

**UNITED STATES MARINE CORPS**  
ENGINEER EQUIPMENT INSTRUCTION COMPANY  
MARINE CORPS DETACHMENT  
686 MINNESOTA AVE  
FORT LEONARD WOOD, MISSOURI 65473-8963

## **LESSON PLAN**

### **BACKHOE 420E IT**

LESSON ID: BEE0-B04

**BASIC ENGINEER EQUIPMENT OPERATOR COURSE**

**CID A1613F1**

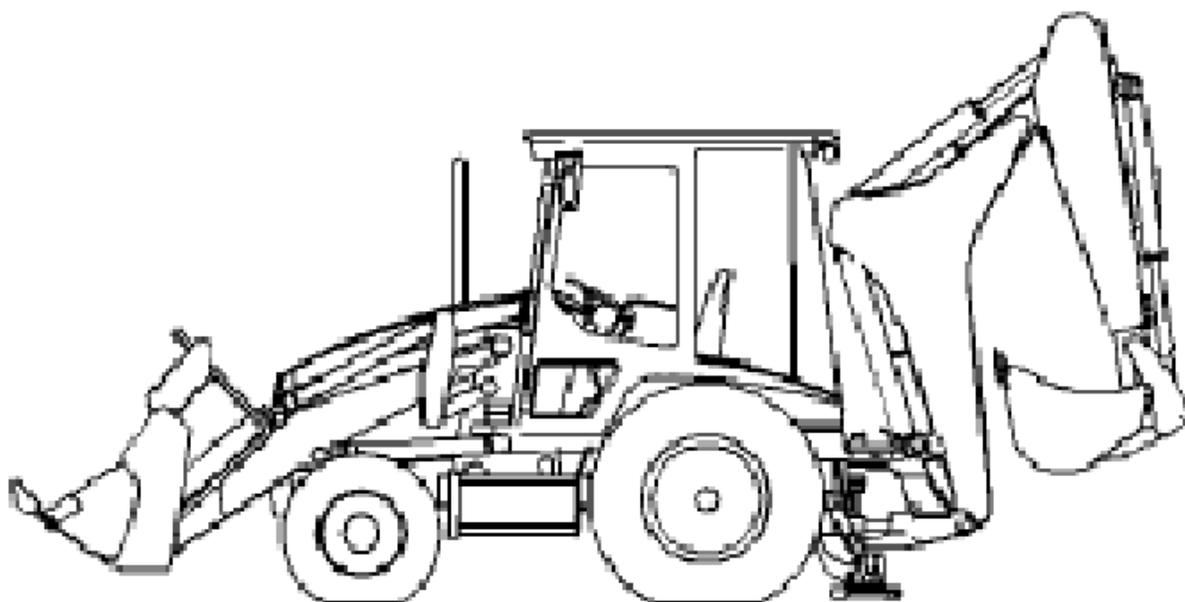
**REVISED 04/02/2013**

**APPROVED BY**

**DATE**

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# CATERPILLAR BACKHOE LOADER



420E IT

**INTRODUCTION**

**(20 min)**

1. **GAIN ATTENTION.** Show video

**(ON SLIDE #2/3)**

2. **OVERVIEW.** Good morning, my name is \_\_\_\_\_, the purpose of this lesson is to give you the tools, knowledge, and skills to safely and effectively operate a 420E IT Backhoe in support of engineer operations. I will cover safety and operator responsibilities, general characteristics, major components, instruments and controls, basic operations, operating techniques, changing attachments, loading and off-loading backhoe operations, preventative maintenance checks and services.

**INSTRUCTORS NOTE**

Introduce learning objectives.

**(ON SLIDE #4)**

3. **LEARNING OBJECTIVES.**

a. **TERMINAL LEARNING OBJECTIVES:**

(1) Provided an engineer equipment requirement, engineer equipment records and forms and references, operate the 420E IT backhoe to safely meet operational requirements with no injury to personnel or damage to the equipment. (1345-HEOP-1004)

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

**(ON SLIDES #5)**

b. **ENABLING LEARNING OBJECTIVES:**

(1) Given the description and characteristics of the 420E IT Backhoe Loader, and without the aid of references, identify the characteristics per the TM 10996A-OR/A. (1345-HEOP-1004a)

(2) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, and with the aid of references, initiate operator records and forms per the TM 4700-15/1. (1345-HEOP-1004b)

(3) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, technical manuals and lubrication orders, perform technical manual research per the TM 10996A-OR/A. (1345-HEOP-1004c)

(4) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, tools, and with the aid of references, demonstrate correct use of tools per the TM 10209-10/1. (1345-HEOP-1004d)

**(ON SLIDE #6)**

(5) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, tools, petroleum, oils, and lubricants and with the aid of references, demonstrate correct use of petroleum, oils, and lubricants per the TM 10996A-OR/A. (1345-HEOP-1004e)

(6) Provided a 420E IT Backhoe Loader, 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 10996A-OR/A. (1345-HEOP-1004f)

(7) Provided a 420E IT Backhoe Loader, an operator, and without the aid of reference, perform hand and arm signals per the FM 21-60. (1345-HEOP-1004g)

**(ON SLIDE #7)**

(8) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, and references, perform front end Loader operations per the TM 10996A-OR/A. (1345-HEOP-1004h)

(9) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, and references, perform ditching/trenching operations per the TM 10996A-OR/A. (1345-HEOP-1004i)

(10) Provided a 420E IT Backhoe Loader, an engineer equipment trailer (EET), engineer equipment records and forms, and with the aid of references, load/unload the 420E IT Backhoe Loader onto/off the (EET) per the TM 10996A-OR/A. (1345-HEOP-1004j)

**(ON SLIDE #8)**

(11) Provided a 420E IT Backhoe Loader, attachments, tools, engineer equipment records and forms, and references, change attachments per the TM 10996A-OR/A. (1345-HEOP-1004k)

(12) Provided a 420E IT Backhoe Loader, engineer equipment records and forms, and with the aid of references, complete operator records and forms per the TM 4700-15/1H. (1345-HEOP-1004l)

(13) Provided a 420E IT Backhoe Loader, tools, petroleum, oils, and lubricants, equipment records, and references, conduct preventive maintenance per the TM 10996A-OR/A. (1345-MANT-1001d)

(ON SLIDE #9)

4. **METHOD/MEDIA/ADMIN.** This lesson will be taught utilizing the lecture, demonstration, and practical application methods. I will be added with the use of video, computer-aided graphics, your outline, and the actual end item of equipment.

**INSTRUCTOR NOTE**

Explain Instructional Rating Forms to students.

5. **EVALUATION.** You will be evaluated on this period of instruction on the morning of the fifth training day. This will be in the form of a twenty five question multiple choice test. That same afternoon you will be evaluated with a practical application evaluation.

