

PHILIPPINE NATIONAL STANDARD

**PNS/BAFS 330:2022
ICS 65.060.01**

Technical Means for Ensuring Safety – Guidelines



BUREAU OF AGRICULTURE AND FISHERIES STANDARDS

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Foreword

In February 2020, the Bureau of Agricultural and Fisheries Engineering (BAFE) proposed for the review and possible revision or amendment of the Philippine Agricultural Engineering Standard (PAES) on Agricultural Machinery – Technical Means for Ensuring Safety – General (PAES 101:2000) during a meeting on the Enforcement and Regulation of Philippine National Standards (PNS). In 2021, the Bureau of Agriculture and Fisheries Standards (BAFS) included the proposal for revision/amendment of the PAES in its prioritization list and issued a call for nomination for the creation of the Technical Working Group (TWG). In 2022, a TWG, composed of representatives from relevant government agencies, academe, research institutions, and private sector, was created under Special Order No. 103, series of 2022 (Creation of TWG for the Development of PNS for Agriculture and Fishery Products and Machinery and Infrastructures).

The draft PNS underwent a series of TWG meetings and stakeholder consultations from January to May 2022. In May 2022, the Philippine Council for Agriculture and Fisheries (PCAF) – Committee on Agricultural and Fisheries Mechanization (CAFMech) also recommended for the approval of the final draft PNS through the issuance of Resolution No. 35, series of 2022 (Recommending to the DA Secretary the Approval of the Final Drafts of the PNS for Knapsack Sprayer – Specifications and Methods of Test and the PNS on Technical Means for Ensuring Safety – Guidelines). The final draft PNS was subsequently endorsed to the DA Secretary for approval.

This PNS/BAFS edition includes the following significant changes compared to the previous PAES 101:2000:

1. Inclusion of terms and definitions; and
2. Inclusion of noise level safety provisions.

This Standard cancels and replaces PAES 101:2000 (Agricultural machinery - Technical means for ensuring safety – General). It was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

1 Scope

This Standard provides guidelines on the prevention of accidents arising from the use of stationary or mobile agri-fishery machinery and equipment. It also specifies technical means of improving the degree of safety of operators, manufacturers and others involved in the course of normal operation, service, and maintenance of agri-fishery machinery and equipment.

2 Normative References

The following documents are referred to in the text in such a way that some or all their contents constitute the requirements of this document. The latest edition of the referenced documents (including any amendments) applies.

Agricultural Machinery Testing and Evaluation Center (AMTEC) - University of the Philippines Los Baños (UPLB). (2000). Agricultural machinery – Operator’s manual – Content and presentation (PAES 102:2000).
<https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-102-Operators-Manual-Content-and-Presentation.pdf>

AMTEC-UPLB. (2000). Agricultural machinery - Technical means for ensuring safety (PAES 101:2000). <https://amtec.ceat.uplb.edu.ph/wp-content/uploads/2019/07/PAES-101-2000-Technical-Means-for-Ensuring-Safety-General.pdf>

An act strengthening compliance with occupational safety and health standards and providing penalties for violations thereof, Republic Act (RA) 11058. (2018).
<https://www.officialgazette.gov.ph/2018/08/17/republic-act-no-11058/>

Department of Labor and Employment (DOLE). (1989). Occupational Safety and Health (OSH) standards.
https://www.dole.gov.ph/php_assets/uploads/2019/04/OSH-Standards-2017-2.pdf

DOLE. (2018). Implementing rules and regulations of Republic Act No. 11058 entitled “An act strengthening compliance with occupational safety and health standards and providing penalties for violations thereof” (Department Order 198, series of 2018).
<https://www.officialgazette.gov.ph/downloads/2018/12dec/20181206-IRR-RA-11058-RRD.pdf>

International Organization for Standardization (ISO). (2001). Agricultural vehicles – Mechanical connections on towing vehicles: Part 1 hook type (ISO 6489-1:2001).

ISO. (2004). Agricultural vehicles – Mechanical connections on towed vehicles – Hitch- rings – Specifications (ISO 5692:2004).

ISO. (2019). Graphic Symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels (PNS ISO 3864-2:2019).

ISO. (2019). Graphic Symbols – Safety colours and safety signs – Registered safety signs (PNS ISO 7010:2019).

ISO. (2019). Public information guidelines systems Part 3: Guidelines for the design and use of information index signs (PNS ISO 28564-3:2019).

