



CONVEYOR GUARDING

Practical guidance for **safer**
operation and maintenance

A PRACTICAL GUIDE

CEMEX AUDIT

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Site Name:

Plant Reference:

Inspected By:

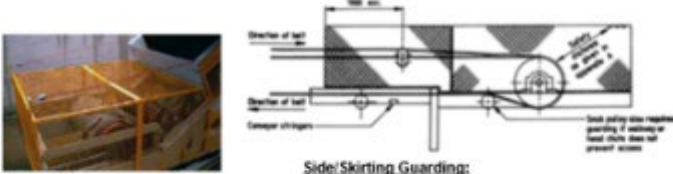
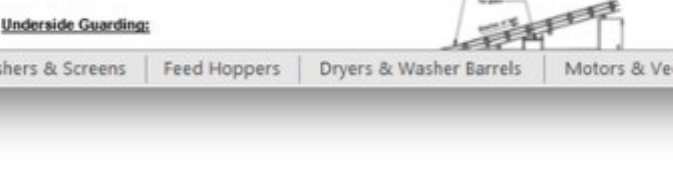
Date:

Enter Y (yes) or N (no) to confirm whether the relevant safeguards are in place, N/A (not applicable) should only be entered where no relevant equipment exists / is required

An action should be generated to address each non compliant item

Remedial actions should be included the Action Plan at the end of the sheet or on the appropriate site action plan

Reference should be made to Safe Guarding Jun10 - V3 for further guidance if required

CONVEYORS			Guidance
Head Drum Guarding	Guarding prevents access to all potential nip points, including snub drums / pulleys. Guarding is secured by tool tight fastenings. Guarding is undamaged.	Y/N	Head / Tail Drum Guarding: - Guards to prevent access to all associated nip points - Distance from guard end to head drum minimum 1000mm - If troughing idlers put belt under tension guards must extend further 1000mm beyond them - Guards extend minimum 1000mm beyond nip point - Guards are robust and secured by tool tight fastenings 
Tail Drum Guarding	Guarding prevents access to all potential nip points. Guarding is secured by tool tight fastenings. Guarding is undamaged. Any spillage is not interfering with conveyor operation.	Y/N	Side/Skirting Guarding: - Where fixed skirts fitted above idlers, panel guards to be fitted to prevent access to nip points - Where conveyor changes angle guards to be fitted to prevent access to nip points - Guards extend minimum 1m beyond a nip point - Guards are robust and secured by tool tight fastenings 
Skirting	Guarding prevents access to all potential nip points. Guarding extends 1m beyond end of skirting. Guarding is secured by tool tight fastenings. Guarding is undamaged.	Y/N	
Side Guarding	Guarding is present where belt changes direction or is under tension. Guarding is secured by tool tight fastenings. Guarding is undamaged.	Y/N	
	Guarding prevents access to all potential nip points. Access beneath the conveyor is		Underside Guarding: 

Safe Guarding

Conveyor

Skips

Crushers & Screens

Feed Hoppers

Dryers & Washer Barrels

Motors & Vee Belts

CEMEX GUIDANCE MATERIALS

Based on existing guidance and experience

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CEMEX REQUIREMENTS

“Where possible dangerous parts of moving machinery should be **close guarded** to prevent people being able to work inside the guarded area. Typical examples include the head and tail end of conveyors, any transition points and crusher drives.”



CONVEYOR GUARDING

The basics



WHY DO PEOPLE REMOVE GUARDS?



Clear
spillage



Greasing



Adjustment



Repairs



EVERY TIME

someone removes
a guard they are
**POTENTIALLY
EXPOSING**
themselves and
others to danger



