



Continuous mechanical handling equipment — Safety code for screw conveyors — Examples of guards for trapping and shearing points

Engins de manutention continue — Code de sécurité des transporteurs à vis — Exemples de protection des points de coincement et de cisaillement

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ISO/TR 9172 was prepared by Technical Committee ISO/TC 101, *Continuous mechanical handling equipment*.

The reasons which led to the decision to publish this document in the form of a technical report type 3 are explained in the Introduction.

0 Introduction

This Technical Report supplements the various safety standards for conveyors for loose bulk materials. It gives examples of the many kinds of hazards connected with screw conveyors at trapping and shearing points; it incorporates illustrative examples which show in principle how sufficient safety can be achieved, without excluding other methods which give the same level of safety.

UDC 621.867.4-783.3

Ref. No. ISO/TR 9172 : 1987 (E)

Descriptors: handling equipment, continuous handling, continuous conveyors, screw conveyors, safety requirements

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1 Scope and field of application

This Technical Report gives examples of the kinds of hazards associated with screw conveyors at danger points, in particular trapping and shearing points located between the moving screw and the fixed parts of the conveyor or surrounding structures.

It describes different safety devices, illustrated by examples of design sheets, capable of meeting safety requirements specified in ISO 1819 and ISO 7149.

2 References

ISO 1819, *Continuous mechanical handling equipment — Safety code — General rules.*

ISO 7149, *Continuous mechanical handling equipment — Safety code — Special rules.*

3 Danger points

3.1 Trapping points

Trapping points occur where the outer edge of the screw approaches a fixed part with a steadily decreasing distance; examples of danger points where this hazard occurs are given in 3.1.1 to 3.1.5.

3.1.1 Between screw and trough

As the distance between the outer edge of the screw blade and the trough decreases down to the operating clearance, there is a danger of limbs being pulled in (see figure 1). In the case of large screw conveyors, the whole body may be pulled in.

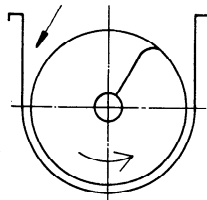


Figure 1

3.1.2 Between screw and screw protection plate

A trapping point will occur on the running area under the protection plate (usually made from angle steel or shaped like a roof) if the clearance c (see figure 2) is less than 50 mm.

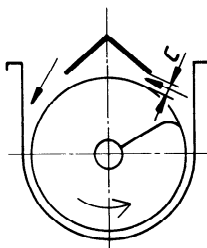


Figure 2

3.1.3 Between multiple screws

Trapping points will occur between adjacent screws [see figures 3a) and 3c)] or on one [see figure 3c)] or both [see figure 3b)] of the trough walls depending on the direction of rotation and the pitch of the screw helix.

The trapping points at the trough sides are the same as in 3.1.1; between the screws, trapping points may occur depending on the distance between the screw blades and the friction generated at the blades.

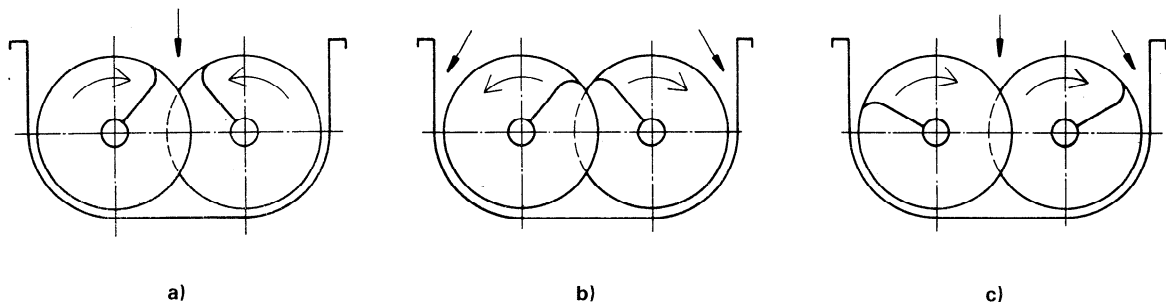


Figure 3

3.1.4 Between screw and supporting bars

At the open end of self-charging screws, trapping points may occur between the screw and the bars supporting the outer bearing of the screw shaft (see figure 4); hands are especially at risk if any of these bars are used for moving the conveyor and clearance a is not large enough.

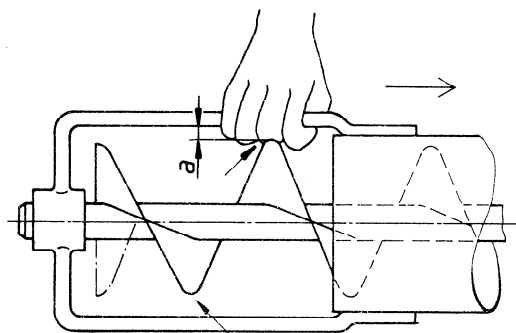


Figure 4

3.1.5 Between screw and ground

On open and running, feeding or distributing screws, trapping points will occur at ground level or between the material to be conveyed and the screw if the screw cannot lift itself because of its own weight or the weight of the machine connected to it.