(ON SLIDE #9, #10)

6. **SAFETY/CEASE TRAINING (CT) BRIEF.** Ensure seat belt is fastened at all times. All controls will remain in the neutral position until utilized. Apply Service and Parking Brakes when stationary. No passengers are allowed at any time. Be aware of all pinch points when servicing or around equipment. Keep hands and feet in the cab at all times. Before and during operation, check all clearances to power lines or other obstructions and keep all pedestrians/ground guides at a safe distance (remember your working zone radius). Wear hard hat at all times. Every Marine is responsible for safety. If you witness an unsafe act you will call cease training and report it to your Instructor. Dress appropriate for the weather.

(ON SLIDE #11)

**TRANSITION:** Are there any questions on what we will cover, how we will cover it, and how you will be evaluated? If not, let's start by discussing the mission and general characteristics of the backhoe.

(ON SLIDE #12)

**BODY**

**(34HRS 35 MINS)**

1. **MISSION:** (10 Min) The mission of the 420E IT Backhoe Loader is to provide units with backhoe and loader operations. These operations include ditching, trenching, dozing, scraping, clamshell, and bucket operations. The general characteristics are as follows;

(ON SLIDE #13)

- a. The 420E IT is a fully hydraulic, rough terrain backhoe/loader manufactured by Caterpillar.
- b. The machine is equipped with manually selected All Wheel Drive.

- c. The front axle can oscillate 11 degrees left or right from center.
- d. The heavy-duty rear axle is rigid mounted to the machine.
- e. The 420E IT can negotiate a maximum grade up to 35 degrees.
- f. The maximum ground clearance is 12 inches.
- g. The 420E IT Backhoe Loader is also equipped with a Roll Over Protective Structure (ROPS) and a Falling Object Protective Structure (FOPS).

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

DANGER!!! In order for the ROPS to protect the operator, the operator must use the seatbelt.

- h. The fuel tank has a capacity of 38 gallons, and is equipped with a locking fuel tank cap.

**(ON SLIDE #14)**

**TRANSITION:** Are there any questions covering the mission or general characteristics of the 420E IT backhoe? If not than I have a question for you.

(Q#1)What is the mission of the backhoe 420E IT

(A#1)To provide units with backhoe and loader operations. These operations include ditching, trenching, dozing, scraping, clamshell, and bucket operations.

**TRANSITION:** If there are no more questions let's move on and discuss the major components.

**(ON SLIDE #15)**

2. **MAJOR COMPONENTS:** (30 Min) There are nine major components on the 420E IT backhoe, the Engine compartment, Transmission, Hydraulic system, Cooling system, Electrical system, Brake system, Multi-purpose front bucket, Backhoe and Auxiliary hydraulics.

**(ON SLIDE #16)**

a. **Engine Compartment:**

(1) The 420E IT is powered by a CAT 3054C, 4.4 Liter, direct injection turbocharged (DIT) diesel engine, which produces a maximum of 93 horsepower at 2200 RPM's.

(a) The engine oil level is to be checked/or serviced daily, before starting engine.

(b) The engine uses 1.9 Gallons of SAE 15W40 oil and is color coded yellow.

**(ON SLIDE #17)**

(2) The 420E IT has two engine air filters.

(a) The engine has a two-stage air filter system, consisting of a Primary air filter and a Secondary air filter.

(b) The Primary engine air filter must be visually inspected each day. It must be cleaned when the service indicator enters the RED zone.

(c) The secondary engine air filter is not to be serviced.

(d) To clean the air filters, use an air compressor, blowing from the inside of the filter out. Do not tap the filters.

**(ON SLIDE #18)**

b. **Transmission:**

(1) The transmission is a Power-Shift Transmission, also known as a "Auto-Shift" transmission, it can be shifted manually or automatically.

(a) The machine has 5 gears forward with a maximum forward speed of 25.4 MPH.

(b) The machine has 3 gears reverse with a maximum reverse speed of 12.1 MPH.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

Students will only operate in first gear while on the lot or in the pit unless told otherwise.

(c) The Transmission oil dipstick and fill point are located in the rear of the engine compartment, color coded purple. Transmission oil capacity is 5 gallons, utilizing SAE 10W oil.

(d) Check the transmission oil level on a level surface; with the engine running at low idle, and the transmission selector in neutral, after the transmission has been used.

(ON SLIDE #19)

c. Hydraulic System:

(1) The 420E IT is equipped with flow-sharing hydraulic valves, ensuring proportional flow of oil to all hydraulic cylinders, providing greater control and improved multi-function performance.

(a) Located between the engine compartment and the cab oil level in the sight gauge should read BETWEEN the "MIN" mark and the "MAX" mark.

(b) The hydraulic oil fill is located in the rear of the engine compartment, next to the transmission oil check/fill, and is color coded blue. Hydraulic system capacity is 10.6 gallons of SAE 10W oil.

(c) You must wait 5 minutes after tractor has been running and then relieve hydraulic pressure by slowly removing the fill cap to add hydraulic oil.

**STUDENT NOTE**

Ensure backhoe is in the stowed position before checking the hydraulic fluid.

(ON SLIDE #20)

d. Cooling System:

(1) The radiator, which holds 6.7 gallons of Extended Life Coolant, is located in the front of the engine compartment. The radiator should be filled to within a ½" from the bottom of the filler neck.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

**WARNING! Mixing ELC with any other type of coolant can result in radiator malfunction and injury to equipment.**

(ON SLIDE #21)

e. Electrical System:

(1) The 420E IT is equipped with a 24-volt negative ground electrical system.

(a) The electrical system features two 12-volt batteries.

(b) A NATO slave receptacle, located on the side of the battery box, is used for slave starting.

(2) Battery Equalizer: The battery equalizer is located on the top of the battery box, under a protective cover.

(a) It is automatically engaged upon startup.

(b) Converts 24-volts into 12-volts for instruments and controls inside the operator cab.

(c) Provides equalization for dual battery system to prolong battery life and maximize performance.

**(ON SLIDE #22)**

**f. Brake and Final drive System:**

(1) The 420E IT is equipped with hydraulically applied wet-disc brakes in the final drive system

(a) Provides a means for disconnecting the engine from the driving wheels.

(b) A Final Drive allows the wheels to rotate at different speeds.

(c) Final drives use SAE 30W

**(ON SLIDE #23)**

**g. Multi-Purpose Front Bucket:**

(1) The 420E IT comes equipped with a multi-purpose front bucket attachment:

(a) The 4-in-1 multi-purpose bucket attachment is hydraulically operated; its functions include Dozing, Scraping, Bucket, and Clamshell operations.

(b) The maximum lifting capacity is 6,363 pounds, with a load capacity of 1 1/4 cubic yards.

(c) The maximum lifting height of the bucket is 8 feet 5 inches (Measured at the full dump angle, from the bucket edge to the deck).

(d) Teeth on the front bucket need to be changed when worn within 2" of the bucket edge, or holes develop.

**(ON SLIDES #24-25)**

**h. Backhoe Arm:**

(1) The 420E IT Backhoe consists of three major parts: The boom, the dipper and the bucket (or work tool).

(a) The backhoe has a reach capability of 18 feet 5 inches, measured from the center of the backhoe pivot.

(b) The maximum digging depth of the backhoe is 14 feet 4 inches.

