TECHNICAL REPORT 5046

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Continuous mechanical handling equipment — Safety code for conveyors and elevators with chain-elements — Examples for guarding of nip points

Engins de manutention continue — Code de sécurité des appareils à chaînes — Exemples de protection des points d'engrènement

Technical Report 5046 was drawn up by Technical Committee ISO/TC 101, *Continuous mechanical handling equipment,* and approved by the majority of its members. The reasons which led to the publication of this document in the form of a Technical Report are the following :

The aim of this Technical Report is to give examples for the guarding of nip points between the chains and the sprocket wheels or caterpillar drives for all conveyors and elevators using chains as transporting elements.

This Technical Report incorporates sketches which show in principle how sufficient safety can be achieved, without excluding other methods which give the same safety factor. As this is a subject that cannot be considered as suitable for an International Standard, it was decided to publish the document as a Technical Report.

1 SCOPE AND FIELD OF APPLICATION

This Technical Report describes different safety devices at nip points for conveyors and elevators with chain-elements. It supplements the various International Standards dealing with safety of continuous mechanical handling equipment.

2 REFERENCE

ISO 1819, *Continuous mechanical handling equipment — Safety code — General rules.*[1)]

1) At present at the stage of draft. (Revision of ISO/R 1819-1970.)

UDC 621.867.1 : 614.8

Ref. No. ISO/TR 5046-1977 (E)

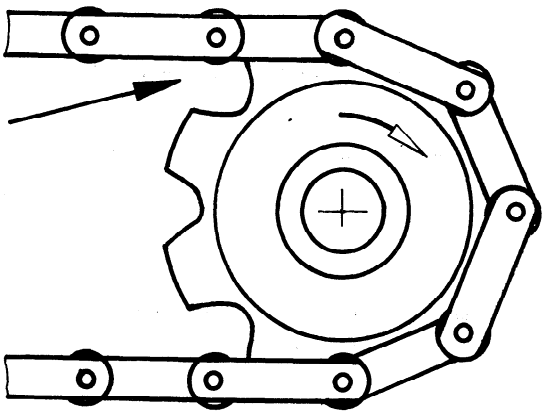
Descriptors : handling equipment, continuous handling, conveyors, chain conveyors, elevators, safety equipment, nip points.

Price based on 23 pages

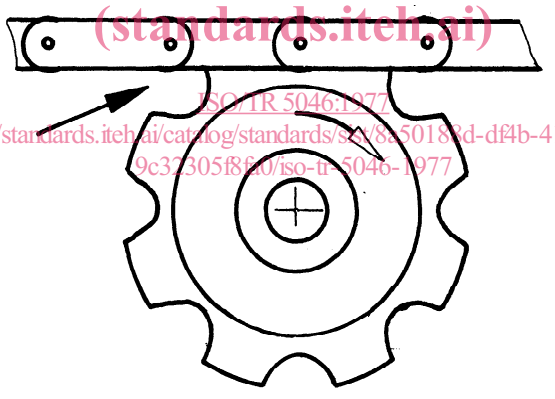
3 NIP POINTS ON CHAIN CONVEYORS

There is a risk of accidents occurring where chains run on to sprocket wheels or guide wheels.

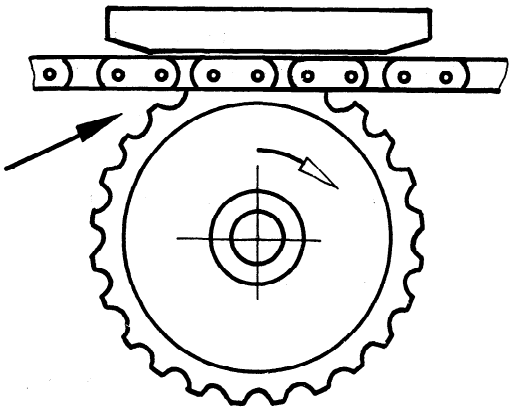
3.1 When the chains run round sprockets.



