

UNITED STATES MARINE CORPS
ENGINEER EQUIPMENT INSTRUCTION COMPANY
MARINE CORPS DETACHMENT
686 MINNISOTA AVE
FORT LEONARD WOOD, MISSOURI 65473

LESSON PLAN

120M MOTORIZED ROAD GRADER

LESSON ID: BEE0-B07

BASIC ENGINEER EQUIPMENT OPERATOR COURSE

CID A1613F1

REVISED 01/07/2013

APPROVED BY _____

DATE _____

INTRODUCTION

(15 MIN)

(Slide 1,2,3)

1. **GAIN ATTENTION**. Show Video (Caterpillar 120M intro) Discuss the video and talk about what the students saw in it. You will gain the ability to create and maintain roads, build flight lines and level areas.

(Slide 4,5)

2. **OVERVIEW**. Good _____ my name is _____. Your next period of instruction will be on the 120M Motorized Road Grader (Grader). We will discuss the mission of the 120M. Major Components broken down into left side, to include front and back, and right side. Draw Bar, Circle, Moldboard components. Controls and instruments broken down by left joystick, right joystick, forward controls, and right side control panel. We will also discuss basic operating positions and techniques and the 7 step military road.

(Slide 6,7,8,9,10,11)

3. **LEARNING OBJECTIVES**.

a. **TERMINAL LEARNING OBJECTIVES**.

(1) Provided engineer equipment, tools, equipment records and references, conduct engineer equipment preventive maintenance, to prevent early breakdown or failure of equipment. (1345-MANT-1001)

(2) Provided an engineer equipment requirement, engineer equipment records and forms, operate the motorized road grader to safely meet operational requirements with no injury to personnel or damage to the equipment. (1345-HEOP-1007)

b. **ENABLING LEARNING OBJECTIVES**.

(1) Provided a (120M), tools, petroleum, oils, and lubricants, equipment records, and references, conduct preventive maintenance per the TM-11621A-OR. (1345-MANT-1001g)

(2) Given the description and characteristics of the (120M), and with the aid of references, identify the characteristics per the TM-11621A-OR. (1345-HEOP-1007a)

(3) Provided a (120M), engineer equipment records and forms, and with the aid of references, initiate operator forms and records per the TM 4700-15/1_. (1345-HEOP-1007b)

(4) Provided a (120M), engineer equipment records and forms, technical manuals and lubrication orders, perform technical manual research per the TM-11621A-OR. (1345-HEOP-1007c)

(5) Provided a (120M), engineer equipment records and forms, tools, and with the aid of references, demonstrate correct use tools per the TM 10209-10/1. (1345-HEOP-1007d)

(6) Provided a (120M), engineer equipment records and forms, tools, petroleum, oils, and lubricants, and with the aid of references, demonstrate correct use of petroleum, oils, and lubricant per the TM 11621A-OR. (1345-HEOP-1007e)

(7) Provided a (120M), engineer equipment records and forms, tools, petroleum, oils, and lubricants, and with the aid of references, perform operation checks (before, during, and after) per the TM 11621A-OR. (1345-HEOP-1007f)

(8) Provided a (120M), an operator, and without the aid of reference, perform hand and arm signals per the FM21-60. (1345-HEOP-1007g)

(9) Provided a (120M), engineer equipment records and forms, and references, perform area leveling per the TM-11621A-OR. (1345-HEOP-1007h)

(10) Provided a (120M), engineer equipment records and forms, and references, perform ditching operations per the TM-11621A-OR. (1345-HEOP-1007i)

(11) Provided a (120M), engineer equipment records and forms, and references, perform road improvement operations per the TM-11621A-OR. (1345-HEOP-1007j)

(12) Provided a (120M), engineer equipment records and forms, and references, perform seven-step military road operations per the TM-11621A-OR. (1345-HEOP-1007k)

(13) Provided a (120M), engineer equipment records and forms, and with the aid of references, complete operator forms and records per the TM 4700-15/1_. (1345-HEOP-1007l)

(Slide 12,13)

4. METHOD/MEDIA. I will teach this period of instruction via the informal lecture, demonstration, and practical application methods. I will be aided by power point presentation and your student handout. Students with the instructional rating forms fill out the header portion and lay it to the side and you will have time at the end to finish filling it out.

(Slide 14)

5. EVALUATION. There will be a 25 question multiple choice written examination on training day 6. On training day 7 there will be a practical application examination.