(c) The backhoe bucket load capacity is 1/4 cubic yard.

(d) A maximum digging force of 13,875 pounds per square inch.

(e) Teeth on the backhoe bucket need to be changed when worn within 2" of the bucket, or holes develop.

(f) The Swing Lock Pin and Boom Lock Lever are 2 safety features that lock the backhoe in the stowed position. They must be engaged while operating the Front Bucket and/or Traveling.

**INSTRUCTOR NOTE**

**On the bottom of your NAVMC 10523, "Swing Lock Pin" and "Boom Lock Lever", will be added as additional checks.**

**(ON SLIDE #26)**

(2) Stabilizers: The 420E IT Backhoe has two stabilizers located on the rear of the tractor.

(a) Stabilizers are used to lift, stabilize and level the tractor while performing backhoe operations.

(b) Before performing backhoe operations, the stabilizers must lift and level the tractor approximately 2-4 inches off the deck.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

**WARNING! While performing backhoe operations do not dig around or near the stabilizers. This can cause the tractor to overturn, resulting in injury to personnel and damage to the equipment.**

**(ON SLIDE #27)**

**i. Auxiliary Hydraulics:**

(1) Located on the exterior right side, the auxiliary hydraulics are to be used with hand-held hydraulic tools.

(a) The auxiliary hydraulics couplings provide connections for hand-held hydraulic tools.

(b) Lifting up and engaging the auxiliary hydraulics switch disengages the standard hydraulics of the 420E IT.

(c) The hand-throttle is to be left in the low idle position when operating hand-held hydraulic tools.

(d) You must disengage the auxiliary hydraulics before attaching or removing a hand-held hydraulic tool.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

**WARNING! Do not attempt to remove hydraulic components until hydraulic pressure has been relieved, or serious personal injury or death may occur.**

**(ON SLIDE #28)**

**TRANSITION:** Are there any questions covering the 9 Major Components of the 420E IT Backhoe? If not than I have a few questions for you.

(Q#1)What type of transmission does the 420E IT have.

(A#1)An Auto-Shift transmission.

(Q#2)What is the maximum digging depth of the backhoe?

(A#2)14 feet 4 inches?

(Q#3)What are the two safety features that lock the backhoe in the stowed position?

(A#3)The swing lock pin and the boom lock lever.

**(ON SLIDE #29)**

**INSTRUCTOR NOTE**

After questions, place class on a 10 min break

**TRANSITION.** Class leader, do we have everybody? Great! Are there any questions covering the engine compartment or the buckets? If not, let's move on and discuss instruments and controls.

**(ON SLIDE #30)**

3. **INSTRUMENTS & CONTROLS:** (20 Min)

**(ON SLIDE #31)**

a. Left Side Front Panel:

(1) Hour Meter: The service hour meter is located on the left side of the instrument console. It gives the operator the hours that the equipment has been operated, so that hourly PMCS and scheduled maintenance can be performed.

(2) Quick Coupler Pin Switch: This switch is used to engage or disengage the pins that lock the front bucket in place. It is equipped with a red lock button for safety purposes.

(4) All Wheel Drive Control: The All Wheel Drive Control engages power to all four tires, and has three positions.

(a) Position 1 (Left) keeps the tractor in full time All Wheel Drive with All-Wheel Drive Braking. **(AWD w/AWD BRAKING)**.

(b) Position 2 (Middle) places the 420E IT in Two Wheel Drive, and uses the service brake pedal[s] to engage AWD braking, which aides braking by utilizing all four brakes. **(2WD w/AWD BRAKING)**.

(c) Position 3(Right) places the 420E IT in 2 Wheel Drive with 2 wheel braking, utilizing only the rear brakes. **(2WD w/2 WHEEL BRAKING)**.

**STUDENT NOTE:**

When roading the 420E IT, the AWD Control Switch should be in Position 2. Doing so prolongs tire life and maximizes braking performance.

(3) Transmission Neutral Lock: Activating this switch keeps the 420E IT in NEUTRAL in case the directional control lever is accidentally shifted into either FORWARD or REVERSE.

**STUDENT NOTE:**

If the transmission neutral lock has been activated, you must shift the direction control lever back into the NEUTRAL position, before you shift the direction control lever.

(4) Aux. Circuit Control: The switch allows the operator to activate a 12 volt auxiliary circuit. Press the top of the switch in order to energize the auxiliary function. Press the bottom of the switch in order to turn off the auxiliary function. The auxiliary circuit can control a separate function such as a water sprayer for a broom.

(5) Work Tool Control: Utilized to operate front work tools such as the broom.

(6) Continuous Flow Control Loader: Used to select the desired flow rate for the thumb control on the loader control.

**(ON SLIDE #32)**

**b. Steering Column:**

(1) Hazard Flashers

(2) Transmission Direction and Speed Control Lever: This lever is located on the left side of the steering column.

(a) It controls the direction that the equipment will travel; forward, neutral, or reverse.

(b) Controls the speed gear setting of 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> gear.

(3) Turning Signal, High Beam & Wiper Control Lever:

(a) Push the lever forward to illuminate the left turn signal, pull it back to illuminate the right turn signal.

(b) Pop the lever up to flash front high beams momentarily. Push the lever down to activate the high beam.

(c) The windshield wiper has 3 speeds. To operate the windshield wipers, rotate the lever forward to the desired setting. Use the button on the lever end for front windshield wiper fluid.

**STUDENT NOTE:**

The Blackout Light Switch must be placed in the Service Drive position for the Front Lights and horn to function.

**(ON SLIDE #33)**

**c. Right Side Front Panel:**

(1) Auto-Shift Control Switch: Has two positions, Manual and Automatic. To reach 5<sup>th</sup> gear, place the transmission gear setting in 4<sup>th</sup> gear and activate the Auto-Shift Control Switch by pressing the top of the switch, placing it in the AUT position. The tractor will then automatically shift gears, from 1<sup>st</sup> gear through 5<sup>th</sup> gear. Press the bottom of the switch to enable manual gear shifting.

(2) Ride Control: The Ride Control acts as a shock absorber by dampening the forces from the bucket when traveling. It has three positions.

(a) ON: Fully pressing the bottom of the switch turns Ride Control on.

(b) OFF: Placing the switch in the middle position turns Ride Control off.

(c) AUT (automatic): Fully pressing the top of the switch automatically enables Ride Control once the tractor's speed reaches approximately 6 MPH.

(3) Horn

**STUDENT NOTE:**

For the front loader bucket to raise the front tires off the deck for backhoe operations, the Ride Control Switch must be in the OFF or AUT position.

**(ON SLIDE #34)**

d. **Pedals:**

(1) Differential Lock Pedal: When engaged both rear wheels will rotate at the same time, increasing traction.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

**DANGER!!! Do not engage the differential lock pedal while your wheels are spinning, or if the speed control is in 3<sup>rd</sup> gear or higher.**

(2) Service Brake Pedals: The tractor is equipped with two service brake pedals that allow the operator to make sharp turns in either direction. It is also equipped with a locking bar that keeps both pedals together. This will be used when traveling or loading and unloading when transporting.

