

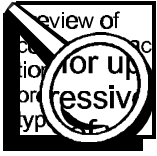
EG-02

MAINTENANCE MECHANIC TRAINING

SKILL DEVELOPMENT GUIDE

Duty EG: Cranes/Hoists
EG-02: PM Crane/Hoist (15 Ton)

Issued 01/01/99



Task Preview

PM Crane/Hoist (15 Ton)

A Preventive Maintenance (PM) inspection is performed quarterly. This task is performed to ensure that the crane is operating safely and to prevent unnecessary downtime. Also, to ensure that the crane's mechanical components are in good condition.

The Maintenance Mechanic must possess a good working knowledge of the crane systems and components and all types of wear associated with those components. Above all, the Maintenance Mechanic must possess knowledge of the safety requirements associated with the wire rope and the hook.

If the components are not maintained properly or on a regularly scheduled basis, the crane may not be able to hold its rated capacity. If the crane slips or a load drops, personnel and/or equipment in the area could sustain severe injury or damage.

The Maintenance Mechanic, with the help of an Electrician or apprentice, checks the condition of the hook and wire rope. The Maintenance Mechanic inspects the condition of the hoists, trolley, and bridge and their related components for serviceability. The PM observations and work performed are documented on the PM Work Order form when the task is completed.

How your skills will be checked

The Skill Check will require you to PM a crane/hoist (15 ton). All tools, materials, and resources will be available. The Evaluator will verify that your demonstration meets the skill objective by observing or measuring each task standard. You must demonstrate safe work practices during the Skill Check. Contact your Evaluator when you are ready for the Skill Check.



Skill Objective

Given a Crane Preventive Maintenance Checklist, PM the crane/hoist.

Task Standards

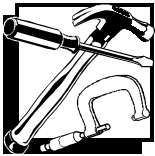
1. The hook must not show signs of cracks or excessive wear.
2. The hook must not deviate more than 10 degrees in twist measurement.
3. There must not be more than one frayed wire in any five foot length of cable.
4. The diameter must not be more than 1/16 inch reduced.
5. All required safe practices must be demonstrated.

What You Will Need

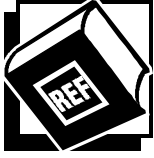
This section contains the safety information, tools, and resources you will need before performing a PM on a crane/hoist.



- Follow all Caterpillar facility safety standards when performing this task.
- The crane's electrical system must be locked and tagged after the power on checks have been completed during the PM check.
- Gloves must be worn to check the wire rope.
- A safety harness must be worn while in the bucket of the JLG.
- A tripping hazard exists when moving around catwalk, while climbing around to check the various components and getting in and out of the cab.



- flashlight
- JLG
- gloves
- adjustable wrench
- channel lock pliers
- putty knife
- shop towels or rags
- caliper
- machinist ruler
- tape measure
- pencil and paper



Crane Preventive Maintenance Checklist



Task Steps

PM Crane/Hoist (15 Ton)

This procedure was analyzed on the 15-ton scrap yard crane. The 50 and 60 ton cranes have some differences and they will be discussed in this analysis. The 'Crane Preventive Maintenance Checklist' is used for all three types of cranes.

Hook Inspection

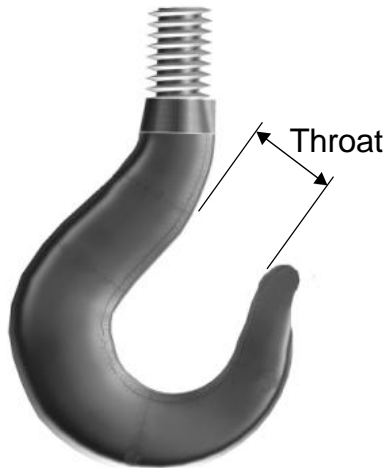
1. Inspect the hook.
 - Lower all hoists on the crane to the floor level, if not already on the floor.
 - Examine the general condition of the hook. Inspect the hook for cracks and excessive wear. See the figure below.



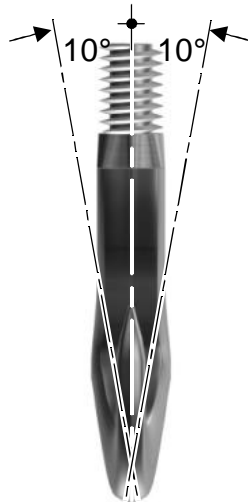
Wear on Hook

- Check the operation of the safety latch, if applicable.