and
INCREASING THE RISK
that guards will not be
refitted or resecured
properly

HOW WE DESIGN FOR SAFETY



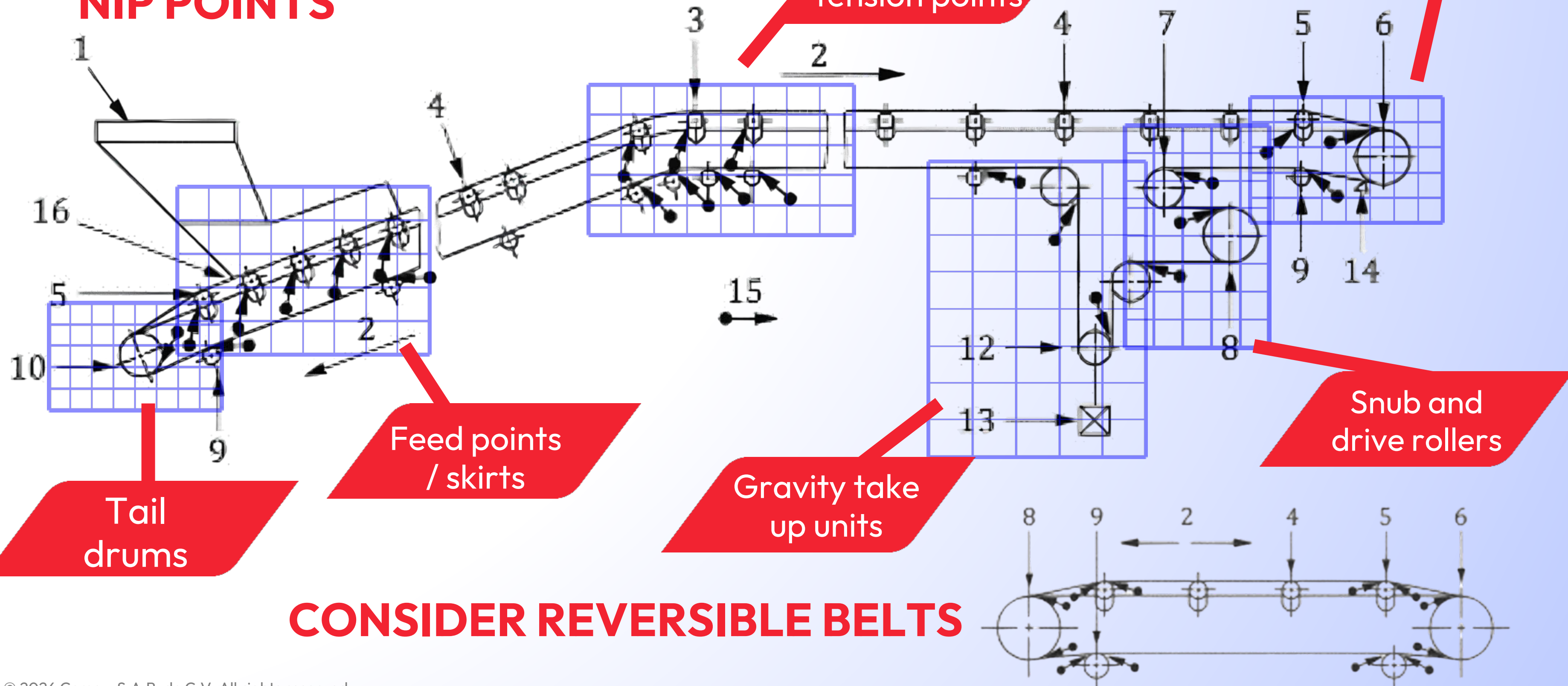
**ELIMINATE /
REDUCE**
the need to remove
guards **first!**



DESIGN GUARDS
so they remain
secure, are easy
to fit and it's
OBVIOUS
when they
are missing

WHAT REQUIRES GUARDING?

NIP POINTS



CONSIDER REVERSIBLE BELTS

There's no such
thing as **SAFE** by
position in Cemex

—
**THIS MUST BE
GUARDED**

DESIGN ESSENTIALS

- Prevent access to dangerous parts
- Strong construction / robust
- Secure fixings
- Allow machinery to be seen where necessary
- Don't introduce additional risks
- Designed to facilitate cleaning / adjustment

CONVEYOR GUARDING DESIGN



Close Fitting Guards
CEMEX PREFERENCE

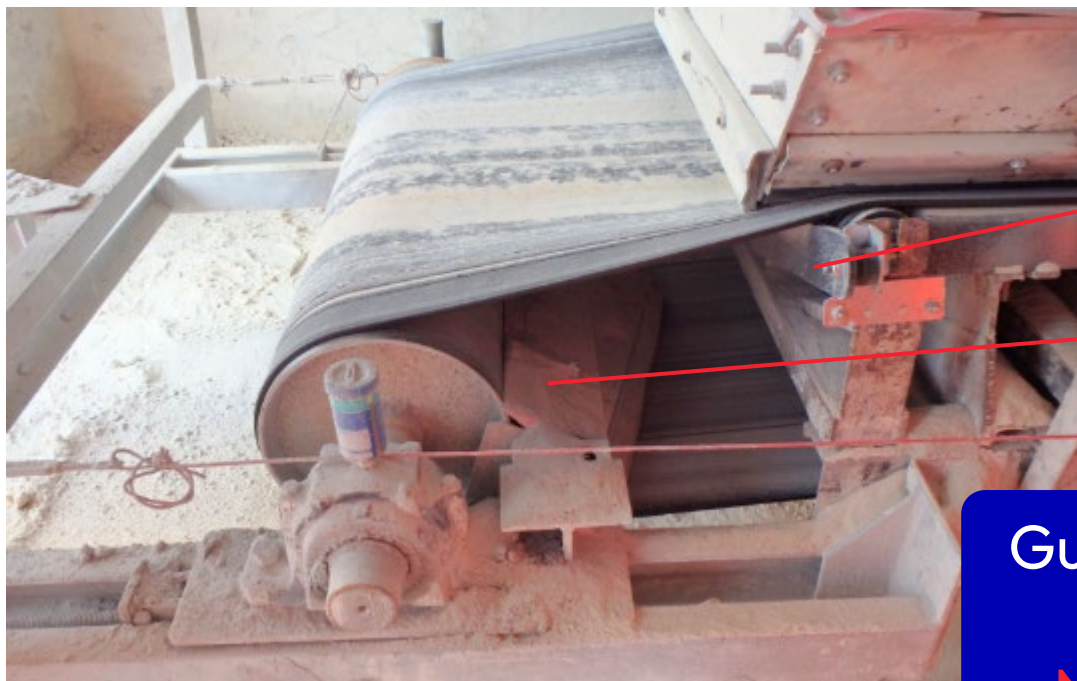


Plate / nip
guards

Guarding directly on main
pulley drums is
NOT RECOMMENDED



Perimeter / Distance Guards:
OK where close guarding not practical

CONVEYOR GUARDING DESIGN

MUST

- Be held in place with fastenings requiring a tool to release them, i.e. nut and bolt fixings
- Have mesh of a size sufficient to allow spillage to fall through (where safe to do so), whilst preventing access to nip points
- Be designed to facilitate cleaning and maintenance
- Be brightly painted when new / refurbished



