Motorsports Technology III

8511 36 weeks / 280 hours

Table of Contents

Acknowledgments ......................................................................................................................................... 1
Course Description ........................................................................................................................................ 2
Task Essentials List ....................................................................................................................................... 2
Curriculum Framework ................................................................................................................................. 3
Applying Safety Practices ............................................................................................................................. 4
Using Tools ................................................................................................................................................... 6
Demonstrating Manual Oxyfuel Gas Cutting (OFC) .................................................................................... 7
Demonstrating Vehicle Setup ....................................................................................................................... 9
Assembling the Vehicle .............................................................................................................................. 10
Ensuring Motorsports Safety ...................................................................................................................... 11
Performing Autobody Procedures ............................................................................................................. 13
Assembling High-Performance Engines ..................................................................................................... 16
SOL Correlation by Task ............................................................................................................................ 20
Entrepreneurship Infusion Units ............................................................................................................... 21
Appendix: Credentials and Career Cluster Information.............................................................................. 22

Acknowledgments

The components of this instructional framework were reviewed by the following curriculum development team members:

Lynnie Doughton, Owner, DRP Performance Products, Rocky Mount
Brian Munsey, President, Brian's Auto Wizard Incorporated, Roanoke
Greg McQuaid, Technical Sales Representative, Lincoln Electric Company, Leesburg
Douglas Newcomb, Teacher, Halifax County High School, Halifax County Public Schools
Charles Overfelt, Owner, Overfelt and Son Welding, Roanoke
Christopher Overfelt, Teacher, Burton Center for Arts and Technology, Roanoke County Public Schools
Kelly Powell, Owner, Powell Motorsports LLC, Roanoke
Brian Seate, Teacher, Halifax County Middle School, Halifax County Public Schools
Course Description

Suggested Grade Level: 12
Prerequisites: 8510

In Motorsports Technology III, students develop advanced skills as they prepare for careers in motorsports technology and the racing industry. Students gain practical experience in vehicle setup, vehicle assembly, and auto body procedures. Emphasis is placed on assembly of high-performance engines and components. In addition, students explore motorsports safety principles and the business aspects of the motorsports industry.

“Motorsports Technology III” may be offered as a complement to an existing concentration sequence in any CTE program area. In some instances, where noted, it may be combined with specific courses to create concentration sequences.

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 List

- 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.
<table>
<thead>
<tr>
<th>Task Number</th>
<th>8511</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applying Safety Practices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>🟢</td>
<td>Follow safety practices.</td>
</tr>
<tr>
<td>40</td>
<td>🟢</td>
<td>Perform housekeeping duties.</td>
</tr>
<tr>
<td>41</td>
<td>🟢</td>
<td>Demonstrate worker and lab safety.</td>
</tr>
<tr>
<td>42</td>
<td>🟢</td>
<td>Follow safety clothing and equipment guidelines.</td>
</tr>
<tr>
<td><strong>Using Tools</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>🟦</td>
<td>Demonstrate the use of a planishing hammer.</td>
</tr>
<tr>
<td>44</td>
<td>🟢</td>
<td>Demonstrate the use of automotive machining lab equipment.</td>
</tr>
<tr>
<td><strong>Demonstrating Manual Oxyfuel Gas Cutting (OFC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>🟢</td>
<td>Demonstrate safety inspections.</td>
</tr>
<tr>
<td>46</td>
<td>🟢</td>
<td>Perform OFC safety procedures.</td>
</tr>
<tr>
<td>47</td>
<td>🟦</td>
<td>Perform straight-cutting operations.</td>
</tr>
<tr>
<td>48</td>
<td>🟦</td>
<td>Perform shape-cutting operations.</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>🟢</td>
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</tr>
<tr>
<td>50</td>
<td>🟢</td>
<td>Identify equipment used in setup procedures.</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>🟢</td>
<td>Demonstrate vehicle assembly safety procedures.</td>
</tr>
<tr>
<td>52</td>
<td>🟢</td>
<td>Perform post-assembly vehicle checklist.</td>
</tr>
<tr>
<td><strong>Ensuring Motorsports Safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>🟢</td>
<td>Describe pit safety.</td>
</tr>
<tr>
<td>54</td>
<td>🟢</td>
<td>Secure a vehicle and equipment for transportation.</td>
</tr>
<tr>
<td>55</td>
<td>🟢</td>
<td>Perform safety checks on vehicle trailer and tow vehicle.</td>
</tr>
<tr>
<td><strong>Performing Autobody Procedures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>🟦</td>
<td>Apply body filler.</td>
</tr>
<tr>
<td>57</td>
<td>🟦</td>
<td>Prepare surface for primer.</td>
</tr>
<tr>
<td>58</td>
<td>🟦</td>
<td>Prime body, parts, and chassis.</td>
</tr>
<tr>
<td>59</td>
<td>🟦</td>
<td>Prepare primed surface for paint.</td>
</tr>
<tr>
<td>60</td>
<td>🟦</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>🟢</td>
<td>Demonstrate the assembly of a high-performance engine.</td>
</tr>
<tr>
<td>62</td>
<td>🟢</td>
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</tr>
<tr>
<td>63</td>
<td>🟢</td>
<td>Assemble the fuel system.</td>
</tr>
<tr>
<td>64</td>
<td>🟢</td>
<td>Assemble the electrical systems.</td>
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<tr>
<td>65</td>
<td>🟢</td>
<td>Assemble drive-line components.</td>
</tr>
<tr>
<td>66</td>
<td>🟢</td>
<td>Assemble hydraulic systems.</td>
</tr>
<tr>
<td>67</td>
<td>🟢</td>
<td>Assemble high-performance suspension components.</td>
</tr>
<tr>
<td>68</td>
<td>🟢</td>
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</tr>
<tr>
<td>69</td>
<td>🟢</td>
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Legend: 🟢Essential 🟦Non-essential ☐Omitted