3.2 When the chain is supported by a sprocket.



3.3 When a shoe above the chain precludes any possibility of the chain lifting.



points to be protected

direction of travel

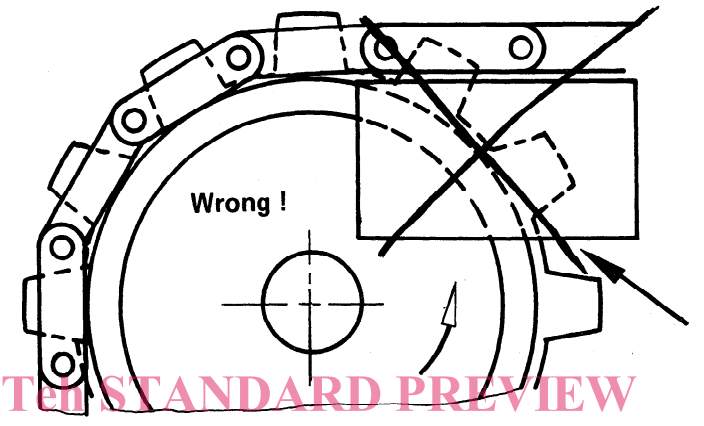
4 BASIC TYPES OF PROTECTING DEVICES

4.1 General requirements

4.1.1 Guards must be shaped in such a way that they do not impede the functioning of the equipment.

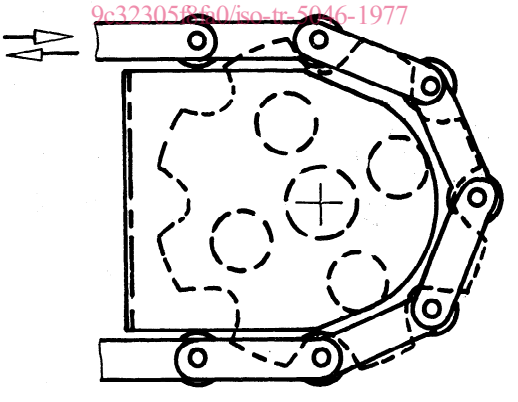
They must cover the dangerous areas completely but should not be larger than necessary, so that the state of maintenance and wear may be seen.

4.1.2 For chain wheels, a plate or a filling block just covering the nip is unsatisfactory, as a shear trap between each tooth and the guard is introduced.

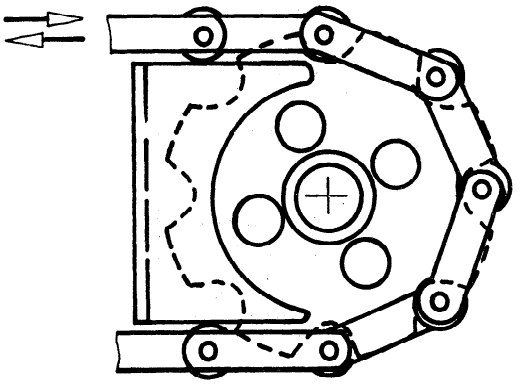


4.1.3 Guards on sprockets with spokes or openings on the disks must be shaped in such a way that no shear points are introduced :

a) by fully covering the wheels;



b) by limiting the guards up to the root radius of the full part of the sprocket where no shear points can arise from the sprocket openings.

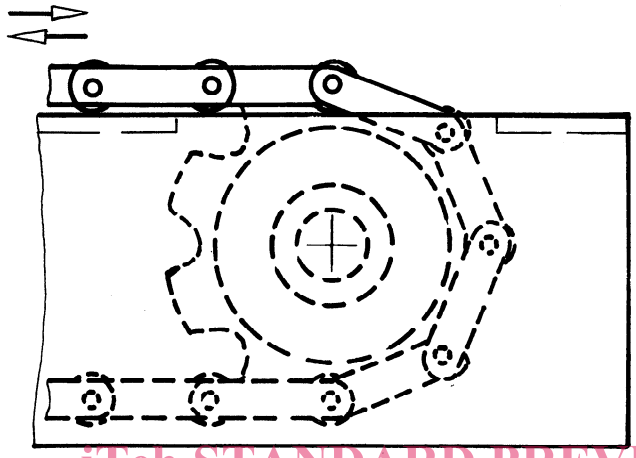


4.2 Examples of protecting devices

Guarding of nip points may be achieved by means of the following devices :

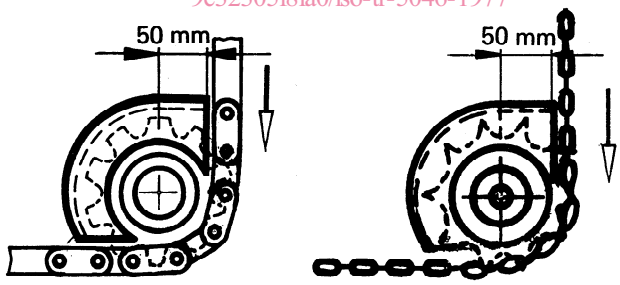
4.2.1 *Structural protection*

Enclosure of the sprocket wheels with the nip points by the machine casing, or under the floor.