(Slide 15)

6. SAFETY/CEASE TRAINING. In the event of inclement weather we will either come back to the classroom or go to the tornado shelter provided. The instructor will give you detailed instructions on what to do when the time comes. If a fire breaks out in the classroom we will exit the hatch furthest away from the fire and form up outside a safe distance away for accountability. Any Marine who witnesses an unsafe act may stop training by giving the appropriate hand and arm signal.

(Slide 16)

TRANSITION: Now that you know what will be taught, how you will be taught, and how you will be evaluated are there any questions? If not we will move on to the mission and major components of the 120M.

BODY

(51 HRS 35 MIN)

(Slide 17)

1. MISSION AND MAJOR COMPONENTS. (1 HR 10 MIN)

a. **Mission.** The 120M motor grader is an all-purpose, medium sized, wheeled machine used for spreading and evening various types of granular material.

(1) The 120M motor graders role includes; construction and maintenance of roads, airfields, hardstands and other site preparation task.

(Slide 18)

(2) Power is provided by a Caterpillar in line six cylinder, direct injected diesel engine.

(3) Hydraulically operated implements allow blade positioning for forward grading, ditching or embankment grading, and snow removal.

(4) A scarifier allows loosening of compacted material prior to grading.

(Slide 19)

(5) Front leaning wheel and frame articulation provide maximum maneuverability.

(6) The grader has a sound suppressing Rollover Protective Structure (ROPS) cab with insulation, heater, windows, which allows for all weather operations.

(7) The grader should be operated with the hatch closed to prevent dust and debris from damaging the electrical components.

(Slide 20)

b. **Major Components Front.**

(1) Scarifier

(2) Teeth

(a) 11 teeth for moderate soil

(b) 6 teeth for hard soil

(3) Stow Rack

(Slide 21)

c. **Major Components Left Side.**

(1) Data Plate

(2) Fuel Tank

- (3) Left Front Access Hatch
- (4) Left Rear Access Hatch
- (5) Lubrication Order
- (6) Backup Camera

(Slide 22)

d. **Major Components Left Front Access Hatch.**

- (1) Coolant Tank
- (2) OE Dipstick
- (3) OE Fill
- (4) Circuit Breakers
- (5) Transmission Check/Fill
- (6) Fuel Water Separator
- (7) Air Filter

INSTRUCTOR NOTE

EXPLAIN COLOR CORDINATED CHECKS AND FILLS

(Slide 23)

e. **Major Components Left Rear Access Hatch.**

- (1) NATO Slave Receptacle
 - (a) 24 volt negative ground electrical system
- (2) Battery Master Switch
- (3) Hydraulic Sight Gauge

INSTRUCTOR NOTE

Instruct students not to take out the key. There should be a piece of 550 cord tied to it.

(Slide 24)

- f. **Major Components Right Side.**
 - (1) Right Rear Access Hatch
 - (2) Right Front Access Hatch
 - (3) Emergency Exit

INSTRUCTOR NOTE

Explain procedures for emergency exit. Provide additional information about the armored cab.

(Slide 25)

- g. **Major Components Right Rear Access Hatch.**
 - (1) Batteries

(Slide 26)

- h. **Major Components Right Front Access Hatch.**
 - (1) Air Tank Drain Valve
 - (a) Must be drained daily
 - (2) Turbocharger
 - (3) Alternator

(Slide 27)

- i. **Major Components Drawbar, Circle and Moldboard.**

(1) Blade: When manipulating the blade there are some hazards to pay attention too. They are tires, scarifier, ladder, fuel filler neck, and any other metal to metal contact.

(2) Moldboard

(3) End Bit

(4) Cutting Edges

(a) Must be replaced when worn within $\frac{3}{4}$ of an inch

(Slide 28)

(5) Right Lift Cylinder

(6) Circle

(7) Saddle

(8) Center Shift Cylinder

(9) Left Lift Cylinder

(Slide 29)

j. **Major Components Critical Lubrication.**

(1) Circle top and circle interior surface require dry lube film lubricant, **not grease.**

(2) Circle drive pinion and circle teeth require grease

(3) Moldboard wear strips require dry film lubricant

(Slide 30)

TRANSITION: We've just discussed the mission and major components of the 120M Motor Grader, are there any questions? If not, I have some for you.

Question 1: How many scarifier teeth do you use for hard soil and how many for moderate soil?

Answer 1: For moderate soil you use 11 teeth. For hard soil you remove 5 teeth, stowing them in the scarifier stow rack, and use 6 teeth for hard soil.

Question 2: What are some of the points you would want to use dry lube for?