Missing guards are more obvious if brightly coloured

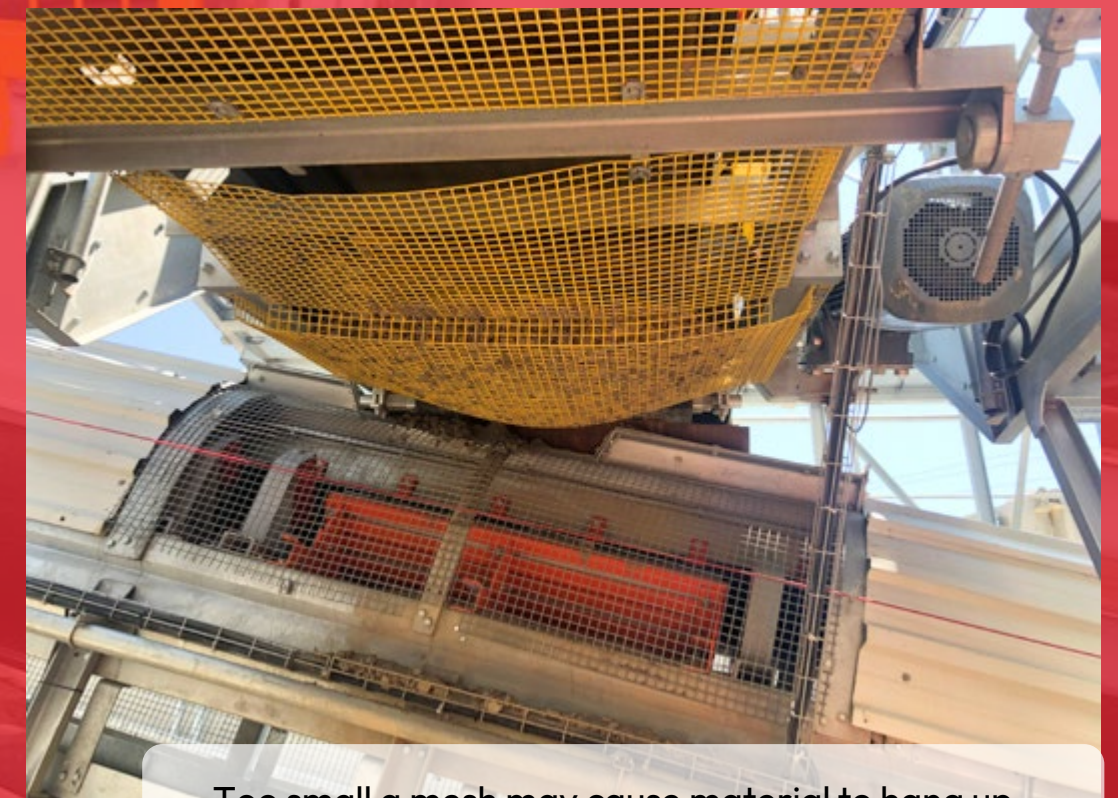


MUST NOT:

- Be hinged
- Remain in place without the fixings
- Be too big / difficult to handle
- Be secured by quick release clips, wing nuts, padlocks or cable ties
- Have an excessive number of bolts

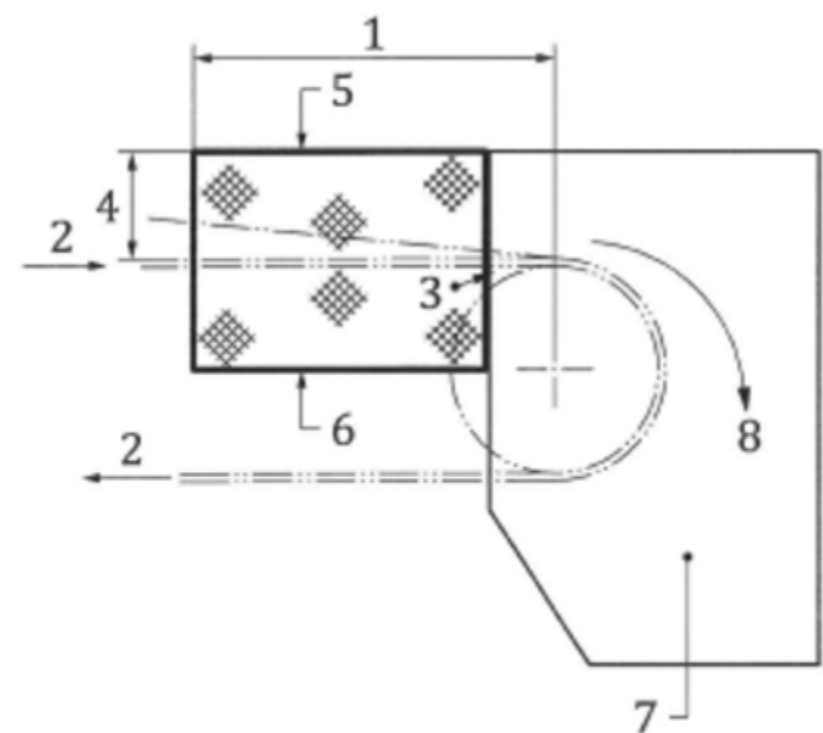


What's the chance of 26 bolts being put back in place?



