

ILO Codes of Practice

**Safe construction and operation
of tractors**



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Foreword

At its 33rd Session, in 1950, the International Labour Conference adopted a resolution drawing attention to the need for further study of the safety and health problems associated with mechanisation and the use of chemicals in agricultural work. In the course of its Fifth Session, the Permanent Agricultural Committee welcomed that resolution and expressed a desire that international standards of safety and health should be laid down for agricultural work.

In pursuance of the above-mentioned resolution the Governing Body convened in 1964 a meeting of experts who were called upon, in particular, to examine a draft code of practice relating to safety and health in agriculture. In addition to approving the draft code the experts recommended that detailed work should be done on several agricultural hazards, including tractors.

The present code of practice has been prepared in accordance with those decisions and recommendations.

The scope of the project was expanded to include not only agricultural tractors but all tractors, and a draft code was prepared by the International Labour Office. This preliminary draft was submitted for comments and observations to the 40 members of an ILO tripartite panel of consultants on safety and health in agriculture, as well as to various interested international organisations. The ILO panel is composed of consultants specialising in the various aspects of the subject, and includes persons from different countries who reflect the views and experience of governments and of employers' organisations and trade unions. Their observations and comments were embodied in the second draft which was also submitted to the panel, and the present consolidated text has been prepared in the light of that second consultation.

Although couched in the language of a set of rules, this code of practice has no binding force and is not intended to supersede national law or regulations or accepted standards; it is merely a body of practical advice for the use of all persons, whether in the

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public or the private sector, who have responsibility for safety in the construction and use of tractors, and who may be framing provisions on that subject. The value of the code lies in the fact that it embodies the knowledge and experience of many countries.

The provisions of this code of practice have been drafted so as to be as consistent as possible with various national and international standards. In particular the documents of the Organisation for Economic Co-operation and Development (OECD) and the International Organisation for Standardisation (ISO) were reviewed and their intent was incorporated where applicable.

The International Labour Office itself has for many years promoted high standards of safety and health in the use of dangerous machinery, including agricultural tractors. It has published a code of practice on safety and health in agricultural work (1965), a code of practice on safety and health in forestry work (1969), a guide to safety in agriculture (1969) and a guide to safety and health in forestry work (1968). All of these publications have dealt to some degree with the construction and safe use of tractors.

In brief, the present code of practice is an attempt to consolidate the essentials of the safety and health provisions applicable to tractors wherever they are used, and so constitute a text that may be of use in all parts of the world.

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1. Definitions

1.0.1. For the purpose of this code the following words are defined:

- (a) "tractor" means a self-propelled vehicle having two or more axles, or equipped with tracks, and designed primarily to operate trailed or mounted implements and machines including trailers and to supply power to operate auxiliary equipment with the vehicle in motion or stationary;
- (b) "danger" means danger of accident or injury to health;
- (c) "adequate" means adequate to prevent danger;
- (d) "safety frame" means a structure designed or intended to be attached to, or form a part of, a tractor for the purpose of protecting the driver from injury if the tractor overbalances; the meaning of the term includes all parts by which the structure is attached to the tractor; and
- (e) "safety cab" means a safety frame, with enclosing panels of suitable material arranged to provide a measure of weather protection.

A. Construction

2. Safety cabs and frames

2.0.1. All agricultural and forestry tractors should be provided with a safety cab or frame to protect the operator and any passenger in case of—

- (a) tractor overturn in any direction;
- (b) falling objects; or
- (c) displaced loads.

2.1. Minimum size

2.1.1. The minimum size of the safety cab or frame after the deflections likely to be caused by overturn should be as determined by the following planes:

- (a) vertical planes 250 mm on either side of the reference plane¹ extending upwards from the seat reference point¹ for 300 mm;
- (b) parallel planes extending from the upper edge of the planes (defined at (a) above) to a maximum height of 900 mm above the seat reference point and inclined so that the upper edge of the plane on the side on which the deflection has occurred is at least 100 mm from the reference plane;
- (c) a horizontal plane 900 mm above the seat reference point;
- (d) an inclined plane perpendicular to the reference plane and including both a point 900 mm directly above the seat reference point and the rearmost point of the seat structure;

¹ See OECD Standard Code for the Official Testing of Safety Cabs and Frames Mounted on Agricultural Tractors.

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- (e) a curvilinear surface, perpendicular to the reference plane, with a radius of 120 mm tangential to the planes defined at (c) and (d) above;
- (f) a curvilinear surface, perpendicular to the reference plane, having a radius of 900 mm extending forward for 400 mm from and tangential to the plane defined at (c) above at a point 150 mm forward of the seat reference point;
- (g) an inclined plane perpendicular to the reference plane, joining the surface defined at (f) above at its forward edge and passing 40 mm from the steering wheel;
- (h) a vertical plane perpendicular to the reference plane 40 mm forward of the steering wheel; and
- (i) a horizontal plane through the seat reference point.

2.2. Dangerous features

2.2.1. On no safety frame or cab should there be—

- (a) along the sides below a height of 95 cm above the horizontal plane of the loaded seat, any longitudinal members against which the operator's or passenger's head might sustain injury, unless there are also members at heights between 38 cm and 50 cm capable of providing support for the shoulders; or
- (b) any other features constituting particular hazards to the operator, e.g. glass of a type likely to shatter dangerously, or insufficient padding inside the roof or wherever the operator's or passenger's head might strike.

2.3. Fitting

2.3.1. The fitting of a safety cab or frame should not adversely affect—

- (a) access between the ground and driver's position;
- (b) the freedom of movement normally enjoyed by the operator when he is in his normal operating position;
- (c) access to the tractor's main controls;

- (d)* the manner in which normal checking and maintenance operations are carried out;
- (e)* the noise level at the operator's position;
- (f)* visibility from the driver's position;
- (g)* the manoeuvrability of the tractor in cramped surroundings;
- (h)* the inherent stability of the tractor, whether by significantly raising the centre of gravity or by limiting the range of wheel track settings;
- (i)* the attachment or use of any equipment that may be connected with the tractor; or
- (j)* the control and adjustment of associated equipment.

