

MODULE OVERVIEW

This module introduces the trainee to the basic concepts and procedures related to using heavy equipment to perform earthwork. It identifies the most appropriate types of equipment for specific jobs and describes the basic operations of the equipment.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Heavy Equipment Operations Level One*.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Identify and explain earthmoving terms and methods.
2. Describe how to safely set up and coordinate earthmoving operations.
3. Identify and explain earthmoving operations.
4. Identify and explain soil stabilization methods.
5. Identify the best equipment for performing a given earthmoving operation.
6. Lay out a basic earthmoving operation.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Explain and describe basic earthmoving operations: clearing and grubbing, excavating the foundation, constructing embankments, backfilling, and compacting.
2. Lay out a basic earthmoving operation.
3. Identify/Select the proper equipment for a given earthmoving operation.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Equipment operator's manuals
Transparencies	Samples of select material
Blank acetate sheets	Set of construction plans and specifications
Transparency pens	Jars of various types of soils
Whiteboard/chalkboard	Marked grade and finish stakes
Markers/chalk	Copy of a NPDES permit and stormwater runoff control plan
Pencils and scratch paper	Samples of various binders for soil stabilizations and their MSDSs
Appropriate personal protective equipment including:	Manufacturer's literature on soil stabilizers
Safety goggles or glasses	One-Call notification cards
Work boots	Copies of the Quick Quiz*
Hard hats	Module Examinations**
Available heavy equipment	Performance Profile Sheets**
Rags	

* Located in the back of this module.

**Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module may require trainees to visit a construction site. Ensure that all trainees are aware of basic site safety.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Avoiding Enforcement Actions: How to Effectively Manage Your Construction Site and Survive Regulatory Scrutiny, Grading and Contractor magazine, July/August 2005. Carol L. Forrest. Santa Barbara, CA: Forester Communication.

Caterpillar Performance Handbook, Edition 27. A CAT® Publication. Peoria, IL: Caterpillar, Inc.

Chemical Soil Stabilization, January/February, 2003. Janis Keating. Erosion Control magazine.

Excavating and Grading Handbook, 1987. Nicholas E. Capachi. Carlsbad, CA: Craftsman Book Company.

Heavy Equipment Repair, 1969. Herbert L. Nichols, Jr. Greenwich, CT: North Castle Books.

United States Environmental Protection Agency (EPA) website, National Pollutant Discharge Elimination System (NPDES). http://cfpub1.epa.gov/npdes/stormwater/const.cfm?program_id=6

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 12½ hours are suggested to cover *Introduction to Earthmoving*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Initial Earthmoving Operations	
A. Introduction	_____
B. Mining	_____
C. Initial Earthmoving Operations	_____
1. Preliminary Activities	_____
2. Laying Out Slopes and Grades	_____
3. Setting Up and Coordinating Operations	_____
D. Laboratory – Trainees practice explaining and describing basic earthmoving operations. This laboratory corresponds to Performance Task 1.	_____
Session II. Earthmoving Operations One	
A. Production Measurement	_____
B. Maintaining Haul Roads	_____
C. Drainage Requirements	_____
D. Site Excavation	_____
E. Loading	_____
Session III. Earthmoving Operations Two	
A. Hauling	_____
B. Dumping	_____
C. Fill and Embankment	_____

- D. Compaction _____
- E. Laboratory – Trainees practice identifying and selecting the proper equipment for a given earthmoving operation. This laboratory corresponds to Performance Task 3. _____
- F. Laboratory – Trainees practice laying out a basic earthmoving operation. This laboratory corresponds to Performance Task 2. _____

Session IV. Stabilizing Soils, Safety, and Review

- A. Stabilizing Soils _____
- B. Laboratory – Trainees practice identifying various soil stabilization methods. _____
- C. Safety Guidelines _____
- D. Review _____

Session V. Module Examination and Performance Testing

- A. Module Examination _____
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- B. Performance Testing _____
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module covers detailed operation of off-road dump trucks used in the construction industry and describes the duties and responsibilities of operators, safety rules, and operator preventive maintenance duties.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One; and Heavy Equipment Operations Level Two, Module 22201-06.*

