

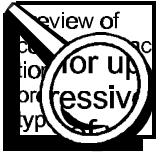
Q-02

ELECTRICIAN TRAINING

SKILL DEVELOPMENT GUIDE

Duty Q: Cranes and Hoists
Q-02: PM/Troubleshoot Hoists

Issued 01/01/99



Task Preview

PM/Troubleshoot Hoists

A Preventive Maintenance (PM) inspection is performed quarterly. Perform this task to ensure that the hoist is operating to its maximum performance and all mechanical components are in good condition.

The Electrician must possess a good working knowledge of the system of the hoist and its components and all types of wear associated with the electrical systems. Above all, the Electrician must possess the knowledge of the safety requirements associated with the hoist.

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

Position the scissor lift or JLG under the hoist and raised to hoist. The power is disconnected and a lockout and tag is performed. The condition of the resistors is checked. The electrical components in the control panel(s) are checked for burnt, loose, or damaged connections. The condition of the brakes is checked. The collectors are inspected. Make sure all the components are bolted tight. Ensure that the power bars are lined up with one another and the collectors are directly under their respective power bar.

How your skills will be checked

The Skill Check will require you to troubleshoot and perform preventive maintenance on a hoist. 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 work request, troubleshoot and perform preventive maintenance on the hoist.

Task Standards

1. The brake pad must display no less than $\frac{2}{3}$ of the original thickness (9mm).
2. The brake seal must not leak.
3. The air gap must be set within $\frac{1}{32}$ to $\frac{1}{8}$ inch.
4. The collector mechanical components must be aligned with the power bar.
5. The control panel(s) connections must be snug, and the wiring and terminals must show no signs of damage.
6. The up/down limit switches must operate within manufacturer's specifications.
7. Bridge, trolley, hoist controllers must show no sign of wear.
8. Bridge, trolley, hoist controllers must operate within manufacturer's specifications.
9. Weight limit switches must operate within manufacturer's specifications.
10. All safe practices must be demonstrated.

What You Will Need

This section contains the safety information, tools, and resources you will need before troubleshooting and performing preventive maintenance on a hoist.



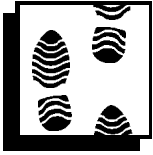
- Follow all Caterpillar facility safety standards when performing this task.
- Harness must be worn when working on the scissor lift/JLG.
- The hoist must be locked and tagged after the power on checks has been completed during the PM check. An electrical hazard exists inside the electrical cabinet and at the power connection.



- scissors lift/JLG
- flashlight
- Electrician's hand tools
- ruler
- feeler gauge
- lock and tag
- Digital Volt Meter (DVM)/Fluke
- gear adjuster (located inside the rotary limit switch)
- 1/2 x 2 3/4 inch bolt