(3) Locking Bar

(4) Steering Wheel Tilt Pedal

(5) Accelerator Pedal

INSTRUCTOR NOTE

Instructor will emphasis the following;

**DANGER!!! Failure to use both Service Brake Pedals while Traveling and Loading or Unloading may cause damage to equipment or injury to personel.**

**(ON SLIDE #35)**

e. **Parking Brake**: To engage the Parking Brake, pull back on the Lever so that it is in the vertical position. To disengage the parking brake push forward on the lever.

STUDENT NOTE:

The Parking Brake most be engaged when dismounting the tractor.

**(ON SLIDE #36)**

f. **Front Bucket Control Lever**: The Front Bucket is controlled by a Joystick Control that has 7 different positions, a toggle, 2 accessory buttons, and a neutralizer.

(1) **Float**: Locking the joystick control all the way forward engages the float position. This allows the bucket to move along the contour of the ground.

(2) **Lower**: By pushing the joystick forward the bucket will lower.

(3) **Hold**: Releasing the joystick from any position places it in hold.

(4) **Raise**: By pulling back on the joystick the front bucket raises.

(5) **Dump**: Pushing the joystick to the right tilts the front bucket forward.

(6) **Tilt-Back**: Pushing the joystick to the left tilts the bucket back.

(7) **Return to Dig**: Locking the joystick control all the way to the left will automatically level the bucket from the dump position.

g. **Clamshell**: Roll the toggle forward to open the clamshell, or roll the toggle rearward to close the clamshell.

**(ON SLIDE #37)**

h. **Transmission Neutralizer**: The transmission neutralizer button is located on the underside of the joystick. When traveling, each depression downshifts the transmission one gear. While operating the front bucket, pressing and holding the button neutralizes the transmission, allowing the RPM created by your engine to be utilized strictly by your hydraulics. The transmission neutralizer is not to be used as a brake.

**(ON SLIDE #38)**

i. **Right hand Console**:

(1) Cab Filter(Recirculation): Located below the right hand console.

(2) A/C & Heater

(3) Hydraulic Lockout Switch: Press the top of the switch in order to lock both the Front bucket and Backhoe. Use this switch when transporting with the machine.

(4) Blackout/Service Lights: This switch has 3 different positions and is equipped with a red locking button, to keep the button locked in the off position. The top of the switch operates the Service Drive Lights. In order to have any lights working and the back alarm on this must be engaged. The middle of the switch is the off position, which does not allow any lights to be on. The bottom of the switch only enables the Front Blackout Driving Lamps and the Rear Blackout Tail lamps.

(5) Engine Start Switch: The OFF position shuts the tractor off, the ON position keeps the tractor running, and the START position engages the starter.

(6) Starting Aid Switch: If the machine fails to start due to cold ambient temperatures, the thermal starting aid can be activated in order to provide heated fuel to the inlet manifold. Only use when 0 degrees or under for cold starting.

(7) Gauges: There are 4 different Gauges that indicate the performance of the tractor; Transmission Oil Temperature, Fuel Level, Engine Coolant temperature, and Tachometer.

(8) Front Work Lights: This switch has 3 different positions. Push the bottom of the switch to engage the Front Running Lights. Push the middle of the switch to enable the 2 outside Flood Lights. Push the top of the switch to engage all 4 Front Flood Lights.

(9) Rear Work Lights: This switch has 3 different positions. Push the bottom of the switch for the OFF position. Push the middle of the switch to enable the 2 outside Rear Flood Lights. Push the top of the switch to engage all 4 of the Rear Flood Lights.

(10) Rear Wiper

(11) Continuous Flow Backhoe: Used to select the desired flow rate for the thumb control on the loader control.

**Student Note**

Turn to start and let go, after four beeps start.

**(ON SLIDE #39)**

**j. Alert Indicators**: The panel is equipped with 8 different indicator lights, which alert the operator to stop the tractor immediately and investigate. It also shows what type of malfunction is occurring.

(1) Hydraulic oil temperature indicates the temperature is too high.

(2) Action light indicates a malfunction in machine system.

(3) Air Filter indicator indicates that the air system is clogged.

(4) Engine Oil Pressure indicates that the pressure is too low.

(5) Charging System indicates that the electrical system is running too high or too low.

(6) Fuel Water Separator indicates that it is plugged.

(7) Brake pressure indicates that the pressure is low.

(8) Hydraulic Oil Filter bypass indicates that oil is bypassing the filter.

**INSTRUCTOR NOTE:**

**Instructor will emphasis the following;**

**DANGER!!! If any needle goes into the RED RANGE in any of the Gauges, the tractor should be shut down immediately and the operator should investigate the problem, and inform maintenance if necessary.**

**(ON SLIDE #40)**

**k. Right Hand Console Controls:**

(1) Throttle Control: Used to increase the RPM's when operating the backhoe. Recommended RPM's should fall between 1500 and 2100 RPM's.

**INSTRUCTOR NOTE**

**Instructor will emphasis the following;**

**DANGER!!! When using the Throttle Control, ensure that the Tachometer stays out of the RED RANGE, recommended RPMs are between 1800-2100 RPMs. This lever is also not a cruise control.**

(2) Stabilizer Controls: These stabilize the tractor when doing Backhoe Operations. Push each control forward to move the stabilizers down, and pull back to bring them back up. When setting up for Backhoe operations, the tractor should only be approximately 2 to 4 inches off the deck.

(3) Boom Lock Lever: This lever locks the boom to the tractor for better stability while traveling or transporting the tractor. Make sure the hook engages over the lock in order to secure the boom in the lock position.

**STUDENT NOTE:**

When releasing the Boom from the Boom Lock, ensure to pull back on the Boom Lever to reduce the pressure off of the Boom Lock Lever.

**(ON SLIDES #41)**

i. Backhoe Control Levers: There are 2 Backhoe Control Levers, with a control tower lock and a foot pedal for attachments. The joystick levers control all three of the backhoe components, which include the boom, dipper, and bucket. It also controls the swing of the backhoe. The tractor also has a Selector valve, located in the cab to switch between two different control patterns.

(1) Left Backhoe Control Lever: This lever actuates the Boom and Bucket of the Backhoe.

- (a) Pushing the lever forward will lower the boom.
- (b) Pulling the lever back will raise the boom.
- (c) Moving the lever to the left will swing the backhoe left.
- (d) Moving the lever to the right will swing it to the right.

**(ON SLIDE #42)**

(2) Right Backhoe Control Lever: This lever actuates the Dipper and the Swing of the Backhoe.

- (a) Pushing the lever forward will move the dipper out.
- (b) Pulling the lever back will move the dipper in.
- (c) Moving the lever to the left will curl the bucket.
- (d) Moving the lever to the right will dump the bucket.
- (e) Console latch

**(ON SLIDE #43)**

**TRANSITION:** Are there any questions on the information we have just covered? If not than I have a few questions for you.

(Q#1)What is the name of the control that allows the backhoe to achieve fifth gear?

(A#1)The auto-shift control.