Answer 2: Dry lube is used for circle drive pinion teeth, blade circle, circle top wear surface, and circle interior vertical surface.

(Slide 31)

Question 3: What is the scarifier used for?

Answer 3: A scarifier allows loosening of compacted material prior to grading.

Question 4: What allows for all weather operation?

Answer 4: The sound suppressing ROPS cab with insulation, heater, and windows allow for all weather operation.

(Slide 32)

Now that we have discussed the mission and major components of the 120M Motor Grader go ahead and take a 10 minute break. When we get back we will discuss the controls and instruments of the 120M Motor Grader.

Instructor Note

Allow the students to take a 10 minute break

TRANSITION: Before the break we discussed the mission and major components of the 120M Motor Grader. Are there any questions about the mission and major components? If not let's move on to the controls and instruments.

(Slide 33)

2. CONTROLS AND INSTRUMENTS. (1 HR 40 Min)

(Slide 34)

INSTRUCTOR NOTE

Play video ANMTN_07 introduction to controls.

(Slide 35)

a. **Overview.**

- (1) Left Joystick
- (2) Forward Controls and Indicators
- (3) Monitoring System
- (4) Right Joystick
- (5) Right Side Control Panel
- (6) Scarifier Roller Control

(Slide 36,37)

b. **Left Joystick.**

- (1) Steer Left
- (2) Steer Right
- (3) Blade Lower Left
- (4) Blade Lift Left
- (5) Wheel Lean Left- leans wheels left
- (6) Wheel Lean Right- leans wheels right
- (7) Up-shift Button- shifts up to desired gear
- (8) Downshift Button- shifts down to desired gear
- (9) Automatic Articulation Center Control- returns machine articulation to the center position
- (10) Articulation Control - twist the joystick to articulate the grader

(Slide 38,39)

- (11) Joystick Steering
 - (a) Failure to properly align the steering

joystick causes the inability to steer machine, disengage park brake, or shift out of neutral

(b) Aligning the steering joystick

(c) Start the engine

(d) Move joystick slowly to the left or right to closely match the angle of the front wheels

(Slide 40,41)

c. **Right Joystick.**

- (1) Blade side shift- LEFT - side shifts the blade left
- (2) Blade side shift- RIGHT - side shifts the blade right
- (3) Blade lower- RIGHT
- (4) Blade lift- RIGHT
- (5) Center shift- LEFT - shifts the circle left
- (6) Center shift- RIGHT - shifts the circle right
- (7) Blade pitch control- FORWARD - pitches the blade forward or down
- (8) Blade pitch control- BACKWARD - pitches the blade back or up
- (9) Blade circle - twist the joystick to rotate the circle

(Slide 42,43)

d. **Front Side of Joysticks.**

- (1) Differential lock
 - (a) Locks differential to increase traction
 - (b) Must be disengaged when turning
- (2) Transmission control switch

(a) engages forward, neutral and reverse

INSTRUCTOR NOTE

Play video ANMTN_07 introduction to controls.

(Slide 44)

INSTRUCTOR NOTE

Explain video was played twice, once before and once after, to help students better understand the controls.

(Slide 45)

INTERIM TRANSITION: We just talked about the left and right joysticks, at this time are there any questions before we take a break?

INSTRUCTOR NOTE

ALLOW THE STUDENTS TO TAKE A 10 MINUTE BREAK

INTERMIN TRANSITION: Before the break we discussed the different functions of the two joysticks for the Grader. Are there any questions on the functions of the joysticks? If not we will move on to forward controls and indicators.

(Slide 46,47)

e. **Forward Controls and Indicators.**

- (1) Center shift lock indicator
- (2) Secondary steering test switch
- (3) Parking brake

- (4) Engine start switch
- (5) Accelerator
- (6) Service brake
- (7) Inching pedal (clutch)

(Slide 48)

f. **Monitoring System.**

INSTRUCTOR NOTE

Go over monitoring system with the student's clock wise from left to right.

(Slide 49)

g. **Right Side Control Panel.**

- (1) Center shift lock switch
- (2) Fan switch
- (3) Blade cushion switch
- (4) 12V power port
- (5) Throttle set/accel switch
- (6) Throttle hold mode switch
- (7) Hazards
- (8) Work light
- (9) High beam switch

INSTRUCTOR NOTE

Students will always ensure blade cushion switch is on while at FLW.