Too small a mesh may cause material to hang up

CONVEYOR DIMENSIONS

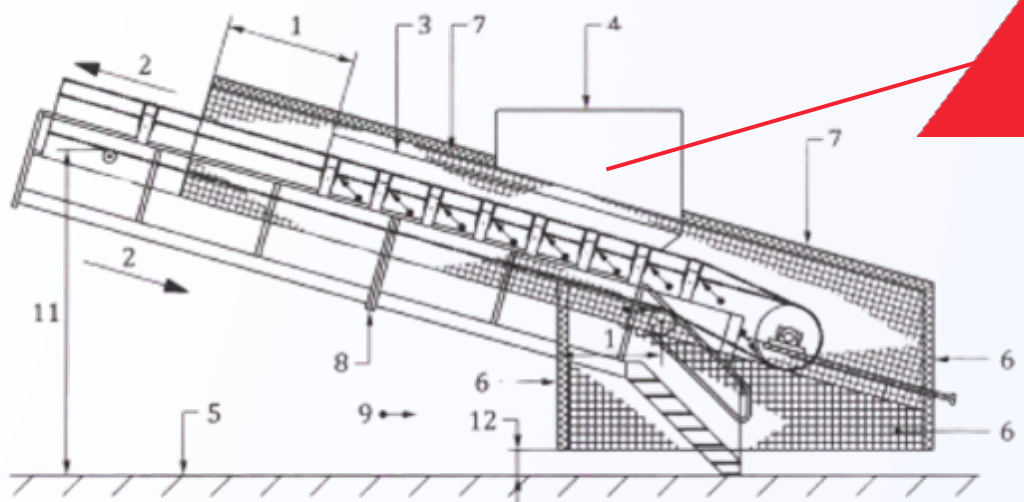


Key

- 1 distance a (see Table 1)
- 2 direction of belt travel
- 3 nip point
- 4 minimum to suit material
- 5 fixed guard e.g. top guard
- 6 under guard or decking plate
- 7 enclosure guarding
- 8 material discharge

Table 1 — Minimum distance of edge of fixed enclosure guard from centre line of pulley, idlers at convex curve and idlers at transition section

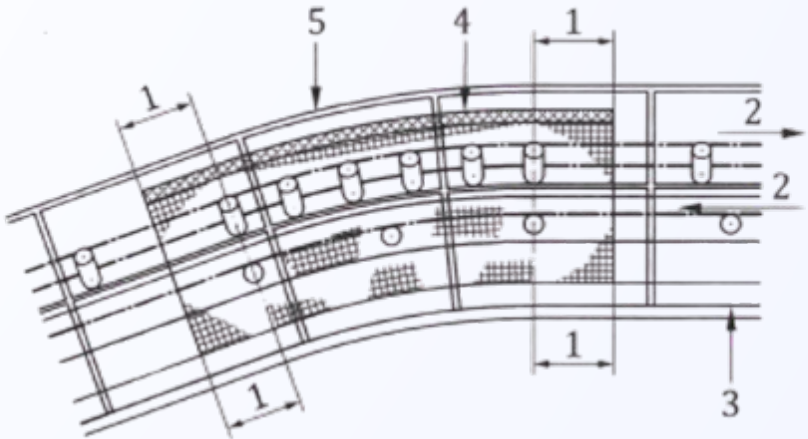
Pulley, idlers at convex curve and idlers at transition sections Diameter	Minimum distance " a "
mm	mm
≤ 850	1 000
> 850	1 200



Key

- 1 distance a (see Table 1) min
- 2 direction of belt travel
- 3 skirt plate
- 4 feed hopper
- 5 floor level
- 6 guards to enclose idlers, tail and snub pulleys
- 7 guard-cover (for vertical guard less than 2 m high)
- 8 walkway
- 9 nip point
- 10 nip guard
- 11 upright reach distance
- 12 clearance below fixed guard

Figure 4 — Example of fixed guards at tail pulley, feed hopper and idlers



Key

- 1 distance a (see Table 1) min
- 2 direction of belt travel
- 3 walkway
- 4 guard-cover (for vertical guard less than 2 m high)
- 5 guard-rail

Figure 5 — Example of fixed guards at convex curve

CLEANING & ADJUSTMENT

Purpose made gaps for conveyor adjustment and “letter boxes” to help with spillage clearance or the addition of fibres, pigments, etc. are **OK so long as you can’t reach a nip point with any part of the body, or insert tools near moving machinery.**

It’s NOT OK to simply cut holes in guards!



