment industry.	5%
3. Describe wheels/tracks and undercarriages and their components.	10%
4. Describe the industry conventions for labeling tire size and applications.	10%
5. Describe snowmobile track types and sizes.	5%
6. Describe track selection for specific applications.	5%
7. Describe accessory or replacement track types and modifications.	10%
a. Types and profiles	
b. Pitch and driver styles	
c. Traction aids	
d. Stud types	
e. Cleats and claws	
f. Paddles	
g. Installation and clearances	
8. Describe the repair procedures for wheels/tracks and undercarriages.	10%
a. Sensory inspection	

- b. Manufacturers' specifications (tolerances)
- c. Common causes of failure

9. Perform inspection and evaluation of wheels/tracks and undercarriages. 20%

- a. Measurements
 - Clearances
 - Tolerances
 - Tread wear patterns
 - Balancing
- b. Evaluation of component conditions (worn, damaged, defective)
- c. Determine causes of component failure

10. Perform repair procedures on wheels/tracks and undercarriages. 20%

- a. Measurements
- b. Manufacturers' specifications
 - Alignment
 - Tension
 - Track width
- c. Removal and replacement of components
 - Tube and tubeless tires
 - Wheel hubs
- d. Correct causes of component failure (locate and repair punctures in tubes/tires)

Marine and Outdoor Power Equipment Technician

Unit: G1 Electrical Principles I

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge of the relevant electrical principles for working with today's marine and outdoor power equipment. Beginning with an overview of terminology and concepts associated with the basic electrical circuit, the unit covers common electrical related calculations, the basic electrical circuit types and their faults, and marine and outdoor power equipment circuits. Electrical and electronic components on both marine and outdoor power equipment have benefited from engineering enhancements, from electronic shifting to digital ignitions and electronic operator controls. Consumer demand for higher levels of amenities and performance has resulted in availability of such features as command start, heated seats and block heaters.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology and concepts associated with the basic electrical circuit.	30%
a. Electrical safety	
b. Voltage	
c. Amperage	
d. Resistance	
e. Conductors and insulators	
f. Direct Current (DC) and Alternating Current (AC)	
g. Ohm's law	
h. Wire and connector repair	
i. Relays	
j. Magnetism concepts	
k. Others	
2. Describe common electrical related calculations.	35%
a. Power (watts), given voltage and amperage	
b. Voltage	
c. Amperage	
d. Resistance	
e. Other related calculations	
3. Define the basic electrical circuit types and their faults.	35%
a. Series circuit	
b. Parallel circuit	

- c. Ground (DC)
- d. Short
- e. Open
- f. Loads
- g. Switches
- h. Fuses and circuit breakers
- i. Others

Marine and Outdoor Power Equipment Technician

Unit: G3 Batteries

Level: One

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the relevant electrical systems knowledge (batteries) for working with today's marine and outdoor power equipment. Beginning with an overview of terminology and concepts associated with batteries, the unit covers batteries and chargers, and battery servicing and maintenance procedures. Electrical and electronic components on both marine and outdoor power equipment have benefited from engineering enhancements, from electronic shifting to digital ignitions and electronic operator controls. Consumer demand for higher levels of amenities and performance has resulted in availability of such features as command start, heated seats and block heaters.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology and concepts associated with batteries.	20%
2. Describe batteries and chargers. a. Type b. Construction c. Operation	20%
3. Describe marine and outdoor power equipment circuits. a. Battery operated starting motor	20%
4. Describe battery servicing and maintenance procedures. a. Manufacturers' specifications b. Maintenance of electrolyte levels c. Testing and Diagnosis (e.g., charge and specific gravity) d. Short and long term storage e. Refractometer f. Other procedures	20%
5. Perform battery servicing and maintenance procedures. a. Installation and removal procedures b. Manufacturers' specifications c. Maintenance of electrolyte levels d. Testing and Diagnosis (e.g., charge and specific gravity) e. Short and long term storage	20%

f. Other procedures

Marine and Outdoor Power Equipment Technician

Unit: G7 Electrical Accessories

Level: One

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge required to work on the electrical accessories used in today's marine and outdoor power equipment. Beginning with an overview of typical dealer installed electrical accessories, the unit covers the operation of accessories and their components, and the repair and servicing procedures for them. Electrical and electronic components on both marine and outdoor power equipment have benefited from engineering enhancements, from electronic shifting to digital ignitions and electronic operator controls. Consumer demand for higher levels of amenities and performance has resulted in availability of such features as command start, heated seats and block heaters.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Define terminology and concepts associated with batteries.</p> <ul style="list-style-type: none"> a. Wiring procedures b. Battery systems c. Heated grips d. Lights and horns e. Depth and fishfinders f. Radios g. Electric winches h. Alternator output i. Security systems 	15%
<p>2. Describe the operation of accessories and their components.</p>	15%
<p>3. Describe marine and outdoor power equipment circuits.</p> <ul style="list-style-type: none"> a. Aftermarket accessory circuits (radio, grip or seat heaters) b. Winch circuit using relays 	15%
<p>4. Describe the repair procedures for accessories and their components.</p> <ul style="list-style-type: none"> a. Sensory inspection b. Manufacturers' specifications c. Common causes of failure 	15%
<p>5. Perform inspection and evaluation of accessories and their components.</p> <ul style="list-style-type: none"> a. Measurements 	20%

- b. Evaluation of component conditions (corrosion and damaged wiring connectors)
- c. Determine causes of component failure

6. Perform repair procedures on accessories and their components.

20%

- a. Measurements
- b. Manufacturers' specifications
- c. Removal, rewiring and replacement of components
- d. Correct causes of component failure
