ACADEMY / TECHNICAL TRAINING SERIES

MECHANICAL FASTENERS & EMERGENCY REPAIRS

MODULE 06 / STUDENT TRAINING WORKBOOK

LEARNER NAME _____

DATE _____ TRAINER / ASSESSOR _____

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TRAINING SCOPE Online theory does not establish practical competence. Mechanical fastening, belt tensioning and emergency repairs require site-specific risk controls, isolation, authorisation and supervised assessment.

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Module Overview

This module explains the basic use of mechanical belt fasteners and emergency conveyor belt repairs.

Mechanical fasteners are often used when a belt needs to be joined quickly, repaired temporarily, or put back into service when hot vulcanising is not practical. They can be very useful on site, but they must be selected, fitted and inspected correctly.

Emergency repairs are usually carried out to reduce downtime and get a conveyor running safely until a more permanent repair or belt replacement can be completed.

A fast repair is not always a permanent repair. The correct method depends on the belt type, conveyor duty, material being carried, pulley sizes, belt speed, scraper setup and site conditions.

This module is designed for engineers, fitters, belt technicians, maintenance teams, apprentices, supervisors and companies wanting to improve in-house conveyor belt repair knowledge.

This module can be used as a classroom training guide, toolbox talk, apprentice handout or self-training document.

Important Safety Notice

This module is for general training and awareness only.

Always follow:

- Site safety rules
- Risk assessments
- Method statements
- Permit-to-work systems
- Lock-off and isolation procedures
- Manufacturer instructions
- Mechanical fastener supplier instructions
- Adhesive and repair material safety data sheets
- Company procedures
- Local health and safety requirements

No person should cut, clamp, repair, clip, tension or restart a conveyor belt unless they are competent, authorised and trained for the task.

If you are unsure, stop and ask a competent supervisor.

Mechanical fasteners and emergency repairs must be checked before the conveyor is returned to service.

Learning Objectives

By the end of this module, the learner should be able to:

1. Understand what mechanical fasteners are.
2. Understand when mechanical fasteners may be used.
3. Understand the limits of mechanical fasteners.
4. Identify common mechanical fastener types.
5. Explain why belt squaring is important before fitting fasteners.
6. Understand the basic steps for fitting a mechanical joint.
7. Understand the risks of poor fastener selection or poor installation.
8. Identify common emergency belt repair methods.
9. Understand when an emergency repair should be treated as temporary.

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10. Complete a basic mechanical fastener and emergency repair checklist.

1. What Are Mechanical Belt Fasteners?

Mechanical belt fasteners are metal or plastic joining systems used to connect two ends of a conveyor belt.

They may be known as:

- Belt clips
- Mechanical joints
- Belt lacing
- Hinged fasteners
- Plate fasteners
- Staple fasteners
- Bolt fasteners
- Rivet fasteners
- Hook fasteners

Mechanical fasteners are often used when a belt needs to be joined quickly or when vulcanising is not possible due to time, access, weather, equipment or site conditions.

They can be used for:

- Emergency belt repairs
- Temporary joints
- Light-duty belts
- Quarry and recycling belts
- Agricultural conveyors
- Mobile plant conveyors
- Workshop repairs
- Belts that need to be removed regularly
- Situations where a fast return to service is required

2. When Mechanical Fasteners May Be Used

Mechanical fasteners may be suitable when:

- The conveyor needs to be repaired quickly.
- Hot vulcanising equipment is not available.
- The belt needs to be joined on site.
- The belt is on mobile plant.
- The belt may need to be removed again.
- The belt is not suitable for vulcanising.
- The joint is temporary.
- The site needs to reduce downtime.
- The conveyor duty is suitable for fasteners.
- The pulley sizes are compatible.
- The belt thickness is within the fastener range.

Mechanical fasteners are useful, but they are not always the best long-term solution.

3. Limits of Mechanical Fasteners

Mechanical fasteners have limitations.

They may not be suitable for:

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- Very high-tension conveyors
- Some small pulley diameters
- Some scraper systems
- Some food-grade applications
- Some fine material applications
- High-speed conveyors
- Severe impact areas
- Some troughing arrangements
- Belts with serious carcass damage
- Steel cord belts unless specifically designed
- Applications where a smooth endless joint is required

Possible problems include:

- Fastener pull-out
- Pin wear
- Belt tear-out
- Joint noise
- Scraper damage
- Material leakage
- Tracking issues
- Fastener corrosion
- Reduced belt life
- Damage to pulleys or rollers if incorrectly selected

Always check the fastener manufacturer's instructions and suitability guidance.