Guards should be designed to enable lubrication and adjustments to be carried out without removing guards wherever possible

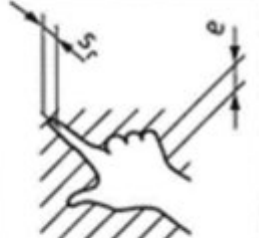
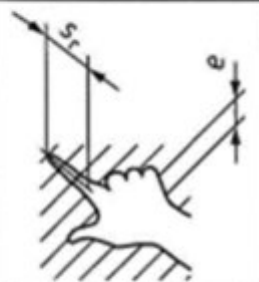
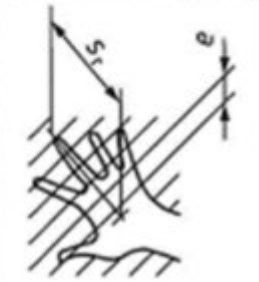
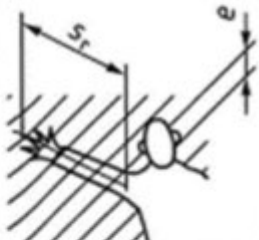


CONVEYOR DIMENSIONS

Local standards may define even stricter safety distances in relation to opening sizes

Table 4 — Reaching through regular openings — Persons of 14 years of age and above

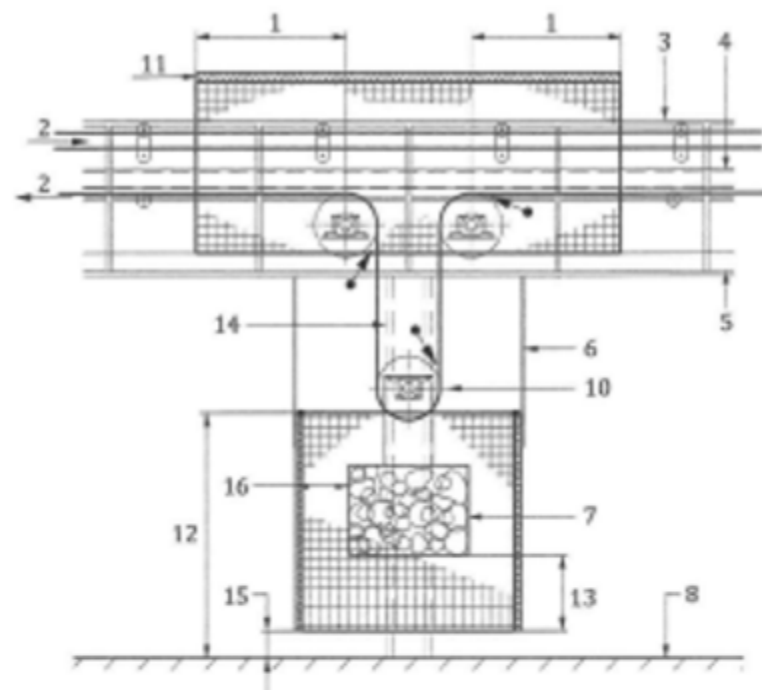
Dimensions in millimetres

Part of body	Illustration	Opening	Safety distance to hazard zone, s_r		
			Slot	Square	Round
Fingertip		$e \leq 4$	≥ 2	≥ 2	≥ 2
		$4 < e \leq 6$	≥ 10	≥ 5	≥ 5
Finger up to knuckle joint		$6 < e \leq 8$	≥ 20	≥ 15	≥ 5
		$8 < e \leq 10$	≥ 80	≥ 25	≥ 20
Hand		$10 < e \leq 12$	≥ 100	≥ 80	≥ 80
		$12 < e \leq 20$	≥ 120	≥ 120	≥ 120
		$20 < e \leq 30$	$\geq 850^a$	≥ 120	≥ 120
Arm up to junction with shoulder		$30 < e \leq 40$	≥ 850	≥ 200	≥ 120
		$40 < e \leq 120$	≥ 850	≥ 850	≥ 850

NOTE The bold lines within the table delineate that part of the body restricted by the opening size.

^a If the length of the slot opening is ≤ 65 mm, the thumb will act as a stop and the safety distance may be reduced to ≥ 200 mm.

GRAVITY TAKE UP UNITS



a) Typical guarding with fixed guards at a gravity take-up device

Key

1	distance a (see Table 1)	10	take-up pulley
2	direction of belt travel	11	fixed guard e.g. top cover
3	guardrail	12	guard height 2.5m recommended
4	conveyor frame	13	reach distance
5	walkway	14	guide column
6	guard to be extended to protect take-up pulley, unless safe by position	15	clearance below guard
7	counterweight	16	minimum distance from the hazard
8	floor level	17	nip guard
9	nip point		

Figure 10 — Typical guarding at a gravity take-up device



Conveyor gravity take-up units should be enclosed with mesh panels which prevent access to moving parts within the tower including the risk of the gravity take-up weight falling to ground level in the event of the belt breaking.

All panels should be secured such that they require a tool for removal.

Note: There is no requirement (unless environmental) to guard the full length of conveyors if there are no nip points under tension that could result in injury.

Under certain circumstances, where this loading has not been factored into the design of the equipment, it can add additional loading from weight, wind, etc. creating risk.

Emergency pullwires / stop buttons should be readily accessible throughout the length of the conveyors where there is access.



Safeguards for troughing, carrying and return idlers in the form of fixed guards (see 4.2.2) or nip guards (see 4.2.5), are not mandatory if the belt can yield (leave the idlers) to produce a clearance of at least 50 mm at the nip point with a maximum force of 150 N (see Figure 11). To measure this force a plate of 50 mm × 50 mm shall be used. The maximum distance of the plate to the idler shall not be more than the diameter of the idler.

