

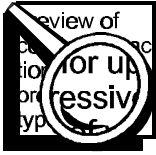
G-31

MAINTENANCE MECHANIC TRAINING

SKILL DEVELOPMENT GUIDE

Duty G: Conveyors
G-31: Replace Belt (Product)

Issued 01/01/99



Task Preview

Replace Belt (Product)

A Maintenance Mechanic replaces a belt when a belt tears, rips, shows signs of edge wear, or will not run true on the system.

The Maintenance Mechanic temporarily splices the new belt to the defective belt using belt fasteners. This is achieved by square-cutting the defective belt and attaching the new belt to the defective belt. The conveyor drive motor is operated to pull the new belt onto the conveyor system. When the new belt is positioned, the temporary splice is removed. The Maintenance Mechanic square-cuts the other end of the new belt and splices the belt ends together.

Incorrect installation could:

- cause partial or total belt damage upon startup.
- prevent tensioning or training of the belt.
- result in a shortened belt life.

Based on conveyor location, a manlift, ladder, or scaffold may be required to access the conveyor system. Demonstrate safe practices when working aloft. The conveyor must be unloaded prior to beginning the replacement procedure. If there is a possibility that the hopper could unload during belt replacement, you will need to lock out the hopper.

How your skills will be checked

The Skill Check will require you to replace a product belt. 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 repair ticket to replace a defective product belt on a conveyor, replace the belt.

Task Standards

1. The belt must run without catching or slipping.
2. The belt must run centered on the conveyor, without side-to-side movement.
3. All safe practices must be demonstrated.

What You Will Need

This section contains the safety information, tools, and resources you will need before replacing a product belt.



- Follow all Caterpillar facility safety standards when performing this task.
- The conveyor drive motor must be locked and tagged when the defective belt is removed and during new belt installation.
- Check to ensure that the conveyor is unloaded before beginning the replacement procedure.
- If there is a possibility that material could be dumped from the hopper, lock out the hopper.
- If the conveyor is located in a dusty area, wear a protective mask, as necessary.
- If the conveyor is located overhead and a ladder, manlift, or scaffold is necessary, exercise caution when working aloft. Wear a harness, as necessary.
- Wear gloves to protect your hands. Conveyors and conveyor service equipment can present hazards such as pinch points, rotating and moving equipment.



- two belt clamps
- transporting equipment (for transporting belt)
- hoist (to support belt during removal and installation) or other means available
- air drive socket
- belt cutter

- cutter guide
- belt fasteners
- air drive socket (special equipment for fastener nuts)
- belt tape
- fastener template
- fastener bolt hole drill
- large framing square
- clamps or nails (for cutter guide and fastener template)
- 2 x 4 piece of wood
- hand-made custom tool or a standard bolt-breaking tool
- remote conveyor jog switch (optional)



- Repair Ticket (Service Order)
- machine parts list
- belt location map
- procedure for adjusting and training sand belts

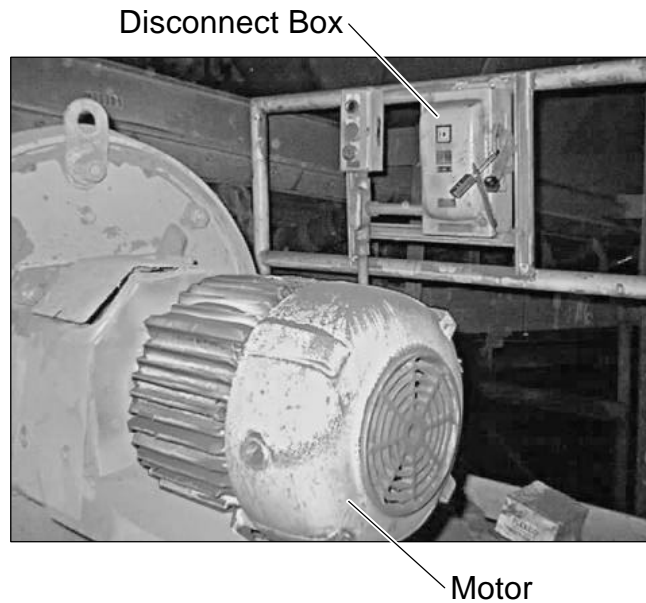


Task Steps

Replace Belt (Product)