2. Measure the hook's throat opening, as shown below.



- Use a ruler or tape measure to measure the width of the hook's throat opening.
 - Record the results on the Crane Preventive Maintenance Checklist.
 - Compare the results with the limits on the Crane Preventive Maintenance Checklist.
3. Check for hook twist, as shown below.



- Visually check the hook from the point end to ensure that the point of the hook lines up with the hook shaft.
- Record the results on the Crane Preventive Maintenance Checklist.

Note: A maximum of 10 degrees deviation is permitted.

Main Hoist

1. Check the wire rope for frayed wire.

- Physically check the wire rope from the floor to the top of the crane.

Note: There should be less than two frayed or broken wires in any five foot length of cable.

- While in the bucket of the JLG, position yourself at the top of the crane.
- Use a shop towel or rag in both palms of the gloved hands and grasp the wire rope. See the figure below.

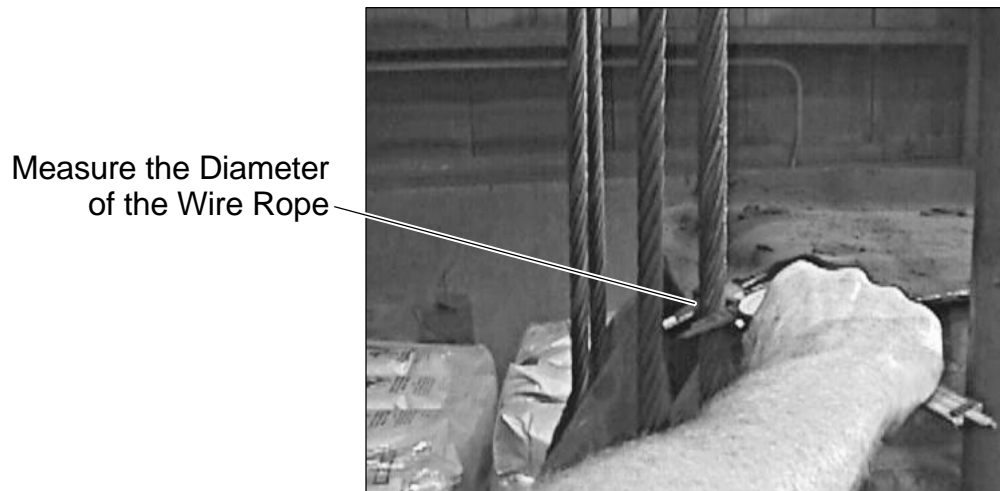


- Request the assistant operate the hoist controls to run the hook up so the entire length of the cable will pass through the gloved hand.

Note: Any frayed wires will snag the shop towel, resulting in small pieces of towel on the wire.

2. Check the diameter of the wire rope.

- Measure the diameter of the wire rope with a caliper and machinist ruler. See the figure below.

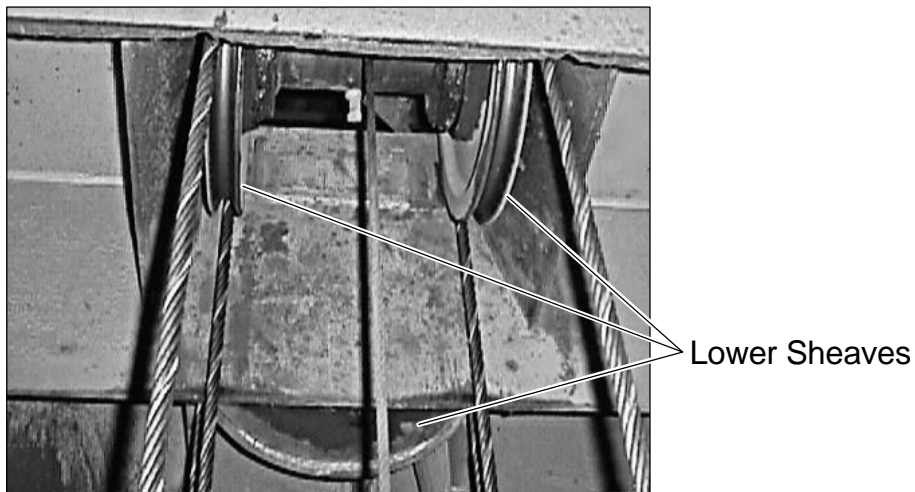


- Record the results.
- Check the diameter of the cable in several places.

Note: On the 15-ton crane, the diameter of the wire rope is $\frac{5}{8}$ inch. On the 50 and 60 ton cranes, the main cable diameter is $\frac{7}{8}$ inch. The diameter should not be more than $\frac{1}{16}$ inch reduced.