**Curriculum Framework**
Applying Safety Practices

Task Number 39

Follow safety practices.

Definition

Following safety practices should include wearing proper work attire, using eye and hearing protection, and adhering to equipment operation standards. It should also include following regulations and requirements of the U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and American Welding Society (AWS) concerning the use, storage, and disposal of hazardous materials related to the motorsports industry. Correct applications, training, and penalties associated with each regulation/requirement, according to local ordinances and instructor's guidelines should be observed.

Process/Skill Questions

- When are safety glasses used?
- Why is it important to follow safety regulations?
- What do EPA, OSHA, and AWS stand for?
- What is the purpose of each organization?

Task Number 40

Perform housekeeping duties.

Definition

Performance should include organizing the lab (e.g., tools, work area, and storage) on a daily basis, according to customer service standards and customer and worker safety. It should also include managing supplies and inventory in an efficient manner.

Housekeeping duties should include

- keeping the duty station clean and safe for work
- keeping tools, workbenches, and manual equipment clean, maintained, and safe for work
- responding appropriately to safety hazards
- maintaining the cleanliness of the work area.
Process/Skill Questions

- Why is it important to maintain a clean and orderly work area?
- What are safety advantages that result from good housekeeping?
- How can good housekeeping improve one's overall work efficiency?

Task Number 41

Demonstrate worker and lab safety.

Definition

Demonstration should include

- wearing safety glasses at all times
- wearing clothing appropriate for the job or skill
- wearing personal protective equipment (PPE) when necessary
- following lab safety guidelines
- following the instructor's rules and regulations.

Process/Skill Questions

- Why is PPE important?
- What are some types of PPE?
- Why is it important to follow the instructor's and safety guidelines?

Task Number 42

Follow safety clothing and equipment guidelines.

Definition

Following safety clothing guidelines should include wearing the types of protective clothing and equipment required to protect the eyes, respiratory system, auditory functions, feet, hands, and body. It should also include taking grooming/hygiene precautions related to hair length, loose clothing, jewelry, greasy hands, shoes, or clothing, and avoiding dirty or scratched eye protection. Guidelines should be followed in accordance with manufacturers' instructions and government regulations concerning hazardous materials and lab safety.

Process/Skill Questions

- What are the advantages of using protective clothing?
- Why are safety glasses needed in lab areas?
- Why are grooming/hygiene precautions important in lab areas?
Using Tools

Task Number 43

Demonstrate the use of a planishing hammer.

Definition

Demonstration should include

- selecting the material to be used
- selecting the operational speed
- selecting the die to be used
- forming the material to the desired shape, using the shot bag and hammer
- using the hammer to smooth and shape the material.

Process/Skill Questions

- What are some ways to use a planishing hammer?
- What are some safety precautions when using a planishing hammer?
- What types of materials can be used on the planishing hammer?

Task Number 44

Demonstrate the use of automotive machining lab equipment.