3 Terms and Definitions

For the purpose of this standard, the following terms and definitions shall apply:

3.1

flywheel

component of machinery mounted on and revolves with the crankshaft of an engine or other shafting of a prime mover, which by its inertia assists in securing uniform motion of machinery by resisting sudden changes of speed (DOLE, 1989)

3.2

guard

device or structure designed to prevent contact with the moving parts by a person and/or clothing (AMTEC-UPLB, 2000)

3.2.1

casing

protective device that prevents contact with the dangerous part from all sides

3.2.2

enclosure

protective device that ensures the safety distance necessary so that the dangerous parts of the machinery cannot be reached inadvertently

3.2.3

shield

cover

protective device designed and fitted that protects the operator from the dangerous parts of the machinery

3.3

polygonal openings

openings where the diameter of the largest circle that can be inscribed is not less than the distance between the two apexes that are the furthest apart (AMTEC-UPLB, 2000)

4 Principles in Providing Safety

- 4.1** Machinery for agriculture shall be designed, constructed, and installed in such a way that it does not cause danger when properly used.
- 4.2** Operating and maintaining the machine should be carried out in accordance with the manufacturer's instructions. These requirements shall primarily be met by the design of the machine. If not possible, the machine shall be equipped with special means for ensuring safety.
- 4.3** Functional components that need to be exposed for correct operation shall be guarded to the maximum extent permitted by the intended function of the components. Additionally, in such circumstances, warning of the hazard shall be indicated on the machine, as stipulated in clause 10.2.

5 Sources of Hazards during Operation

In general, all moving parts including its fasteners and supports shall be treated as dangerous during operation. Particular attention is drawn to the following:

- a) All shafts (including joints, shaft ends, and crank shafts), pulleys, flywheels, gearing (including friction roller mechanisms), cables, sprockets, belts, chains, clutches, couplings, and all blades or wings of fans;
- b) Run-on point of any belt, chain or cable;
- c) Grease fittings and oil caps, that protrude from moving parts;
- d) All points where the danger of pinching or shearing is possible;
- e) Ground wheels or tracks adjacent to the operator's position (standing platform, seat, and footrest) and passenger seat (if provided);
- f) Parts of the machine that may heat up;
- g) Components of machinery where pressure may build up; and
- h) Implements of the machine.

6 Guard Classifications

There are three types of guards designed to prevent contact with the moving parts by a person and/or clothing. These may be classified as:

6.1 Shield or Cover

Guard that prevents dangerous parts from being reached and protects the operator against accidents or hazards. These should be designed to be detachable or movable during maintenance. An example is shown in Figure 1 for a rotary drum composter.

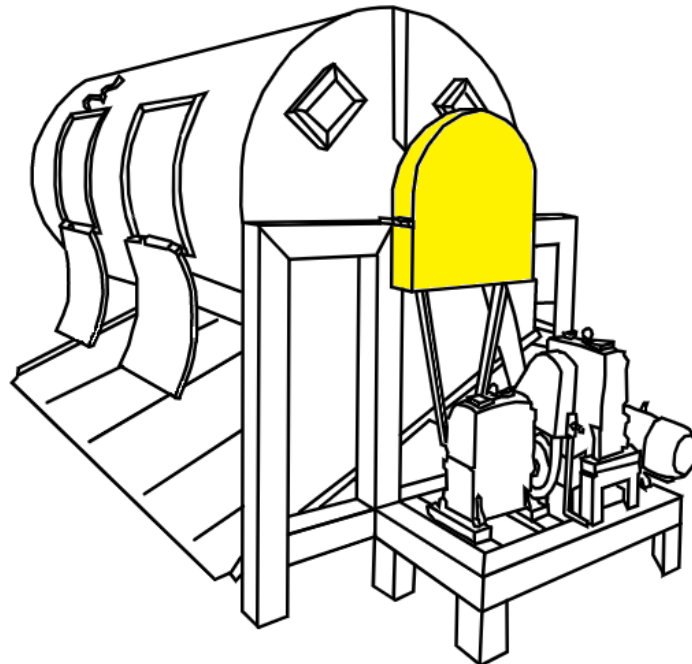


Figure 1. Shield or cover of a rotary drum composter (AMTEC-UPLB, 2022)

6.2 Casing

Guard that prevents contact with the dangerous part from all sides and contains major parts of the machine. Casings are more permanent and considered an integral part of the machinery. Additionally, it can only be removed during major repairs. It also acts as protection for rotating components and should be load bearing, as shown in Figure 2 for a rice mill.

