## PREVENTIVE MAINTENANCE CHECK AND SERVICES

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<th>POI FILE NUMBER:</th>
<th>88H31E03</th>
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<td>LESSON UNIT TITLE(S)/TASK NUMBER(S)</td>
<td>METHOD</td>
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<td>Preventive Maintenance Check and Services</td>
<td>CO</td>
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<td>Non-Tasked Based</td>
<td>PE1</td>
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<td>SUMMARY</td>
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I. INTRODUCTION

Attention
Introduce self and lesson

Motivator
As a cargo specialist, you must supervise and train personnel in preventive maintenance checks and services (PMCS) on the rough-terrain container crane (RTCC). Enforcing these procedures is essential to maintaining safe/operational vehicles and preventing personnel injuries. You will supervise before, during, and after operational checks. You must acquire an in-depth knowledge of the RTCC, its components, and functions. A team effort is essential for success. (Stress the importance of the lesson through personal experience or a related story.)

Note:
Show objective viewgraph (VGobjective)

Terminal Learning Objective
At the completion of this lesson, you (the student) will supervise the before, during, and after operation maintenance on the RTCC. The objective of preventive maintenance is to prevent equipment failures by finding and fixing minor problems before major defects occur.

II. BODY

Transition
Now we will review preventive maintenance checks and services.
A. PREVENTIVE MAINTENANCE CHECK AND SERVICES
TN: Non-Task Based

1. Introduction

Motivator As a cargo specialist you must supervise and train personnel in preventive maintenance checks and services (PMCS) on the rough-terrain container crane (RTCC). Enforcing these procedures is essential to maintaining safe/operational vehicles and preventing personnel injuries. You will supervise before, during, and after operational checks. You must acquire an in-depth knowledge of the RTCC, its components, and functions. A team effort is essential for success. (Stress the importance of the lesson through personal experience or a related story.)

Note: Inform the students of the following learning objective requirements.

Objective(s) At the completion of this lesson, you (the student) will:

| ACTION: | Supervise the enforcement of preventive maintenance checks and services on a 40-ton rough terrain container crane. |
| CONDITIONS: | Given DA Form 2404, DS 350 operator’s manual, STP 55-88H24-SM-TG, a 40-ton crane with assistant operator, a safety briefing, and wearing safety clothing, perform this task under the supervision of the section sergeant. |
| STANDARD: | All steps in preventive maintenance checks and services must be completed and in order. All rough-terrain container crane deficiencies must be noted on DA Form 2404. All operator deficiencies must be corrected before turning DA Form 2404 in to maintenance. |
**Safety Instructions**

This is a dangerous task. Failure to enforce all safety precautions can result in **death** or **serious injury**. If unsafe practices are observed, halt them immediately. If you do not know the proper procedure or solution to a problem, consult your supervisor. Extreme care must be taken in the proper training of personnel. Never leave a hazardous situation unattended. **Send** for help if necessary. You must wear safety clothing at all times. Your commander will give you a safety briefing before all task assignments.

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**Facility Requirements**

Clear working area, mobile or stationary crane, crane operator, and cargo. The crane operator, the senior crane operator, or section chief will observe the soldier performing the task at all times.

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**Tools, Equipment, and Materials**


Student: Student Guide and notepad

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**References**

DA 2404  
DS 350  
STP 55-88H24-SM-TG
2. **Learning Step/Activity 1: Conference**

   Method of instruction: **CO**. Instructor to student ratio is 1:class.
   Time of instruction: **0.67 hour(s)**.
   Media: **Viewgraphs**. (VG01-VG04)

   **Instructional Lead-in**
   During this lesson you will learn to supervise preventative maintenance checks and services. As a cargo specialist it is very important that you gain an in-depth knowledge of the RTCC, its components, and functions. It is vital that you ensure these procedures are carried out accurately and sequentially by personnel under your supervision.