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe why dump trucks are used widely in the construction industry.
2. State the types of dump trucks and their uses.
3. Describe the function and operations of the dump hoist, power takeoff unit, auxiliary axle, engine retarder, differential lockout, air brake system, and manual transmission.
4. Demonstrate and state the steps of the pre-operational safety inspection.
5. Perform the proper warmup, operation, and shutdown procedure.
6. State the duties and responsibilities of a dump truck operator.
7. Identify the controls of a dump truck.
8. Safely operate a dump truck.
9. Back up with a trailer attached to the dump truck.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Complete proper prestart inspection and maintenance for a dump truck.
2. Perform the proper startup, warmup, and shutdown procedures.
3. Carry out basic operations with a dump truck; dump a load in a designated spot, and tailgate-spread the load.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Grease gun
Transparencies	Air gauge
Blank acetate sheets	Hydrometer
Transparency pens	Rags
Whiteboard/chalkboard	Fluids for equipment servicing
Markers/chalk	Safety video (optional)
Pencils and scratch paper	TV/VCR/DVD (optional)
Appropriate personal protective equipment	Copies of <i>Figure 19</i> or <i>20</i>
Dump truck	Colored pencils or pens
Trailer	Snow plows
Operator's manual	Module Examinations*
Inspection checklist	Performance Profile Sheet*
Hand tools	

*Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires that trainees operate heavy equipment. Ensure that all trainees are familiar with machine safety procedures.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Moving the Earth, Latest Edition. New York, NY: McGraw-Hill.

Truck Driver's Guide to CDL, First Edition. New York, NY: Prentice Hall Press.

Trucking's Web Resources for Journalists and Communicators, 2005. www.twna.org.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Dump Trucks*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Sessions I and II. Dump Trucks	
A. Introduction	_____
B. Types of Dump Trucks	_____
C. Instruments and Controls	_____
D. Laboratory – Trainees practice identifying the controls on a dump truck.	_____
Sessions III and IV. Inspection, Maintenance, and Safety	
A. Inspection and Maintenance	_____
B. Safety	_____
C. Laboratory – Trainees practice completing prestart inspections and maintenance. This laboratory corresponds to Performance Task 1.	_____
Sessions V and VI. Dump Truck Operation	
A. Over-the-Road Operation	_____
B. Laboratory – Trainees practice starting, warming up, and shutting down a dump truck. This laboratory corresponds to Performance Task 2.	_____
C. Laboratory – Trainees practice carrying out basic dump truck operations. This laboratory corresponds to Performance Task 3.	_____
D. Backing Safely	_____
E. Laboratory – Trainees practice backing up with a trailer attached.	_____
F. Operating Bottom Dump Trailers and Off-Road Trucks	_____
G. Transporting Off-Road Dump Trucks	_____
H. Towing	_____
Session VII. Snow Removal and Review	
A. Snow Removal	_____
B. Review	_____

Session VIII. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
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B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module covers the operation of the various machines used to compact soil, as well as soil classifications and compaction. It describes the duties and responsibilities of operators, safety rules, and operator preventive maintenance duties.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One; and Heavy Equipment Operations Level Two*, Modules 22201-06 and 22202-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe the uses of a roller.
2. Identify the components and controls on a typical roller.
3. Explain safety rules for operating a roller.
4. Perform prestart inspection and maintenance procedures.
5. Start, warm up, and shut down a roller.
6. Perform basic maneuvers with a roller.
7. Describe the accessories used on rollers.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Complete prestart inspection and maintenance for a roller.
2. Perform proper startup, warmup, and shutdown procedures.
3. Carry out basic maneuvers with a roller; compact an area approximately 20 feet long and 10 feet wide.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Hand tools
Transparencies	Grease gun
Blank acetate sheets	Air gauge
Transparency pens	Hydrometer
Whiteboard/chalkboard	Rags
Markers/chalk	Fluids for equipment servicing
Pencils and scratch paper	Chocks and tie-down equipment
Appropriate personal protective equipment	Contracts with different specifications for compaction
Roller	Soil density testing equipment
Roller operator's manual	Copies of the Quick Quiz *
Company safety manual	Module Examinations**
Daily inspection checklist	Performance Profile Sheet**
Roller maintenance manual	
Machine maintenance records	

* Located in the back of this module.

** Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to operate heavy equipment. Ensure that all trainees are briefed on machine safety rules and review the operator's manual before operating equipment. This module may require trainees to visit construction sites. Ensure that all trainees are briefed on site safety policy.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Caterpillar Performance Handbook, Edition 27. A CAT® Publication. Peoria, IL: Caterpillar, Inc.

Excavation and Grading Revised, 1987, Nick Capachi. Carlsbad, CA: Craftsman Book Company.

Moving the Earth, Latest Edition. New York, NY: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Rollers*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Identification of Equipment	
A. Introduction	_____
B. Identification of Equipment	_____
Sessions II. Safety, Inspection, and Maintenance	
A. Safety	_____
B. Inspection and Maintenance	_____
C. Laboratory – Trainees practice performing a prestart inspection and maintenance. This laboratory corresponds to Performance Task 1.	_____
Sessions III and IV. Roller Operation	
A. Preparing to Work	_____
B. Basic Maneuvering	_____
C. Transporting the Roller	_____
D. Laboratory – Trainees practice performing proper startup, warmup, and shutdown procedures. This laboratory corresponds to Performance Task 2.	_____
Session V. Work Activities and Review	
A. Compaction Method Considerations	_____
B. Checking Quality	_____
C. Leveling and Compacting and Backfilling	_____
D. Compacting Cement and Asphalt	_____
E. Laboratory – Trainees practice compacting an area to proper grade. This laboratory corresponds to Performance Task 3.	_____
F. Review	_____

Session VI. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
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B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module describes the duties and responsibilities of operators, as well as safety rules, and operator preventive maintenance duties. It also covers scraper techniques and emphasizes scraper safety.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One; and Heavy Equipment Operations Level Two*, Modules 22201-06 through 22203-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe the uses of a scraper.
2. Identify the components and controls on a typical scraper.
3. Explain safety rules for operating a scraper.
4. Perform prestart inspection and preventive maintenance procedures for scrapers.
5. Start, warm up, and shut down a scraper.
6. Perform basic maneuvers with a scraper.
7. Perform the basic earthmoving operations with a scraper.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Complete proper prestart inspection and preventive maintenance for a scraper.
2. Perform proper startup, warmup, and shutdown procedures.
3. Execute basic maneuvers with a scraper (moving forward, backward, and turning).
4. Carry out basic earthmoving operations with a scraper; pick up a load and hand it to a dump truck.
Deposit approximately a 4-inch mat.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Rags
Transparencies	Fluids for equipment servicing
Blank acetate sheets	Company safety manual
Transparency pens	Daily inspection checklist
Whiteboard/chalkboard	Scraper maintenance manual
Markers/chalk	Machine maintenance records
Pencils and scratch paper	Cutting edges
Appropriate personal protective equipment	Rulers
Scraper	Sand, gravel, or contrasting material to soil
Scraper operator's manual	Stakes
Bulldozer	Chocks and tie-down equipment
Hand tools	Copies of the Quick Quiz *
Grease gun	Module Examinations**
Air gauge	Performance Profile Sheet**
Hydrometer	

* Located in the back of this module.

** Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to operate heavy equipment. Ensure that all trainees are briefed on machine safety rules and review the operator's manual before operating equipment. This module may require trainees to visit construction sites. Ensure that all trainees are briefed on site safety policy.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Excavation and Grading Revised, 1987. Nick Capachi. Carlsbad, CA: Craftsman Book Company.

Moving the Earth, Fourth Edition. H.L. Nichols. New York, NY: McGraw-Hill.