(Slide 50,51)

h. **All-Wheel Drive Controls.**

- (1) AWD mode switch
 - (a) AWD off
 - (b) Tandems propel the machine
- (2) Creep mode
 - (a) Only front wheels propel the machine
 - (b) Turn AWD mode switch to creep
 - (c) Increase/decrease ground speed by adjusting AWD control dial
 - (d) Maximum speed of 5mph
- (3) Manual mode (six wheel drive)
 - (a) AWD control dial adjust front wheel speed in relation to rear wheels 99% - 100% - 120%
 - (b) Engage manual mode while the machine is in gear

INSTRUCTOR NOTE

Students will not utilize either AWD function.

(Slide 52)

i. **Messenger Display.**

- (1) Messenger display - Provides machine menu's of information, performance, totals, settings, and operator warnings
- (2) Implement lock out switch - locks out hydraulic functions while traveling, does not affect steering

(Slide 53)

(3) Operator warning categories

INSTRUCTOR NOTE

Ensure students know about all warning categories and the actions required.

(Slide 54,55)

TRANSITION: We just discussed joysticks, forward controls and indicators as well as the right side control panel and the messenger display for the Grader, are there any questions? If not, I have some for you.

Question 1: When using the manual mode for all wheel drive, what is the percentage of the front wheel speed in relation to the rear wheels?

Answer 1: The speed control allows for front wheels to turn 99-120% of rear wheel speed.

Question 2: What joystick and what is the motion for blade lower left?

Answer 2: To lower the blade on the left side grasps the left joystick with the left hand. Push down/forward on left joystick to lower the left side of the blade.

Question 3: What must the operator ensure is disengaged when turning?

Answer 3: The operator must ensure the differential lock is disengaged when turning to prevent damage to the differentials.

Now that we have covered controls and instruments we will go ahead and take a break. When we return from the break we will go over basic operating.

(Slide 56)

INSTRUCTOR NOTE

Allow the students to take a 10 minute break

TRANSITION: Before the break we covered controls and instruments, does anyone have any questions about what we have covered to this point? If not, we will move on to basic operating.

(Slide 57)

3. BASIC OPERATING. (1 HR 45 MIN)

(Slide 58)

a. Starting Procedures.

- (1) Perform before operations checks
- (2) Battery switch
- (3) Use three points of contact to enter the tractor
- (4) Adjust seat, seatbelt and arm pads
- (5) Ensure transmission is in neutral
- (6) Engage parking brake
- (7) Crank engine no longer than 30 seconds, if it does not start wait at least 2 minutes to let the starter cool down
- (8) Idle machine, cycling implements until hydraulic oil reaches 41 degrees Fahrenheit

(Slide 59)

b. Shut Down Procedures.

- (1) Place transmission in neutral
- (2) Apply parking brake
- (3) RHGG
- (4) Pitch blade forward
- (5) Lower blade and scarifier to the deck

(6) Idle grader for five minutes to allow turbocharger to cool

(7) Exit tractor using three points of contact

(8) Perform after operations check

(9) Battery switch

(Slide 60)

c. **Transmission Operation.**

(1) Automodulation

(a) Shifting into forward or reverse utilizing transmission control switch

(b) Transmission will engage smoothly

(c) Recommended for gears 1-5

(Slide 61)

(2) Inching Pedal

(a) Disengages power to the rear wheels

(b) Utilized for speed control

(c) Depress the inching pedal

(d) Select direction and gear

(e) Release pedal slowly, launching the machine

(Slide 62)

(3) Sequential Speed Shifting

(a) Up/Down shifting while the machine is in motion

(b) Use up/down shift buttons

(c) Match shifts to machine load and speed

(Slide 63,64)

- (4) Shuttle Shifting
 - (a) Utilize while moving
 - (b) Change direction without stopping in neutral
 - (c) Move the transmission switch from FORWARD to REVERSE or vice versa without stopping in NEUTRAL

INSTRUCTOR NOTE

Explain what gears to use the shuttle shift function

(Slide 65)

d. **Basic Leveling.**

(1) Perform 3 overlapping general grade passes, moving material laterally from right to left and left to right across the training area.

(2) The initial cut will not be more than ½", cutting with the entire blade.

(3) The remaining two passes will only serve to move the windrow created by the first pass across the training area.

(a) Blade horizontal to the deck, toe skimming, heel cutting ½"

(4) Turn the machine around, remain in general grade, and push the material back across the training area, evenly re-depositing the material

(5) When the machine reaches the opposite side of the training area there should not be any windrow remaining

(Slide 66)

e. **Articulated "Lollypop" Turn.**

(1) Utilizing the left joystick, turn the wheels then the frame in the direction of travel

(2) To further reduce the turning radius, lean wheels in the direction of travel

(Slide 67,68)

f. **Basic Leveling Positions.**

(1) Right Hand General Grade: General grade positions are utilized by the operator to level material. The operator utilizes the lift cylinders to keep the blade horizontal to the deck and the blade pitch adjustment for minor depth adjustments.