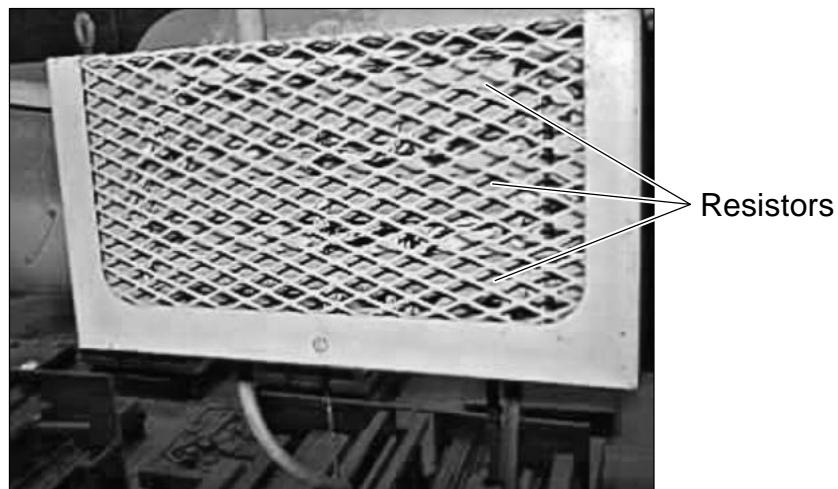
- none required



Task Steps

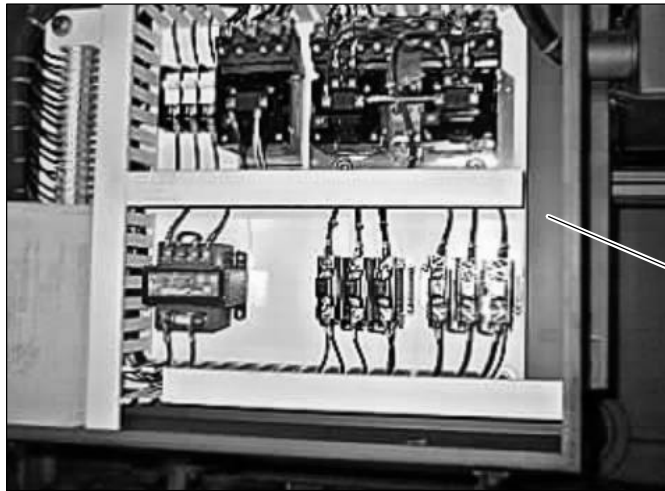
PM/Troubleshoot Hoists

1. Get the scissors lift or JLG and position it into place under the hoist.
2. Check that the hoist moves freely.
 - Move the hoist in the North, South, East, West directions to ensure that both ends move evenly.
3. Turn the power off at the disconnect box, then install the lock and tag.
 - Use a Fluke or Digital Volt Meter (DVM) to ensure that the power to the bridge and trolley collector bars is off.
4. Check the condition of the resistors. See the figure below.



5. Inspect the bridge control panel.

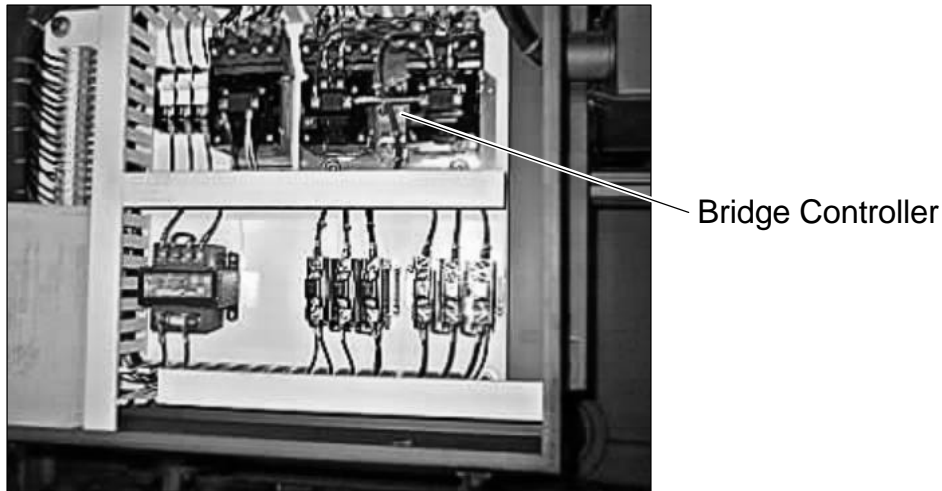
- Check the contactor contacts inter-lock switch and mechanical inter-lock for tightness. See the figure below.



Bridge Control
Panel

- Using a flathead screwdriver, loosen the screws and raise the panel door.
- Visually inspect for broken or loose wiring and connections.
- Using a flathead screwdriver, physically check connections for tightness.

- Check both of the bridge controller contacts for wear. See the figure below.
 1. Remove the contact cover.
 2. Push up on the bottom of the contact assembly and visually inspect the contacts.
 3. Check the spring action.



Note: Only one contact assembly will move at a time. For example, when you are pushing up on the right assembly, the left one should not move.

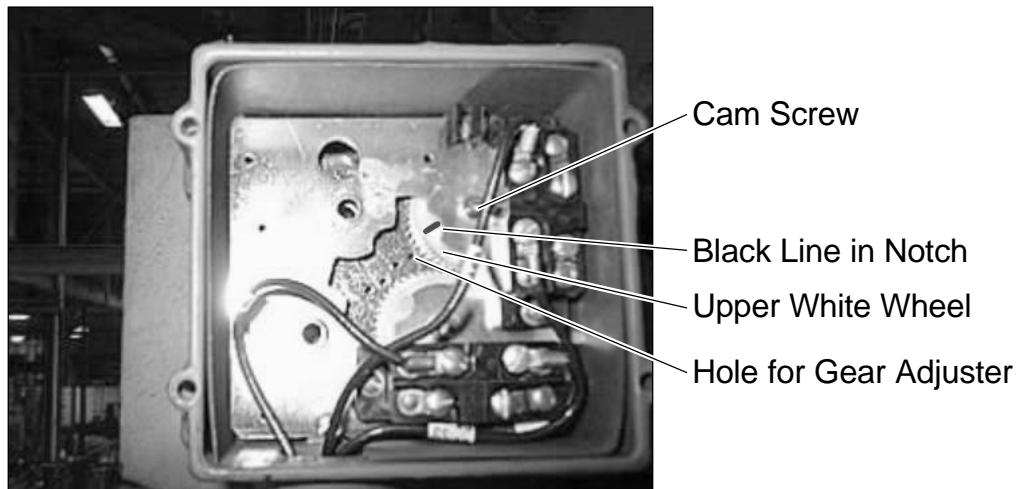
- Lower the contact cover and tighten the screws.
6. Check the gear limit switch.
- Remove the cover.
 - Remove the lock and tag and restore the power.
 - Run the hook up until it automatically stops.