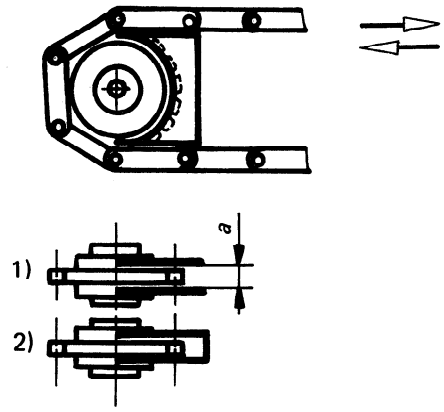


4.2.2 *Guards*

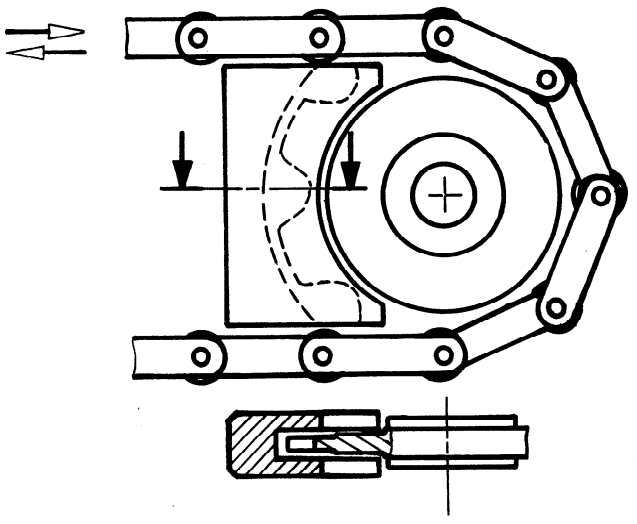
4.2.2.1 Guards extending between the chains up to the root radius of the sprocket wheel, with an extension of at least 50 mm perpendicular to the chain at the entry side.



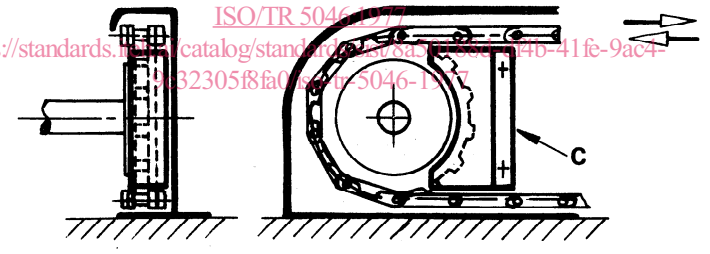
4.2.2.2 Guarding of both sides of the nip points by covers between the strands of chain. If the distance *a* between the covers is greater than 20 mm, the guard should be of a suitable length, or the opening between the sheets filled in (2) to prevent access to the nip points.



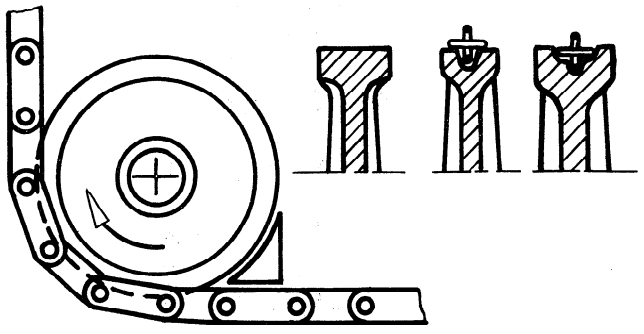
4.2.2.3 A filler block filling the space between the chains and shaped to cover the teeth to the root.



4.2.2.4 A guard outside and above the chain. In the working area an additional internal piece C prevents access to the nip points.