2.3.2. A safety cab or frame should be fitted in such a manner as to prevent excessive heat, draught, dust and fumes from reaching the operator.

2.4. Visibility

2.4.1. The cab should be provided with—

- (a)* a windscreen and windows of clear transparent material that do not break into sharp fragments in a crash;
- (b)* a power-driven wiper which clears a substantial portion of the windscreen; and
- (c)* a water spray to clean the windshield.

2.5. Protruding members

2.5.1. Safety frames and cabs should be so constructed that—

- (a)* there are no protruding members or components which would be likely to cause serious injury in an overturning accident or which might trap the operator, e.g. by the leg or foot, as a result of deformation; and
- (b)* all edges and corners that might injure the operator are covered with rubber or equivalent protective padding material.

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2.6. Egress

2.6.1. (1) Egress from an overturned tractor should be provided.

(2) Safety frames or cabs should be so designed and constructed that egress is not unduly restricted if the tractors to which they are fitted overbalance.

(3) Tractors fitted with safety cabs and operating on or near lakes or rivers, whether frozen or not, should be provided with a means of egress through the roof. This means of egress should slide or open outwards.

2.7. Attachment of supporting members

2.7.1. When attaching a safety frame or cab all major fastenings, such as pins, screws, nuts and bolts, that are used in its construction and attachment should be securely locked.

2.7.2. The construction and attachment of the safety frame or cab should be such that no water or rubbish will accumulate in such a manner as to accelerate corrosion.

3. Guards

3.1. Types

3.1.1. There are four main types of guards that may be used: shields, covers and casings are stationary; the fourth type of guard moves with the moving part but has a smooth surface and is so designed and fitted that it will stop independently of the moving part on contact with persons or their clothing.

3.2. Construction

3.2.1. Guards should—

(a) be made of sufficiently strong material;

- (b) be able to withstand without permanent deformation a force of 120 kgf in such a position that they could be used as a step;
- (c) retain their strength at very low temperatures;
- (d) be rigidly fastened; and
- (e) have no sharp edges.

3.2.2. (1) Only a stationary guard may be made of mesh or take the form of a grating.

(2) If a guard is made in the manner described in subparagraph (1), the size of the openings should be dependent on the distance between the guard and the moving part: where the openings are round, their diameter should not exceed 6 mm or one-tenth of the distance from the moving part, whichever is greater; if the openings are polygonal the largest circle that can be inscribed in them should not have a diameter exceeding that dimension, and in addition the distance between the apexes that are furthest apart should not exceed twice that dimension.

3.3. Hot parts

3.3.1. A guard or shield should be fitted to reduce to a minimum the possibility of inadvertent contact during normal operations with any exposed hot element that may cause harm. The guard should be constructed of heat-insulating material, or positioned and mounted in such a manner that it will not itself become hot.

3.4. Rear wheels or tracks

3.4.1. (1) All tractors should be provided with rear wheel or full track guards (mud guards) which should be higher than the circumference of the wheels or track and so far ahead that the operator's or passenger's feet cannot come into contact with the wheels or track.

(2) The wheel guard may be omitted when the wheels are already protected by other means such as auxiliary equipment.

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3.5. Fans

3.5.1. All propeller or axial fans which are exposed and within reach of the ground, the operator's position or the passenger's position should be guarded against contact.

3.6. Pulleys and belts

3.6.1. Tractor belt pulleys should be so located or guarded while in operation that if the belt breaks or slips off it cannot strike the operators and there is no risk of contact with the nip point.

3.6.2. If the belt or pulley guard is so located that the operator or passenger could step on it, it should be strong enough to withstand without permanent deformation a force of 120 kgf evenly distributed over an area of 250 cm².

3.6.3. (1) Open gears, belts and chain drives and idlers should have nip points protected by guards or by other parts of the equipment.

(2) Chain drives, as well as belts that are joined in such a manner as to present protrusions, should be guarded over their entire length if there would otherwise be a possibility of contact with them.

(3) Substantial bars or rods may be used to shield several drives simultaneously.

3.7. Other nip points

3.7.1. Other nip points that should be guarded by adequate guards or location are—

- (a) any shafting (including joints, shaft ends and cranked shafts), fly wheels, gearing (including friction roller mechanism), cables, sprockets, clutches and coupling;
- (b) set screws, bolts, key ways, keys and grease nipples that protrude on moving parts; and

(c) any parts between which pinching or shearing is possible.

3.7.2. Constant running drives, or drives that rotate when the engine is running with all clutches disengaged, should have the outside face of pulleys, sheaves, sprockets and gears plus the sides of nip points adequately guarded.

4. Seats and operating positions

4.1. Passenger seats

4.1.1. All passengers should be provided with fixed seats with back rests, foot rests and handholds.

4.1.2. (1) If a safety cab or frame is fitted, the passenger seat should be inside the area protected by the cab or frame, and should be equipped with seat belts.

(2) Seat belts should be installed only on tractors fitted with safety cabs or frames.

4.2. Operator's seat

4.2.1. Operators' seats should be—

- (a) adequately sprung or suspended to absorb vibrations¹;
 - (b) provided with a backrest of at least 15 cm in height above the loaded cushion, and with a foot rest;
 - (c) fully adjustable to the operator's height, weight, and arm and leg reach;
 - (d) equipped with a cushion of sufficient strength and convenient shape and adequately upholstered to ensure that the operator can sit in safety and comfort whatever his size and weight;
- and

¹ Particular attention should be given to vibrations in the 4 Hz to 9 Hz range, which are particularly troublesome.