Note: If the hook pushes the weight up, adjust the limit switch. See step 7.

- Check the black line on the white plastic wheel to ensure that it is in the notch. The wheel moves counterclockwise.
- Run the hook down until it automatically stops in the proper position, just touching the floor (check with the operator).

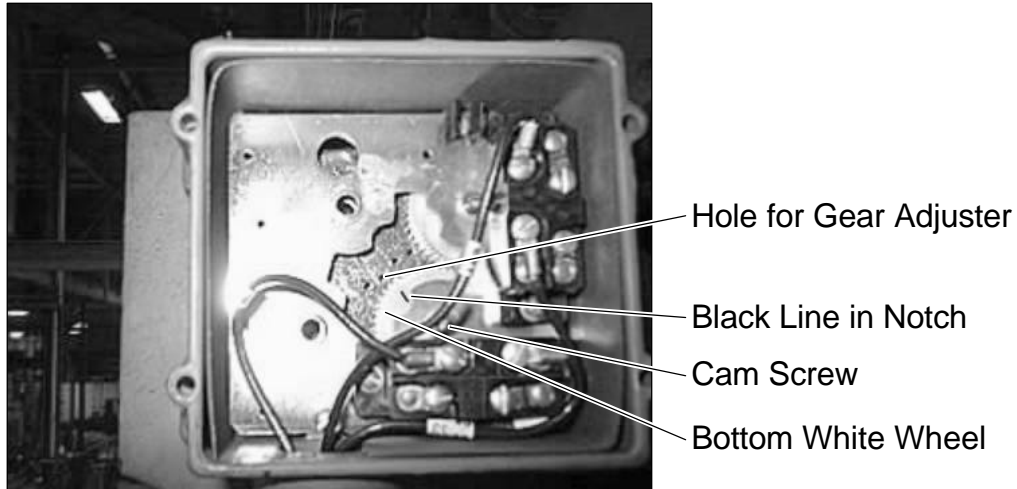
Note: If the hook continues to travel downward, proceed to step 8. If the hook stops well above the floor, proceed to step 9.

7. Adjust the up gear limit switch (hook pushes up the deadman weight).
 - Position the hook in the proper position (approximately 12 inches from the bottom of the weight).
 - Loosen the cam screw on the upper white wheel.
 - Install the gear adjuster in the hole closest to the upper wheel.
 - Turn the adjuster clockwise, moving the white wheel until the switch breaks (a snap sound) and the black line is in the notch.
 - Tighten the cam screw.
 - Run the hook down and then up to test the limit switch. If the hook does not stop at the proper position, repeat step 7. See the figure below.



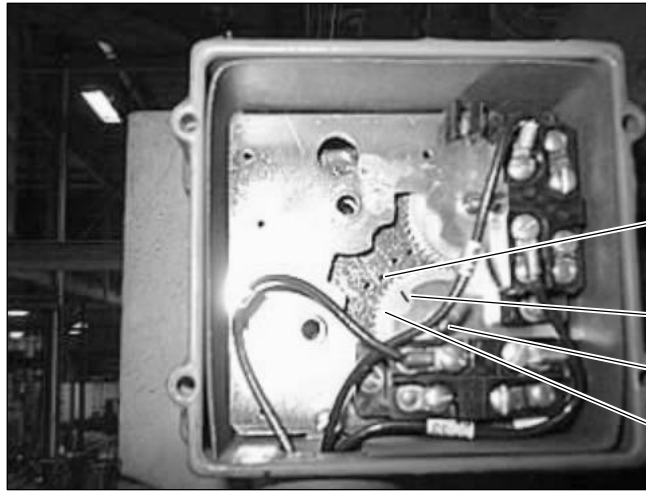
8. Adjust the down gear limit switch (hook continues to travel downward).
 - Position the hook in the proper position (just touching the floor).
 - Loosen the cam screw on the bottom white wheel.
 - Install the gear adjuster in the hole closest to the bottom wheel.
 - Turn the adjuster counterclockwise moving the white wheel until the switch breaks and the black line is in the notch.
 - Tighten the cam screw.