1. Look up the crib number for the replacement belt.
 - From the CAT network, type EIMS <ENTER> and Alt-Select to clear the screen.
 - Type WA <SPACE> REPR <ENTER> to access the -ERS REPAIRMAN MENU-.
 - Enter your badge number to sign on.
 - Enter the machine number (from the Repair Ticket) to access the Service Order.
 - Go into the BM20 screen and enter the machine number to find a parts list for the conveyor.
 - Locate the IBM (Crib) number of the belt.
2. Order the belt.
 - Most belting must be ordered from an outside supplier before the job is scheduled.
 - Ask to have the belt delivered to the conveyor vicinity.
3. If the conveyor is in an unfamiliar area, locate (from the machine number and location indicated on the Service Order) the machine on a map.
4. Gather the tools and equipment necessary for replacing the conveyor belt, and transport them to the conveyor.
5. Find the replacement belt and bring it to the tail pulley of the conveyor.
 - Use a fork truck, if necessary.
 - Put the belt conveyor system in Hand located on the conveyor control panel.
 - Notify all personal of your intent to work in the area.
 - Lock off the conveyors on both ends of the belt being work to prevent debris from falling on it and possible injury to personal.

6. Lock out power to the belt drive motor. See the figure below.



Locked Out Drive Motor

7. Arrange equipment to allow the new belt to unwind from its roll onto the conveyor top side.
 - Be sure the thick rubber side of the belt will be up and the cord side next to the supporting rollers.
8. Remove the tail pulley guard. See the figure below.



9. Install a belt clamp on the load (feed) and return sides of the belt. See the figure below.



Belt Clamp Being Installed

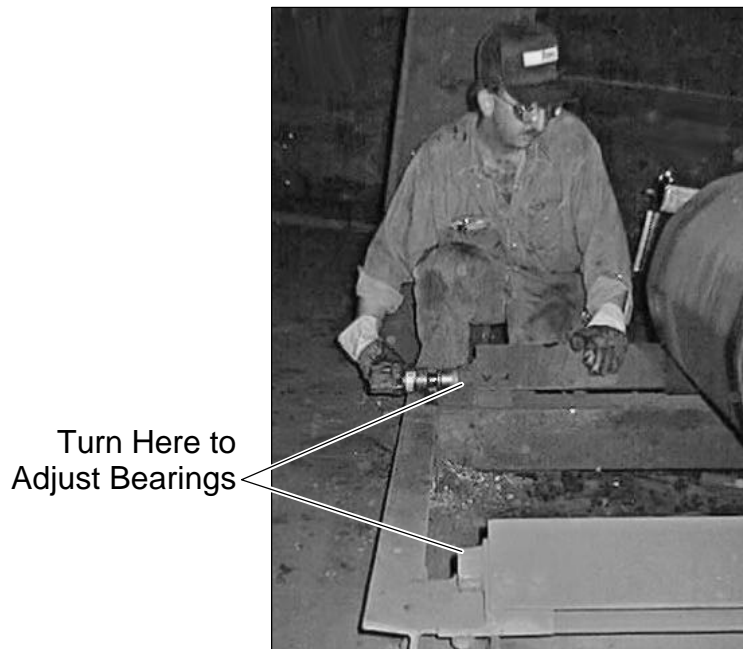


Belt Clamp in Place to Block Belt Movement

- Position the belt clamps to keep the belt in position when belt tension is relieved.

Caution: Belt clamps are hazardous to fingers and hands. Be careful to avoid pinches.