4.2.2.5 A filler block as illustrated may be used with smooth pulleys or grooved pulleys as shown.

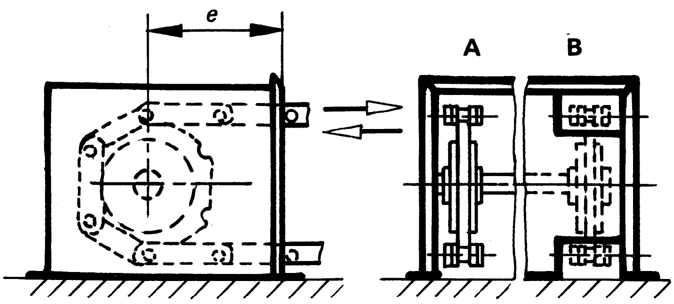


4.2.3 *Enclosing guards*

4.2.3.1 Enclosing guards of solid material or mesh for horizontal runs of conveyors.

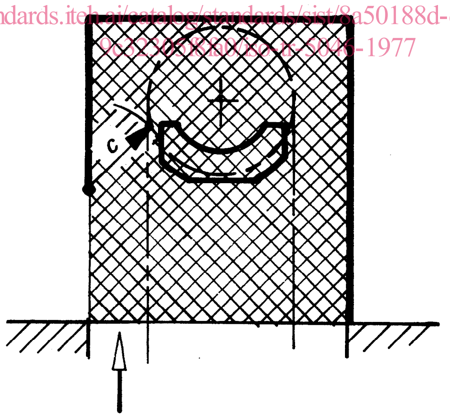
If there are no guards between the chains as shown in A, the distance *e* should not be less than 850 mm. If there are guards between the chains as shown in B the covered length must be such as to prevent access to the nip points.

The height of the guard above the chain depends to a great extent on the construction of the conveyor. Relevant information is to be found in clause 5.

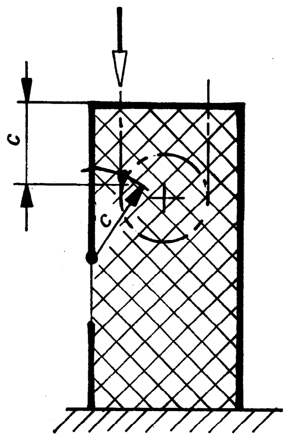


4.2.3.2 Guards for vertical runs of conveyors can be made of solid material or mesh. The guard should prevent access to the nip points. The nip points must not be accessible through loading openings.

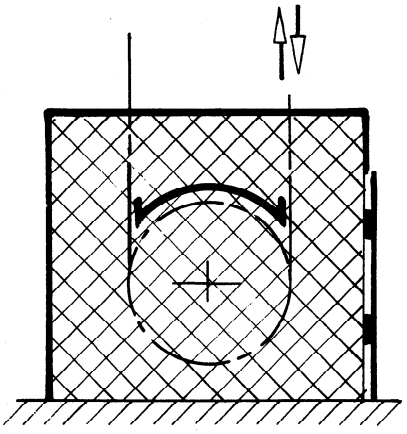
If the distance *c* from the upper edge of the opening to the nip point is less than 850 mm, the nip point is to be made safe by internal guards.



4.2.3.2.1 Guards which prevent access to the nip points from outside. If the guard does not extend 850 mm from the nip point, the nip point should be guarded separately.