- Run the hook up and then down to test the limit switch. If the hook does not stop at the proper position, repeat step 8. See the figure below.



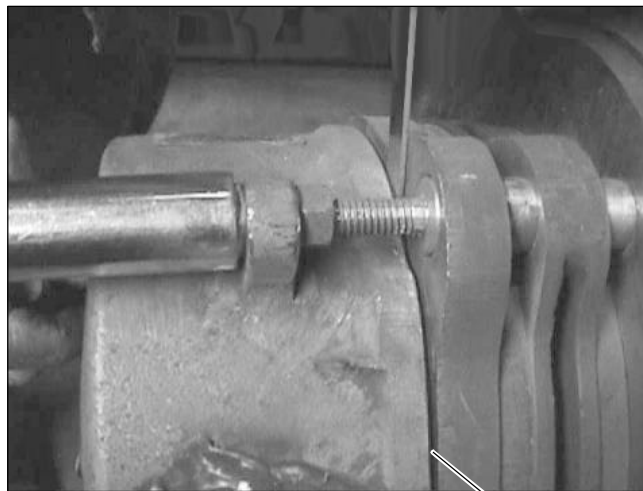
9. Adjust the down gear limit switch (hooks stops well above the floor).
 - Loosen the cam screw on the bottom white wheel.
 - Install the gear adjuster in the hole closest to the bottom wheel.
 - Turn the adjuster clockwise, moving the white wheel.
 - Run the hook down to the proper position.
 - Turn the adjuster clockwise until the switch breaks.
 - Tighten the cam screw.

- Run the hook up and then down to check the setting. If the hook stops above the proper position, repeat step 9. See the figure below.



- Close the panel door and tighten the screws with a flathead screwdriver.
10. Turn the power off at the disconnect box and install the lock and tag.
 11. Check the brake.
 - Using a 1/2 inch wrench, loosen the four bolts and remove the cover.
 - Visually inspect brake pads for proper thickness (9mm). If the brake pads are less than 2/3 of the original thickness, proceed to step 12.
 - Using a feeler gauge, check the air gap for proper setting. The proper setting is 1/32 inch normal to 1/8 inch maximum (0.03125 inch to 0.125 inch).
 - Using an adjustable wrench, physically check the nuts for tightness.
 - Install the cover and tighten the four bolts.
 12. Replace the brake pads.
 - Remove the brake assembly.
 1. Using a 3/4 inch socket, install the 1/2 x 2 3/4 inch bolt to disengage the armature.
 2. Remove the three lock nuts securing the brake coil.
 3. Slide the brake assembly off the block.

4. Check for seal leaks.
 5. Inspect the area around the block for evidence of oil. If a leak is detected, notify a Maintenance Mechanic.
- Install the brake assembly.
1. Configure the brake disc assembly.
 2. Install the brake assembly on the block.
 3. Install the three lock nuts to reconnect the coil.
 4. Remove the bolt to engage the armature.
 5. Set the air gap. The air gap must be $1/32$ inch to $1/8$ inch. Set the air gap as shown below.