(a) Position blade 4-6 inches off the deck.

(b) Lean wheels to the heel. Wheel lean is proportional to the side draft imposed on the machine.

(c) Pitch blade to a 3in overhang

(d) Center shift approximately 8" to the left. (heel cylinder will by straight up and down).

(e) Circle blade 25-30 degrees to cast material outside of the left tandem.

(f) Lower blade to the deck ensuring the blade is horizontal.

(Slide 69,70)

(2) Park Line Position: Park line position is used to properly ground all implements.

(a) Assume Right Hand General Grade, wheels straight up and down

(b) Pitch the blade all the way forward

(c) Lower blade 1-2" off the deck

(d) Put both sides of the blade in the float position

(e) Lower scarifier to the deck

(Slide 71)

TRANSITION: We have just talked about basic operating; at this time do I have any questions? If not, I have a few questions for you.

Question 1: What is sequential speed shifting?

Answer 1: Shifting up or down while the machine is in motion.

Question 2: How much material are you cutting with the first pass of basic leveling?

Answer 2: ½ inch with the whole blade.

(Slide 72)

Question 3: In left hand general grade where is the windrow deposited?

Answer 3: In left hand general grade the heel will be on the right outside tandems horizontal to the deck, therefore the windrow will be deposited outside the right tandems.

Question 4: What is the first step to obtain the park line position?

Answer 4: The first step to obtain the proper park line position is to first position the tractor in the right hand general grade position.

(Slide 73)

Now that we have talked about basic operating go ahead and take a 10 minute break. After the break meet me outside and we will go into the demonstration and practical application of the 360 walk around.

INSTRUCTOR NOTE

Allow the students to take a 10 minute break

INTERIM TRANSITION: Now that we are outside looking at the piece of equipment does anyone have any questions before we start the demonstration of the 360 walk around?

INSTRUCTOR NOTE

Ensure all students are wearing the proper safety equipment

INSTRUCTOR NOTE

Introduce the demonstration of the 360 walk around

DEMONSTRATION (30 Min) The purpose of this demonstration is to show the students how to perform before, during and after operational checks with the aid of a trip ticket as well as to familiarize students with major components. The demonstration also covers a 360 degrees walk around. Items required are a 120M for the Instructor to use and students will have trip tickets and student handouts. Have the students gather around the 120M for a demonstration of before, during and after operational checks and a 360 walk around. Normal class size is 12. There are 1 instructors required for this demonstration.

STUDENT ROLE: Students will observe the demonstration asking questions if they don't understand and also identify the checks with the trip ticket.

INSTRUCTOR(S) ROLE: Primary Instructor will demonstrate how to perform before, during and after operational checks with the aid of a trip ticket and a 360 walk around and go over and explain major components.

1. Safety Brief: No safety concerns with this class.

2. Supervision and Guidance: Instructor will show the students the following items.

LEFT SIDE

Scarifier tooth stow rack
Hydraulic cylinders and hoses
Tire pressure and lug nuts
Lights
Windows
Wipers
Left front access panel
Left rear access panel
Back up camera

RIGHT SIDE

Hydraulic cylinders and hoses
Tire pressure and lug nuts
Lights
Windows
Wipers
Right rear access panel
Right front access panel
Drawbar, circle, and moldboard

CAB

Joysticks
Seat adjustments
Fire extinguisher
Safety hammer
Forward controls and instruments
Foot pedals
Right side control panel

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just went over how to perform before, during and after operational checks with the aid of a trip ticket and a 360 walk around are there any questions? If not, let's move on to the practical application of a 360 walk around on the 120M.

INSTRUCTOR NOTE

Introduce the practical application of the 360 walk around

PRACTICAL APPLICATION. (1 Hrs.) The purpose of this Practical Application is to allow the students to complete a 360 walk around on the 120M. Items required are six 120M's for the students. Normal class size is 12. The students are broken into groups of three and assigned a tractor with one student conducting a 360 walk around and the others observing. There are two instructors required for this demonstration.

PRACTICE: Students will perform the following checks.