NOTE 1 With the maximum force of 150 N, it is assumed that the operator will be able to escape from the nip point by pulling back their limbs or pass the nip point.

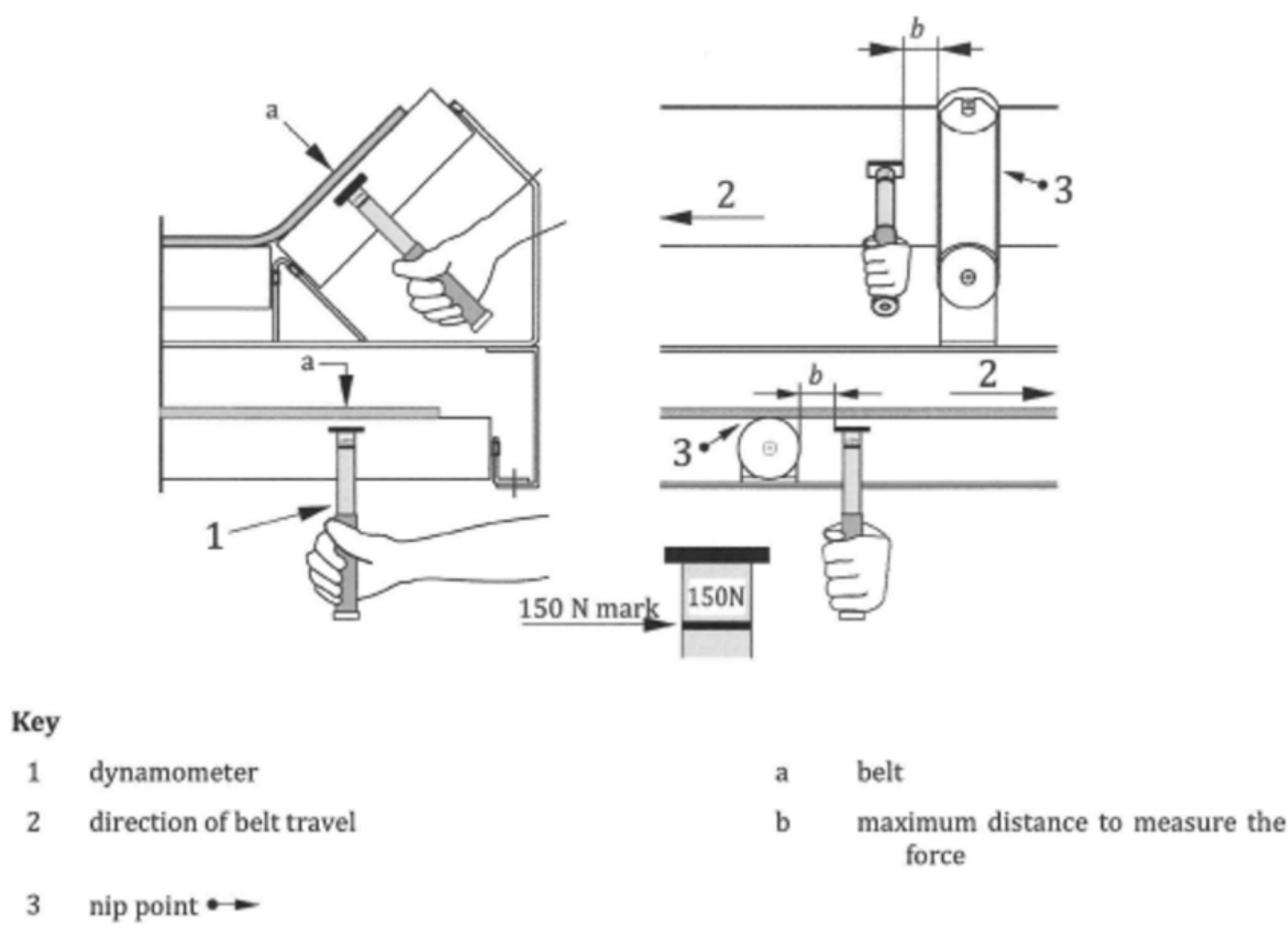


Figure 11 — procedure to measure the belt clearance at a nip point

RETURN SUPPORT / IDLER ROLLERS

Return idler / support rollers only require to be guarded where they are accessible to persons and there is a risk of entanglement from a nip point, usually as a result of downward pressure on the roller being applied by the conveyor belt. If a conveyor is floor mounted the return idler rollers are not accessible and do not require guarding, similarly if the return idler rollers are out of reach of persons they do not require guarding.

0.7 – 2.5 Metres from the Ground

If the return idler rollers of a conveyor are at a height above 0.7 metres and up to 2.5 metres from the ground they must be guarded to prevent entanglement. The guards must be one of the three types described below:

Fixed distance guards for Return Idler Rollers

Fixed distance guards shall be securely fixed in position using captive type fastenings and shall only be capable of being opened or removed with the aid of a tool.



Nip Guards for Return Idler Rollers

Nip guards at return idler rollers shall extend across the width of the belt and for a minimum of 150 mm from the nip point.

They shall be closely fitted to follow the belt line and idler periphery approaching the nip point, with a maximum clearance of 5 mm.

1. Direction of belt travel



Fixed enclosing guards

Fixed enclosed guards shall be securely fixed in position using captive type fastenings and shall only be capable of being opened or removed with the aid of a tool.