Definition

Demonstration should include the different types of lab equipment encountered in the motorsports technology field according to manufacturers' specifications and instructor's guidelines, to include the following:

- valve resurfacer machine
- valve and seat grinder
- head resurfacing machine
- rod and pin bushing machine
- sonic tester
• crack detector
• valve guide measuring gauge
• precision valve refacer
• valve guide and seat machine
• valve grinding machine
• pressure testing equipment
• pressure washer or cleaning equipment
• camshaft bearing installation tools
• cylinder block and honing machine
• cylinder head displacement machine
• piston pin press
• cylinder boring machine
• rod and pin honing bench
• various types of equipment designed to perform specific tasks

Demonstrating Manual Oxyfuel Gas Cutting (OFC)

Task Number 45

Demonstrate safety inspections.

Definition

Demonstration should include a daily visual inspection of Oxyfuel Gas Cutting (OFC) equipment and accessories (e.g., clothing, hand tools, and base metal), according to the instructor's policy.

Process/Skill Questions

• What pressure should the regulators be set to?
• Why is proper safety important when using OFC?
• Why should one bleed down the lines and regulators on OFC equipment?

Task Number 46

Perform OFC safety procedures.
Definition

Performance should include

- moving cylinders on a three-wheel dolly
- securing cylinders before removing the safety caps
- storing regulators in a safe location after they have been removed
- checking equipment and cylinders for leaks, using the leak detection solution
- using a hand-held spark lighter to light OFC equipment
- making sure all valves on the torch handle are off and all lines are tight before setting pressures.
- adjusting pressures
- lighting the torch.

Process/Skill Questions

- Why should an acetylene cylinder be set upright before its use?
- How long before use should an acetylene cylinder be set upright?
- Why should one install the safety cap before moving the cylinder?

Task Number 47

Perform straight-cutting operations.

Definition

Performance should produce a straight production cut surfaced according to the specifications based on the instructor's guidelines.

Process/Skill Questions

- What steps can you take to facilitate cutting straight lines?
- What is the maximum thickness material that can be cut with an OFC torch?
- What number filter lens would be used in OFC?

Task Number 48

Perform shape-cutting operations.

Definition
Performance should produce a shape cut to the instructor's specifications or to those specified by a drawing.

**Process/Skill Questions**

- Why is it important to brace yourself during OFC?
- When should you clean the tip on the OFC torch?
- What determines the size of the tip on the OFC torch?

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**Demonstrating Vehicle Setup**

**Task Number 49**

**Demonstrate setup safety procedures.**

**Definition**

Demonstration should include

- securing the vehicle
- checking to make sure the master cutoff switch is in the off position or that the battery is disconnected
- raising the vehicle off the ground and placing safety equipment as needed (e.g., weights, scales, stands, etc.).

**Process/Skill Questions**

- Why is proper raising of the vehicle important?
- Why is it important to have a master cutoff switch?
- What is the proper way to disconnect the battery, if no cutoff switch is available?

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**Task Number 50**

**Identify equipment used in setup procedures.**

**Definition**
Identification of equipment used in setup procedures depends on the desired motorsports vehicle. Equipment could include

- tape measure
- plumb bob
- string
- level
- scales
- bump steer gauge
- shock dyno
- stagger gauge
- caster-camber gauge
- toe plates
- durometer
- air gauge
- pyrometer
- squares
- surface plate
- ride height gauge.

**Process/Skill Questions**

- Why is setup important?
- What are some benefits of using scales?
- Why is suspension geometry important?

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**Assembling the Vehicle**

**Task Number 51**

**Demonstrate vehicle assembly safety procedures.**

**Definition**

Demonstration should include the identification of tools and equipment used in assembling a motorsports vehicle.

**Process/Skill Questions**

- Why is fit of tools to fasteners important?
• Why is protection of electrical wiring important?
• Why is routing of brake, fuel, lubrication, and coolant lines important?

Task Number 52

Perform post-assembly vehicle checklist.

Definition

Performance should include

• creating a post-assembly checklist
• assigning tasks on the checklist to an individual
• performing all post-assembly checklist tasks.

Process/Skill Questions

• Why is it important to recheck all installed items?
• Why are checklists needed?
• What are the advantages of having a post-assembly checklist?

Ensuring Motorsports Safety

Task Number 53

Describe pit safety.

Definition

Description should include

• looking both ways before you take a step
• watching where you are walking
• never standing in front of or behind any vehicle while it is being started
• making sure trained emergency personnel are available on site
• keeping the trailer, work areas, and walkways clear of obstructions
• storing fuel in the proper area
• knowing the location of fire equipment
• keeping all flammable products in a safe place.