4. Common Mechanical Fastener Types

There are several types of mechanical fasteners.

Hinged Plate Fasteners

Hinged plate fasteners join the belt ends using plates and a hinge pin.

They are often used on heavier rubber belts and quarry-type applications.

Staple Fasteners

Staple fasteners use staples driven through the belt and fastener plates.

They can provide a strong joint when installed correctly.

Rivet Fasteners

Rivet fasteners use rivets driven through the fastener and belt.

They are common in quarry, recycling and heavy-duty belt applications.

Bolt Solid Plate Fasteners

Bolt solid plate fasteners use bolts and plates to join the belt.

They are often used for heavier-duty repairs or belts where a strong mechanical grip is required.

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Wire Hook Fasteners

Wire hook fasteners are often used on lighter-duty belts.

They are common on package handling, agricultural and lighter conveyor applications.

Plastic or Spiral Lacing

Plastic or spiral lacing may be used on light-duty belts, PVC belts or specialist applications.

Repair Plates

Repair plates or bolt repair fasteners may be used to hold damaged belt sections together temporarily.

5. Choosing the Correct Fastener

The fastener must suit the belt and conveyor.

Before selecting a fastener, check:

- Belt type
- Belt width
- Belt thickness
- Belt rating
- Number of plies
- Top cover thickness
- Bottom cover thickness
- Minimum pulley diameter
- Conveyor speed
- Material being carried
- Scraper type
- Belt cleaner pressure
- Trough angle
- Fastener strength rating
- Fastener material
- Corrosion risk
- Installation tools required
- Whether the joint is temporary or permanent

Do not select fasteners only by belt width. Belt thickness, rating and pulley diameter are also important.

6. Belt Squaring Before Fastening

Before fitting mechanical fasteners, the belt ends must be cut square.

If the belt end is not square, the joint may:

- Run out of line
- Cause tracking problems
- Put uneven load on fasteners
- Damage the belt edge
- Pull the fasteners unevenly
- Shorten the life of the joint

Do not rely on old belt edges if they are worn or damaged.

Basic squaring method:

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1. Find the belt centre line.
2. Measure across the belt width.
3. Mark equal points from the centre line.
4. Use a square, straight edge or approved belt squaring method.
5. Mark the cut line.
6. Check the measurement again.
7. Cut the belt end clean and square.

7. Preparing the Belt End

Before installing fasteners, the belt end should be clean, square and suitable.

Check:

- Belt end is square
- Belt end is not delaminated
- Belt is not badly worn
- Covers are not loose
- Plies are not damaged
- Belt thickness is correct for the fastener
- Belt is clean and dry
- Fastener strip is the correct width
- Installation tools are correct
- Hinge pin is correct
- Fastener is facing the correct direction

Some fasteners require skiving or cover removal before fitting. Always follow the fastener manufacturer's instructions.

8. Basic Mechanical Fastener Installation Principles

The exact fitting method depends on the fastener type and manufacturer.

However, the basic principles are:

1. Isolate and lock off the conveyor.
2. Control belt tension and stored energy.
3. Clamp and support the belt.
4. Square the belt end.
5. Prepare the belt end as required.
6. Select the correct fastener.
7. Position the fastener evenly across the belt.
8. Install using the correct tool.
9. Check fastener seating and alignment.
10. Repeat on the second belt end.
11. Bring belt ends together carefully.
12. Fit the hinge pin or joining pin if required.
13. Trim any sharp edges or hazards.

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14. Check scraper clearance.

15. Check pulley suitability.

16. Tension and track the belt carefully.

17. Run the belt slowly and inspect.

9. Joining Pin or Hinge Pin

Hinged fasteners normally use a joining pin.

The joining pin connects the fasteners from both belt ends.

Check:

- Pin type
- Pin diameter
- Pin length
- Pin material
- Pin flexibility
- Pin wear resistance
- Pin security
- Pin clearance at belt edges

A worn, loose or incorrect pin can cause joint failure.

Some pins may need retaining, trimming or securing according to the fastener instructions.

10. Fasteners and Belt Cleaners

Mechanical fasteners must be checked against the belt cleaner or scraper system.

Problems can occur if:

- Scraper pressure is too high
- Scraper blade catches the fastener
- Fastener profile is too high
- Fastener is damaged
- Belt is tracking to one side
- Fastener pin protrudes
- Repair plates catch on scrapers

Before returning the conveyor to service, check the scraper and fastener interaction.