If they are removable, they shall be capable of being removed and replaced without dismantling any other part. Fixed enclosing guards shall be designed so that they cannot remain in the closed position unless they are fastened.

Fixed enclosing guards shall not be designed to have sufficient space to allow any person to enter and be enclosed inside.



PRIORITIZATION



A team want to improve conveyor guarding, where should they start:

- 1) Interim measures** – Restrict access to dangerous areas
- 2) Assess the risk in each area**, using the Global Audit where appropriate, and implement a formal / tracked plan – consider hazards and access e.g.
 - Tail end
 - Head end with walkways
 - Gravity take up units
 - Head ends without access

RETURN SUPPORT / IDLER ROLLERS



15:11 ☒ Head Drum Guarding



Head / Tail Drum Guarding: - Guards to prevent access to all associated nip points. - If troughing idlers put belt under tension guards must extend further 1000mm beyond nip point. - Guards are robust and secured by tool tight fastenings.

- ☒ Does the Guarding prevent access to all potential nip points, including Snub Drum
- ☒ Is the Guarding secured by tool tight fastenings?
- ☒ Is the Guarding free from any damage?

15:11 ☒ Tail Drum Guarding

- ☒ Does the Guarding prevent access to all potential nip points?
- ☒ Does the Guarding extend 1m beyond the end of the skirting?
- ☒ Is the Guarding secured by tool tight fastenings?
- ☒ Is the Guarding free from any damage?

15:11 ☒ Skirting

Skirting Guarding: - Where fixed skirts fitted above idlers, panel guards to be fitted to changes angle guards to be fitted to prevent access to nip points. - Guards extend m secured by tool tight fastenings.

- ☒ Does the Guarding prevent access to all potential nip points?
- ☒ Is access beneath the conveyor restricted below 2.5m to prevent contact with mo
- ☒ Is access beneath the conveyor protected from any falling material?

15:11 ☒ Side Guarding

Side Guarding: - Where fixed skirts fitted above idlers, panel guards to be fitted to pre changes angle guards to be fitted to prevent access to nip points. - Guards extend m secured by tool tight fastenings.

- ☒ Is Guarding present where the belt changes direction or is under tension?
- ☒ Is the Guarding secured by tool tight fastenings?
- ☒ Is the Guarding free from any damage?

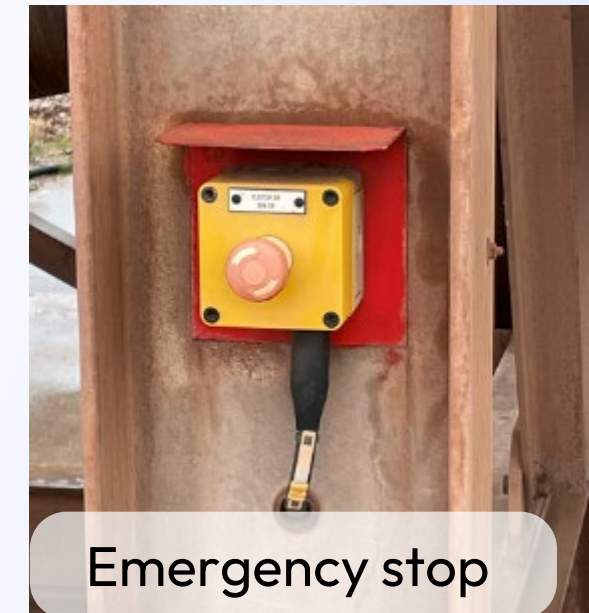
Formal inspection schemes should be in place, where guards and other related safety equipment are inspected by a competent person at least every month; this person may be a trained member of the site team.

Records of the inspections and any observations / action plans should be documented, along with evidence of completion of any remedial works.

EMERGENCY STOPS / PULLWIRES

All conveyors should be fitted with emergency stop controls:

1. Pull wires should cause the conveyor to stop in the event of their being pulled in any direction, breaking, slackening or removal of the pullwire...tension springs should be fitted, rather than fixed ends.
2. Pullwires should be readily accessible, running along the outside of fixed guarding. They may extend round the end of guards using pulley systems, or down each side of the conveyor to the end of the guards.
3. Emergency stop buttons may be used to supplement pull wires, they should be:
 - Readily accessible
 - Red
 - Mushroom head
 - Prominently marked
4. The frequency of testing emergency pullwires and stops should be defined and recorded in the site inspection scheme.
5. Emergency stop devices MUST NOT be used as an alternative to machinery isolation when working on equipment...Full LOTOTO / isolation processes should be in place.



LOTOTO / MACHINERY ISOLATION



Before removing guards, remember key processes such as Permit to Work and Take 5.