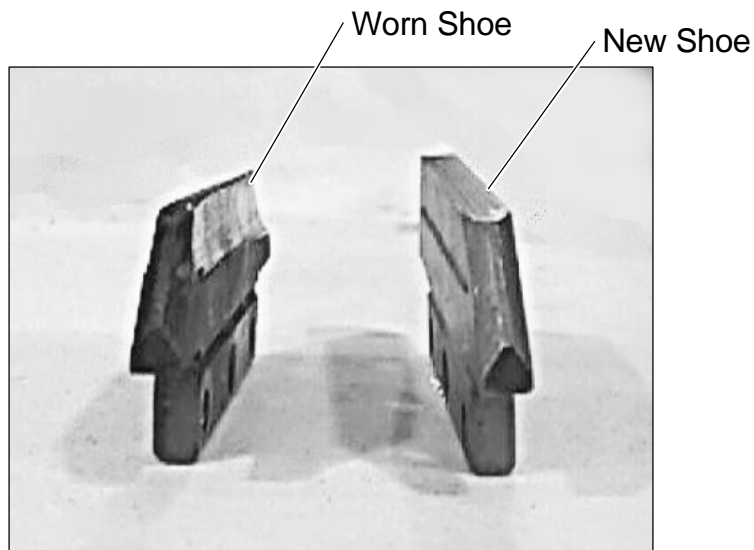


Air Gap

13. Check the collectors.

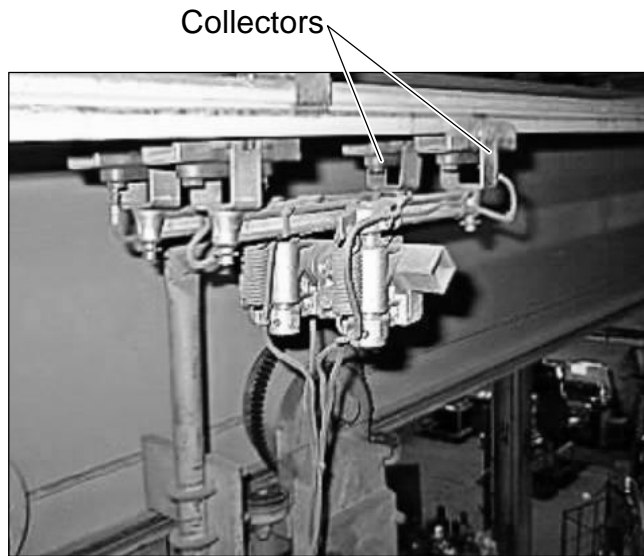
- Pull down on each collector and visually inspect the shoe for groove wear. See below.

Note: If the V groove is worn, replace the shoe. See the figure below.



- Pull down on the collector to check the spring action. If the spring is broken or weak, replace the spring.
- Ensure that each collector is lined up with its respective bar. If not, loosen the bolt and align the collector.

- Check the electrical wiring for cracks and broken or loose connections. See the figure below.

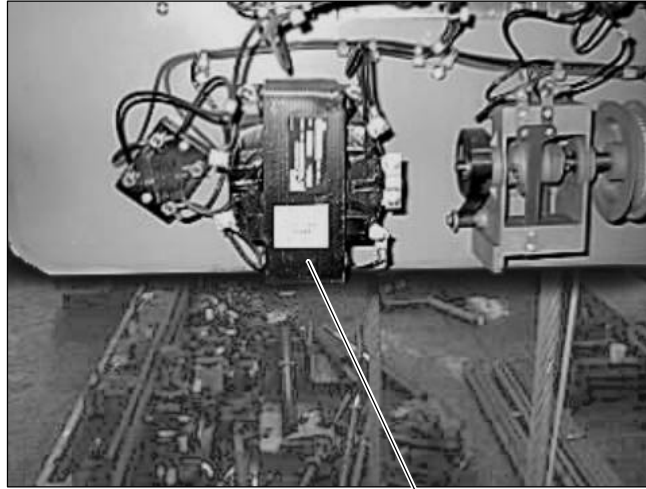


14. Check the hoist control panel.

Warning: Ensure that the power is disconnected and the lock and tag is installed before removing the panel cover.

- Using a flathead screwdriver, remove the screws, then remove the cover.

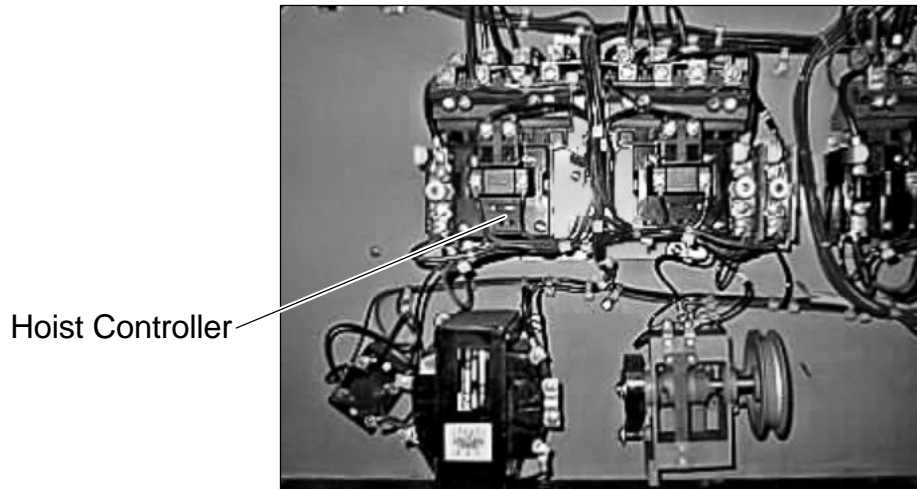
- Using a flathead screwdriver, ensure that the brake transformer is fastened to the panel. See the figure below.