LEFT SIDE

Scarifier tooth stow rack

Hydraulic cylinders and hoses
Tire pressure and lug nuts
Lights
Windows
Wipers
Left front access panel
Left rear access panel
Back up camera

RIGHT SIDE

Hydraulic cylinders and hoses
Tire pressure and lug nuts
Lights
Windows
Wipers
Right rear access panel
Right front access panel
Drawbar, circle, and moldboard

CAB

Joysticks
Seat adjustments
Fire extinguisher
Safety hammer
Forward controls and instruments
Foot pedals
Right side control panel

PROVIDE HELP: The Instructor will assist students throughout the practical application and will ensure the students are properly conducting a 360 walk around.

1. Safety Brief: Reference the ORAW

2. Supervision and Guidance: Instructor is moving around the site assisting students.

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just went over the practical application of conducting a 360 walk around on the 120M, are there any questions? If not, let's move on to the demonstration of positions.

INSTRUCTOR NOTE

Introduce the demonstration of positions

DEMONSTRATION. (1 Hrs) The purpose of this demonstration is to familiarize the students with the positions for the 120M well as how to move the tractor. There are two instructors required for this demonstration.

STUDENT ROLE: Students will observe the demonstration asking questions if they don't understand and also identify the positions with their student handouts.

INSTRUCTOR(S) ROLE: Primary Instructor will explain each position as the assistant instructor performs each position.

1. Safety Brief: All students must stay a safe distance from the tractor while it is being positioned.

2. Supervision and Guidance: Instructor will show the students the following positions.

- (1) Park line
- (2) Right Hand General Grade
- (3) Left Hand General Grade
- (4) Move the tractor using the inching pedal.

4. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just went over the different positions and how to move the tractor. Are there any questions, if not we will move on to the practical application.

INSRTUCTOR NOTE

Introduce the practical application of operating positions

PRACTICAL APPLICATION. (1 Hrs.) The purpose of this practical application is to give the student the opportunity to position the tractor for various grading scenarios. There are two instructors required for this practical application.

PRACTICE: Students will perform the following positions:

- (1) Park line
- (2) Right Hand General Grade
- (3) Left Hand General Grade
- (4) Move the tractor using the inching pedal.

Once students have had a chance to position tractor they will drive around the outside edge of the training area.

PROVIDE HELP: The Instructor will assist students throughout the practical application and will ensure the students are properly operating the equipment.

1. Safety Brief: Reference the ORAW

2. Supervision and Guidance: Instructor is moving around the site assisting students.

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just went over the practical application of blade positions, are there any questions? If not, let's move on to the demonstration of Basic Leveling.

INSTRUCTOR NOTE

Introduce the demonstration for basic leveling

DEMONSTRATION (30 MIN) The purpose of this demonstration is to familiarize the students with the positions needed and how to perform basic leveling with the 120M. There are two instructors required for this demonstration.

STUDENT ROLE: Students will observe the demonstration asking questions if they don't understand and also identify the positions with their student handouts.

INSTRUCTOR(S) ROLE: Primary Instructor will explain each position as the assistant instructor performs each position.

1. Safety Brief: All students must stay a safe distance from the tractor while it is being positioned and operated.

2. Supervision and Guidance: Instructor will show the students the following:

The assistant instructor will demonstrate basic leveling by making three passes moving material laterally in one direction and then return making three passes back in the opposite direction.

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just demonstrated basic leveling are there any questions? If not, we will move onto the practical application of basic leveling.

INSTRUCTOR NOTE

Introduce the practical application of basic leveling

PRACTICAL APPLICATION. (12 Hrs.) The purpose of this practical application is to give the student the opportunity to basic level. There are two instructors required for this practical application.

PRACTICE: Students will perform the following: The student will perform basic leveling by making three passes moving material laterally in one direction and then return making three passes back in the opposite direction.

PROVIDE HELP: The Instructor will assist students throughout the practical application and will ensure the students are properly operating the equipment.

1. Safety Brief: Reference the ORAW

2. Supervision and Guidance: Instructor is moving around the site assisting students.

3. Debrief: Answer any student questions and review the learning points.

(Slide 74)

TRANSITION: We just went over the 360 walk around, operating positions, and basic operating; at this time are any questions? If not, I have a few questions for you.

Question 1: How many passes do you make during basic leveling?

Answer 1: 3 passes one direction and 3 passes to level the area back out for a total of 6 passes.

Question 2: What part of the blade is cutting on the first pass of basic leveling?

Answer 2: On the first pass you use the entire blade cutting 1/2 of an inch.

(Slide 75)

4. 7 STEP MILITARY ROAD. (2 HR)

(Slide 76,77)

a. **Right Hand Ditching Position:** Ditching positions are utilized IOT make sloped cuts of 3-4" at a maximum of a 1:3 slope and cast material between the tandems.