Process/Skill Questions

• What safety device is used to secure a vehicle when it is being raised to the desired height?
• Where should one stand if a vehicle is being pulled into the trailer? Why?
• What measures should be taken to clean up an oil spill?

Task Number 54

Secure a vehicle and equipment for transportation.

Definition

Securing a vehicle should include the use of properly rated restraints and an additional safety restraint to lock the vehicle from moving. All equipment should be fastened and secured according to the Department of Transportation requirements.

Process/Skill Questions

• How should you determine the rating of straps to be used?
• Should all straps or chains be rated for the correct amount of the load? Why or why not?
• What are some safety issues involved with the securing of the vehicle and equipment?
• When should you re-check the vehicle and the trailer to make sure they are secure? Why?

Task Number 55

Perform safety checks on vehicle trailer and tow vehicle.

Definition

Performance should include

• checking air pressure in all tires
• checking the tow vehicle and trailer for road readiness
• checking for correct trailer ball size
• checking the trailer hitch to tow the vehicle
• checking safety chains, lights, and securing all items
• checking to make sure the vehicle in the trailer is secure
• making sure the proper towing weight is acceptable
• making sure the tongue weight is acceptable.
Process/Skill Questions

- How often should you walk around the tow vehicle and trailer to look for problems?
- When doing your safety check, what should you smell for?
- What would touching the hubs and tires of the trailer tell you?

Performing Autobody Procedures

Task Number 56

Apply body filler.

Definition

Application should include

- removing all rust, paint, and dirt, using a 16- to 24-grit abrasive disk (open coat)
- mixing body filler
- applying body filler and cheese-grating during curing.

Note: All procedures must be completed according to the filler manufacturer's directions and to ASE standards.

Process/Skill Questions

- What happens if filler is mixed incorrectly?
- What might happen if material is not properly prepared?
- How does cheese-grating help in sanding fillers?

Task Number 57

Prepare surface for primer.

Definition

Preparation should include
• removing dirt, road grime, and wax or protective coatings from the area to be refinished and adjacent vehicle surfaces; washing the entire vehicle
• inspecting and identifying the substrate, type of finish and surface condition; developing a plan for refinishing, using a total product system
• determining whether to remove or to mask trim
• allowing space for paint build-up
• selecting type and width of masking tape or paper.

Note: All descriptions must be in accordance with ASE standards.

Process/Skill Questions

• What could happen if the surface to be primed is not properly prepared?
• What precautions need to be taken while priming?
• What materials need to be used when masking a vehicle?

Task Number 58

Prime body, parts, and chassis.

Definition

Priming should include

• mixing the primer, primer-surfacer, or primer-sealer
• spraying the primer onto the surface of the repaired area
• applying a two-component finishing filler to minor surface imperfections.

Process/Skill Questions

• What do primers do?
• What are some safety issues that should be addressed before using primer?
• What PPE should be worn when using primer?

Task Number 59

Prepare primed surface for paint.

Definition
Preparation should include

- dry or wet sanding the area to which primer-surfacer has been applied
- dry sanding the area to which two-component finishing filler has been applied
- removing dust from the area to be refinished, including cracks, moldings, or adjacent areas
- cleaning the area to be refinished, using a final cleaning solution
- removing, with a tack rag, any dust or lint particles from the area to be refinished
- applying a suitable sealer to the area being refinished when sealing is needed or desired
- scuff sanding to remove nibs or imperfections from a sealer
- restoring corrosion-resistant coatings, caulking, and seam sealers to repaired areas.

Note: All procedures must be completed according to ASE standards.

Process/Skill Questions

- How should sanding through the primer be corrected?
- What factors determine the type of primer to be used?
- What are some safety issues that could occur when preparing the primed surface for painting?

Task Number 60

Fabricate fiberglass panels.

Definition

Fabrication should include

- repairing plastic parts with urethane or epoxy adhesives, using reinforcements, if necessary
- repairing holes and cuts in rigid and flexible plastic parts, using backing materials and adhesives
- removing damaged areas from rigid exterior sheet molded compound (SMC) panels; repairing with partial panel.

Note: All procedures must be completed according to ASE standards.

Process/Skill Questions

- What is the purpose of fabricating fiberglass panels?
- What safety procedures should be followed when fabricating fiberglass panels?
- What tools would be used to fabricate fiberglass panels?
Assembling High-Performance Engines

Task Number 61

Demonstrate the assembly of a high-performance engine.