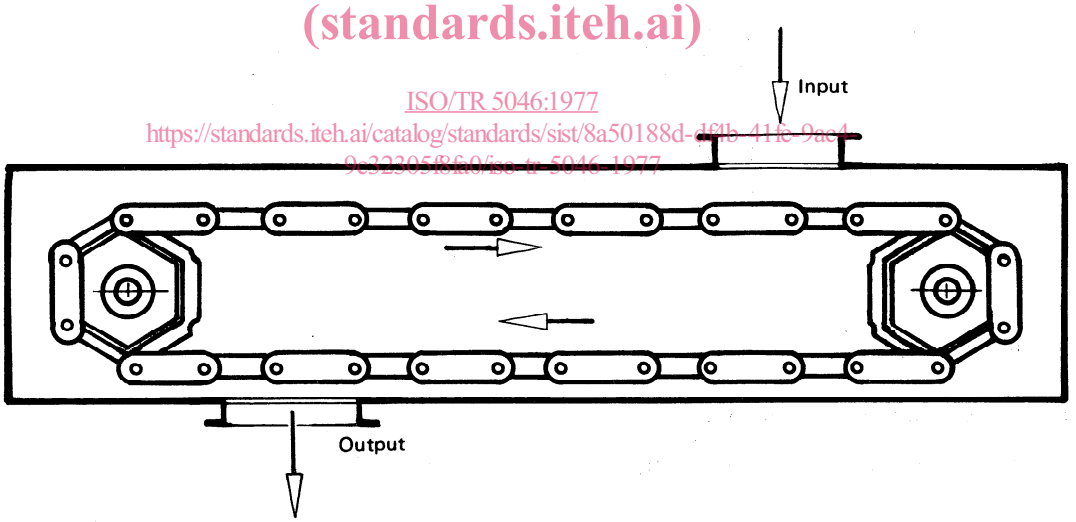


4.2.3.2.2 If access gates are fitted in the guards, additional guards must be provided to fence any accessible nip point.



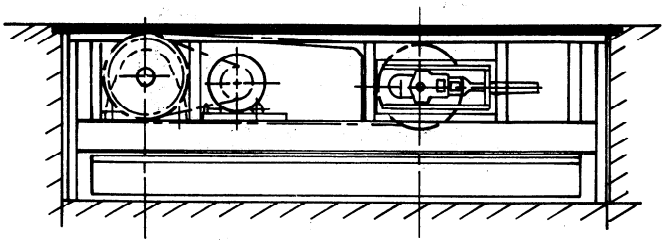
4.2.4 *Enclosed casings*

When nip points are inside an enclosed casing they must not be accessible through the feeding, unloading or control openings.



4.2.5 *Guards common to several nip points*

If the components to be guarded are located under the floor, the guard must conform to the design load of the floor, or traffic must be prohibited.

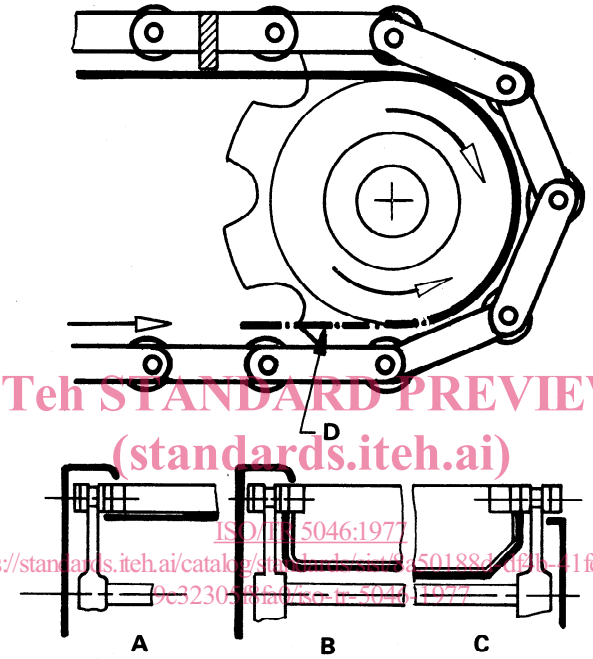


4.2.6 *Guarding by the bottom plate (flat or troughed) of drag-link, push-plate or flight conveyors*

When the chains are connected with flights and the surfaces under them solidly lined, the plate as shown in A provides the inner guard for the nip point at the delivery end. The shear point between the teeth and the plate should not be accessible. With deep troughs as shown in B and C, the lateral metal plates should be taken up to the chain.

At the loading point, the nip point is located at the underside of the conveyer; hence the plate must be extended to guard it as shown by D.

It is necessary to provide for external protection of the nip point. This guard may enclose the chain as shown in B, or end immediately below it as shown in C.