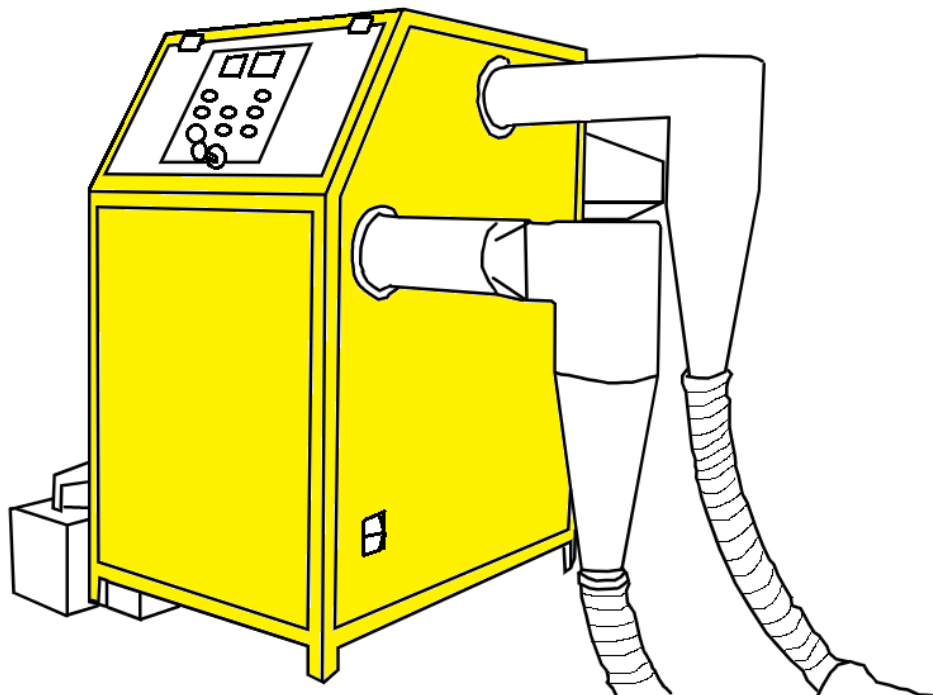


Figure 2. Casing example from rice mill (AMTEC-UPLB, 2022)

6.3 Enclosure

Guard that protects the machinery by covering it from all sides, preventing access from unauthorized personnel and keeping the operator at a distance. Examples would be rails, metal bars or frames as shown in Figure 3 for solar panels of a solar powered irrigation system.

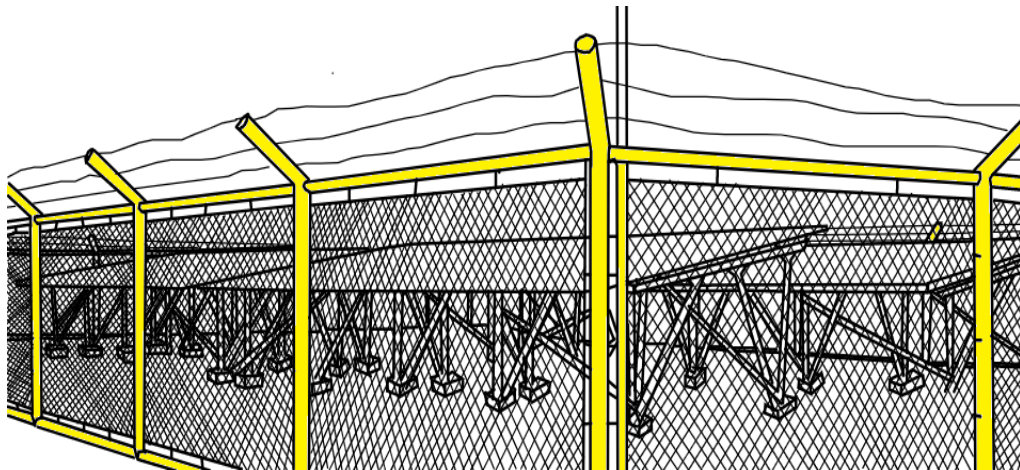


Figure 3. Enclosure example for solar panels of a solar powered irrigation system (AMTEC-UPLB, 2022)

7 Guard Construction

- 7.1** Guards shall be sufficiently strong without cracking, tearing or permanently deflecting in accordance with safety factors of the particular machinery.
- 7.2** Parts designed as platforms and steps, which are also guards, shall comply with appropriate strength requirements as specified in the OSH standards.
- 7.3** Guards shall be securely fastened and weather-resistant, shall have no sharp edges, and shall be able to retain their strength under extreme temperatures, taking into account the intended use.
- 7.4** Guards shall be designed in such a way that operating and servicing the machine can be readily carried out.
- 7.5** Guards shall be attached securely to the machine and should be provided with a convenient means to keep them closed. Secure attachment should include the use of threaded fasteners, split pins, or other means that can be dismantled with common hand tools.
- 7.6** Guards should be easily removed. During removal, guards should remain attached to the machine by some means (e.g., hinge, slide, linkage or other suitable means).
- 7.7** In some circumstances, the guard shall be designed such that the movement of dangerous parts is automatically stopped when it is opened, or it is

prevented from being opened until all movement of the dangerous parts has stopped. In these cases, a suitable warning notice shall be provided for the guard and any of its opening without securing devices.

- 7.8** Guards should be made of a welded or bolted rigid mesh or grill. The size of the allowable opening depends on the distance between the guard and the moving parts as provided in clause 8. The design of the guard shall be such that it is not possible to distort the mesh or the grill during proper use in such a way that the opening size and distance relationship exceeds the limits given in clause 8.