Scraper Operation, 1997. Heavy Equipment Training Series Video, Earthwork Productions LLC.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Scrapers*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Identification of Equipment	
A. Introduction	_____
B. Identification of Equipment	_____
Sessions II and III. Safety, Inspection, and Maintenance	
A. Safety	_____
B. Inspection and Maintenance	_____
C. Laboratory – Trainees practice performing pre-operational inspection and maintenance. This laboratory corresponds to Performance Task 1.	_____
Sessions IV through VII. Scraper Operation and Review	
A. Preparing to Work	_____
B. Basic Maneuvering	_____
C. Operating the Bowl, Apron, and Ejector	_____
D. Hauling Costs	_____
E. Laboratory – Trainees practice starting, warming up, performing basic maneuvers and earthmoving operations, and shutting down a scraper. This laboratory corresponds to Performance Tasks 2, 3, and 4.	_____
F. Review	_____

Session VIII. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
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B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module covers the various uses of wheel and track loaders, as well as operator maintenance, loader safety, and operating procedures. It contains procedures for using the loader in loading, grading, excavation, and demolition work.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One*; and *Heavy Equipment Operations Level Two*, Modules 22201-06 through 22204-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe the uses of a loader.
2. Identify the components and controls on a typical loader.
3. Explain safety rules for operating a loader.
4. Perform prestart inspection and preventive maintenance procedures.
5. Start, warm up, and shut down a loader.
6. Perform basic maneuvers with a loader.
7. Perform basic earthmoving operations with a loader.
8. Describe the accessories used on loaders.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Complete proper prestart inspection and maintenance for a loader.
2. Perform proper startup, warmup, and shutdown procedures.
3. Execute basic maneuvers with a loader, including proper movement and curling the bucket.
4. Carry out basic earthmoving operations with a loader; load a truck (to capacity, if possible), and build a storage pile.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Fluids for equipment servicing
Transparencies	Company safety manual
Blank acetate sheets	Daily inspection checklist
Transparency pens	Loader operator's manual
Whiteboard/chalkboard	Loader maintenance manual
Markers/chalk	Machine maintenance records
Pencils and scratch paper	Chocks and tie-down equipment
Appropriate personal protective equipment	Soil or other loads
Loader	Safety video (optional)
Dump truck	TV/VCR/DVD player (optional)
Hand tools	Traffic cones or other devices to create and obstacle course (optional)
Grease gun	Copies of the Quick Quiz*
Air gauge	Module Examinations**
Hydrometer	Performance Profile Sheet**
Rags	

* Located in the back of this module.

** Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to operate heavy equipment. Ensure that all trainees are briefed on machine safety rules and review the operator's manual before operating equipment. This module may require trainees to visit construction sites. Ensure that all trainees are briefed on site safety policy and have appropriate personal protection equipment.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Excavation and Grading Revised, 1987, Nick Capachi. Carlsbad, CA: Craftsman Book Company.

Moving the Earth, Fourth Edition. H.L. Nichols. New York, NY: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Loaders*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Identification of Equipment	
A. Introduction	_____
B. Identification of Equipment	_____
C. Attachments	_____
Session II. Safety, Inspection, and Maintenance	
A. Safety	_____
B. Inspection and Maintenance	_____
C. Laboratory – Trainees practice completing proper prestart inspection and maintenance. This laboratory corresponds to Performance Task 1.	_____
Sessions III and IV. Basic Operation	
A. Preparing to Work	_____
B. Laboratory – Trainees practice performing proper startup, warmup, and shutdown procedures. This laboratory corresponds to Performance Task 2.	_____
C. Basic Maneuvering	_____
D. Laboratory – Trainees practice executing basic maneuvers with a loader. This laboratory corresponds to Performance Task 3.	_____
Sessions V through VII. Work Activities and Review	
A. Basic Activities Performed By the Loader	_____
B. Working in Unstable Soils	_____
C. Using Special Attachments	_____
D. Transporting the Loader	_____
E. Laboratory – Trainees practice carrying out basic earthmoving operations with a loader. This laboratory corresponds to Performance Task 4.	_____
F. Review	_____