3. Check the lower sheaves on the crane.

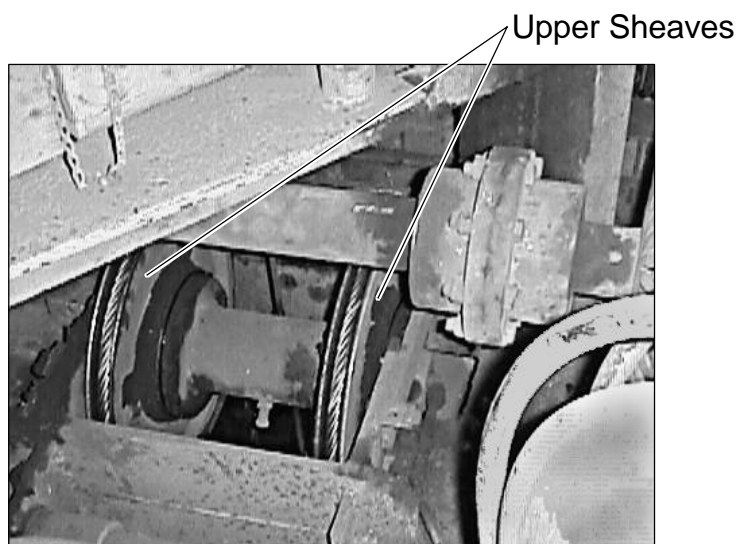
- Ensure that the wire rope is riding correctly in the sheaves. The wire rope is in the groove of the sheaves. See the figure below.



- Ensure that the bolts holding the covers are wrench-tight.

4. Check the upper sheaves.

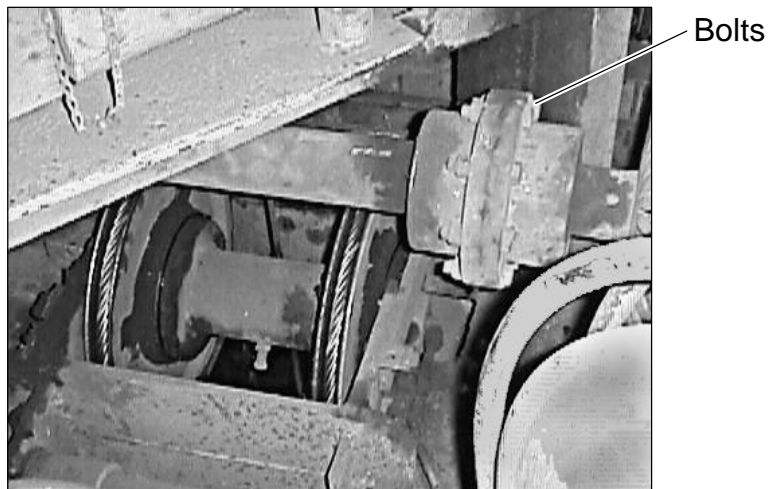
- Visually inspect the side of the sheaves for wear. See the figure below.



- Ensure that the wire rope is positioned in the groove of the sheaves.
- Check for broken or missing bolts on the clamps that hold the sheave shaft.
- Check for obvious signs of sheave bearing failure such as:
 1. Sheaves rock from side to side.
 2. Cocked sheave.
- 5. Check the drive train.

Note: The drive train of the main hoist consists of a motor, drive shaft, magnetorque (magnetic brake), gear box, drum, and one or two shoe brakes.

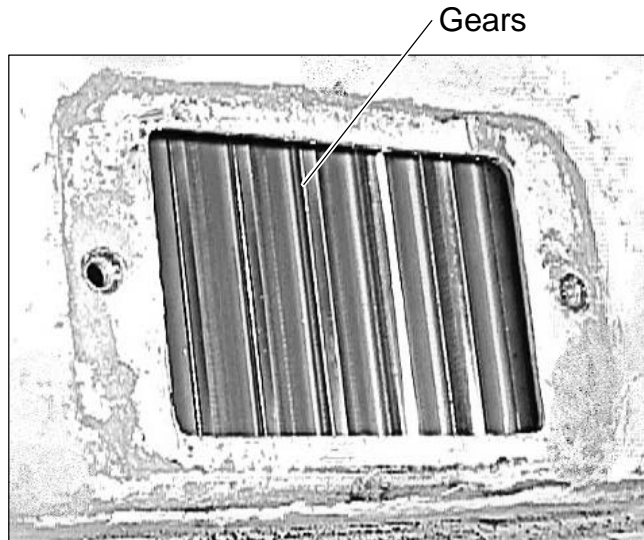
- Visually inspect the couplings between each component.
- Check for broken, missing or bent bolts. See the figure below.