Brake Transformer

- Check all connections for tightness.
- Check both trolley controller contacts for wear.
- Remove the contact cover.
- Push up on the bottom of the contact assembly to visually inspect the contacts.
- Check the spring action.

Note: Only one assembly will move at a time. Example: Pushing up on the right assembly, the left one should not move. See the figure below.

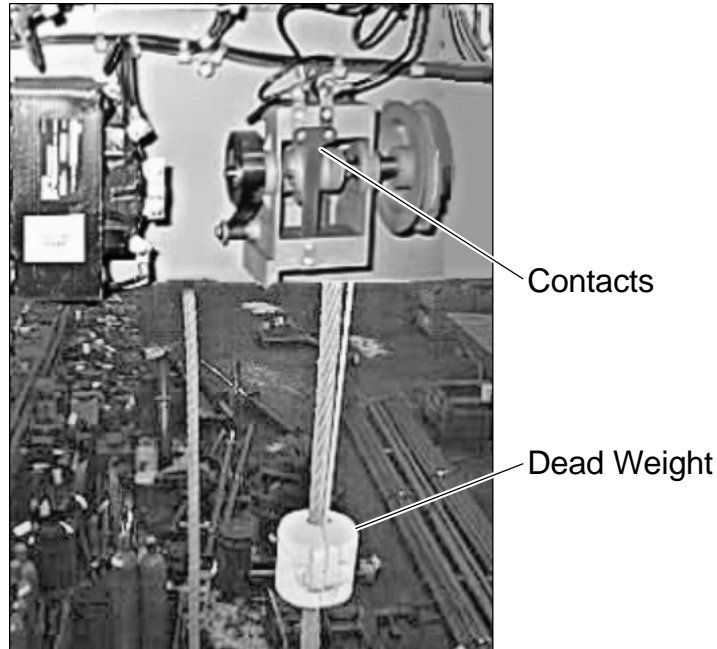


- Install the contact cover.
- Check both hoist controller contacts for wear.
- Remove the contact cover.
- Push up on the bottom of the contact assembly and visually inspect the contacts.
- Check the spring action.

Note: Only one assembly will move at a time. For example, when you push up on the right assembly, the left one should not move.

- Install the contact cover.

- Push up on the weight to open the contacts and check for wear. See the figure below.



- Check the string on the weight for frayed areas.
 - Check the screws and bolts for tightness on the weight and pulley.
 - Install the cover.
15. Remove the lock and tag and restore the power.
 16. Clean up the work area.
 17. Complete the PM form to document the work history.



Concept Check

PM/Troubleshoot Hoists

Answer the following questions to check your understanding of troubleshooting and performing preventive maintenance on a 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. What is the setting for the air gap on the hoist brake?
 - a. $1/64$ to $3/16$
 - b. $1/32$ to $1/8$
 - c. $3/64$ to $1/4$
 - d. $1/16$ to $3/8$

2. Replace the brake pads if they are less than _____ of the original thickness.
 - a. $1/2$
 - b. $2/3$
 - c. $3/4$

3. What is the proper position for the hook when it is operated in the downward direction?
 - a. just touching the floor
 - b. laying on the floor
 - c. 12 inches above the floor

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

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 hoist for performing a PM. During the practice you will:

- Perform an operational check on the bridge, trolley, and hoist controls.
- Inspect the bridge and hoist control panels.
- Check the gear limit switches.
- Inspect the brakes.
- Check the collectors.

Your Trainer will observe you as you inspect the hoist components to ensure that this task is preformed 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 minimum thickness of the brake pads must be $\frac{2}{3}$ of the original thickness (9mm). The air gap must be within $\frac{1}{32}$ to $\frac{1}{8}$ inch. The brake seal must not leak. The up and down limit switches must be operate as specified. The collector mechanical components must be in good condition and align with the power bar. The control panels connections must be snug, and wiring and terminals must show no signs of damage. The weight limit switch must show no signs of wear and operate as specified. 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.