

Heavy Equipment Operation and Repair



Exam Information	Description																
Exam number 904 Items 73 Points 81 Prerequisites None National Career Cluster Architecture & Construction Agriculture Performance standards Included (Optional) Certificate available Yes	<p>This comprehensive course introduces students to the foundational principles, skills, and safety practices essential for operating and maintaining heavy equipment in the construction and industrial sectors. Through a blend of classroom instruction and hands-on training, students will gain experience in safe operation, equipment maintenance, basic surveying, and site preparation. Upon completion, students will be equipped with the practical skills and technical knowledge to begin a career in heavy equipment operation, maintenance, and construction site management, with a strong foundation in jobsite safety and best practices.</p>																
	Exam Blueprint																
	<table> <tr> <th>Standard</th><th>Percentage of exam</th></tr> <tr> <td>1. Safety</td><td>12%</td></tr> <tr> <td>2. Tools</td><td>16%</td></tr> <tr> <td>3. Welding/Torching</td><td>6%</td></tr> <tr> <td>4. Identification of Heavy Equipment</td><td>22%</td></tr> <tr> <td>5. Preventative Maintenance</td><td>25%</td></tr> <tr> <td>6. Basic Operational Techniques</td><td>10%</td></tr> <tr> <td>7. Surveying and Site Work</td><td>9%</td></tr> </table>	Standard	Percentage of exam	1. Safety	12%	2. Tools	16%	3. Welding/Torching	6%	4. Identification of Heavy Equipment	22%	5. Preventative Maintenance	25%	6. Basic Operational Techniques	10%	7. Surveying and Site Work	9%
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Standard 1 Safety

Students learn OSHA 10 principles, identify Focus Four hazards, use PPE, work safely around trenches and machinery, and read SDS sheets.

Objective 1 Identify the Focus 4 hazards and how they relate to heavy equipment operation.

Objective 2 Define what OSHA is and demonstrate the principles of OSHA 10 on a jobsite.

Objective 3 List the types of PPE used when working with heavy equipment.

Objective 4 Explain the dangers of working around trenches and excavation sites

Objective 5 Identify and read SDS sheets for information on a given chemical.

Objective 6 Describe how to safely lift and hold a machine.

Standard 1 Performance Evaluation included below (Optional)

Standard 2 Tools

Students identify and safely use common tools like wrenches, sockets, hammers, and grinders, and learn proper setup for shop and field tasks.

Objective 1 Demonstrate proper equipment and tool setup and usage.

Objective 2 Identify tools based on their design and function:

1. Wrenches
2. Sockets
3. Hammers
4. Grinders

Standard 2 Performance Evaluation included below (Optional)

Standard 3 Welding/Torching

Students will learn safe setup and use of welding and torching equipment, proper PPE, gas cylinder handling, and differences between MIG and STICK welding.

Objective 1 Identify and use necessary PPE for welding and torching

Objective 2 Safely handle and store gas cylinders

Objective 3 Properly set up and use:

1. Welder
2. Torch

Objective 4 Differentiate between STICK and MIG welding

Standard 3 Performance Evaluation included below (Optional)

Standard 4 Identification of Heavy Equipment

Students identify major types of heavy equipment, understand their uses, match machines and attachments to tasks, and learn basic components.

Objective 1 Identify and list basic uses for the following equipment:

1. Wheel Loaders
2. Backhoe loaders
3. Excavators
4. Dozers
5. Scrapers
6. Skidsteer/ Compact Track Loader
7. Compaction Equipment
8. Dump Trucks
9. Material handling equipment
10. Graders
11. Utility tractors
12. Trailers and proper binding of equipment

Standard 4 Performance Evaluation included below (Optional)

Standard 5 Preventative Maintenance

Students perform routine maintenance on heavy equipment, including servicing batteries, tires, hydraulics, and power trains. Students also learn to read schematics and diagnose basic system issues.