8 Safety distance

8.1 General

There may be circumstances where the requirements of clause 4 can be met by ensuring a safety distance from the dangerous part. It is possible to circumvent the protection provided by a safety distance (as specified in 8.2 to 8.6) by the misuse of steps, ladders, boxes or chairs, etc. However, the general principle of a safety distance, in compliance with clause 4, shall be acceptable provided that the criteria here in clause 8 are met so that the dangerous parts are out of reach.

8.2 Safety Distance from Dangerous Part

The safety distance is based on the measurements from the location where a person can occupy to operate, maintain, or inspect the dangerous part.

8.2.1 Upward Reach

For unguarded machinery components located above the operator, the safety distance for upward reach shall be at least 2500 mm for people standing upright.

8.2.2 Reach Below Barriers

No safety distance is specified where it is possible to reach below a safety barrier, unless the aperture is small enough to be considered only in relation to finger, hand or arm access in which case the requirements of 8.5 apply.

8.3 Reach Over Barriers

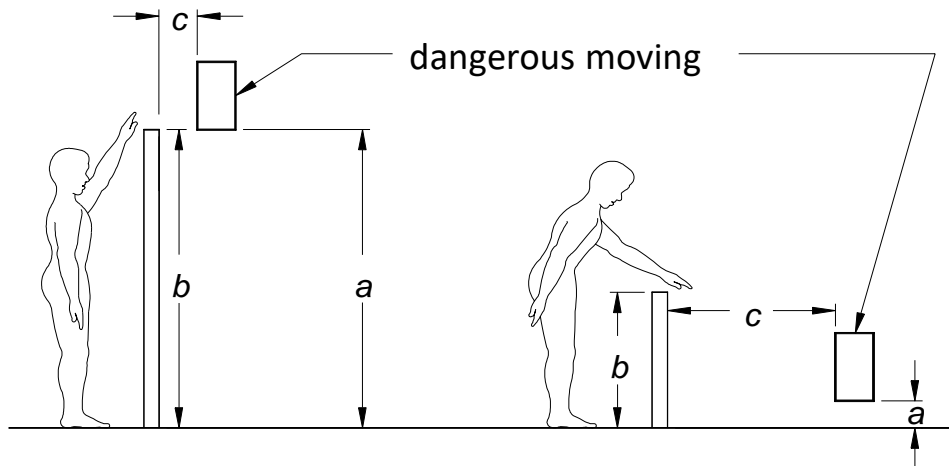
- 8.3.1** The height of the barriers shall be at least 1000 mm above the location a person can occupy. The safety distance for sideward or downward reach over barriers of 1000 mm or greater height depends on the following:

8.3.1.1 Distance from the ground level to the dangerous part;

8.3.1.2 Height of the guard; and

8.3.1.3 Horizontal distance between the dangerous part and the guard.

8.3.2 The principles for determining required distance from the guard to the dangerous part is shown in Figure 4. The distance of the dangerous moving part from the ground is denoted as a , the height of the guard is denoted as b , and the distance of the dangerous moving part from the guard is denoted as c .



Key:

- a distance of dangerous moving part from the ground
- b height of the guard
- c distance of the dangerous moving part from the guard

Figure 4. Principles for determining the distance required from a guard to the dangerous part (AMTEC-UPLB, 2000)

8.3.3 When designing a barrier, the dimensions in Table 1 shall be met based on the principles found in Figure 4.

Table 1. Downward and sideward safety distance (AMTEC-UPLB, 2000)

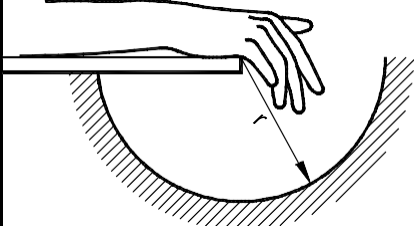
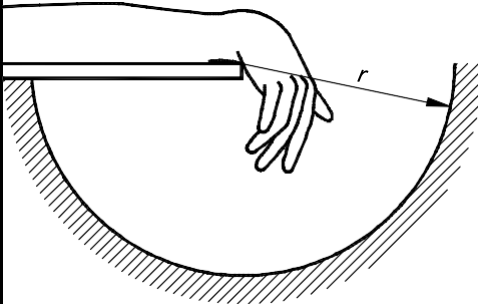
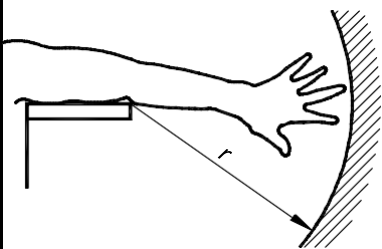
a, mm	b, mm ¹							
	2400	2200	2000	1800	1600	1400	1200	1000
c, mm								
2400	-	100	100	100	100	100	100	100
2200	-	250	350	400	500	500	600	600
2000	-	-	350	500	600	700	900	1100
1800	-	-	-	600	900	900	1000	1100
1600	-	-	-	500	900	900	1000	1300
1400	-	-	-	100	800	900	1000	1300
1200	-	-	-	-	500	900	1000	1400
1000	-	-	-	-	300	900	1000	1400
800	-	-	-	-	-	600	900	1300
600	-	-	-	-	-	-	500	1200
400	-	-	-	-	-	-	300	1200
200	-	-	-	-	-	-	200	1100