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- (e) provided with seat belts, which move with the adjustable seat, when the tractor is equipped with a safety cab or frame.

4.3. Guarding of operating positions on auxiliary equipment

4.3.1. (1) Persons at the operating position should be protected from falls by every appropriate means.

(2) Any platform on which a worker is required to stand during the operation of the machine or associated equipment should be level and offer a good grip for the feet, and should be provided on all sides with—

- (a) a foot guard (toe-board) which should be fitted around the edge of the platform or not more than 50 mm outside of it and should extend not less than 75 mm above the platform; and
- (b) a guard rail which should be at least 100 cm and not more than 105 cm above the platform.

(3) It is not necessary to provide a foot guard or guard rail for the platform where—

- (a) the machine itself affords protection at least equal to that which a foot guard and guard rail would provide if they were fitted; or
- (b) the access of persons or movement of material must not be impeded; however, it is suggested that a movable guard rail be installed across this opening.

5. Lights

5.1. On public roads

5.1.1. When used on public roads, all tractors should comply with public traffic regulations.

5.2. Field use

5.2.1. When used during periods of reduced visibility or at night, tractors should be provided with—

- (a) at least two headlights symmetrically mounted and aimed forward;
- (b) at least one tail lamp (which it should be possible to switch off or convert to red); and
- (c) at least one red reflex reflector on each side mounted as nearly as practical to the extreme right and left edges of the tractor.¹

6. Tyres

6.1. Inflation

6.1.1. The tyre manufacturer's recommendations concerning tyre inflation should be followed.

6.2. Ballast

6.2.1. For increased stability or traction, internal liquid or external solid ballast may be attached to the front or rear wheels, or both.

6.3. Inspection

6.3.1. Tyres should be regularly inspected for damage, and new ones fitted when cleats are worn to the point of providing poor traction or grip.

7. Access

7.0.1. All tractors should be equipped with steps or other equivalent means to facilitate entry to and exit from the operator's and passenger's positions.

¹ In some countries it is recommended that at least one flashing warning lamp be mounted as high as practicable, not obscured and indicating as nearly as practicable the farthest projection to the outside rear. Provision should be made in the flashing warning circuit for disabling the flasher.

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7.1. Handles

7.1.1. Any tractor on which the presence of a person other than the driver is required (i.e. an operator or passenger) should be fitted with properly designed and adequately placed handholds or handles.

7.1.2. If the handholds or handles are covered by attached equipment the attached equipment should itself be provided with handholds or handles.

7.2. Steps

7.2.1. The lowest step should be not more than 55 cm from the ground. The interval between that step and the operator's position should be evenly divided, with the steps no more than 30 cm apart.

7.2.2. The surface of steps should be as slip resistant as possible and of such design that snow or mud will not build up on it.

7.2.3. If the use of the steps would otherwise be dangerous owing to the proximity of moving parts, an adequate means of protection should be fitted.

7.2.4. The minimum clear distance behind the front edge of the step should be 18 cm.

7.2.5. If the steps are covered by attached equipment, other steps in conformity with the provisions of paragraphs 7.2.1 to 7.2.4 inclusive should be provided.

7.3. Maintenance

7.3.1. Unless protection is provided by other parts of the tractor or attached machinery, adequate footholds and, where necessary, adequate handholds should be provided for persons servicing, adjusting or inspecting a tractor.

8. Power take-off

8.1. General

8.1.1. A power take-off should be so designed that there is a minimum clearance of 8 cm in any direction between the centre of the end of the splined shaft and any stationary part of the tractor.

8.1.2. (1) An instrument indicating the speed of the power take-off when operating under load should be made available for tractors.

(2) An instrument of the kind described in subparagraph (1) should be fitted as part of any tractor capable of driving a rear power take-off in excess of 600 rpm when operating under load.

8.2. Rear power take-off

8.2.1. The direction of rotation of a rear power take-off should be clockwise when viewed by an observer facing in the direction of forward travel.

8.2.2. (1) When operating under load, the speed of a rear power take-off should normally be maintained within the following limits at the design speeds indicated:

(a) at 540 rpm \pm 10 rpm for a design speed of 540 rpm; and

(b) at 1,000 rpm \pm 25 rpm for a design speed of 1,000 rpm.

(2) Tractors should be fitted with means of preventing the inadvertent operation of rear power take-offs under load in excess of—

(a) 630 rpm for a design speed of 600 rpm; and

(b) 1,150 rpm for a design speed of 1,100 rpm.

8.3. Auxiliary power take-offs

8.3.1. An auxiliary power take-off should have a normal speed under load of 1,000 rpm \pm 25 rpm.

8.3.2. (1) A power take-off drive mounted on the right-hand side of a tractor and extending to the right (when viewed by an

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observer facing in the direction of forward travel) should have a clockwise rotation when viewed from the outer end of the shaft.

(2) A power take-off drive mounted on the left-hand side of a tractor and extending to the left (when viewed by an observer facing in the direction of forward travel) should have a counter-clockwise rotation when viewed from the outer end of the shaft.

(3) A mid-tractor power take-off drive should have a clockwise rotation when viewed by an observer facing in the direction of forward travel.

8.3.3. The position of a mid-tractor power take-off should be such that its shaft extends forward parallel to the line of the shaft of the rear power take-off.

8.4. Power take-off shield

8.4.1. (1) Protective devices for power take-offs should be substantially constructed, firmly secured in position and maintained in good condition.

(2) When the power take-off is in use, it should be covered on top and on both sides by a shield attached to the tractor and preventing any person from coming into contact with the shaft.

(3) When the power take-off is not in use, it should be completely enclosed in a cover attached to the tractor.

(4) The power take-off cover should be secured to the tractor by a chain or other means in order to prevent its loss.