   **Resource Requirements**
   None

   **Note:**
   Every mission begins and ends with paperwork. The forms and records you fill out have several uses. They are a permanent record of the services, repairs, and modifications made on your vehicle. These forms are reports to organizational maintenance and to your commander. These records are a checklist to determine what was/is wrong with the vehicle and whether or not those problems were fixed.

   **Note:** Show viewgraph (VG01)

   a. **Form DA 2404**
      1) It is a record of problems found during all inspections.
      2) At Direct Support/General Support levels, it is used as a required list of problems for the estimated cost of damage report.
      3) Marine condition surveys of watercrafts are recorded on this form.
      4) It is a record of technical inspections and/or equipment.
      5) It is a record of battlefield damage assessment and repair (BDAR).

   The Load Moment Indicator (LMI) is an operational aid that warns a crane operator of approaching overload conditions and overhoist conditions which could cause injury/damage to equipment and personnel. The device is not a substitute for operator experience, judgment, and safe operating procedures.

   **Note:** Show viewgraph (VG02)
The following tests must be performed with care to prevent damage to the machine or injury to personnel. Proper functioning of the system requires successful completion of these tests.

If the LMI light and audible alarm do not function as described and the crane does not stop, the system is not working properly. The malfunction must be corrected before operating the crane.

b. Procedures to Perform LMI Pre-operation Inspection

Ensure that the following steps are completed by personnel performing the LMI pre-operative inspection.

1) Check that the cabling connecting the various parts of the system is checked for physical damage.

2) Check the anti-two-block switches and weights for free movement.

3) Check the spring-loaded cable reel to be sure it is free to rotate, has tension, and the cable is reeled properly.

4) Validate that the anti-two-block alarm light and the audible alarm are functioning by manually lifting the weight attached to the anti-two block switches.

5) Slowly raise the main boom hookblock to bring it into contact with the switch weight. When the hookblock lifts the weight, the audible alarm should sound, the anti-two-block alarm light should activate, and the motion of the hookblock should be stopped. Lower the hookblock slightly to eliminate this condition.

6) Slowly lower or extend the boom to create a potential two-block condition. When the hookblock lifts the weight, the audible alarm should sound, the anti-two-block alarm light should activate, and the boom lowering and/or boom extension function should be stopped.

7) Verify that the display of the main boom length agrees with the actual boom length.

8) Check that the display of the main boom angle agrees with the actual angles.

9) Verify that the display of the operating radius of the crane agrees with the actual radius.

If there is any error code displayed on the console which is not listed in the malfunctions table, you should call maintenance.

c. Troubleshooting the LMI

Show viewgraph (VG03-VG04)
Malfunctions in the system caused by exceeding approved working range or operating errors by the crane operator him/herself are indicated on the display. These error codes are eliminated by the crane operator.

1) Operator Errors

a) Error 01

- **Cause:** Fallen below the minimum radius or above the angle given in the load chart due to raising the boom too far.
- **Remedy:** Lower the boom back to a radius or angle given in the load chart.

b) Error 02

- **Cause:** The maximum radius or minimum angle given in the load chart was exceeded due to lowering the boom too far.
- **Remedy:** Raise the boom back to a radius or angle given in the load chart.

c) Error 04

- **Cause:** The operating mode switch in the console set incorrectly. The operating mode selected is not permissible with actual crane configuration.
- **Remedy:** Set the operating mode switches correctly to the operation mode of the crane.

d) Error 05

- **Cause 1:** The boom was telescoped too far; you may only operate up to a certain maximum or minimum boom length.
- **Remedy:** Telescope the boom to correct length given in the load chart.
• Cause 2: The length sensor adjustment changed; i.e., length sensor cable slid off the length of the sensor drum.
• Remedy: For remedy, refer to service manual.

e) Error 80
• Cause: The load indicating device meets SAE J376 Sec. 4.2 accuracy requirements for loads on hook from 9,000 pounds to 80,000 pounds. This error code indicates load on hook is below 9,000 pounds.
• Remedy: No corrective action required. Load indication will occur between 9,000 pounds and 80,000 pounds.

f) EEE
• Cause: This display will appear if actual load exceeds 200% of rated machine capacity at a given operating condition.
• Remedy: This will not occur when operating within approved machine load chart and operating conditions.

d. Operation Procedures

1) The operator must be thoroughly familiar with all controls of the LMI and he/she must properly set each switch before operating the crane.