- (1) Position Blade 4-6" off the deck
- (2) Lean Wheels to the heel
- (3) Ensure the blade is centered on the circle
- (4) Pitch blade to a 3" overhang
- (5) Center shift approximately 8" to the left. (heel cylinder will be straight up and down).
- (6) Circle blade 45 degrees to cast material between the tandems.
- (7) Raise left cylinder approximately 18"
- (8) Lower the toe to the deck to make the cut

INSTRUCTOR NOTE

Explain what Left Hand Ditching Position looks like

(Slide 78,79)

b. **Center Windrow Position:** Center windrow position is utilized to form the crown of the road after reaching centerline with a windrow.

- (1) Position blade 4-6" off the deck
- (2) Ensure wheels are straight up and down
- (3) Pitch blade to a 3" overhang
- (4) Circle blade to zero degrees (straight across the circle)
- (5) Ensure blade is centered on the circle (six bolts on either side)
- (6) Center shift so the neither lift cylinder is straight up and down. (create a "V" with the lift cylinders)
- (7) Lower blade to 1-2 inches off the deck (depending on the size of the windrow you are leveling)

(Slide 80,81)

c. **Right Hand Shoulder Clean-up:** Shoulder cleanup is utilized by the operator to move the windrow created by ditching operations, forming the road shoulder and creating a windrow with excess material to be utilized to form the road crown. Minor depth adjustments can be made using blade pitch.

- (1) Position blade 4-6" off the deck
- (2) Lean wheels to the left
- (3) Pitch blade to a 3" overhang
- (4) Assume the center windrow position

- (5) Lower blade to the deck
- (6) Raise blade 2" off the deck
- (7) Side shift the blade all the way to the right
- (8) Center shift all the way to the right
- (9) Circle blade past 45 degrees to cast material between the tandems. Toe will be positioned 12-18" from the front right tire

INSTRUCTOR NOTE

Explain what Left Hand Shoulder Clean-up Position looks like

INTERIM TRANSITION: We just talked about the 7 step military road positions. At this time are there any questions? If not go ahead and take a 10 minute break.

INSTRUCTOR NOTE

ALLOW THE STUDENTS TO TAKE A 10 MINUTE BREAK

INTERMIN TRANSITION: Before the break we discussed 7 step military road positions. Now we are going to move into the 7 step military road design.

(Slide 82,83,84,)

d. **7 Step Military Road Design.**

(1) The purpose of a 7 step military road is to construct a roadway used for travel by various types of military vehicles.

(2) The road will consist of ditches, shoulders, cross slope, and a crown. There will be approximately a 2% slope from the shoulder to the crown.

(3) Steps - The steps are general in nature. Each step may be repeated as many times as necessary. Also, some steps such as scarify and level the area may be skipped.

(a) Scarify (as needed): You may need to loosen the ground prior to ditching re reduce wear on the blade components and minimize the amount of time and passes required.

(b) Level area (as needed): If the work site requires it you may need to perform basic leveling to level the area prior to performing any ditching operations.

(c) Marking cut: The marking cut is to ensure the ditch is within the proper boundaries before removing excess material. The marking cut should be no deeper than 1-2 inches.

(d) Ditching cut: The ditching cut is used to remove material from the ditch for drainage. The material removed from the ditch will be used to construct the rest of the road surface. Excavate approximately 3-4 inches, depending on the material you are working in, on each pass. Repeat this step until your ditch is in the proper depth or until too much dirt is built up along the shoulder of the road.

(e) Shoulder clean-up: The shoulder clean-up position is used when too much material is built up on the shoulder or desired depth has been reached. The shoulder clean-up allows for moving material away from the ditch without filling in the ditch. It also creates the shoulder while starting the cross slope towards the crown.

(f) General grade modified: General grade modified is used to continue moving material toward the crown of the roadway, while maintaining the proper cross slope.

(g) Crown (center windrow or general grade modified): This is the final step used once the material reaches the crown. This will allow the excess material to be spread evenly on both sides of the crown. This can be either the center windrow or general grade modified position.

(Slide 85)

TRANSITION: We have just finished discussing the 7 step military road, are there any questions? If there are no questions I have a few for you.

Question 1: In left hand general grade where is the windrow deposited?

Answer 1: In left hand general grade the windrow will be deposited outside the right tandems.

Question 2: What is the purpose of the shoulder cleanup position?

Answer 2: Shoulder cleanup is utilized by the operator to move the windrow created by ditching operations, forming the road shoulder and windrowing material to be utilized to form the road crown.