(5) The power take-off shields and covers should be capable of withstanding a force of 120 kgf evenly distributed over a maximum area of 250 cm² when attached to the tractor without taking a permanent set.

(6) Attaching points should be provided for the power take-off shaft guard.

8.5. Power take-off drive line shield

8.5.1. All power take-off drive lines should be shielded.

8.5.2. Both towed and integral type machines driven by power take-off should be equipped with adequate shielding for the part of the power line that is exposed. This shielding should prevent the operator from coming into contact with positively driven rotating members of the power line.

8.5.3. The shielding of the power-driven line, including all yokes and joints, should provide adequate protection during turns under load.

8.5.4. When the casing rotates with the shaft, it should be so designed and fitted that it will stop independently of the shaft on contact with persons or their clothing.

8.5.5. At the machine end of the shaft (the power input to the machine), the shield may include a casing that completely encircles the shaft and overlaps the casing fitted on to the shaft itself, so that no part of the shaft, couplings or clutches is exposed under any operating conditions.

8.5.6. The shield should—

- (a) be free from protuberances;
- (b) cover the knuckles at any angle assumed by the universal joints during operation; and
- (c) not present a pinch point during articulation.

8.5.7. Where integral type implements driven by power take-off are of a design requiring removal of the tractor master shield, such implements should also include adequate protection for the portion of the tractor power shaft that protrudes from the tractor.

9. Safety devices

9.1. Slow-moving-vehicle symbol

9.1.1. The rear of every tractor operating on a public road should carry a standard slow-moving-vehicle symbol.

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9.2. Rear-view mirrors

9.2.1. All tractors should be fitted with rear-view mirrors.

9.2.2. An external rear-view mirror should be firmly attached to each side of the cab (or of the power body in the absence of a cab).

9.2.3. The two external rear-view mirrors should preferably be adjustable from the inside, both in inclination and in extension, to reflect a good image of the field and of any implements or traffic on the sides and to the rear.

9.2.4. The safety glass of the cab should be effectively cleaned by wiper, in order to enable the operator to make use of the mirrors.

9.3. Audible signals

9.3.1. All tractors should be equipped with audible signalling devices operated by compressed air or battery power. The signal should be clearly audible under normal conditions at a distance of at least 100 metres.

9.4. First-aid kit and fire extinguisher

9.4.1. All tractors should be equipped with a suitable first-aid box and fire extinguisher. These items should be securely attached and readily available, and their condition should be inspected at regular intervals.

9.5. Warning and safety signs and instructions

9.5.1. Tractors should be provided with legible warning and safety signs and instructions as needed.

9.5.2. The tractor manufacturer should provide a safety instruction placard in a prominent place on the tractor specifying—
(a) the normal operating speed of the power take-off;

- (b) that the tractor draw bar is to be adjusted and locked in the proper position; and
- (c) that the power line safety shields are to be kept in place.

9.5.3. The operator's manuals for the tractor should also include the information referred to in paragraph 9.5.2.

9.5.4. If a conversion assembly is made available for changing tractors or implements from 540 rpm to 1,000 rpm or vice versa, these conversion units should include an instruction plate or placard specifying the power take-off speed and the corresponding draw bar adjustments.

9.5.5. Tractors provided with protective frames or cabs should have a suitably placed sign reading as follows:

CAUTION

Always fasten the safety belt. If the tractor turns over, keep a firm hold of the steering wheel. Do not jump. Stop the engine.

9.5.6. The caution indicated in paragraph 9.5.5 should be supplemented by general safety instructions, which should at least include the following:

- (a) keep all shields and guards in place;
- (b) stop the engine before leaving the operator's position to adjust, oil, clean or unclog the machine, unless otherwise specifically recommended in the operator's manual;
- (c) wait for all movement to stop before servicing the machine;
- (d) keep hands, feet and clothing away from power-driven parts;
- (e) keep off equipment unless a seat or platform for its operation and observation is provided;
- (f) keep all unauthorised persons off tractors;

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- (g) except when prohibited by law, use the flashing warning light when operating on highways; and
- (h) make certain everyone is clear of the machine before starting the engine or the operation.

10. Noise

10.0.1. (1) All practicable steps should be taken to reduce the noise associated with the running of the tractor to a level not exceeding the level established by the competent authority. When levels have not been established, the level of 90 dbA at the driver's ear is suggested. In all cases the exhaust system should include a silencer.

(2) The noise level indicated in subparagraph (1) should not be exceeded regardless of the mode of operation, the implements used or the presence of a safety cab or frame.

(3) Where it is not feasible to reduce the noise level to 90 dbA operators should use ear defenders to reduce sound levels to within the limits of the table.

(4) The level of the noise generated by the tractor should be determined by using approved national or international testing methods.

Duration per day (hours)	Sound level dbA Slow response	Duration per day (hours)	Sound level dbA Slow response
8	90	1½	102
6	92	1	105
4	95	½	110
3	97	¼ or less	115
2	100		

11. Fumes and gases

11.1. Exhaust system

11.1.1. Tractor exhaust pipes should—

- (a) be so located and directed as to prevent an accumulation of harmful gases and fumes around the driver or any passenger;
- (b) discharge at least 1 metre above the operator's seat; provided that if the tractor is fitted with a cab, the level of discharge of the exhaust pipe should be at least as high as the roof of the cab;
- (c) be equipped with an approved spark arrestor; and
- (d) be shielded at exposed points where the operator could come into contact with hot parts of the system.

11.2. Cooling system

11.2.1. The air flow through the cooling system should be so arranged as to avoid hazards to the operator.

12. Brakes

12.1. Service brakes

12.1.1. Tractors should be equipped with brakes that will stop the tractor under the heaviest load that it can haul on any gradient and in any operating condition.

12.1.2. Apart from hydrostatic transmissions only drum or disc brakes should be used as service brakes.

12.1.3. (1) Unless a third pedal is provided that acts on both wheels jointly, provision should be made for coupling the separate left and right wheel brakes.