- Physically check the bolts for tightness. All bolts must be wrench-tight.
- Check couplings for lubrication and lube as necessary.

6. Check the gearbox.

- Open one of the inspection plates.
- Check the oil inside the gearbox and add if needed.
- Check the gears for broken teeth. See the figure below.



- Check to ensure that the gears mesh properly.

Auxiliary Hoist Checks (50 and 60 Ton Cranes)

1. Check the wire rope for frayed wire.

- Physically check the wire rope from the floor to the top of the crane.

Note: There should be less than two frayed wires in any five foot length of cable.

- While in the bucket of the JLG, position yourself at the top of the crane.
- Place a shop towel or rag in the palm of the gloved hand and grasp the wire rope.
- Request the assistant operate the hoist controls to run hook up so the entire length of the cable will pass through the gloved hand.

Note: Any frayed wires will snag the shop towel, resulting in small pieces of towel on the wire.

2. Check the diameter of the wire rope.

- Measure the diameter of the wire rope with a micrometer and machinist ruler.
- Record the results.
- Check the diameter of the cable in several places.

Note: The diameter of the new wire rope is 1/2 inch. The diameter should not be more than 1/16 inch reduced.

3. Check the lower sheaves on the crane.

- Ensure that the wire rope is riding correctly in the sheaves. The wire rope is in the groove of the sheaves.
- Ensure that the bolts holding the covers are wrench-tight.

4. Check the upper sheaves.

- Visually inspect the side of the sheaves for wear.
- Ensure the wire rope is positioned in the groove of the sheaves.
- Check for broken or missing bolts on the clamps that hold the sheave shaft.
- Check for obvious signs of sheave bearing failure such as:
 1. The sheaves rock from side to side.
 2. Cocked sheave.

5. Check the drive train.

Note: The drive train of the auxiliary hoist consists of a motor, drive shaft, magnetorque (magnetic brake), gear box, drum and one or two shoe brakes.

- Visually inspect the couplings between each component.
- Check for broken, missing or bent bolts.
- Physically check bolts for tightness. All bolts must be wrench tight.
- Check couplings for lubrication and lube as necessary.

6. Check the gearbox.
 - Open one of the inspection plates.
 - Check the oil inside the gearbox and add if needed.
 - Check the gears for broken teeth.
 - Check to ensure that the gears mesh properly.

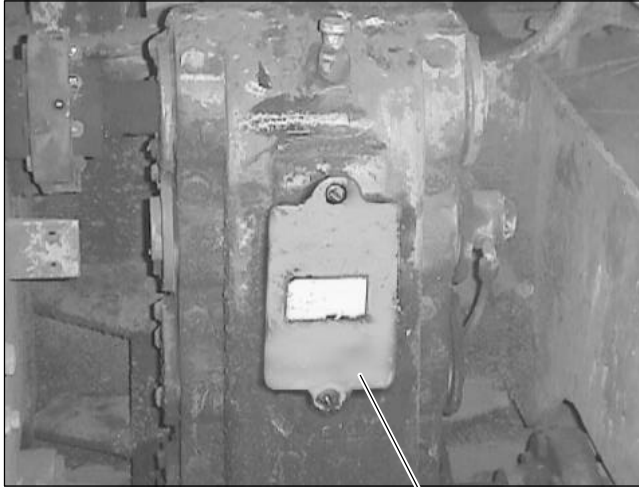
Trolley (North/South Motion)

1. Check the brake fluid level in the hydraulic brake reservoir (15 ton cranes only). See the figure below.



Hydraulic Brake
Fluid Reservoir

2. Check the gearbox. See the figure below.



Gearbox Inspection Plate

- Open one of the inspection plates.
 - Check the oil inside the gearbox and add if needed.
 - Check the gears for broken teeth.
 - Check to ensure that the gears mesh properly.
3. Check the couplings between the motor and the gearbox for missing, broken, or bent bolts.
 4. Check the couplings between the gearbox and drive wheels for missing, broken, or bent bolts.