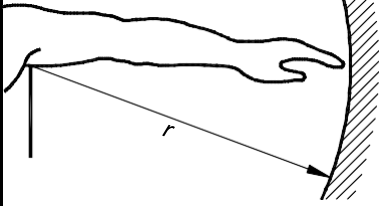
a, mm	b, mm ¹							
	2400	2200	2000	1800	1600	1400	1200	1000
	c, mm							
¹ Values of b < 1000 mm do not increase the reach. Moreover, the danger arises of falling towards the danger source.								

8.4 Round reach

Table 2 shows the extent of reach around barriers, which takes into account the aperture and the distance from other obstructions. Dangerous components shall be beyond these limits if they are not independently guarded. These limits shall only apply to machinery where the operator is exposed to the moving part during operation.

Table 2. Extent of reach (AMTEC-UPLB, 2000)

Limb		Illustration	Safety distance, r (mm)
From	To		
Finger base	Fingertip		$r > 120$
Wrist	Fingertip		$r > 230$
Elbow	Fingertip		$r > 600$

Limb		Illustration	Safety distance, r (mm)
From	To		
Shoulder	Fingertip		$r > 850$

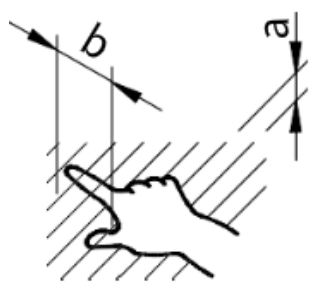
8.4.1 Inside Reach Through Guards

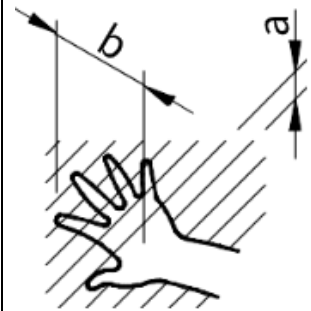
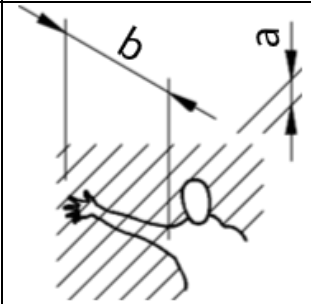
The safety distances shall depend on the shape of the openings.

8.5 Openings

The openings shall not exceed the size appropriate to the distance of the guard from the moving part. For guards with opening that are either rectangular or slots, Table 3 shows the required width of aperture and safety distance dimensions.

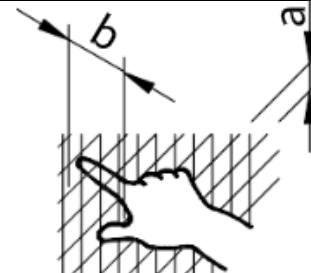
Table 3. Reach dimensions through rectangular opening or slot (AMTEC-UPLB, 2000)

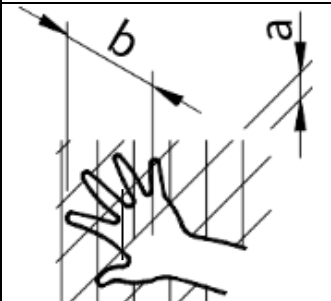
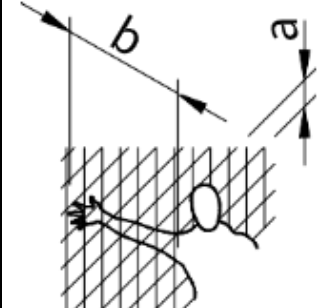
Limb	Illustration	Width of aperture (diameter or lateral length), a (mm)	Safety distance to danger source, b (mm)
Fingertip		$4 < a < 8$	$b > 15$
Finger		$8 < a < 25$	$b > 120$

Limb	Illustration	Width of aperture (diameter or lateral length), a (mm)	Safety distance to danger source, b (mm)
Hand		$20 < a < 40$	$b > 230$
Arm		$30 < a < 135^1$	$b > 850$
¹ When the width is greater than 135 mm, part of the body can also pass through the aperture. In this case, safety distances as specified in 8.7 shall be observed			

For guards that have a mesh or grill openings, on the other hand, Table 4 shows the minimum safety dimensions and distance required.