10. Adjust the tail pulley bearing slides, as shown below, to relieve the tension.



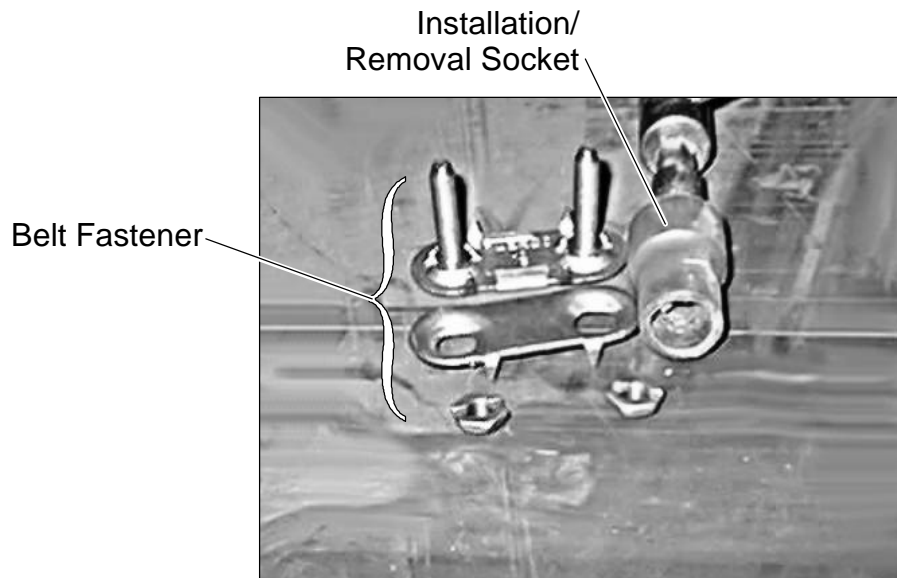
Relieving Belt Tension

- Mark the position of the slides first as a reference.
 - Adjust both takeups in equal, small, increments to avoid misaligning the tail pulley and stress on the tail pulley bearings.
11. Cut the old belt.
- Set a belt cutting guide on the top surface of the belt. Square it to the belt and clamp or nail it (through the belt with double-headed nails) to a two-by-four on the under side of the belt.
 - Adjust the belt cutter knife out slightly, slip the cutter into the guide slot, and slide the cutter across the belt.
 - Advance the knife. Bring the cutter back across the belt. Advance the knife and repeat, going back and forth across the belt until the belt is cut through.
12. Unwrap the longer end of the cut belt from the tail pulley and lay the end out of the way.

13. Wind the end of the new belt out to butt against the cut end of the old belt.
 - Cut the end of the new belt exactly square, if necessary, with the belt cutting guide, as in step 11.

Note: Both ends of the new belt must be cut precisely square before they are joined, or it will be impossible to train the belt to run centered in the conveyor.

14. Use the template to drill three or four (on wider belts) equally spaced fastener bolt holes in the end of the old belt, and corresponding holes in the end of the new belt.
15. Insert the belt fasteners in the holes to connect the old and new belt ends together. See the figure below.

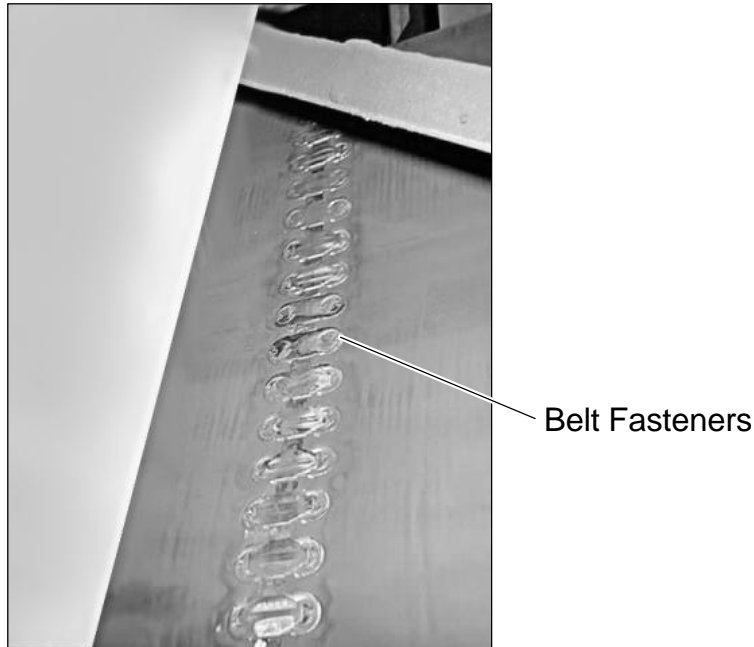


Belt Fastener and Fastener Nut Socket

- Use the guide tool to help insert the fastener bolts through the belt.
- Install the top plate of the fastener over the bolt holes and thread the nuts down over the bolts.
- Break off the protruding fastener bolts with the guide tool.