2) All settings must be checked by lifting a load of known weight and comparing the load to the information displayed on the load moment indicator.

3) Rated loads include the weight of slings and auxiliary lifting devices. The weight of the slings and auxiliary lifting devices shall be subtracted from the listed ratings to obtain the net load weight.

Note: During PMCS, there will be before, during, and after operational checks. PMCS should always be performed in the same order so it becomes routine; after some practice, you will detect problems quickly.
e. Procedures to Perform “Before” Operational Checks

1) Have crew members check for proper engine oil level.

2) Confirm that crew members check for proper engine coolant level. Ensure that the engine is cool before removing the cap.

3) Ensure that crew members check fuel sediment bowl for dirt/water.

4) Verify that crew members visually check batteries and check the state of the charge indicator with a flashlight.

5) Have a crew member check windshield washer located in the valve compartment behind the operator’s cab.

6) Confirm that crew members open air tank drain cocks.

7) Check air filter indicator and tubing for cracks, cuts, or excessive wear.

8) Validate that crew member has visually checked fuel injectors for leaks and/or damage.

9) Ensure that crew members check fan belts for cracks, fraying, cuts, and/or excessive wear.

10) Verify that crew checks tires for severe cuts, foreign objects embedded in treads, and for correct inflation pressure.

11) Ensure that crew checks the wire rope for kinks, frays, and dents.

12) Confirm that crew checks sheaves and hook block/headache ball for any condition that could cause damage to the rope.

13) Ensure that crew members check seat belts.

14) Verify that crew member checks fire extinguisher to ensure that the pointer is in the green zone.

15) Confirm that crew checks safety decals.

16) Validate that crew checks all lights, turn signals, flashers, horn, and gauges (oil pressure, fuel, etc.).

17) Ensure that crew member checks the wiper/washer switch to ensure the windshield wipers and washer are operational.

18) Verify that crew member checks transmission for proper fluid level (with engine running).
19) Ensure that crew check hydraulic fluid for proper levels.

20) Confirm that crew member checks hydraulic window indicator for oil leakage around window assembly.

21) Verify that crew checks the proper operation of all control levers and pedals.

22) Confirm that personnel check service brakes.

23) Verify that crew checks if steering properly functioning.

f. Procedures to Perform “During” Operational Checks

1) The engine oil pressure reading should be between 10 and 30 psi (70-210 kPa) at idle or between 30 and 50 psi (210-350 kPa) when operating crane.

2) The air pressure gauge reading should be between 105 and 120 psi (724-827 kPa).

3) The engine coolant temperature gauge should read between 180 and 250° F (82-121° C).

4) The LED alert display has a self test feature that lights all symbols for five (5) seconds each time the engine is started.

5) The park brake control is a push-pull type air valve. Crew members should pull the knob out to set the parking brakes.

6) When the bubble is centered in the level indicator, the crane is level. Ensure the crane is level before operating.

g. Procedures to Perform “After” Operational Checks

1) Confirm that crew has the hook block secured to eye on the front center of the crane.

2) Ensure that the crew checks main hook block for cracks, dents, cuts, distortions, and worn sheaves.

3) Verify that the crew checks wire rope on auxiliary and main hook blocks for fraying, kinks, and worn spots.

4) Check that the crew has fully retracted the boom.

5) Ensure that the crew has fully retracted the outriggers and outrigger stabilizers.
6) Verify that the crew has all four stabilizer floats properly stowed.

7) Confirm that the crew has drained the air tanks, along with fuel/filter/water separator pump.

8) Verify that all deficiencies are correctly noted on DA Form 2404.