(Q#2)When do you engage the hydraulic lockout switch?

(A#2)When transporting the machine.

(Q#3)What are the recommended operating RPM's for the backhoe?

(A#3)The recommended RPM level is 1800-2100 RPM's.

**(ON SLIDE #44)**

**INSTRUCTORS NOTE**

Review material covered to this point and place students on a 10  
minute break

**TRANSITION.** Class leader, do we have everybody? Great! let's move on and discuss Operations of the 420E IT Backhoe.

**(ON SLIDE #45)**

**4. OPERATIONS: (20 MIN)**

**(ON SLIDE #46)**

**a. Basic Operations:**

(1) Starting Procedures:

(a) Ensure you have your hard-hat on and hearing protection in before performing starting procedures.

(b) Perform a 360 walk-around, before mounting the equipment. Start at the engine compartment looking for any leaks, broken or missing bolts, or any other discrepancies around the engine. Then walk around the tractor looking underneath for any leaks. Inspect the tires for serviceability and proper tire pressure. Inspect for cracked windows, broken bolts, or cracked hydraulic lines.

(c) Ensure when you mount the tractor that you are facing it, and maintain 3 points of contact on the tractor.

(d) Use the seat belt, and ensure that it is serviceable and works properly.

(e) Place the tractors key into the Engine Start Switch and turn it to the ON position for 3 to 5 seconds. Then turn it to the start position, once the tractor turns on let go of the key. The key will then turn to the ON position.

(f) Wait 3 to 5 minutes to allow the tractor's turbo-charger to warm up. Ensure that all gauges stay in the green ranges, and the Alert Indicators are normal.

**(ON SLIDE #47)**

(2) Set-Up for Front Bucket Operations and Traveling:

(a) Before operating, ensure that both the swing lock pin and the Boom Lock Lever are both in the locked position.

(b) Tilt all the way back and raise the bucket 12-18 inches off the deck.

(c) Disengage the Parking Brake and turn the Neutral Lock switch off.

(d) Ensure the tractor is in 1<sup>st</sup> gear, and move the Transmission Direction Lever into either forward or reserve.

**(ON SLIDE #48)**

(3) Set-Up for Backhoe Operations:

(a) Place the Transmission Direction Lever into the neutral position, and push the Transmission Neutral Lock switch into the lock position.

**STUDENT NOTE**

When setting up on a slope, be sure to engage parking break

(b) Tilt the Front Bucket all the way down and lower it into the deck until it raises the front of the tractor approximately 2 to 4 inches off the deck.

(c) Rotate the operator's chair around with the rotate lever under the seat, to use the Backhoe Controls.

**STUDENT NOTE:**

Ensure that the Ride Control is either in the OFF or in the (AUT) positions.

(d) Lower Stabilizers down to the deck, then continue to lower them until the rear of the tractor is raised approximately 2 to 4 inches off the deck and level.

(e) Manually unlock the Swing Lock Pin, located on the outside of the tractor just below the rear of the cab. Ensure to fasten the seat belt once complete.

(f) Unlock the Boom Lock with the Boom Lock Lever.

(g) Increase the RPM's with the Throttle Control to 1800 rpm's, for backhoe operations.

(h) Dipper all the way out, uncurl the bucket, and boom down until the bucket knuckle is 4" off the deck, with the bucket teeth on the deck.

(i) Mark your "KILL ZONE" with your bucket teeth, by swinging the backhoe, creating a 180 degree arc. Ensure the bucket knuckle does not contact the deck.

(j) Make your marking cut

**(ON SLIDE #49)**

(4) Stopping Procedures:

(a) Before stopping the tractor, ensure that the tractor is on a level surface.

(b) Place the Transmission Direction Lever into the neutral position, and push the Transmission Neutral Lock switch into the lock position.

(c) Engage the Parking Brake by pulling back on the lever.

(d) Level the Front Bucket and lower it until it is lightly on the deck.

(e) Allow the engine to cool down for 3 to 5 minutes to prevent damage to the turbo-charger.

(f) Exit the tractor facing the equipment, while maintaining 3 points of contact. Then perform a 360 walk-around noting any discrepancies on your NAVMC 10523.

**(ON SLIDE #50)**

**b. Operating Techniques:**

(1) Flat Bottom Ditches: Uses of a flat bottom ditch may vary between making any type of fighting position, a basic ditch for a road, or even footers for a new building. Along with making steps in the ditch, squared walls, and crossing ditches. The basic ditch design includes ditch 6-7' long. Both the head and foot walls will have 90 degree angles leading to a flat bottom. The ditch will be 36-42" deep. The spoils from the ditch will be 3' wide by 3' high and will be the entire length of the ditch.

(2) Loading and Clamshell: The Front Bucket may be used to load material into a haul unit which includes, using the Clamshell for easy release of loose materials. The Clamshell may also be used to move logs or like materials.

(3) Grading and Leveling: The Front Bucket is equipped with a Clamshell, which can perform both Dozing and Scraping. Either technique may be used to level or grade an area for job site maintenance. The bucket also has a float position that allows the bucket to move along the contour of the ground to do finishing work.

(4) Roading: The 420E IT Backhoe was not designed to handle long periods or distances of traveling. After 25 miles or 1 hour of traveling the tractor should be stopped 30 minutes to cool the tires and other components.

**(ON SLIDE #51)**

**c. Changing Attachments:**

(1) Backhoe Bucket:

(a) The backhoe bucket should be level, and 2 to 4 inches off the ground.

**Student Note**

When changing attachments the hydraulic pressure must be relieved before the lines can be connected or disconnected. Turn off tractor and then turn ignition switch to the on position, do not start the tractor. Then move the control levers back and forth using all the functions.

(ON SLIDE #52)

(b) Remove the lynch pin from the lock pin and then remove the lock pin.

**Instructors Note**

Do not use metal to metal, it will mushroom the end and will not come out.

(ON SLIDE #53)

(c) Push down on the actuating lever in order to release the linkage pin from the quick coupler.

**NOTE: If the quick coupler does not release the linkage pin, use the Actuating Lever to release the linkage pin. Push down on the lever in order to release the linkage pin.**

(d) Uncurl the bucket, then dipper/stick out, to release the quick coupler from the pivot pin of the bucket.

(ON SLIDE #54)

(1)Hydraulic Hammer: Used to chisel rock, concrete, cutting asphalt, and frozen ground.

(ON SLIDE #55)

(2)Auger: Used to drill holes in the ground for posts.

(ON SLIDE #56)

(3)Auger Bit: Bit used to make holes in the ground.

(ON SLIDE #57)

(4)Ditch Bucket: Used for drainage ditches.

(ON SLIDE #58)

(5)Vibrator Compactor: Used to compact soils.

(ON SLIDE #59)

d. Loading and Off-loading of an Engineer Equipment Trailer:

**NOTE: Because the 420E IT was not designed for long distant travel, the Engineer Equipment Trailer (EET) was created for hauling the tractor.**

(1) Trailer:

(a) Engage trailer service brakes by pulling the knob on the tongue of the EET.