Definition

Demonstration should include

- checking for proper parts for application
- checking manufacturer's suggested clearances
- checking the block and head surfaces
- installing the cam bearings
- installing freeze and gallery plugs
- installing the camshaft and checking the degree of camshaft
- installing the crankshaft and rear seal
- installing the timing components
- installing the cylinder heads, push rods, and rocker arms
- adjusting the rocker arms to performance specifications
- torquing all bolts to manufacturer's specifications
- lubricating parts.

Note: Recheck torque on all bolts before final assembly of oil pan, timing cover, and intake manifold.

Process/Skill Questions

- What is the importance of checking valve-to-piston clearance?
- Why is it important to check bearing clearances?
- Why should you install the camshaft before the crankshaft?
- Why should bolts be torqued to manufacturer's specifications?

Task Number 62

Assemble coolant equipment.
Definition
Assembly should include

- collecting all coolant parts
- installing all coolant parts
- bleeding air from the systems.

Process/Skill Questions

- What does the coolant system include?
- What precautions should be taken around the coolant systems?
- Would coolant be considered hazardous waste? Why or why not?

Task Number 63

Assemble the fuel system.

Definition
Assembly should include

- collecting fuel system components
- installing fuel system components
- checking the routing of fuel system components
- securing fuel system components.

Process/Skill Questions

- What areas should be avoided when working with fuel lines?
- What hazards occur in fuel systems?
- What are the components of a fuel system?

Task Number 64

Assemble the electrical systems.

Definition
Assembly should include
• collecting electrical parts and equipment
• installing electrical parts and equipment
• checking the routing of electrical parts
• checking the continuity of electrical parts
• securing wires.

Process/Skill Questions

• What does checking for continuity tell us?
• Why is proper routing of wires important?
• What is the proper way to secure all electrical wires?

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Task Number 65

Assemble drive-line components.

Definition

Assembly should include

• collecting all drive-line components
• installing all drive-line components
• checking for proper alignment of drive-line components.

Process/Skill Questions

• What are the parts of a drive-line component?
• What alignment tools are used to align the drive-line component?
• Why are proper drive-line components necessary?

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Task Number 66

Assemble hydraulic systems.

Definition

Assembly should include

• collecting hydraulic system components
• installing hydraulic system components
• checking hydraulic system components for leaks.

Process/Skill Questions

• What components are included in a hydraulic system?
• Why are leaks harmful?
• What safety precautions need to be taken when working around hydraulic systems?

Task Number 67

Assemble high-performance suspension components.

Definition

Assembly should include

• collecting all suspension components
• installing all suspension components
• checking alignment of suspension components.

Process/Skill Questions

• What are the parts of suspension components?
• Why is suspension alignment important?
• What precautions should be taken to keep nuts and bolts from coming loose?

Task Number 68

Assemble high-performance steering components.

Definition

Assembly should include

• collecting steering components
• installing steering components
• checking alignment of steering components.

Process/Skill Questions
• What are the parts of a steering system?
• What do steering components do?
• What happens if steering components are out of alignment?

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**Task Number 69**

**Assemble performance braking systems.**

**Definition**

Assembly should include

• collecting brake system components
• installing brake system components
• checking for proper routing of lines
• bleeding air from the system
• checking for leaks in the system.

**Process/Skill Questions**

• What are the components of a braking system?
• Why is proper routing of lines important?
• Why is air in the lines harmful?

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**SOL Correlation by Task**

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Assemble hydraulic systems.
Assemble high-performance suspension components.
Assemble high-performance steering components.
Assemble performance braking systems.

Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.”
Appendix: Credentials and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Core: Introductory Craft Skills Entry-Level Assessment
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- SENSE Training Program Certification Examination (Level 1, Entry-Level Welder)
- Welding Assessment
- Welding Examination
- Welding Level One Entry-Level Assessment
- Workplace Readiness Skills for the Commonwealth Examination

Career Cluster: Transportation, Distribution and Logistics

<table>
<thead>
<tr>
<th>Pathway</th>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
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<td>Electrical and Electronic Installer</td>
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<tr>
<td></td>
<td>Electrical and Electronic Repairer</td>
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<tr>
<td></td>
<td>Marine Watercraft Repair and Maintenance Worker</td>
</tr>
<tr>
<td></td>
<td>Service Technician</td>
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<tr>
<td></td>
<td>Small Engine Mechanic</td>
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</tbody>
</table>