Note: Ask students if there are any questions before transitioning to the check on learning.

Check on Learning

Distribute copies of the check on learning #1 (master is located in the Training Support Package) to the students and have them complete the questions. Allow the students 10 minutes to complete the check on learning. As you review the items individually, ask students if they have any questions.

a. What is the angle of the crane when the bubble level indicator is centered in the sight glass?

(The crane is level.)

b. What should the oil pressure read when the engine is idle?

(Between 30 and 50 psi (70-210 kPa) )

c. What feature does the LED have that lights all symbols for five seconds each time the engine is started?

(The self-test feature)

d. What are you looking for when you check wire rope on the auxiliary and main hook blocks?

(Evidence of fraying, kinks, and worn spots)

e. What should you use to check the state of the charge indicator on a battery?

(A flashlight)
3. **Summary**

Method of instruction: **CO**. Instructor to student ratio is 1: class.
Time of instruction: **0.25 hour(s)**.

In summary, we will now review the key points covered during this lesson.

a. **Form DA 2404**
   - It serves as an inspection record and estimated cost damage report.
   - It acts a watercraft condition report.
   - It is a record of technical inspections and/or equipment.
   - It is a battlefield damage assessment and repair record.

b. **Procedures to Perform LMI Pre-Operation Inspection**
   - Check cabling for physical damage.
   - Check that anti-two block switches and lights are functioning properly.
   - Verify that actual main boom length and angle agree with display data.
   - Verify that actual operating radius agrees with display data.

c. **Troubleshooting the LMI**
   - Lists error code meanings and definitions.
   - E01, E02, E04, E05, E80, and EEE are the codes used.

d. **Operation Procedures**
   - Be familiar with all controls.
   - Properly set all switches.
   - Check all settings for correct position.

e. **Procedures to Perform “Before” Operational Checks**
   - Check that engine coolant, engine oil, hydraulic fluid, and transmission fluid levels are correct.
   - Check air filter, tubing, fan belts, tires, wire ropes, and sheaves for fraying, cuts, and/or excessive wear.
   - Ensure all control levers, wipers and washers, seat belts, control levers and pedals are operational.
   - Check fuel injectors and the hydraulic window indicator are checked for leakage.
Check that air drain cocks are open and check fuel sediment bowl for dirt/water.

f. Procedures to Perform “During” Operational Checks
   • Engine oil pressure should read between 10 and 30 psi (70-210 kPa) when crane is idle. Pressure should be between 30 and 50 psi (210-350 kPa) when crane is operating.
   • Engine coolant should be between 180 and 205° F(82-96° C).
   • Ensure crane is level before operating.

g. Procedures to Perform “After” Operational Checks
   • Secure hookblock to front center of crane and check it for damage.
   • Retract the boom, outriggers, and outrigger stabilizers.
   • Drain air tanks and fuel/filter/water separator pump.
   • Verify all deficiencies are correctly noted on DA Form 2404.

Check on Learning
Determine if students have learned the material presented by:

a. Soliciting student questions and explanations.

b. Asking questions and getting answers from the students.

c. Correcting any student misunderstandings.

Transition
This completes the lesson summary. Now let’s perform a practical exercise.
4. Learning Step/Activity 2: Practical Exercise

Method of instruction: PE1. Instructor to student ratio is 1:1:1. Time of instruction: 1.92 hour(s).

Media: None.

Instructional Lead-in

As a cargo specialist you are expected to supervise and train personnel in performing PMCS on a rough terrain container crane (RTCC). The PMCS requires in-depth knowledge about the RTCC, its components, and functions. For this practical exercise, you will be scored on your ability to perform the before, during, and after PMCS on the RTCC accurately and in correct order.

Resource Requirements

Rough Terrain Container Crane (RTCC), DA Form 2404, RTCC Operator’s Manual, student guide, pen or pencil, and clipboard.

Note:

For this practical exercise put students into groups of threes. Assign one student to perform a before, during or after operational check. Rotate students until all have completed all three checks.