(2) The coupling pedal, if any, should be on the left of the brake pedals.

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12.2. Parking brakes

12.2.1. It should be possible to lock the brakes on when the tractor is stationary, either by use of the coupling pedal or by a parking brake lever.

12.2.2. A parking brake should be provided which should hold the tractor with the maximum rated load on a gradient of 15 per cent, or on the maximum gradient which the tractor is able to climb, whichever is the lower.

13. Operating controls

13.1. General

13.1.1. The operating controls, such as steering wheels or levers, gear levers, cranks, pedals and switches, should be arranged and fitted in such a way as to allow safe and easy control and manipulation by the operator in the normal operating position.

13.1.2. Peg pedals for clutches and braking should not be allowed.

13.1.3. For reasons both of safety and of comfort, consideration should in future be given to arranging control levers in such a way that they will never be between the operator's legs.

13.1.4. Controls should not project beyond the contours of the tractor in any position.

13.1.5. It should be possible to secure devices for engagement and disengagement of drives in the disengaged position, so that they cannot be re-engaged unintentionally by the operator or by falling objects.

13.2. Pedals

13.2.1. Pedals should be of safe and adequate construction; in particular—

- (a) all pedals except accelerator pedals should have a rough, non-slip surface and be adequate in size and spacing;
- (b) where a pedal does not have a non-slip surface, the outer edge of the pedal should be raised in order to minimise the possibility of the operator's foot slipping off the pedal;
- (c) pedals should be so constructed or arranged that soil or snow cannot build up on or under them; and
- (d) a floor or footrest should be provided for the operator's feet while he is not operating the pedals.

13.3. Hand controls

13.3.1. Hand controls should be of a shape and size that permit an adequate grasp and hand clearance. The clearance around these controls should be not less than 70 mm.

13.4. Identification

13.4.1. All dials, indicating devices and controls should be identified. The meaning of any symbols used should be clear.

13.5. Steering controls

13.5.1. The steering system should be such that—

- (a) when a steering wheel control is provided, a clockwise rotation should effect a right turn and a counter-clockwise rotation should effect a left turn;
- (b) when a single lever is used for steering, a lateral motion of the lever to the right should effect a right turn and a lateral motion to the left should effect a left turn; and
- (c) when two levers are provided for steering by controlling the speed or direction of rotation of the drive wheels individually, the right-hand lever should control the right wheel and the left-hand lever should control the left wheel.

13.5.2. A steering assembly with a steering wheel should be so designed as to prevent any sudden movement of that wheel,

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such as may cause injury to the operator's hand, caused by a front wheel striking an obstacle on the ground.

13.6. Brake controls

13.6.1. The brake controls should meet the following requirements:

- (a) the brake pedal or pedals should normally be designed to be actuated by the operator's right foot, with a forward or downward motion, or both, for engagement;
- (b) when separate brake pedals are provided for the independent right and left brake controls, there should be some means of achieving combined and equalised control;
- (c) the handle of the parking brake or device should be within easy reach of the operator; and
- (d) when the brakes are applied by means of a pedal, the force required on the pedal should be within the limits set by ergonomic principles.

13.7. Master clutch

13.7.1. The master clutch should be actuated by the operator's left foot, with a forward or downward motion, or both, for disengagement.

13.7.2. If a hand-operated master clutch is provided, it should move towards the rear of the vehicle for disengagement.

13.8. Gear selector lever

13.8.1. The gear selector lever should be located forward of the operator, and the shifting pattern should be clearly and permanently labelled.

13.8.2. Where a directional lever is provided it should be moved forward or upward, or both, for forward vehicle movement

and downward or towards the rear of the vehicle, or both, for reversing.

13.8.3. An interlock should be provided to prevent the engine from being started unless the gear selector is in a neutral position and the transmission clutch is not engaged.

13.8.4. Where a transmission differential lock control is provided, it should be moved forward or downward, or both, to actuate the engagement of the lock.

13.8.5. (1) When hydrostatic ground drive is provided, the control lever should be within easy reach of the operator.

(2) The hand lever should be moved generally forward or away from the operator, from the neutral position, for forward travel and increasing forward speed; it should be moved generally towards the rear of the vehicle or towards the operator, from the neutral position, for reverse travel and increasing reverse speed.

(3) To facilitate the positioning of the lever, provision should be made for a sector or quadrant clearly indicating forward, neutral and reverse positions, as well as power settings.

13.9. Engine speed control

13.9.1. When a foot-operated engine speed control pedal is provided, it should be operated by the right foot, with a forward or a downward motion or both, to increase engine speed.

13.9.2. When a lever-operated engine speed control is provided, it should move forward or away from the operator to increase engine speed.

13.10. Power take-off control

13.10.1. (1) The clutch control for the independent power take-off should be hand-operated.

(2) The direction of motion to the disengaged position should be downward or towards the rear of the vehicle, or both.

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13.10.2. Constant-running and transmission-driven power take-off controls should conform to the provisions of section 13.7.

13.11. Hydraulic controls

13.11.1. (1) The hydraulic control levers should be within easy reach of the operator.

(2) The levers should be moved upward or towards the rear of the vehicle, or both, to raise the implement, and should be clearly and permanently labelled.

13.11.2. Hydraulic controls should be located on the right-hand side of the operator.

13.11.3. Provision should be made to prevent accidental and possibly dangerous operation of hydraulic lifting gear controls.

14. Engine control and components

14.1. Starting mechanism

14.1.1. The tractor engine should be provided with self-starting equipment.

14.1.2. Tractor engine starting should be controlled, from the operator's position, by a rotary or pull-out switch and not by a tumbler switch, so as to reduce the risk of accidental starting. Where practicable these switches should be key-operated.