Session VIII. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
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B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module covers the different types of forklifts and their applications on construction sites. It includes instructions for lifting, transporting, and placing various types of loads. It also describes the duties and responsibilities of operators, as well as safety rules, and operator preventive maintenance duties.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One*; and *Heavy Equipment Operations Level Two*, Modules 22201-06 through 22205-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe the uses of a forklift.
2. Identify the components and controls on a typical forklift.
3. Explain safety rules for operating a forklift.
4. Perform prestart inspection and maintenance procedures.
5. Start, warm up, and shut down a forklift.
6. Perform basic maneuvers with a forklift.
7. Perform basic lifting operations with a forklift.
8. Describe the accessories used on forklifts.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Complete proper prestart inspection and maintenance for a forklift.
2. Perform proper startup, warmup, and shutdown procedures.
3. Execute basic maneuvers with a forklift.
4. Perform basic lifting operations with a forklift.
5. Demonstrate proper parking of a forklift (with forks down).

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Hydrometer
Transparencies	Rags
Blank acetate sheets	Fluids for equipment servicing
Transparency pens	Company safety manual
Whiteboard/chalkboard	Daily inspection checklist
Markers/chalk	Forklift operator's manual
Pencils and scratch paper	Forklift maintenance manual
Appropriate personal protective equipment	Machine maintenance records
Forklift	Chocks and tie-down equipment
Hand tools	OSHA PowerPoint® presentation on forklift safety or video on forklift safety (optional)
Grease gun	TV/VCR/DVD player (optional)
Air gauge	

Multimedia projector for PowerPoint® presentation (optional)	Traffic cones or devices
Computer with internet access (optional)	Samples loads, including:
Base with upright and extension to hang a load (optional)	Pallet of empty barrels
Wooden blocks or sample loads for tipping demonstration (optional)	Long pipe
	Blocking
	Module Examinations*
	Performance Profile Sheet*

*Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to operate heavy equipment. Ensure that all trainees are briefed on machine safety rules and review the operator’s manual before operating equipment. This module may require trainees to visit construction sites. Ensure that all trainees are briefed on site safety policy and have appropriate personal protection equipment.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference work is suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Forklift Safety: A Practical Guide to Preventing Powered Industrial Truck Incidents and Injuries, 2nd Edition, 1999. George Swartz. Lanham, MD: Government Institutes.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 17½ hours are suggested to cover *Forklifts*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Identification of Equipment	
A. Introduction	_____
B. Identification of Equipment	_____
C. Attachments	_____
Session II. Safety, Inspection, and Maintenance	
A. Safety	_____
B. Inspection and Maintenance	_____
C. Laboratory – Trainees practice completing proper prestart inspection and maintenance. This laboratory corresponds to Performance Task 1.	_____
Sessions III and IV. Basic Operation	
A. Preparing to Work	_____
B. Laboratory – Trainees practice performing proper startup, warmup, shutdown procedures, and parking. This laboratory corresponds to Performance Tasks 2 and 5.	_____

C. Basic Maneuvering

D. Laboratory – Trainees practice executing basic maneuvers with a forklift.
This laboratory corresponds to Performance Task 3.

Sessions IV through VI. Work Activities and Review

A. Basic Operational Movement

B. Laboratory – Trainees practice performing basic lifting operations with
a forklift. This laboratory corresponds to Performance Task 4.

C. Special Attachments

D. Transporting a Forklift

E. Review

Session VII. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module covers formulas and methods used to compute cut and fill requirement on a job, and illustrates techniques used to quickly estimate excavations. It also provides a brief overview of software used to compute excavation requirements.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One*; and *Heavy Equipment Operations Level Two*, Modules 22201-06 through 22206-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Identify basic geometric shapes.
2. Calculate the surface area of squares, rectangles, triangles, trapezoids, and circles using formulas.
3. Calculate the volume of cubes, rectangular objects, prisms, and cylinders.
4. Calculate the excavation volume of a job using information supplied on the building plans.
5. Calculate the weight of an excavation from its volume.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Using information provided, calculate the volume and weight of a given excavation operation.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Rulers
Transparencies	Scissors
Blank acetate sheets	Clay
Transparency pens	Cubes, rectangular objects, prisms
Whiteboard/chalkboard	Several empty vessels of various shapes
Markers/chalk	Sand or water to fill vessels
Pencils and scratch paper	Measuring cup
Appropriate personal protective equipment	Scale
Calculator	Module Examinations*
Cardboard	Performance Profile Sheet*

*Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Ensure that all trainees are briefed on site safety policy and have appropriate personal protection equipment.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Caterpillar Performance Handbook, Edition 27. A CAT® Publication. Peoria, IL: Caterpillar, Inc.