Special Instructions to Students

Provide assistance and coaching throughout the PE by walking around and observing for accuracy.

Each of you will be grouped with two other students. You will be assigned to perform either the before, during, or after operational check. You must perform the steps as identified in your student guide. Once you have completed your operational check, you will begin another operational check as assigned by your cargo chief. You will rotate with the other students until all of you have completed all the operational checks.

Feedback Requirements

Score the soldier “GO” if all steps are passed and the soldier executes the PMCS steps correctly and in order. Score the soldier “NO GO” if any step is failed. If the soldier fails any step, show what was done wrong and how to do it correctly.

Check on Learning

Critique students’ performance of the practical exercise and summarize the learning activity.
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<td>This completes the practical exercise. Now let’s summarize what you’ve learned.</td>
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5. **Summary**

Method of instruction: CO. Instructor to student ratio is 1:class.
Time of instruction: 0.08 hour(s).

In summary, we will now review the key points covered during this lesson.

a. Procedures to Perform “Before” Operational Checks
   - Check that engine coolant, engine oil, hydraulic fluid, and transmission fluid levels are correct.
   - Check air filter, tubing, fan belts, tires, wire ropes, and sheaves for fraying, cuts, and/or excessive wear.
   - Check that all control levers, wipers and washers, seat belts, control levers and pedals are operational.
   - Check fuel injectors and the hydraulic window indicator for leakage.
   - Check that air drain cocks are opened and check fuel sediment bowl for dirt/water.

b. Procedures to Perform “During” Operational Checks
   - Engine oil pressure should read between 10 and 30 psi (70-210 kPa) when crane is idle. Pressure should be between 30 and 50 psi (210-350 kPa) when crane is operating.
   - Engine coolant should be between 180 and 205° F (82- 96°C).
   - Ensure crane is level before operating.

c. Procedures to Perform “After” Operational Checks
   - Secure hookblock to front center of crane and check it for damage.
   - Retract the boom, outriggers and outrigger stabilizers.
   - Drain air tanks and fuel/filter/water separator pump.
   - Verify all deficiencies are correctly noted on DA Form 2404.

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**Check on Learning**

Determine if students have learned the material presented by:

a. Soliciting student questions and explanations.
b. Asking questions and getting answers from the students.
c. Correcting any student misunderstandings.
Transition  

This completes the practical exercise. Now let’s summarize what you have learned.
III. SUMMARY

Method of instruction: CO. Instructor to student ratio is 1: class.
Time of instruction: 0.08 hour(s).
Media: Viewgraph. (VGsummary)

Note: Show summary viewgraph (VGsummary)

Review/Summarize Lesson Unit
In this lesson we learned how to supervise and enforce preventive maintenance checks and services. The following key points were discussed.

- Form DA 2404
- Procedures to perform LMI pre-operation inspection
- Troubleshooting the LMI
- Operation procedures
- Procedures to perform “before” operational checks
- Procedures to perform “during” operational checks
- Procedures to perform “after” operational checks

Check on Learning
Determine if students have learned the material presented by:

- Soliciting student questions and explanations.
- Asking questions and getting answers from the students.
- Correcting any student misunderstandings.
IV. STUDENT EVALUATION

Testing Requirements

The student will be evaluated on this lesson by completing a written test. The test consists of multiple choice questions. The test will measure student knowledge of preventive maintenance checks and services.

Written Test

1) The student must achieve a score of 70% on the written test to receive a “GO” for this lesson.

2) The written test will be administered following a block of instruction and is located in the Instructor Test Package. Refer to the Course Management Plan/Program of Instruction (CMP/POI) for guidance on administering the test.

Note: Refer students to the Student Evaluation Plan.

Feedback Requirement

a. Schedule and provide feedback on the evaluation and any information to help answer students’ questions about the test.

b. Provide remedial training as needed.

c. Correct any student misunderstandings.

Note: Rapid, immediate feedback is essential to effective learning.