14.1.3. The tractor engine starting mechanism should be interlocked with the transmission or clutch so as to prevent the engine from starting up if left in gear.

14.1.4. If tractors are provided with hand cranks for starting—

(a) the cranks should be so designed, installed and located that kick-back will not occur; and

(b) the electrical part of the ignition should be so interlocked that the engine will not start with hand cranking if left in gear.

14.1.5. The tractor should be provided with a device controlled from the operator's position for quickly stopping the engine.

14.2. Battery

14.2.1. The battery should be safely located and secured.

14.2.2. An air space of at least 30 mm should be left above the live terminals of the battery, or the battery cover should be fitted with an insulated lining.

14.2.3. When there are openings in the cover they should be protected against the entrance of foreign bodies. The cover should be rigid enough to absorb, in normal use, any distortion that might bring it into contact with live parts of the cells.

14.2.4. Ventilation openings should be provided in the vertical walls of the battery container or compartment above the cells.

14.2.5. Removable battery containers should be secured on the chassis in such a way as to avoid any accidental displacement while the tractor is in motion.

14.2.6. Arrangements for the removal of the battery should be such that no damage or injury will occur during handling.

14.2.7. The battery should be so located and secured as to ensure that spillage or accidental contact with uninsulated components will not occur in the event of an overturn.

14.3. Fuel system

14.3.1. The tractor fuel system should be safely located and protected.

14.3.2. The fuel tank and associated fuel lines should be guarded against external damage.

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14.3.3. The filler neck of the tank should be so positioned that when the tank is being filled, any spilled fuel cannot reach parts heated by the engine.

14.3.4. It should not be possible for spilled fuel to flow down and around the operating position, i.e. under the operator's seat or his feet.

14.3.5. Sediment bowls used on gasoline engines should be heat resistant.

14.3.6. Fuel tanks should have the air volume vented. The maximum vehicle operating angles encountered in normal operating conditions should be considered in deciding where to place the vents.

14.3.7. Fuel tanks, filler necks and air vents should be so located, secured, designed and sealed as to ensure that spillage will not occur in the event of an overturn.

14.4. Hot engine components

14.4.1. Shields should be provided for the engine manifold, muffler, exhaust pipe and other hot engine components where necessary to prevent contact with flammable materials or liquids associated with normal tractor operation.

B. Operation

15. General

15.1. Operator

15.1.1. All operators of tractors should—

- (a) be in good health;
- (b) be adequately trained and, when required, properly licensed;
- (c) obtain and read the operating manual before using a tractor for the first time;
- (d) wear adequate and well-fitting footwear maintained in good repair;
- (e) wear snug-fitting clothing; and
- (f) keep hands, feet and clothing away from all moving parts.

15.2. Starting of tractor

15.2.1. Before starting a tractor, the operator should—

- (a) clear all material from the cab floor and all mud, ice or snow from the pedals;
- (b) inspect each machine to make certain that it is properly adjusted and in good working condition;
- (c) lubricate working parts, tighten all loose parts and secure safety shields in place; and
- (d) place all controls in neutral.

15.3. Operating conditions

15.3.1. Tractors should not be started or operated in buildings unless conditions are such that there is no risk of fire or contamination of the air.

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15.3.2. (1) All shields for power take-offs, including the tractor master shield and the power take-off shaft shield, should be in place during use.

(2) When power take-off is not in use, the stub shaft should be provided with a shield.

15.3.3. Except in an emergency, no person should mount or dismount from a tractor while it is in motion.

15.3.4. All clutches should be engaged gradually, particularly when starting to move heavy loads.

16. Travelling

16.1. General

16.1.1. When a safety frame or cab is provided, the operator should use a seat belt. It is strongly recommended that no seat belt be used if a safety frame or cab is not provided, when working near water where danger of drowning exists or when travelling on ice.

16.1.2. Adjustable wheels should whenever necessary be spread as far as practicable, considering the work to be done, to reduce tipping hazards.

16.1.3. Tractors should not be driven faster than is safe, having regard to prevailing conditions. It is recommended that a speed limit of 6 to 8 km/h be observed off the road and 13 to 25 km/h on smooth, dry roads.

16.1.4. While a tractor is moving no person should—

- (a) stand or sit in an unsafe place such as a roof, drawbar, mud-guard, running board or load;
- (b) climb from one tractor or trailer to another;
- (c) jump on or off except in emergencies;

- (d)* apply wheel chocks; or
- (e)* leave arms, legs or any object protruding outside.

16.1.5. The operator should check brake adjustment at the start of the day, before starting down steep slopes and before entering a public highway.

16.1.6. Tractors should be driven with particular care—

- (a)* over sloping, uneven, soft, slippery or otherwise unsafe ground;
- (b)* alongside ditches or banks;
- (c)* when turning;
- (d)* when reversing; and
- (e)* when driven with any attachment that drastically raises or changes the tractor's centre of gravity.

16.1.7. Owing to the possibility of tipping backward, particular care should be taken in driving when—

- (a)* transporting heavy loads up a slope;
- (b)* using rear wheel weights or ballast in rear tyres;
- (c)* using rear-mounted equipment;
- (d)* raising the position of the hitch point on towed loads;
- (e)* the rear wheels dig into soft ground;
- (f)* using forward gear if the wheels are frozen to the ground; and
- (g)* attempting to drive forward if the rear wheels are in a ditch or hole.

16.1.8. If necessary to prevent rearing, the front of the tractor should be weighted.

16.2. Travelling on public roads

16.2.1. When travelling on public roads the operator should—

- (a)* comply with all traffic laws and regulations;

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- (b)* stop at all unguarded railway crossings and make sure that no trains are coming;
- (c)* signal intention to turn, slow down or stop;
- (d)* stop before entering or crossing public roads;
- (e)* keep on the correct side of the road and, when it is safe to do so, pull off the highway to allow faster traffic to pass;
- (f)* shift to a lower gear for control when going downhill;
- (g)* shift to a lower gear, to avoid stalling, when going uphill; and
- (h)* reduce speed when roads are slippery owing to snow, ice, rain or any other cause.