If there are no more questions take a 10 minute break and meet me outside by the grader.

(Slide 86)

INSTRUCTOR NOTE

Allow the students to take a 10 minute break

INTERIM TRANSITION: Now that we have learned about the 7 step military road in the classroom we are going to go over the demonstration of the V ditching positions.

INSTRUCTOR NOTE

Introduce the demonstration of the V ditching positions

DEMONSTRATION. (1 HRS) The purpose of this demonstration is to familiarize the students with the positions needed and how to perform v-ditching operations as well as build a road. There are two instructors needed for this demonstration.

STUDENT ROLE: Students will observe the demonstration asking questions if they don't understand and also identify the positions with their student handouts.

INSTRUCTOR(S) ROLE: Primary Instructor will explain each position and step as the assistant instructor performs each position and step.

1. Safety Brief: All students must stay a safe distance from the tractor while it is being positioned and operated.

2. Supervision and Guidance: Instructor will show the students the following: The assistant instructor will demonstrate how to construct a v-ditch and carry material to form a road. Only one side of the road will be demonstrated up to the centerline or crown. Then the assistant instructor will fill in the ditch using basic leveling techniques.

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We've just performed demonstration of constructing a road using the v-ditch method. Are there any questions, if not we will move on to practical application.

INSTRUCTOR NOTE

Introduce the practical application of V ditching operations

PRACTICAL APPLICATION. (24 Hrs.) The purpose of this practical application is to give the student the opportunity to perform v-ditching operations as well as build a road. There are two instructors needed for this practical application.

PRACTICE: Students will perform the following:

The student will demonstrate how to construct a v-ditch and carry material to form a road. Only one side of the road will be demonstrated by each student up to the centerline or crown. Then the student will fill in ditch using basic leveling techniques.

PROVIDE HELP: The Instructor will assist students throughout the practical application and will ensure the students are properly operating the equipment.

1. Safety Brief: Reference the ORAW

2. Supervision and Guidance: Instructor is moving around the site assisting students.

3. Debrief: Answer any student questions and review the learning points.

INTERIM TRANSITION: We have just performed practical application of 7-step military road. At this time are there any questions? If not we will move on to Preventive Maintenance Checks and Services (PMCS).

INSTRUCTOR NOTE

Introduce the practical application PMCS

PRACTICAL APPLICATION. (4 Hrs.) No demonstration is required for this Practical application. The Marines receive all the knowledge needed for this during the Shop Operations phase as well as during the demonstration of 360 walk around. The purpose of this practical application is to give the student the opportunity to perform PMCS for the 120M. There are two instructors needed for this practical application.

PRACTICE: Students will perform the following:

The student will use a lubrication order provided or the one on the tractor to perform required PMCS. They will also clean cab and windows and remove all debris from back of the moldboard.

PROVIDE HELP: The Instructor will assist students throughout the practical application and will ensure the students are properly performing required PMCS.

1. Safety Brief: Reference the ORAW

2. Supervision and Guidance: Instructor is moving around the site assisting students.

3. Debrief: Answer any student questions and review the learning points.

TRANSITION: We just performed how to construct a 7 step military road with the Grader, are there any questions? Are there any questions pertaining to anything we have covered up to this point from the very beginning to now? If not, I have some for you.

(Slide 87)

Question 1: What is the scarifier used for?

Answer 1: A scarifier allows loosening of compacted material prior to grading.

Question 2: What are some of the points you would want to use dry lube for?

Answer 2: Dry lube is used for circle drive pinion teeth, blade circle, circle top wear surface, and circle interior vertical surface.

(Slide 88)

Question 3: What must the operator ensure is disengaged when turning?

Answer 3: The operator must ensure the differential lock is disengaged when turning to prevent damage to the differentials.

Question 4: When using the manual mode for all wheel drive, what is the percentage of the front wheel speed in relation to the rear wheels?

Answer 4: The speed control allows for front wheels to turn 99-120% of rear wheel speed.

(Slide 89)

Question 5: When using the manual mode for all wheel drive, what is the percentage of the front wheel speed in relation to the rear wheels?

Answer 5: The speed control allows for front wheels to turn 99-120% of rear wheel speed.

(Slide 90)

SUMMARY

(10 MIN)

We have talked about the mission, major components, controls and instruments, basic operating and the 7 step military road. I am now more than confident that with the information you have received this week you will be able to basic level as well as

build and maintain a road using the 7 step process and conduct preventive maintenance. Take a ten minute break.