Objective 1 Battery

1. Apply understanding of basic electrical principles
2. Demonstrate knowledge of electrical schematics
3. Service and inspect batteries
4. Diagnose and repair starting systems
5. Diagnose and repair lighting systems
6. Diagnose and repair charging systems

Objective 2 Tires

1. Check pressure
2. Mount equipment tires
3. Describe safety practices for servicing tires
4. Identify and interpret tire size

Objective 3 Hydraulics

1. Identify the components and their functions
 - a. Hydraulic pump
 - b. Hydraulic motor
 - c. Hydraulic valve
 - d. Hydraulic filter
 - e. Hydraulic cylinder
 - f. Hydraulic tank
 - g. Hydraulic relief valve

Objective 4 Power Trains

1. Differentiate between transmission types in heavy equipment
2. Explain how a standard transmission works
3. Explain how a clutch works
4. Explain how an automatic transmission works
5. Explain how a differential works
6. Explain how a hydrostatic transmission works

Standard 5 Performance Evaluation included below (Optional)

Standard 6 Basic Operational Techniques

Students operate heavy equipment to complete jobsite tasks such as trenching, loading, and inspections, while applying safe operating procedures.

Objective 1 Equipment for Operations

1. Dump Trucks
2. Utility tractors
3. Loaders
4. Skid Steers
5. Backhoes
6. Dozers
7. Excavators
8. Scrapers
9. Motor graders
10. Rough Terrain Forklifts
11. Compaction Equipment

Objective 2 Given an equipment task—choose 3 to perform

1. Dig a trench using a backhoe or excavator
2. Load a dump truck using a loader or skid steer
3. Perform a pre-trip inspection

Standard 6 Performance Evaluation included below (Optional)

Standard 7 Surveying and Site work

Students identify soil types, use basic surveying tools, establish grades, and apply water control techniques for safe and efficient site preparation.

Objective 1 Identify the basic types of soils, their characteristics, and how they impact excavation work:

1. Machine performance
2. Safety

Objective 2 Identify tools and equipment used for surveying

Objective 3 Identify types of stakes and markings

Objective 4 Identify how to establish grades on a jobsite

Objective 5 Explain the importance of controlling water on a job site and the methods used

Standard 7 Performance Evaluation included below (Optional)

Performance Standards

0	Limited skills	2	→	4	Moderate skills	6	→	8	High skills	10
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Complete 5 of the 7 performance requirements.

Standard 1 – Safety

Score:

- Demonstrate understanding of OSHA focus 4 elements.
- Demonstrate proper PPE use.
- Demonstrate safe practices while operating equipment on site
- Demonstrate safe practices while while in the shop

Standard 2 – Tools

Score:

- Identify appropriate tool for task
- Safely use tools and equipment.

Standard 3 – Welding / Torching *OPTIONAL

Score:

- Identify appropriate tool for task
- Properly follow the steps to safely setup and operate equipment

Standard 4 – Identification of Heavy Equipment

Score:

- Identify appropriate equipment for a given task (5 scenarios)
- Identify parts to equipment
- Identify which attachments are required for a given job

Standard 5 –Preventative Maintenance

Score:

- Perform basic machine preventative maintenance based on a manufacturers' recommendations
 - At least 1 tracked
 - At least 1 wheeled
 - Choose tasks as appropriate:
 - Perform tire maintenance
 - Lubrication services
 - Adjust track tension
 - Adjust valves
 - Perform routine maintenance on brake systems
- Setup a set of batteries in series and parallel

Standard 6 – Basic Operational Techniques

Score:

- Complete 3 equipment tasks:
 - Examples:
 - Dig a trench using a backhoe or excavator
 - Load a dump truck using a loader or skid steer
 - Perform a pre-trip inspection

Standard 7 – Surveying and Site Work

Score:

- Identify tools and equipment used for surveying
- Properly set up a laser level or auto level
 - Determine the elevation difference between two established points

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____