16.2.2. Moving of tractors and farm equipment should be planned in such a way that—

- (a)* moves are made during daylight hours; and
- (b)* moves are not made during periods of heavy traffic.

16.2.3. When moves are made during the night or other periods of reduced visibility, all lights and reflectors should be used as required by law, and they should be kept in good working condition and clean.

16.2.4. A distinctive emblem for slow-moving vehicles should be displayed on the rear of any towed equipment at all times while on public roads.

16.2.5. Rear-view mirrors should be properly adjusted.

16.2.6. In case of travel during rain, when a cab is not provided, provision should be made to mount an umbrella above the driver's seat.

16.3 Travelling on ice

16.3.1. When tractors are used on frozen rivers or lakes, the ice should be at least 50 cm. thick for tractors up to 12.5 t.

16.3.2. Tractor speed should be reduced when travelling on ice.

16.3.3. Cab doors should be left open and seat belts removed when moving across ice.

16.3.4. Intervals between tractors on ice should be at least 40 m, and only one-way traffic should be allowed.

17. Forestry work

17.0.1. Tractors used for skidding should not enter a tree-felling area without giving a warning signal and receiving a permissive signal from the head feller in reply.

17.0.2. Tractors to which logs have been attached should not start up without a permissive signal from the chokerman, rigging slinger or other workers concerned. Permissive signals should not be given until all workers are in the clear.

17.0.3. A tractor should not be left standing on slopes unless—

- (a) the engine has been stopped; and
- (b) the brakes have been applied and locked.

17.0.4. If tractors are left standing, bulldozer blades or buckets should be lowered or securely blocked.

17.0.5. The hands should never be used to guide hauling cables onto tractor winch drums. If guidance is necessary, a bar or other appliance should be used.

17.0.6. While the tractor is moving or the haulage cable is taut no worker should—

- (a) adjust or remove the attachment of the logs;
- (b) loosen chokers;
- (c) cross or pass over hauling cables; or
- (d) be in close proximity to the hauling cable.

18. Front-end loader operation

18.0.1. When using a front-end loader on a tractor—

- (a) the load should be kept as low as practicable while moving;
- (b) the bucket should not be overloaded;
- (c) the bucket should be evenly loaded;
- (d) the adjustable wheels should be set as wide as possible;
- (e) turns should be made as slowly and as wide as possible; and
- (f) extra weight should be added to the rear wheels to increase stability.

19. Reversing and turning

19.0.1. Speed should be reduced, using the tractor throttle as much as possible, before making any turns.

19.0.2. Before turning or reversing, the tractor operator should make certain that there are no workers or obstacles in the path of travel.

19.0.3. When a tractor is mired in mud or stuck in a ditch, the operator should always attempt to drive out in reverse gear only. If this attempt is unsuccessful he may secure logs or planks behind the rear wheels, to increase traction, and again attempt to drive out using reverse gear. Under no condition should logs or planks be secured in front of the rear wheels to increase traction.

20. Stopping

20.0.1. Before leaving a stopped tractor the operator should—

- (a) shift the gear selector to neutral;

- (b) re-engage the master clutch, except in the case of torque converter machines;
- (c) lock the parking brake;
- (d) lower bulldozer blades, buckets and other attachments to the ground; and
- (e) put all power-operated attachments and power take-offs into neutral.

20.0.2. The operator should not dismount unless the tractor is stationary and there is an adequate and safe place for him to step onto.

20.0.3. When slowing down or stopping, brakes should be applied equally to the two rear wheels.

20.0.4. Tractors should not haul heavy vehicles or machinery unless they can be stopped in a safe and controlled manner.

21. Use of attached vehicles

21.0.1. Towed attachments should be attached only to the draw bar provided on the tractor. The draw bar should be located between 33 and 43 cm above ground level.

21.0.2. In no case should attachments be secured to the front or rear axle, to the seat bracket or to any other frame member.

21.0.3. When attachments are hitched to the tractor—

- (a) the attachment should be blocked with blocks or chocks, if the tractor is backed;
- (b) if the attachment is pulled onto the tractor, the attachment should be kept under control by brakes or chocks; and
- (c) no person should remain between the tractor and attachment, and the draw bar should be handled with a hook or other suitable device.

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21.0.4. When attachment and tractor are unhitched, both vehicles should be blocked by brakes or chocks.

21.0.5. All shields should be secured in place after hitching and before use of any attachment.

21.0.6. When attachments become clogged, the engine should be shut off and then they should be cleared.

22. Carrying of passengers or objects

22.0.1. Tractors should not carry—

- (a) any person for whom there is not a safe seat;
- (b) children; or
- (c) loose objects unless a safe place is provided for them.

23. Towing and pushing

23.0.1. A tractor should not be used to push other vehicles unless an adequate and securely fastened push bar is fitted to it.

23.0.2. Tractors should not haul loads so heavy as to prevent effective control, especially on any sloping, uneven, soft or otherwise unsafe ground.

24. Operating on sloping ground

24.0.1. When starting up a slope, the operator should choose a power gear to avoid stalling or shifting of gears on the slope, and should engage the clutch slowly to avoid upsetting backwards.

24.0.2. Adjustable wheels should be spread as far as possible for the job at hand.

24.0.3. The gear lever should not be put in neutral when descending slopes. A low gear should be selected to assist in braking the tractor.

24.0.4. If necessary to prevent rearing, the front of the tractor should be weighted, when ascending a slope, or the tractor should be preferably backed up to the top.