Usually the feet are pulled in first and the whole body afterwards. Open ends of ribbon-type screws can also catch parts of the clothing, thus unbalancing the whole body or pulling it in.

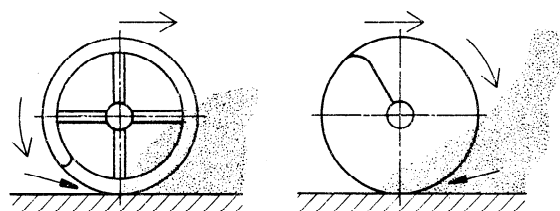


Figure 5

3.2 Shearing points

Shearing points may occur when the screw helix passes edges lying across the conveying direction. Parts of the body which may have become caught are pinched by the screw blade, trapped and then cut off by the scissor action of the screw edge moving close across the edge of the opening.

Shearing points like this occur at the points listed in 3.2.1 to 3.2.5.

3.2.1 At feed and discharge openings

Shearing points occur at feed and discharge openings whatever their position in the housing or the exact configuration of the edge of the opening (see figure 6); hands especially are at risk.

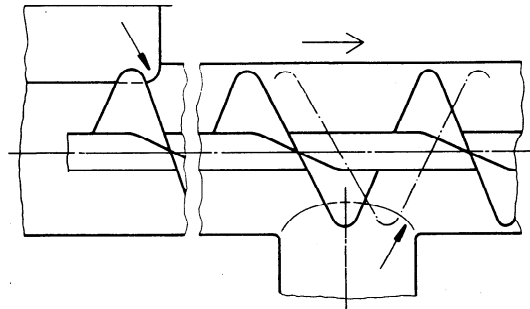


Figure 6

3.2.2 At openings of tubes of self-charging screws

Shearing points occur as the leading edges of the screw helix enter the tube of self-charging screws (see figure 7); depending on the type of operation, hands or feet especially are at risk.

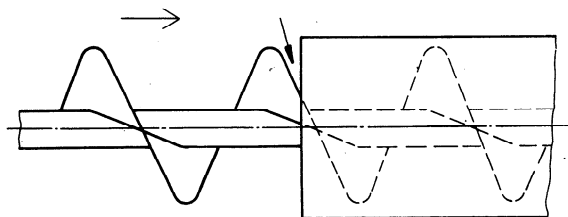


Figure 7

3.2.3 At openings of conveying troughs or tubes (of open feed hoppers or pans)

Shearing points occur as the leading edges of the screw helix enter the conveying trough or tube of an open-feed hopper or pan (see figure 8).

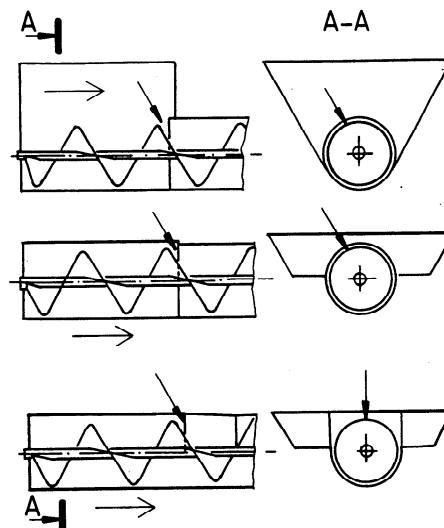


Figure 8

3.2.4 Cross-members

Shearing points occur at points where cross-members are exposed (see figure 9).

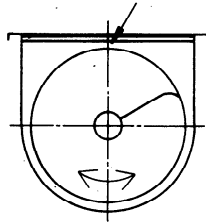
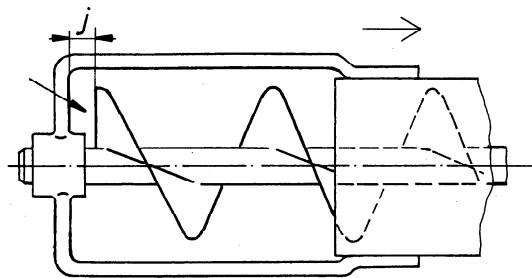


Figure 9

3.2.5 At shaft outer bearings

Shearing points occur at the shaft outer bearings of self-charging screws between the bars supporting the bearing and the lead-in edges of the screw blade (see figure 10).



NOTE — For clearance j , see 6.1.

Figure 10

4 Guarding trapping points

Because of the sharp edges of the screw blade and the small clearance between screw and trough, there is always a danger that a trapped part of the body may be sheared. Guards shall therefore be properly constructed to the correct standards.

4.1 Guards for general use

Examples of possible guards for general use are given in 4.1.1 to 4.1.9.

4.1.1 Closed tube

The screw can be placed in a closed tube where all openings for assembly, inspection or maintenance are securely closed (see figure 11). For inspection purposes, permanently fixed glasses or grids may be provided. Any lubrication necessary can be done from the outside.

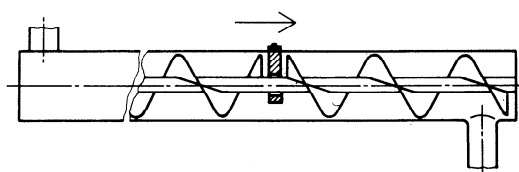


Figure 11