In some cases, scraper pressure may need adjustment, or a different fastener may be required.

11. Fasteners and Pulley Diameter

Mechanical fasteners must be able to travel around the conveyor pulleys.

If the pulley is too small for the fastener or belt, the joint may:

- Lift
- Crack
- Pull out
- Damage the belt
- Damage the fastener
- Create high stress
- Reduce joint life

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Always check the minimum pulley diameter recommended for the fastener and belt.

12. Fastener Inspection Before Restart

Before restarting the conveyor, inspect the mechanical joint.

Check:

- Fasteners are fully seated
- Fasteners are straight
- No missing staples, bolts or rivets
- No sharp edges
- No protruding pin
- Pin is secure
- Belt ends are aligned
- Belt is not delaminated
- No loose tools or blades remain
- Scraper clearance is acceptable
- Guards are refitted
- Everyone is clear

The conveyor should be started slowly where possible and watched carefully.

13. Running-In a Mechanical Joint

After fitting a mechanical joint, the conveyor should be monitored.

During the first run, check:

- Belt tracking
- Joint noise
- Fastener movement
- Pin movement
- Scraper contact
- Pulley contact
- Material leakage
- Edge damage
- Belt tension
- Any signs of pulling out

Stop the conveyor if the joint starts to fail, catch, track badly or make unusual noise.

Do not leave a new mechanical joint unchecked.

14. Emergency Belt Repairs

Emergency belt repairs are used when a belt is damaged and the site needs to reduce downtime.

Emergency repairs may be used for:

- Belt tears
- Small rips
- Edge damage
- Cover damage
- Holes
- Pulled fasteners

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- Damaged splice area
- Punctures
- Temporary joint failure
- Material impact damage

An emergency repair should make the belt safe enough to run until a proper repair, splice or replacement can be completed.

Emergency repair does not mean ignore the cause of the failure.

15. Types of Emergency Repair

Common emergency repair methods include:

Mechanical Fastener Joint

Used when a belt has broken or needs to be joined quickly.

Bolt Repair Plates

Used to hold damaged belt sections together temporarily.

Temporary Patch Repair

Used to cover holes or worn areas for short-term service.

Cold Bonded Repair

Uses adhesive and repair material without heat, where suitable.

Hot Vulcanised Repair

Uses heat, pressure and uncured rubber, where time and equipment allow.

Edge Repair

Used when belt edge damage needs to be controlled to stop further tearing.

Rip Control

Used to stop a tear or rip from spreading, depending on belt condition and method.

16. Assessing Belt Damage

Before carrying out a repair, assess the damage.

Check:

- Damage length
- Damage width
- Depth of damage
- Is the carcass damaged?
- Are plies cut?
- Is the belt edge damaged?
- Is the splice damaged?
- Is the belt contaminated?
- Has material gone through the belt?

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- Is the belt still safe to run?
- What caused the damage?
- Will the damage continue if restarted?
- Is the repair temporary or permanent?
- Is belt replacement required?

Do not repair a belt that is unsafe to run unless the repair method has been properly assessed and authorised.

17. Cover Damage

Cover damage affects the rubber surface of the belt.

Examples include:

- Cuts
- Gouges
- Abrasion
- Small holes
- Pulled rubber
- Impact marks
- Heat damage
- Chemical damage

If the damage is only in the cover and the carcass is sound, a cover repair may be possible.

If the damage reaches the carcass, a stronger repair or belt replacement may be required.

18. Carcass Damage

The carcass is the strength layer of the belt.

Carcass damage may include:

- Cut plies
- Torn fabric
- Broken cords
- Delamination
- Severe punctures
- Long rips
- Edge tearing
- Splice separation

Carcass damage is more serious than surface cover damage.

A belt with carcass damage may not be suitable for a simple patch repair.

19. Longitudinal Rips

A longitudinal rip runs along the length of the belt.

Longitudinal rips can be caused by:

- Trapped metal
- Sharp material
- Chute damage
- Skirt damage
- Structure contact

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- Seized rollers
- Material trapped at the pulley
- Foreign objects

Before repairing a longitudinal rip, find and remove the cause.

A repair may stop the rip temporarily, but if the cause remains, the belt may rip again.

20. Edge Damage

Belt edge damage can be caused by:

- Poor tracking
- Belt rubbing structure
- Misaligned pulleys
- Seized rollers
- Material build-up
- Bad loading
- Damaged fasteners
- Belt running off centre

Repairing the edge without correcting the tracking issue may not solve the problem.