Construction Surveying and Payout, 1995. Wesley G. Crawford. West Lafayette, IN: Creative Construction Publishing.

Cut-and-Fill Software: The Real-World Experience, Grading and Excavation Magazine. September/October 2002. Penelope O'Malley. Forester Communications.

Excavation and Grading Handbook, 1987. Nick Capachi. Carlsbad, CA: Craftsman Book Company.

Excavators Handbook Advanced Techniques for Operators, 1999. Reinard Christian. Addison, IL: The Aberdeen Group, A division of Hanley-Wood, Inc.

Pipe and Excavation Contracting, 1987. Dave Roberts. Carlsbad, CA: Craftsman Book Company.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Excavation Math*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Working with Formulas and Equations	
A. Introduction	_____
B. Working with Formulas and Equations	_____
Session II. Area	
A. Area and Area Exercises	_____
B. Squares and Rectangles	_____
C. Triangles	_____
D. Trapezoids	_____
E. Circles	_____
F. Laboratory – Trainees practice calculating the area of various shapes.	_____
Session III. Volume	
A. Cubes and Rectangular Objects	_____
B. Prisms	_____
C. Cylinders	_____
D. Volume Exercises	_____
E. Laboratory – Trainees practice calculating the volume of various solids.	_____

Sessions IV and V. Estimating Excavations and Review

- A. Determining and Gathering Required Information _____
- B. Calculating Excavations _____
- C. Estimating Excavation Examples _____
- D. Laboratory – Trainees practice using the information provided to calculate the volume and weight of a given excavation operation. This laboratory corresponds to Performance Task 1. _____
- E. Complex Calculations _____
- F. Review _____

Session VI. Module Examination and Performance Testing

- A. Module Examination _____
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- B. Performance Testing _____
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module uses information presented in previous modules to teach proper methods for setting grades, interpreting grade stakes, and reading site plans to ensure that earthmoving work meets specifications.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One; and Heavy Equipment Operations Level Two, Modules 22201-06 through 22207-06.*

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Define selected terms associated with plan reading, grade setting, and drainage.
2. State how cycle time affects scheduling of earthwork.
3. Describe proper practices for setting grades from a bench mark.
4. Describe proper practices for setting grades using a laser level or string.
5. Describe various methods for keeping construction sites well drained.
6. Describe the work required for the basic grading operations.
7. Describe proper practices for setting the grade of a trench and drain pipe.
8. Interpret construction plans to determine grading requirements.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Interpret plans and profile sheets to determine grading requirements and operation.
2. Set up a level and take three shots of a point on the ground placed by the instructor.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Surveying equipment, including:
Transparencies	String line levels
Blank acetate sheets	Laser levels
Transparency pens	Tapes
Whiteboard/chalkboard	Straight edges
Markers/chalk	Carpenter's levels
Pencils and scratch paper	Plastic box
Appropriate personal protective equipment	Soil
Highway plans and profile sheets	Water
Plans sheets for several basic earthmoving projects	Pipe
Bench marks	Sand, soil, gravel
Motor grader	Module Examinations*
Grade stakes	Performance Profile Sheet*
Simple digging tools	

*Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Ensure that all trainees are briefed on site safety policy and have appropriate personal protection equipment. This module requires trainees work with laser instruments. Ensure all trainees are briefed on laser safety.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference work is suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Excavation and Grading Handbook, 1987. Nick Capachi. Carlsbad, CA: Craftsman Book Company.