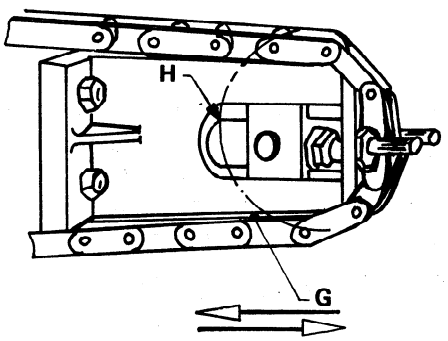
5 EXAMPLES OF GUARDS

5.1 Raised link or offset roller chain conveyors

Nip points of these chain conveyors can be guarded by any of the following methods :

5.1.1 Fixed and sliding bearings, so shaped that the space between the upper strand and lower strand of the chain is filled. It should not be possible to insert a finger between the bearing support and the chain (G).

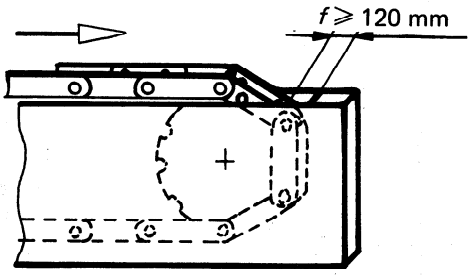
Ensure that no tooth may cause a shear point between the bearing support and the sprocket wheels in the tensioning area (H).



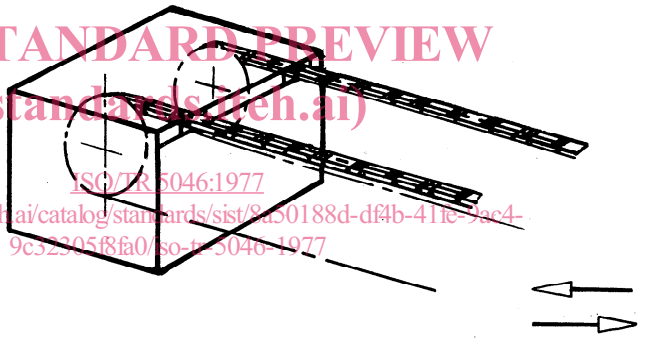
5.1.2 Guarding both sides of the nip point by means of covers between the chain strands (see 4.2.2.2). In the case of sliding bearings, this plate must move with the bearing.

5.1.3 Enclosing of the sprocket wheel in a channel which covers both sides of the sprocket wheel. The chain must pass close to the walls of the channel (< 10 mm) so that finger traps are avoided. The gap *f* between chain and the end-plate must be at least 120 mm.

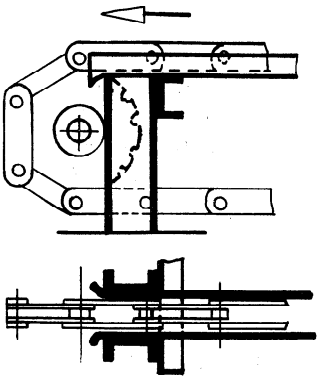
Where the guard consists of a single metal sheet, further protection may be provided inside, as in 4.2.2.4.



5.1.4 Enclosing the sprockets in a hood, with a clearance of at least 30 mm above the chain; see 4.2.3.1. (In certain cases, this guard may be so designed to enable it to be used to stop the load.)



5.1.5 Chain supporting track extended over the nip point, the end being bell-mouthed or flared. The exposed teeth must also be guarded.



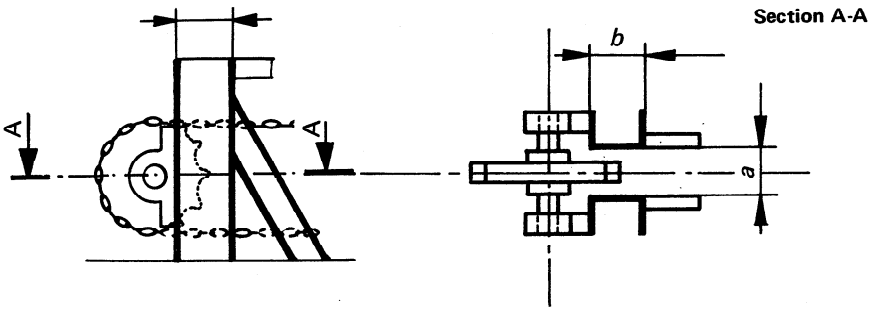
5.1.6 When multi-chain (two or more) conveyors have close-pitched carrying rods, rollers, slats or wire mesh, these automatically provide internal guarding if they prevent access to the nip points.[1] If this is not the case, the methods shown in 5.1.1 to 5.1.5 can be used.