(b) Set the front trailer stabilizers down before setting the rear stabilizers.

(c) Stand on the EET, loosen the ramp binders, and push the ramps down.

**(ON SLIDE #60)**

(2) Loading:

(a) Keep the 420E IT in 1<sup>st</sup> gear forward THE ENTIRE TIME.

(b) The Ride Control will be in the OFF position.

(c) The Auto Shift control needs to be in the OFF position.

(d) Lock the Service Brake Pedals together using the locking bar.

(e) All Wheel Drive switch will be in position 1 (AWD w/AWD Braking).

(f) Ensure you have the proper travel carry (12-18" full tilt to the rear).

**(ON SLIDES #61-62)**

(g) Center the tractor on the trailer ramps, driving up onto the trailer bed. Follow the hand and arm signals of your ground guide. Use low RPMs to ensure you have optimum control of the tractor. Once the rear tires are between both chalk blocks, **STOP!** Parkline the tractor, and set the backhoe components down for traveling due to their high overhead clearance. Before shutting down the tractor, engage the hydraulic lockout switch.

**(ON SLIDE #63)**

(3) Off-Loading:

(a) Pack up and lock the backhoe components, and ensure all chains are off.

(b) Keep the 420E IT in 1<sup>st</sup> gear forward THE ENTIRE TIME.

(c) The Ride Control will be in the OFF position.

(d) The Auto Shift control needs to be in the OFF position.

(e) Lock the Service Brake Pedals together using the locking bar.

(f) All Wheel Drive switch will be in position 1 (AWD w/AWD Braking).

(g) Ensure you have the proper travel carry (12-18" full tilt to the rear).

(h) Center the tractor on the trailer ramps, backing off of the trailer, down the ramps to the deck. Look back and follow the hand and arm signals of your ground guide. Use low RPMS to ensure you have optimum control of the tractor. Back **SLOWLY** off the trailer until you have been cleared to a safe distance.

**(ON SLIDE #64)**

**TRANSITION.** Are there any questions on operations for the 420E IT Backhoe? If not than I have a few questions for you.

(Q#1)How long should you turn the start switch to on position before starting the tractor?

(A#1)Turn it to the ON position for 3 to 5 seconds and then turn it to the start position.

(Q#2) How far should all four tires be raised off the deck?

(A#2) The entire tractor should be raised 2 to 4 inches off the deck.

(Q#3) How long can you travel before you must stop to cool the tractor down?

(A#3) After 25 miles or 1 hour of traveling the tractor should be stopped 30 minutes to cool the tires and other components.

**TRANSITION.** Okay, if there are no further questions, let's move on to Preventive Maintenance Checks and Services.

**(ON SLIDE #65)**

## 5. **PREVENTIVE MAINTENANCE AND CHECKS & SERVICES: (15 MIN)**

a. **Fluids:** The 420E IT requires many different types of petroleum, oils, and lubricants (POLs). The Daily checks, along with your NAVMC 10523, require that POLs be checked before, during, and after operations. For proper operation each fluid must be maintained to the correct fill level. All proper fluid levels are listed in the equipments Operator's Manual.

b. **Grease Points:** At each grease point, the tractor has a moving component that needs to be lubricated properly. A list and view of each grease fitting is located on the Lubrication Chart, located inside the Lubrication Order (LO). When performing lubrication to the front bucket, ensure you, the operator, install the Brace for the Loader Lift Arm, to service the grease points under the front bucket.

c. **Battery Maintenance**: Before performing this, make sure all electrical is in the OFF position. Disconnect the positive battery cable from battery. Inspect battery terminals, cables for corrosion. Clean and/or replace. Perform any necessary repairs.

**(ON SLIDE #66)**

d. **Bucket Teeth**: Inspect each tooth for wear; once edges are rounded they must be replaced when worn within 2 inches of the bucket edge or holes develop.

e. **Tires**: The correct front tire pressure is 50 PSI. The correct rear tire pressure is 31 PSI.

f. **Operator's Manual**: This manual is intended to aide the operator in conducting proper operation, and preventive maintenance (PMCS) of the 420E IT (**TM 10996B-OR**).

(1) Preventive Maintenance Checks and Services

(2) Lubrication Instructions

(3) Military-Specific Operations

(4) Caterpillar Operations

(5) Maintenance Manual

**(ON SLIDE #67)**

**TRANSITION.** Are there any questions covering Preventive Maintenance, Checks and Services or any other information we have covered throughout this period of instruction? If not then I have a few final questions for you.

(Q#1) What is the max ground clearance?

(A#1) 12 inches.

(Q#2) What manual is intended to aide the operator?

(A#2) TM 10996B-OR

**INSTRUCTOR NOTE**

Place the students on a 10 Minute break

**(ON SLIDE #68)**

**TRANSITION:** Before the break we covered in the classroom the major points on how to operate the backhoe. I will cover what you will be expected to do and then we will move on to the

demonstration of a 360 walk around.

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**NOTE:**

**Ensure that all personnel are properly wearing the correct safety equipment when performing any type of PMCS.**

**INSTRUCTOR NOTE**

Introduce Demonstration of 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. The demonstration also covers a 360 degrees walk around and PMCS. Items required are a 420E IT Backhoe Loader for the Instructor to use and students will have student handouts to make any notes and trip tickets. Normal class size is 12. There are two instructors required for this demonstration.

**STUDENT ROLE:** Students will gather around the Instructor with student handouts and trip tickets and observe the demonstration. Students will be encouraged to ask questions.

**INSTRUCTOR (S) ROLE:** The Primary Instructor will conduct a detailed demonstration of how to perform before, during and after operational checks with the aid of a trip ticket and a 360 walk around. The assistant Instructor will assist the primary Instructor with the demonstration and any student questions.

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** The Instructor will demonstrate the following.

**LEFT SIDE**

- (1) Fuel fill/pre-strainer
- (2) Lift arm brace
- (3) Engine compartment
- (4) Engine oil check
- (5) Transmission oil check

- (6) Coolant check
- (7) Primary air filter/secondary/test gauge
- (8) Engine compartment hood close procedure
- (9) Stabilizers
- (10) Swing lock pin/Boom lock lever
- (11) Boom
- (12) Bucket
- (13) Dipper
- (14) Hydraulic attachment couplings

**RIGHT SIDE**

- (1) Boom Pads
- (2) Aux hydraulic couplings
- (3) Battery equalizer cover
- (4) Batteries
- (5) Slave receptacle
- (6) Multipurpose 4in1 bucket

**LEFT SIDE**

- (1) Lift arm brace

**CAB**

- (1) Diff lock
- (2) Brake pedal lock
- (3) Steering column
- (4) Gauges
- (5) Column controls
- (6) Park brake
- (7) Front bucket control lever
- (8) Seat controls
- (9) All rear controls with seat turned 180 degrees
- (10) All gauges/controls on left panel with seat turned 180

**3 Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the demonstration.

**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 Demonstration of operating the 420E IT Backhoe Loader.

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**INSTRUCTOR NOTE**

Introduce Demonstration of equipment operations

**DEMONSTRATION. (30 MIN)** The purpose of this demonstration is to show the students how to operate the 420E IT Backhoe Loader. Items required are a 420E IT Backhoe Loader. Normal class size is 12. There are two instructors required for this demonstration.