Isolation and lock off must include ALL forms of energy in static and mobile equipment, i.e:

- Electrical
- Pneumatic
- Hydraulic
- Mechanical / Gravity



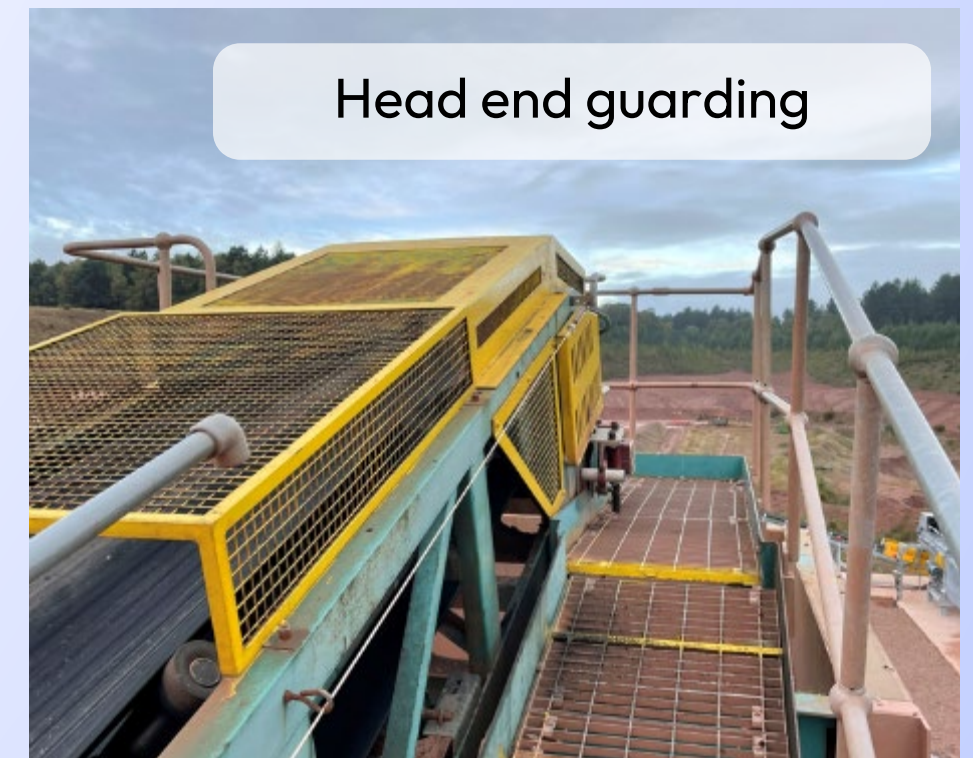
All forms of stored (‘potential’) energy should be assessed and safely dissipated / released / locked before the removal of guards from machinery.

LOTOTO procedures should be clear, concise and well understood, incorporating photos as necessary. The procedures must ensure any upstream and downstream equipment is isolated, with careful consideration of the advantages and disadvantages of local, zonal and full isolation. They should include a “test start” to ensure isolation is effective.

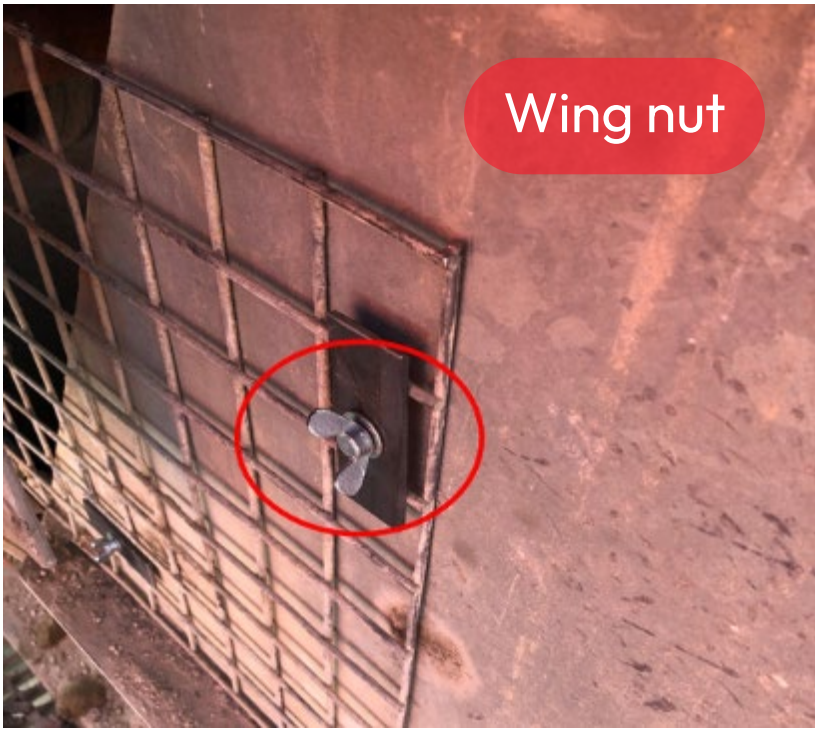
All relevant personnel shall be trained in isolation and lock-off procedures to include a practical demonstration of the isolation and lock off. On completion of training, a record of training shall be completed and filed.

4	On Main Isolation Control panels turn isolation switch to Off position Isolation controller (MIC) then supervises all persons on the job applying their individual locks to the isolator using hasp & Tags	
5	Anyone who has put a lock on i.e. Contractor/operator & MIC carries out the following test procedure: 1. On control panels press any green button, ensure the light does not remain on. If at any stage any green lights comes on and/or any part of the plant can be heard to start - STOP and contact site management immediately!	
6	MIC puts on yellow lock & tags onto the isolator and tests to ensure isolation is completed	

GOOD PRACTICE EXAMPLES



2022 POOR PRACTICES





QUESTIONS / DISCUSSION