1) Guidance regarding dimensions can be taken from CIS 110 (Centre International de Sécurité).

5.2 Drag-link conveyors

5.2.1 *Single-strand drag-link chains above floor level*

5.2.1.1 Guarding of the nip points of a conveyor mounted above the floor level by the supporting trestle (for example, transport of tree-trunks). If access between the chain strands and the trestle is possible (for example if $b < 200$ mm and $a > 50$ mm), an additional guard will be required.



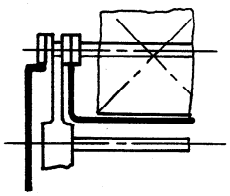
5.2.1.2 Filler blocks at the nip points (see 4.2.2.3).

5.2.1.3 Guards at the nip points (see 4.2.2.2).

5.2.1.4 Enclosing hoods with intermediate plate between the chain strands as shown in 4.2.3.1. There should be a minimum clearance of 50 mm between the top of the chains and the hood. To avoid the danger of shear traps between the flights and fixed parts, guards as referred to in 5.2.1.1 to 5.2.1.3 should preferably be fitted.

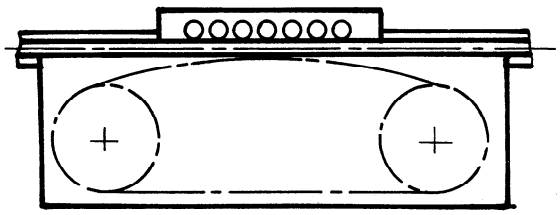
5.2.2 *Double-chain conveyors with push-plates*

5.2.2.1 Guards on the outside that prevent access. The glide way should be extended laterally and upwards to the lower level of the chain so as to cover the nip points (see 4.2.6). With adjustable solid sprocket wheels, adjustable filler blocks are required.

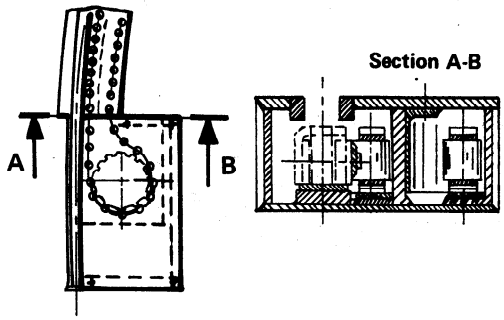


5.2.3 *Under-floor drag-link conveyors*

5.2.3.1 Completely cover all driving or deflecting parts of chains below the floor except the gap for the drag-links.

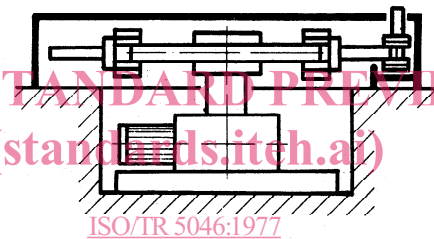


5.2.3.2 A guard that encloses the end sprocket and jockey sprocket except the gap for the passage of the drag-links.

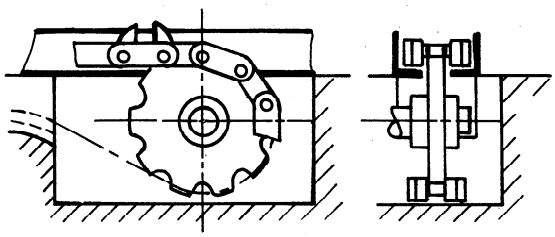


5.2.3.3 Load-deflecting points of under-floor conveyors should be guarded as in 5.2.3.2.

5.2.3.4 Hoods over the whole drive. Chains operating round perpendicular shafts arranged above floor level. The lower part of the plant lies below floor level.



5.2.3.5 Run of the load-pushing chain above floor level fitted with channel or angle track which acts as a guard with the channel or angle sides extending past the nip point. The other components are situated below floor level.



5.2.3.6 Rollers between two chains guarded as in 5.2.3.5. The guiding track can run above or just below floor level. The track way is gapped to accept the sprockets. The glide way is gapped twice and lies directly under the chain. The guiding profile can run above or below floor level.