Edge damage can worsen quickly if the belt continues to run into the structure.

21. Pulled or Failed Fasteners

Fasteners may fail because of:

- Wrong fastener selected
- Poor installation
- Belt too worn
- Belt too weak
- Pulley too small
- Belt tension too high
- Scraper catching
- Pin wear
- Belt not square
- Poor tracking
- Excessive impact
- Corrosion

If fasteners have pulled out, do not simply fit the same fasteners again without checking why they failed.

22. Temporary vs Permanent Repairs

Not every repair is permanent.

A temporary repair is used to keep the conveyor running until:

- A planned shutdown
- A proper vulcanised repair
- A replacement belt
- A longer splice repair
- A replacement section
- A better access window

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Temporary repairs should be monitored and recorded.

Do not treat a temporary emergency repair as forgotten once the conveyor is running.

23. Finding the Cause of the Damage

A repair is only part of the job.

Always ask: Why did the belt fail?

Possible causes include:

- Impact damage
- Sharp material
- Trapped metal
- Poor tracking
- Belt slip
- Seized roller
- Damaged scraper
- Skirt rubber cutting into the belt
- Misaligned pulley
- Material build-up
- Incorrect belt specification
- Over-tensioning
- Under-tensioning
- Poor splice
- Wrong fastener
- Foreign object in chute

If the cause is not found, the repair may fail again.

24. Emergency Repair Checklist

Before carrying out an emergency repair, check:

Safety

- Conveyor isolated and locked off
- Stored energy controlled
- Belt clamped and supported
- Work area safe
- Correct PPE worn
- Tools inspected
- People clear of tension line

Damage Assessment

- Damage type identified
- Damage length measured
- Damage depth checked
- Carcass condition checked
- Edge condition checked
- Splice condition checked
- Cause of damage investigated

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Repair Method

- Repair method selected
- Temporary or permanent repair agreed
- Correct fasteners or materials available
- Manufacturer instructions followed
- Belt thickness and rating checked
- Pulley diameter checked
- Scraper clearance checked

Restart

- Repair inspected
- Tools removed
- Guards refitted
- People clear
- Conveyor started slowly if possible
- Repair monitored under load
- Follow-up inspection planned

25. Recording the Repair

Emergency repairs should be recorded.

Record:

- Date
- Conveyor number
- Belt width
- Belt type
- Damage type
- Damage location
- Cause if known
- Repair method
- Fastener type if used
- Materials used
- Technician name
- Whether repair is temporary or permanent
- Follow-up action required
- Photos before and after repair

A repair record helps plan future maintenance and prevents temporary repairs being forgotten.

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Practical Exercise

Use a belt sample, conveyor photograph, damaged belt section or training example and complete the following exercise.

1. Identify the Belt Damage

2. Decide Whether the Repair Is Temporary or Permanent

3. Choose a Mechanical Fastener Type

4. Check the Belt End Is Square

5. Check the Pulley Diameter

6. Check the Belt Cleaner

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7. Inspect the Fastener Installation

8. Identify the Cause of the Damage

9. Plan the Restart Inspection

10. Record the Repair

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Knowledge Check

Question 1

What are mechanical belt fasteners?

Question 2

When might mechanical fasteners be used?

Question 3

Name three common types of mechanical fastener.

Question 4

Why must the belt end be cut square?

Question 5

Why is pulley diameter important?

Question 6

Why should scrapers be checked after fitting fasteners?

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Question 7

What should be checked before restarting a conveyor after fitting fasteners?

Question 8

What is an emergency belt repair?

Question 9

Why must the cause of belt damage be found?

Question 10

Why is carcass damage more serious than cover damage?

Question 11

What can cause fasteners to fail?

Question 12

Why should emergency repairs be recorded?

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Self-Assessment

Tick each statement once you understand it.

- I understand what mechanical fasteners are.
- I understand when mechanical fasteners may be used.
- I understand that mechanical fasteners are not suitable for every conveyor.
- I can name common types of fastener.
- I understand why the belt end must be square.
- I understand why fastener selection matters.
- I understand why pulley diameter must be checked.
- I understand why scraper clearance must be checked.
- I understand the importance of inspecting the joint before restart.
- I understand what an emergency belt repair is.
- I understand the difference between cover damage and carcass damage.
- I understand why the cause of damage must be found.
- I understand the difference between temporary and permanent repair.
- I understand why emergency repairs should be recorded.

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