**STUDENT ROLE:** Students will gather around the Instructor with student handouts and observe the demonstration. Students will be encouraged to ask questions.

**INSTRUCTOR (S) ROLE:** The Primary Instructor will conduct a detailed demonstration of how to operate the 420E IT Backhoe Loader. The assistant Instructor will assist the primary Instructor with the demonstration and any student questions.

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Instructor will demonstrate the following.

- (1) Travel position
- (2) Neutral start switch
- (3) Parking brake
- (4) Neutral trigger
- (5) Float
- (6) Clamshell
- (7) Ride control engagement/disable
- (8) Tractor setup
- (9) Raise front boom and tilt bucket all the way forward raising front tires 2 to 4 inches off the deck.
- (10) Rotate seat 180 to backhoe position
- (11) Lower stabilizer and raise rear tires 2 to 4 inches off the deck.
- (12) Disengage swing lock Pin
- (13) Fasten seat belt
- (14) Disengage boom lock
- (15) Set RPM to 1500-2100 (2000 optimum)
- (16) Extend Boom/dipper/bucket all the way out
- (17) Lower to deck so teeth touch deck
- (18) Mark kill zone left and right
- (19) Make marking cut 6 to 7 feet inside kill zone
- (20) Dig ditch 6 to 7 feet long. 36 to 42 inches deep, and one bucket width using the general purpose bucket.
- (21) Correct placement of spoil 1 to 2 feet from hole.

(22) Backfill ditch utilizing backhoe bucket by pushing material back into ditch and compacting down fill  
(23) Curl bucket back to lock position and lock boom latch and  
(24) swing lock pin.  
(25) Retrieve stabilizers  
(26) Spin seat 180  
(27) Raise front bucket  
(28) Curl bucket back to travel  
(29) Back scrape over ditch for final level with front bucket  
**3 Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the demonstration.

**INTERIM TRANSITION:** We've just went over the demonstration of operating the 420E IT backhoe Loader, are there any questions? If not, let's move on to the practical application.

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**INSTRUCTOR NOTE**

Introduce Practical Application of equipment operations

**PRACTICAL APPLICATION. (24 HRS)** The purpose of this Practical Application is to allow the students the opportunity to practice operating the 420E IT backhoe Loader. Before the practical application the Instructor will have four 420E IT backhoe Loaders prepared and a radio in each one. Normal class size is 12. The students are broken into groups of three and assigned a tractor with one student operating and the others observing. There are two instructors required for this demonstration.

**PRACTICE:** Each student will operate the equipment. Students are allowed to use hand outs and ask questions. The students will practice the following task.

- (1) Travel position
- (2) Neutral start switch
- (3) Parking brake
- (4) Neutral trigger
- (5) Float
- (6) Clamshell
- (7) Ride control engagement/disable
- (8) Tractor setup

- (9) Raise front boom and tilt bucket all the way forward raising front tires 2 to 4 inches off the deck.
- (10) Rotate seat 180 to backhoe position
- (11) Lower stabilizer and raise rear tires 2 to 4 inches off the deck.
- (12) Disengage swing lock Pin
- (13) Fasten seat belt
- (14) Disengage boom lock
- (15) Set RPM to 1500-2100 (2000 optimum)
- (16) Extend Boom/dipper/bucket all the way out
- (17) Lower to deck so teeth touch deck
- (18) Mark kill zone left and right
- (19) Make marking cut 6 to 7 feet inside kill zone
- (20) Dig ditch 6 to 7 feet long. 36 to 42 inches deep, and one bucket width using the general purpose bucket.
- (21) Correct placement of spoil 1 to 2 feet from hole.
- (22) Backfill ditch utilizing backhoe bucket by pushing material back into ditch and compacting down fill
- (23) Curl bucket back to lock position and lock boom latch and
- (24) swing lock pin.
- (25) Retrieve stabilizers
- (26) Spin seat 180
- (27) Raise front bucket
- (28) Curl bucket back to travel
- (29) Back scrape over ditch for final level with front bucket

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

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. In the case of lightning training will stop and the class will move in doors. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Brief the students of their responsibilities during the practical application. The Instructor will be on the lot observing operations, assisting students and answering questions.

**3. Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the Practical Application.

**INTERIM TRANSITION:** We've just went over the practical application of operating the 420E IT backhoe Loader, are there any questions? If not, let's move on to the demonstration of operating the attachments.

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**INSTRUCTOR NOTE**

Introduce Demonstration of operating attachments

**DEMONSTRATION. (20 MIN)** The purpose of this demonstration is to show the students how to operate and change the attachments. Before the demonstration the Instructor will have one 420E IT Backhoe Loader, Jack hammer, Auger and Compactor prepared. Normal class size is 12. There are two instructors required for this demonstration.

**STUDENT ROLE:** The students will gather around the 420E IT Backhoe Loader with student handouts and observe the instructors demonstration. Students will be encouraged to ask questions.

**INSTRUCTOR (S) ROLE:** The Primary Instructor will conduct a detailed demonstration operating and changing the attachments. The assistant Instructor will assist the primary Instructor with the demonstration and any student questions.

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Instructor will demonstrate the following.

(1) Procedures for changing the Jack hammer, Auger and Compactor Operate Toggle switch for attachments

**3 Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the demonstration.

**INTERIM TRANSITION:** We've just went over the demonstration of operating and changing the 420E IT backhoe Loader attachments, are there any questions? If not, let's move on to the practical application of operating and changing the attachments.

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**INSTRUCTOR NOTE**

Introduce the practical application of operating and changing the attachments

**PRACTICAL APPLICATION. (1.5 HRS)** The purpose of this practical application is to allow the students the opportunity to practice operating and changing the attachments. Before the practical application the Instructor will have four 420E IT Backhoe Loaders, Jack hammers, Augers and Compactors prepared. Normal class size is 12. There are two instructors required for this practical application.

**PRACTICE:** Students will be broken into groups of three in which one student operates while the other two ground guide and change attachments. Students are allowed to use hand outs and ask questions.

Students will practice the following:

(1) Change and Operate the Jack hammer, Auger and Compactor.

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

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In the case of lightning training will stop and the class will move indoors. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Brief the students of their responsibilities during the practical application. The Instructor will be on the lot observing operations, assisting students and answering questions.

**3. Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the Practical Application.

**INTERIM TRANSITION:** We've just completed the practical application of operating and changing the attachments, are there any questions? If not, let's move on to the demonstration of hand and arm signals.

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**INSTRUCTOR NOTE**

Introduce Demonstration of hand and arm signals.

**DEMONSTRATION. (20 MIN)** The purpose of this demonstration is to show the students the purpose and correct use of hand and arm signals. This demonstration can be done inside or outside. Normal class size is twelve (12). One (1) instructor is required for this demonstration.