Table 4. Reach dimensions through mesh or grill (AMTEC-UPLB, 2000)

Limb	Illustration	Width of aperture (diameter or lateral length), a (mm)	Safety distance to danger source, b (mm)
Finger tip		$4 < a < 8$	$b > 15$
Finger		$8 < a < 25$	$b > 120$

Limb	Illustration	Width of aperture (diameter or lateral length), a (mm)	Safety distance to danger source, b (mm)
Hand		$20 < a < 40$	$b > 230$
Arm		$40 < a < 250$	$b > 850$

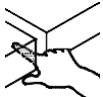
8.6 Polygonal Openings

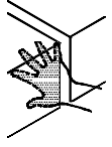
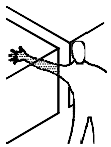
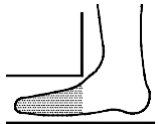
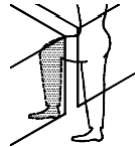

Polygonal openings shall meet the same requirements as for round openings. The diameter of the inscribed circle shall be regarded as the size of the opening. All other polygonal openings shall be regarded as slots.

8.7 Pinching Points

A pinching point shall be considered dangerous for the parts of the body if the appropriate minimum separation distance is not maintained as illustrated in Table 5. The design of the machine shall ensure that the next bigger part of the body cannot pass through.

Table 5. Minimum separation distance for pinching points (AMTEC-UPLB, 2000)

Limb	Illustration	Minimum separation distance required (mm)
Finger		25

Limb	Illustration	Minimum separation distance required (mm)
Hand Wrist Fist		100
Arm		120
Foot		120
Leg		180
Body		500

9 Noise Levels

The acceptable maximum noise level shall comply with the Permissible Noise Level Exposure (DOLE, 1989) as shown in Table 6.

Table 6. Permissible Noise Level Exposure (DOLE, 1989)

Duration per day, hours	Sound levels [dB(A)]
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

10 Provision of Information

10.1 Operating Manuals

An operating manual shall be provided as specified in PAES 102:2000 (Agricultural machinery – Operator’s manual – Content and presentation).

10.2 Warning Notices

10.2.1 Durable warning notices shall be affixed to parts of the machine that may cause danger to the operator along with circumstances where the inadvertent lowering of parts of equipment can cause danger. Particular danger or safety warnings shall be indicated on the notice.

10.2.2 There shall be specific symbols, sizes, layout or color present on the machinery. The warning notice shall be either pictorial or text in a language acceptable to the user, if appropriate. Warning notices and safety signs shall refer to PNS ISO 3864-2:2019 (Graphic Symbols – Safety colours and safety signs – Part 2: Design principles for product safety labels), PNS ISO 7010:2019 (Graphic Symbols – Safety colours and safety signs – Registered safety signs) and PNS ISO 28564-3:2019 (Public information guidelines systems Part 3: Guidelines for the design and use of information index signs).

10.2.3 For tractors and other large vehicles, triangular notices or any indication that they are slow moving vehicles (SMV) shall be provided.

11 Working Stability

11.1 Machines and trailers that may create a danger to the user through tilting, as a result of the shifting of the center of gravity (for example when emptying or filling), shall be provided with means of preventing such danger.

11.2 Hydraulically-raised components that need to be held in a raised position to allow servicing or adjustment shall be provided with an independent and reliable means of retaining them in the required position.

12 Operator’s Workplace

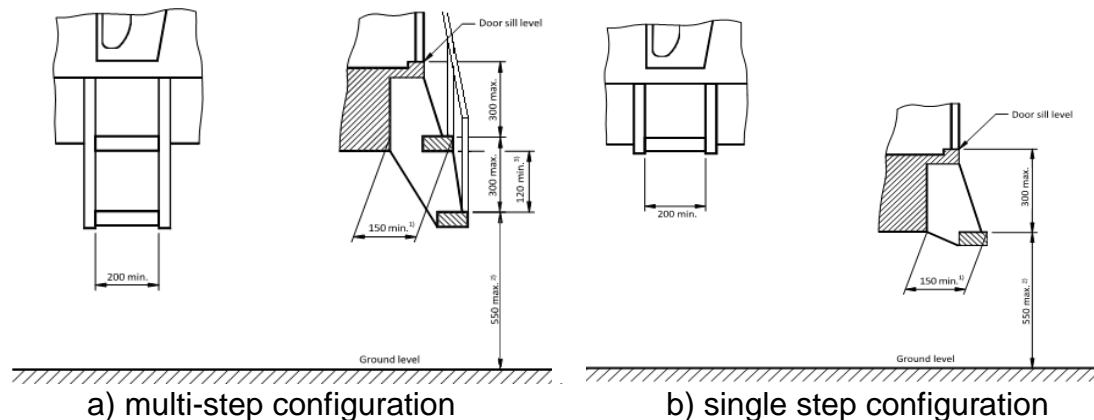
12.1 Handholds and Steps

12.1.1 Any machinery with the driver or operator is necessary to be above ground level. In addition, any place to which access is required for service or maintenance of any driven/operated machinery shall be fitted with handle or handholds and steps.