Excavators Handbook Advanced Techniques for Operators, 1999. Reinar Christian. Addison, IL: The Aberdeen Group, A Division of Hanley-Wood, Inc.

Basic Equipment Operator, 1994 Edition. John T. Morris (preparer), NAVEDTRA 14081, Naval Education and Training Professional Development and Technology Center.

Pipe & Excavation Contracting, 1987. Dave Roberts. Carlsbad, CA: Craftsman Book Company.

Moving the Earth, Latest Edition. New York, NY: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Grades, Part Two*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Sessions I and II. Introduction and Planning a Job	
A. Introduction	_____
B. Planning a Job	_____
C. Laboratory – Trainees practice interpreting plans and profile sheets to determine grading requirements and operation. This laboratory corresponds to Performance Task 1.	_____
Sessions III and IV. Setting Grade Stakes	
A. Bench Marks	_____
B. Highway and Other Horizontal Construction	_____
C. Building Foundations and Pads	_____
D. Laboratory – Trainees practice using survey equipment to set grades from a bench mark.	_____
Session V. Grading and Keeping Positive Drainage	
A. Automated Grading	_____
B. Using Motor Graders	_____
C. Laboratory – Trainees practice cutting a ditch with a motor grader.	_____
D. Keeping Positive Drainage	_____
Sessions VI and VII. Drains, Setting Pipe, and Review	
A. Natural Drainage and Drains	_____
B. Setting Grades for Pipe Using a Laser	_____
C. Setting Grades for Pipe Using a String Line	_____

D. Laboratory – Trainees practice setting up a level, taking measurements, and setting grades using lasers or a string line. This laboratory corresponds to Performance Task 2.

E. Review

Session VIII. Module Examination and Performance Testing

A. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

B. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module explains how to read site plans to obtain cut and fill information. It also identifies safety and legal issues that are of concern for heavy equipment operators, such as underground utilities and property lines.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Heavy Equipment Operations Level One; Heavy Equipment Operations Level Two*, Modules 22201-06 through 22208-06.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe the types of drawings usually included in a set of plans, and list the information found on each type.
2. Identify the different types of lines used on drawings.
3. Identify common abbreviations and symbols used on plans.
4. Read and interpret drawings to determine the type of excavations needed to prepare the site.
5. Describe the operator's duties to ensure that the job is completed safely and according to the plans.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Interpret a set of drawings to determine the proper type and sequence of excavation operations needed to prepare the site.
2. Identify the proper equipment needed in the above operation.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Graph or sketch paper
Transparencies	Change order
Blank acetate sheets	Soil report
Transparency pens	Architect's ruler
Whiteboard/chalkboard	Engineer's ruler
Markers/chalk	Standard ruler
Pencils and scratch paper	Automated scaling device
Appropriate personal protective equipment	Specifications
Set of roadway drawings	Site plans for commercial building
Set of building drawings	Small model truck
Local building codes	Quick Quiz*
Newspaper or other articles on buildings that violate setback requirements	Module Examinations**
Red pencils	Performance Profile Sheet*

* Located in the back of this module.

** Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Architectural Graphic Standards, The American Institute of Architects. New York, NY: John Wiley & Sons, Inc.

Reading Architectural Plans for Residential and Commercial Construction, 1988. Ernest R. Weidhaas. Upper Saddle River, NJ: Prentice Hall.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Civil Blueprint Reading*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Drawing Set	
A. Introduction	_____
B. Drawing Set	_____
Sessions II and III. Reading and Interpreting Drawings	
A. Site Plan	_____
B. Lines and Symbols	_____
C. Dimensioning	_____
D. Abbreviations	_____
Sessions IV and V. Specifications, Guidelines, and Review	
A. Specifications	_____
B. Guidelines for Reading a Drawing Set	_____
C. Laboratory – Trainees practice interpreting a set of drawings and determining the proper type and sequence of excavation operations and equipment needed. This laboratory corresponds to Performance Tasks 1 and 2.	_____
D. Review	_____
Session V. Module Examination, and Performance Testing	
A. Module Examination	_____
1. Trainees must score 70 percent or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	
B. Performance Testing	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	