24.0.5. Unbraked towed equipment should not be taken down steep slopes without extreme caution.

25. Stationary work

25.0.1. When using the tractor as a source of power for stationary power take-off or belt work—

- (a) all shields and guards should be in place before power is applied; and
- (b) the tractor frame should be earthed to remove static electricity.

25.0.2. When tractors are used for stationary work inside a building, adequate means of removing exhaust gases and supplying fresh air should be provided.

25.0.3. When a tractor with a winch is used for pulling, the tractor should be properly aligned in the direction of the pull.

26. Tractor fuelling

26.0.1. When the fuel tanks of internal combustion engines are being filled—

- (a) the engines should not be running; and
- (b) no open flame devices, open lights, lighted cigarettes or the like should be allowed.

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26.0.2. Hot engines should be allowed to cool down before refuelling.

26.0.3. After fuelling, some time should be allowed for fuel vapours to disappear before the engine is re-started.

26.0.4. Contact should at all times be maintained between the metal outlet of the refuelling hose or the can spout, on the one hand, and the fuel tank opening on the tractor on the other, or other means of bonding should be ensured to minimise the possibility of an explosion or outbreak of fire due to the discharge of an accumulation of static electricity.

26.0.5. The tractor fuel system should be checked frequently to detect fuel leaks. To be checked in particular are the fuel tank seams, fuel lines, fuel filler caps, fuel line shut-off valves, chokes and all fuel line connections.

26.0.6. (1) Fire extinguishers should be provided on the tractor, at the refuelling point and in the building where the tractor is stored.

(2) The extinguishers referred to in subparagraph (1) should be of the type approved for petroleum fires (i.e. carbon dioxide, dry chemical). Carbon tetrachloride extinguishers should not be used, owing to the poisonous gas given off.

27. Garages and fuel storage

27.0.1. Garages for tractors should—

- (a) be adequately ventilated;
- (b) have at least one outside wall; and
- (c) have doors opening to the outside.

27.0.2. Electrical installations in garages should be in conformity with national regulations or the requirements of the competent authority.

27.0.3. It is desirable that only indirect heating be installed in garages.

27.0.4. Inspection pits in garages should be—

- (a) accessible by means of safe steps with handrails; and
- (b) provided with safe covers when not in use or guard rails on all sides.

27.0.5. Garage floors should have a drainage system such that—

- (a) there is a trap for petrol (gasoline) and oil; and
- (b) the trap can be easily and safely emptied.

27.0.6. Large quantities of fuel and oil should not be stored in garages. Small quantities of fuel should be stored in approved safety containers.

27.0.7. No work that involves welding, cutting, brazing or the generation of sparks should be done in garages without proper precautions concerning the fire hazards.

27.0.8. Oily and greasy waste should be kept in self-closing metal receptacles in garages.

27.0.9. At an easily accessible place in a garage there should be kept in readiness for use—

- (a) a suitable fire extinguisher; or
- (b) an adequate quantity of dry sand and a shovel.

27.0.10. (1) An underground tank should be provided for the bulk storage of petroleum fuels other than liquified petroleum gas.

(2) Where underground storage is not feasible, safe fuel storage may be provided as far as practicable from buildings; 12 m. is considered a minimum. The storage should be in closed drums or metal containers inside a fenced yard.

(3) The word "Petrol" ("Gasoline") should be painted on the containers of that fuel and outlined in red. A shut-off valve should be provided between the hose and the container.

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(4) The area surrounding the fuel container yard should be kept clear of weeds and trash and combustible substances over a width of at least 10 m.

28. Maintenance

28.0.1. Tractors should be maintained according to the recommendations of the manufacturer as laid down for ordinary work conditions. It is recommended that all machines be repaired and reconditioned during the off season and sufficiently in advance of use.

28.0.2. Steering mechanisms, control mechanisms, warning devices, lights and governors should be maintained in a safe operating condition.

28.0.3. Right and left brakes should be adjusted so that braking is equal on the two rear wheels.

28.0.4. All stressed parts of frame members, including safety cabs or frames, should be carefully and regularly inspected and maintained in a safe operating condition.

28.0.5. (1) Guards and safety devices should be inspected regularly.

(2) Seats, audible signals, spark arrestors, and silencers and other noise reduction devices should be inspected regularly.

28.0.6. (1) All hydraulic systems should be regularly inspected and maintained to conform with the manufacturer's recommendations.

(2) Hydraulic cylinders, valves and other similar parts should be checked to ensure that neither internal nor external leakage has developed to such an extent as to create a hazard.

28.0.7. Batteries, electric motors, controllers, switches, protective devices and electrical conductors and connectors should

be inspected and maintained in accordance with generally accepted good practice. Special attention should be paid to the condition of electrical insulation.

28.0.8. Wheels should be checked for deterioration of pneumatic tyres, side walls and rims. The inflation pressure specified by the tractor or tyre manufacturer should be maintained and checked before commencement of work.

28.0.9. Plates or tags placed on a tractor by the manufacturer and concerning capacity rating, or bearing instructions concerning operation and maintenance or any other subject, should be maintained in a legible condition.

29.0.10. Tractors should be kept clean to prevent fire hazards and ensure the detection of loose or defective parts.

28.0.11. Care should be taken to ensure that all replacement parts are of a quality equal to or better than that provided in the original equipment. All modifications to the original equipment design should be the subject of consultation between the user and the tractor manufacturer.

28.0.12. If inspection shows that substantial repairs are required to parts that affect its stability, safety or strength, the tractor should not be used until it has been properly repaired, tested and thoroughly examined by a competent person.

28.0.13. The tractor should always be lubricated completely and carefully according to the manufacturer's instructions.

28.0.14. Radiator lids should be removed in such a way as to prevent danger of scalding from steam or boiling water.

28.0.15. No person should go under a tractor unless the operator has first descended and made certain that the tractor cannot move, and that movable attachments are safely blocked up or lowered to the ground.

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