12.1.2 Both handholds and steps may be parts of the machine if they are suitably designed and placed. Steps shall be designed in relation to the general construction of the machinery to ensure protection from moving parts. If moving

parts, tire sections for example, form restrictions or trapping areas with the steps, a suitable means of protection shall be provided. Steps shall have a non-slip surface and vertical retainer at both sides.

12.1.3 The dimensions for steps shall be indicated in the specification standards of the particular machinery. In case of no specific provision, the steps shall comply with the dimensions in millimeters as shown in Figure 5.



NOTE 1 Minimum clearance and not size of tread surface.

NOTE 2 The dimensions shall be obtained also with the largest tires (normally inflated).

NOTE 3 The vertical distance between adjacent steps shall be equal (within a tolerance of ± 20 mm)

Figure 5. Limiting dimensions of a) multi step and b) single step configurations (AMTEC-UPLB, 2000)

12.1.4 Where access is provided by a series of steps which are designed to be used alternately each by one foot, then the minimum width and height specified do not apply.

12.2 Operating Positions

12.2.1 Means shall be provided to prevent the operator from falling from his workplace. Any platform on which the operator is required to stand during the operation of the machine shall be leveled evenly, have a non-slip surface, and provided with drainage if necessary.

12.2.2 The platform should be provided with the following:

12.2.2.1 A foot-guard (toe-board) on all sides, which shall be fitted around the edge of the platform or not more than 50 mm farther away and shall extend not less than 75 mm above the platform; and

12.2.2.2 A rail with a height of not less than 1000 mm and not more than 1100 mm

above the platform and an intermediate rail so that the vertical distance between any two rails does not exceed 500 mm. The diameter of the rails shall be at least 10 mm.

12.2.3 A foot-guard or fixed rails for the platform is not required when:

12.2.3.1 The machine itself affords protection of at least equal to that which the foot-guard and guard-rail would provide if these were fitted; and

12.2.3.1 The operation permits access of persons or movement of material. A rail or chain shall be provided across the access when the machine is operating.

12.3 Seats

A seat shall be provided on a machine on which the operator is required to sit. It shall conform to ergonomic principles and adequately support the operator in all working and operating modes. Adequate and comfortable support and protection for the feet shall be provided.

12.4 Seatbelts

Seatbelts shall be provided on mobile machinery for the operator or driver. It shall be adjustable enough to avoid hindering the movements of the operator while using the machinery.

12.5 Operating control

The operating controls, such as steering wheel or steering levers, transmission levers, cranks, pedals, and switches, shall be arranged and fitted in such a way as to allow safe and easy control and manipulation by an operator in the normal operating position. Any handheld controls shall be provided with the proper handle that is comfortable for the operator to use. Pedals and controls shall be positioned so that they do not obstruct access. The function of the controls shall be marked on or near the control.

12.5.1 Steering mechanism

The steering mechanism, if applicable, shall be designed to reduce the force of any sudden movement of the steering wheel or steering lever(s) due to reaction from the steered wheel(s).

12.5.2 Lifting and lowering controls

Provision shall be made to protect and locate controls to prevent accidental operation which may cause dangerous movement.

12.5.3 Clutches (Drive engagement controls)

The following requirements shall be complied, if applicable:

12.5.3.1 Foot-operated clutches

It should be located in a position convenient to the operator's left foot. To disengage, the pedal should be pushed forward. In the case of a combined traction-drive/power take-off (PTO) clutch, the PTO shall be disengaged on the second stage.

12.5.3.2 Hand-operated clutches

It should be located in a position convenient to the operator. To disengage, the control should be moved rearward. Control should be operated only when the operator is in the operator's station.

12.5.3.3 Electronically-operated clutches

It should be located in a position convenient to the operator. Control should be operated only with the operator in the operator's station and shall be hazard free (e.g., no electrocution).

12.5.3.4 Hydraulically-operated clutches

It should be located in a position convenient to the operator. Components shall be checked before operation to properly ensure their working capabilities.

12.5.4 Stopping Devices for Power Sources

12.5.4.1 Power sources shall be fitted with a stopping device which can immediately stop the power source. It shall be designed such that it does not depend on sustained manual effort for its operation and that, when it is in the "stop" position, the power source cannot be started unless the device is reset manually.

12.5.4.2 The stopping device shall be easily accessible on either manned machines with the operator at normal operating position or unmanned machines. It shall be placed on or near the power source or near the operating control position.