16. Prepare the conveyor for changing the belt.
 - Arrange equipment to pull/wind the old belt off the conveyor.
 - Remove the belt clamps.
 - Set the conveyor drive motor control to HAND operation.
 - Ask an Electrician to connect a remote jog pushbutton, or arrange for an assistant to operate the jog pushbutton on the drive motor controller.
 - Remove the lock on the conveyor drive motor control.
17. Pull the new belt on and the old belt off.
 - Start the conveyor motor, and be prepared to stop it immediately if a problem develops.
 - Monitor the progress of the new belt as it feeds into the conveyor.
 - Maintain sufficient tension on the old belt to keep it coming smoothly off the conveyor.
 - Allow the conveyor to run until the joint between the new belt and the old belt comes out under the tail pulley far enough to wrap over the tail wheel.
Note: Use a forklift and chain or Tug It. Attach the chain by cutting hole in the belt or using a belt clamp.
18. Remove the belt fasteners, roll up the old belt, if necessary, and move it out of the way.
19. Wrap the end of the new belt up around the tail pulley. Determine where the other end of the new belt must be cut. This provides the correct belt length when the tail pulley is drawn back to tension the belt.
20. Cut the end of the new belt exactly square as described above.
21. Using the template (lined up with the holes already drilled in the pulled end of the new belt), drill all fastener bolt holes in both ends of the new belt.

22. Install fasteners in each pair of holes to join the ends of the new belt. See the figure below.



Belt Ends Connected

- Crimp covers over the bottom fastener plates before inserting the bolts up through the belts.
 - Before tightening the fastener nuts, insert belt tape under the top and bottom plates of the fasteners all the way around the belt, to seal the joint and prevent joint rippling.
 - Fasteners should be tightened enough to draw the lower plate and cover into the belt, to allow free movement of the belt over the rollers.
23. Adjust the tail pulley bearings out toward the original marks in small, equal increments.
24. Tension and train the belt.
25. Replace the tail pulley guard.

26. Monitor the conveyor closely for the first hours of operation.

- Check for slip on the drive pulley and side drift.
- Re-tension and retrain the belt as necessary with the belt operating under load and at normal operating temperature, and to compensate for possible uneven loading.



Concept Check

Replace Belt (Product)

Answer the following questions to check your understanding of replacing a product belt. 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 unwinding the new belt onto the conveyor top side, the:
 - a. rubber side must be down, next to the supporting rollers and the cord side must be up.
 - b. rubber side must be up, and the cord side next to the supporting rollers.
2. If both ends of the new belt are not cut square, it will be impossible to:
 - a. install the belt.
 - b. tension the belt.
 - c. train the belt.
 - d. splice the belt.
3. The power to the belt drive motor is locked out:
 - a. before installing the belt clamps (for relieving the belt tension).
 - b. after installing the belt clamps (for relieving the belt tension).

Answers: (1. b 2. c 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 1

Your Trainer will ask you to cut the old belt. You will have to lock out the power to the belt drive motor before preparing the belt for cutting. Be careful when positioning the belt clamps. Avoid pinch points.

Practice Objective 1

The tail pulley must be aligned. The belt must be cut square, when checked with a framing square. All safe procedures associated with cutting the belt must be demonstrated.

Practice 2

Your Trainer will ask you to install the new belt. You will be asked to remove the old belt, feed the new belt onto the conveyor, and finally to tension and train the belt.

Practice Objective 2

Sufficient tension must be maintained on the old belt to enable the belt to roll off the conveyor smoothly. The end of the new belt must be cut square. Fastener bolt holes must be drilled using the template. Belt tape must be installed under the top and bottom plates. When operated, the belt must not slip or drift side-to-side. 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.