**STUDENT ROLE:** The students will gather around the Instructor with student handouts and observe the instructors demonstration. Students will be encouraged to ask questions.

**INSTRUCTOR(S) ROLE:** The Instructor will conduct a detailed demonstration of correct use of hand and arm signals.

1. **Safety Brief:** No safety issues.

2. **Supervision and Guidance:** The Instructor will demonstrate the following:

- (1) Boom Up
- (2) Boom Down
- (3) Tilt Down
- (4) Tilt Up
- (5) Turn left/right
- (6) Move forward/backward
- (7) Straighten tires
- (8) Stop
- (9) Park line

3. **Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the demonstration.

**INTERIM TRANSITION:** We've just completed the demonstration of hand and arm signals, are there any questions? If not, let's move on to the practical application of hand and arm signals.

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**INSTRUCTOR NOTE**

Introduce practical application of hand and arm signals.

**PRACTICAL APPLICATION.** (30 Min) The purpose of this Practical Application is to allow the students the opportunity to practice conducting hand and arm signals. Before the practical application the Instructor will have 4 backhoes prepared. Normal class size is twelve (12). Two (2) instructors are required for this demonstration.

**PRACTICE:** The students will be in groups of three. One student operating and two on the ground as ground guides. Students are allowed to use hand outs and ask questions. Students will perform the following Hand and Arm Signals:

- (1) Boom Up
- (2) Boom Down
- (3) Tilt Down
- (4) Tilt Up
- (5) Turn left/right
- (6) Move forward/backward
- (7) Straighten tires
- (8) Stop
- (9) Park line

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

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. In the case of lightning training will stop and the class will move in doors. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Brief the students of their responsibilities during the practical application. The Instructor will be on the lot observing operations, assisting students and answering questions.

**3. Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the Practical Application.

**INTERIM TRANSITION:** We've just completed the practical application of hand and arm signals, are there any questions? If not, let's move on to the demonstration of loading/unloading on Engineer Equipment trailer (EET).

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**INSTRUCTOR NOTE**

Introduce demonstration of loading/unloading on Engineer Equipment trailer (EET).

**DEMONSTRATION. (20 MIN)** The purpose of this demonstration is to show the students how to load/unload the 420E IT Backhoe onto the Engineer Equipment trailer (EET). Before the demonstration the Instructor will have one 420E IT Backhoe and trailer prepared. Normal class size is 12. There are two instructors required for this demonstration.

**STUDENT ROLE:** The students will gather around the Instructor with student handouts and observe the instructors demonstration. Students will be encouraged to ask questions.

**INSTRUCTOR (S) ROLE:** The instructor will conduct a detailed demonstration of how to load/unload the 420E IT Backhoe onto the Engineer Equipment trailer (EET). The assistant Instructor will assist the primary Instructor with the demonstration and any student questions.

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** The instructor will demonstrate the following:

- (1) Align tires to ramp
- (2) Load the 420E IT Backhoe onto the EET
- (3) Correct position of tires and front bucket on the trailer
- (4) Placement of rear backhoe
- (5) Securing the backhoe to the trailer
- (6) Offloading of the 420E IT Backhoe off the EET

**3 Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the demonstration.

**INTERIM TRANSITION:** We've just completed the demonstration of loading and unloading the 420E IT Backhoe on and off the Engineer Equipment trailer (EET). If there are no questions we will move on to the Practical Application exercise of loading and unloading the 420E IT Backhoe onto the Engineer Equipment trailer (EET).

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**INSTRUCTOR NOTE**

Introduce Practical Application of load unload backhoe onto the Engineer Equipment trailer (EET).

**PRACTICAL APPLICATION. (2HRS)** The purpose of this practical application is to allow the students the opportunity to practice loading/offloading the 420E IT Backhoe onto the Engineer Equipment trailer (EET). Before the practical application the Instructor will have one 420E IT Backhoe and trailer prepared. Normal class size is 12. There are two instructors required for this demonstration.

**PRACTICE:** Students will work in groups of two, one student is loading/offloading the 420E IT Backhoe while the second student acts as a ground guide. Paired students will switch off operating and ground guiding duties. Students are allowed to use hand outs and ask questions. The students will practice the following task.

- (1) Align tires to ramp
- (2) Load the 420E IT Backhoe onto the EET
- (3) Correct position of tires and front bucket on the trailer
- (4) Placement of rear backhoe
- (5) Securing the backhoe to the trailer
- (6) Offloading of the 420E IT Backhoe off the EET

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

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. In the case of lightning training will stop and the class will move in doors. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Brief the students of their responsibilities during the practical application. The Instructor will be on the lot observing operations, assisting students and answering questions.

**3. Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the Practical Application.

**INTERIM TRANSITION:** We've just went over the practical application of loading and offloading the tractor onto an EET, are there any questions? If not, let's move on to the practical application of conducting PMCS.

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**INSTRUCTOR NOTE**

Introduce practical application of conducting PMCS

**PRACTICAL APPLICATION. (3 HRS)** **This practical application will be the last step of the performance exam.** The purpose of this Practical Application is to allow the students the opportunity to practice conducting PMCS. Before the practical application the Instructor will have all 420E IT Backhoe Loaders prepared. There are two instructors required for this practical application. hearing protection, hard hats, safety glasses and PMCS worksheets. Normal class size is 12.

**PRACTICE:** Have the students break into groups of two's. Students will work the practical application checking for and correcting all discrepancies and complete the PMCS worksheet. Students are allowed to use hand outs and ask questions. The students will practice the following task.

(1) Complete the PMCS worksheet

**PROVIDE-HELP:** The Instructor will assist students throughout the practical application and will ensure the students are properly conducting PMCS.

**1. Safety Brief:** Instructor will cover ORAW. Hard hats will be worn while on the lot. Each student and Instructor will have hearing protection. Ensure all personnel are clear of the equipment prior to starting or moving the equipment. Ground guides will be utilized when necessary. In the case of lightning training will stop and the class will move in doors. In case of mishap students will move to the classroom and instructor will call emergency personnel.

**2. Supervision and Guidance:** Brief the students of their responsibilities during the practical application. The Instructor will be on the lot observing operations, assisting students and answering questions.

**3. Debrief:** Allow students the opportunity to comment on what they experienced and/or observed. Provide overall feedback, guidance on any misconceptions, and review the learning points of the Practical Application.

**(Slide #69)**

**TRANSITION:** Are there any questions before we summarize? If not I have a one for you.

(Q#1) When conducting trenching operations how long does your spoil need to be?

(A#1) The entire length of the trench.

(Q#2) What must be conducted before you start to operate?

(A#2) Conduct a thorough 360 walk around of the tractor utilizing the trip ticket.

(Q#3) What is the technical name for the trip ticket?

(A#3) NAVMC 10523

Instructors Note

Answer all questions then go into the summary.

**(Slide #70)**

**SUMMARY**

**(5 MIN)**

This week we have covered various topics dealing with the backhoe. Specifically, we have covered the mission, general characteristic, major components, instruments and controls and operations. Make sure IRFs are given to the Instructor. This concludes this period of instruction take a **10 minute break.**