12.5.4.3 The purpose and method of operation shall be clearly indicated. The control shall be red in color and preferably in contrast with the background and other controls.

12.5.5 Valves, Taps and Switches

The function and effect of hand-operated valves, taps and switches or other means of control provided for controlling pneumatic, hydraulic or electrical systems shall be clearly indicated, where necessary, for safety reasons.

12.5.6 Pedals

Pedals shall be of adequate size and of appropriate configuration. They shall

have non-slip surfaces to avoid the possibility of the operator's foot slipping off the pedals, provided with a rim at the edge of the pedal where necessary.

12.5.7 Differential locks

Any manually operated device fitted to a machine to lock the differential gear shall be designed and fitted so that there is a clear indication to the operator that the lock is engaged. It shall be designed so that it minimizes the possibility of inadvertent actuation.

13 Means for supporting machines

13.1 Hitches

Mobile machines that are not self-propelled shall be provided with suitable hitch devices. Machines used for towing or which are towed shall be provided with a towing device constructed and fitted to be secure for the purpose.

13.1.1 Hitch hook

If the towing machine is equipped with a hitch hook, it shall be in accordance with ISO 6489-1 (Agricultural vehicles – Mechanical connections on towing vehicles: Part 1). The towed machine shall, in such cases, have a drawbar eye according to ISO 5692 (Agricultural vehicles – Mechanical connections on towed vehicles – Hitch- rings – Specifications).

13.1.2 Drawbars

The drawbar shall be situated in the longitudinal mid-plane of the machinery. An example of a drawbar from a four-wheel tractor is shown in Figure 6. The specifications of the drawbar shall be in accordance with the specific standard for the particular machinery involved.

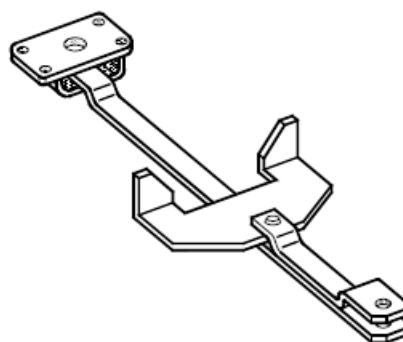


Figure 6. Example of a drawbar used in four-wheel tractors (AMTEC-UPLB, 2001)

13.2 Stand supports

- 13.1.1** Machinery that are not stable when disconnected shall be provided with supports to prevent tilting. They shall be attached to avoid the risk of losing them. However, these may be detached to permit the machine to operate only if necessary.
- 13.1.2** Non-stable machines or trailers having a drawbar shall be provided with an adjustable support.
- 13.1.3** The support shall be constructed and secured to the machine to prevent the drawbar from falling when it is in use and shall have a base of adequate size to prevent it from sinking into soft ground.
- 13.1.4** This requirement shall not apply to a machine or trailer with a drawbar designed to be picked up mechanically by the towing vehicle. In such cases, a stand capable of securely supporting the drawbar with the hitch point 150 mm above the ground level shall be fitted.

14 Power transmission

14.1 Power take-off (PTO)

- 14.1.1** A guard that protects the sides of the PTO shall be fitted.
- 14.1.2** For four-wheel tractors, an additional cover shall be provided when the PTO is not in use. This cover shall be fitted to the PTO.
- 14.1.3** The provisions covering construction of guards, as shown in clause 7, shall also be met.

14.2 Power intake connection (PIC)

- 14.2.1** A casing shall be fitted which completely encloses PIC and overlaps the casing fitted to the PTO drive-shaft so that no part of the shaft (i.e., for couplings, clutches, etc.) is exposed at any time.
- 14.2.2** The provisions covering construction of guards, as shown in clause 7, shall also be met.

14.3 PTO drive-shafts

- 14.3.1** A casing shall be fitted, whether the machine is towed, mounted or semi-mounted. This provides stationary protection against contact with the PTO drive-shaft and protects the shaft throughout its length.
- 14.3.2** The guard shall be firmly mounted. It shall be detachable only by means of tools. It may be permanently fitted to the shaft.

14.3.3 The provisions covering construction of guards, as shown in clause 7, shall also be met.

15 Miscellaneous

15.1 Exhaust pipes

The orientation of the exhaust pipe shall be directed away from the operators and should have the capability to be redirected. During operation, the muffler shall be attached to the exhaust at all times.

15.2 Hot parts

Insulation and protection devices shall be provided to minimize the possibility of inadvertent contact with any exposed element, which may cause burns during mounting, dismounting or operating the machinery. Legible and non-removable warning notices or signs made of heat resistant materials for hot parts shall be provided.

15.3 Battery

The location of the batteries shall be such that hazards to the operator due to fumes and electrolyte are minimized.

15.4 Security

Anti-theft devices, such as trackers, other GPS devices, and CCTV should be provided for the security and maintenance of the machine.

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