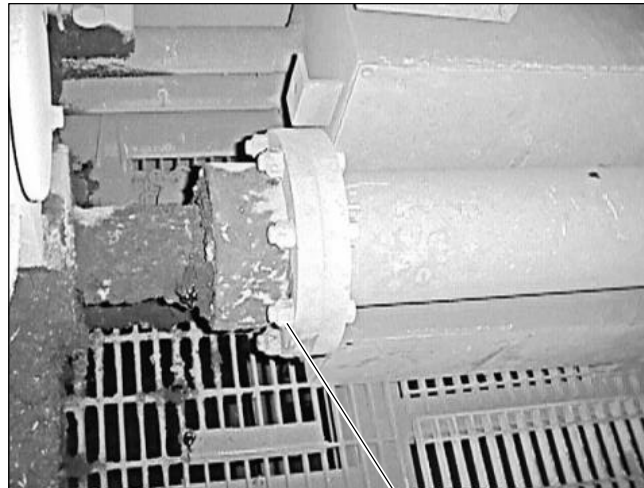
Bridge (East/West Motion)

1. Check the brake fluid level in the hydraulic brake reservoir (50 and 60 ton cranes only).
2. Check the two gearboxes, one on each end of the bridge. See the figure below.



- Open one of the inspection plates.
- Check the oil inside the gearbox and add if needed.
- Check the gears for broken teeth.
- Check to ensure that the gears mesh properly.

3. Check the couplings between the motor and the gearbox for missing, broken, or bent bolts.
4. Check the couplings between the gearbox and drive wheels for missing, broken, or bent bolts. See the figure below.



Check Bolts

Operational Check

1. Operate the bridge controls.
 - Check to ensure that the brakes function properly.
 - Check to ensure that the crane moves evenly, east/west along the track.
2. Operate the trolley controls.
 - Check to ensure that the brakes function properly.
 - Check to ensure that the crane moves evenly, north/south along the bridge.
3. Operate the hoist controls.
 - Check the brakes as the hook travels up and down.
 - Check the limit switches. Ensure that the hooks stop in the proper positions.

Note: As the hook travels up, it should stop just before the dead weight. The scrap yard crane should be positioned over the pit area to check the downward travel of the hook. The hook should travel down into the pit, below the floor.

Structural Steel

1. Visually check the structural steel during the PM.
2. Check for cracks and broken braces. See the figure below.



Check Braces for Cracks



Concept Check

PM Crane/Hoist (15 Ton)

Answer the following questions to check your understanding of performing a PM on a crane/hoist. Circle the correct answer in each question. Then compare your responses with the answers at the bottom of this page. Some of the questions may have more than one correct answer. If you have difficulty answering a question, review the Skill Development Guide or ask your Trainer for assistance.

1. When measuring the diameter of the wire rope on the 15-ton crane, it should not be reduced more than:
 - a. 1/64 inch.
 - b. 1/32 inch.
 - c. 1/16 inch.
 - d. 1/8 inch.
2. How many frayed wires are permitted in any five foot length of cable.
 - a. one
 - b. two
 - c. three
3. The hook must not deviate more than:
 - a. 5 degrees in twist measurement.
 - b. 10 degrees in twist measurement.
 - c. 15 degrees in twist measurement.
 - d. 20 degrees in twist measurement.

Answers: (1. c 2. a 3. b)

Next Step

If you are ready to demonstrate the task now, ask your Evaluator or Trainer to schedule the Skill Check. However, if you need to practice some of the steps first, continue to the next section.



Practice

The following practice will help prepare you for the Skill Check. Ask your Trainer to set up the practice for you. After you complete a practice, ask your Trainer to check your work.

Practice

Your Trainer will designate a crane/hoist for performing a PM. During the practice you will:

- Inspect the hook.
- Check the main hoist.
- Check the auxiliary hoist (50 and 60 ton cranes) if applicable.
- Check the trolley (north/south motion).
- Check the bridge (east/west motion).
- Perform an operational check on the bridge, trolley, and hoist controls.

Your Trainer will observe you as you inspect the hook, the main and auxiliary hoist, trolley, and bridge to ensure that this task is performed properly. You are required to follow all the recommended safe practices.

Practice Objective

The major components will be inspected for serviceably, showing no signs of wear, cracks, or breakage. The hook must show not show signs of cracks or excessive wear. The hook must not deviate more than 10 degrees in twist measurement. The cable must not have more than one frayed wire in any five foot length. The diameter of the wire rope must not be more than 1/16 inch reduced. All safe practices must be demonstrated.

Next Step

Continue to practice until you are ready for the Skill Check. When you are ready to demonstrate the task, ask your Evaluator or Trainer to schedule the Skill Check.

