



UL 62841-4-1000

STANDARD FOR SAFETY

Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 4-1000: Particular Requirements For Utility Machines

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UL Standard for Safety for Electric Motor-Operated Hand-Held Tools, Transportable Tools And Lawn And Garden Machinery – Safety – Part 4-1000: Particular Requirements For Utility Machines, UL 62841-4-1000

First Edition, Dated June 19, 2020

Summary of Topics

This revision of ANSI/UL 62841-4-1000 dated January 5, 2023 includes the following changes in requirements:

- **Maximum payload capacity clarification; [K.8.3](#)**
- **Stability test clarification; [K.19.8](#)**

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated November 18, 2022.

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JUNE 19, 2020
(Title Page Reprinted: January 5, 2023)



ANSI/UL 62841-4-1000-2023

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UL 62841-4-1000

Standard for Electric Motor-Operated Hand-Held Tools, Transportable Tools

And Lawn And Garden Machinery – Safety – Part 4-1000: Particular

Requirements For Utility Machines

First Edition

June 19, 2020

This ANSI/UL Standard for Safety consists of the First Edition including revisions through January 5, 2023.

The most recent designation of ANSI/UL 62841-4-1000 as an American National Standard (ANSI) occurred on January 5, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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Application

All clauses, Clauses 1-28, of the main body of UL 62841-1 apply unless otherwise specified in this standard.

This standard is to be used in conjunction with Annex K in the First edition of UL 62841-1.

1 Scope

Replacement:

This standard applies to battery power-assisted utility **carts**, **wagons** and **wheelbarrows**, which hereinafter will be referred to as a “**utility machine**” and are covered by Annex [K](#).

This standard does not apply to **utility machines** connected to the supply mains or to a **non-isolated source**.

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Annex K (normative)

Battery tools and battery packs

All clauses of the main body of this Part 4-1000 apply unless otherwise specified in this Annex. If a clause is stated in this Annex, the requirements replace the requirements of the main body of this standard unless otherwise specified.

K.1 Scope

All clauses of Part 4-1000 apply unless otherwise specified in this annex.

This standard applies to battery power-assisted utility **carts**, **wagons** and **wheelbarrows**, which hereinafter will be referred to as a “**utility machine**”.

Utility machines are intended to be attended and controlled by an operator in physical contact (physical presence) with the **utility machine** at all times; they are not intended to be operated unattended or operate automatically.

Utility machines are intended for use to convey inanimate goods, materials or equipment on land, typically gardens and construction sites; they are not intended for transporting the operator or any passengers.

This standard does not apply to hand trucks (also known as a dolly) or forklifts.

K.3 Terms and definitions

This clause of Part 4-1000 is applicable, except as follows:

Replacement:

K.3.63 **Working voltage:** voltage, without the effect of transient voltages, across any insulation or between any parts of different polarity when the machine is supplied by (a) **fully charged battery(ies)** and operating at no-load, or with the machine in the “off” condition, whichever is greater

Addition:

K.3.301 **Brake system:** A system provided to reduce the speed or stop movement of the machine, or to prevent unintended movement of a parked machine.

K.3.302 **Cart:** A machine used to convey **payloads**, that has three or more wheels, and are designed for with the weight of the **payload** to be supported solely by the wheels during use.

K.3.303 **Code protected disabling device:** A **safety disabling device** which is operated by a specific “key sequence” (e.g. an alpha and/or numerical code).

K.3.304 **Control devices:** Devices used to control motor propulsion, direction of movement, speed, **lifts** or **hoppers**.

K.3.305 **Direction control:** A **control device** used to vary or fix the direction of motion, forward or reverse.

K.3.306 **Disabling device:**

a) **Removable**

detachable part, such as for example a key, which prevents operation of the machine when it is removed

b) Code protected

device which, when operated, prevents operation of the machine and requires a coded input (such as via a keypad) before it can operate

NOTE 1 to entry: See K.21.301

K.3.307 Gradability: The steepest grade or slope of the ground surface on which the **utility machine** is designed to be operated safely. Expressed as a degree from a flat level surface, and if appropriate, either up, down or across in either direction. May vary for different configurations or conditions of use.

K.3.308 Hopper: The structure of the machine intended to carry payloads, also known as a bucket or carrier. May be hinged for dumping.

K.3.309 Lift: An electro-mechanical or hydraulic mechanism for raising or lowering the height of the **payload** from the normal position of the **hopper** when transporting.

K.3.310 Lock-out system: A device or other part of the machine used to prevent unintended operation of the machine by either mechanically locking/unlocking the main **control devices** or by electronically making/breaking electric power to the main **control devices**.

K.3.311 Motor-propulsion control: A control device used to initiate or cease **motor-propelled** motion.

K.3.312 Parking brake: A **brake system** provided to prevent unintended movement of the parked machine without operator intervention.

K.3.313 Payload: The carrying capacity of the machine, usually expressed in terms of weight.

K.3.314 Removable disabling device: A **safety disabling device** which is removable (e.g. a “key” or “toggle”).

K.3.315 Safety disabling device: A device which prevents operation of the machine. Part of a **lock-out system**.

K.3.316 Service brake: A **brake system** provided to reduce the speed or stop movement of the machine.

K.3.317 Utility machine: A general term for a battery power-assisted utility **cart**, **wagon** or **wheelbarrow**.

Note 1 to entry: The requirements for a low-power circuit are given in Annex H.

K.3.318 Wagon: Same as a **cart**.

K.3.319 Wheelbarrow: A machine used to convey **payloads**, that has one or more wheels at the front and two handles at the rear, and are designed for the weight of the **payload** to be supported by both the wheel(s) and handles carried by the operator during use.

K.5.17 Addition:

*The mass of the **utility machine** includes the **hopper** or carrier (empty) (if any), in the heaviest configuration in accordance with 8.14.2 and includes the heaviest **battery(ies)** in accordance with K.8.14.2 e) 2).*

K.5.301 *Wheels which are air-inflated shall be inflated to the recommended pressure specified in accordance with 8.14.2 c) 102) during tests.*

K.7.2 *Modification:*

Machines shall not be classified with an IPXX rating according to IEC 60529:2013.

Compliance is checked by inspection of markings on the machine and instructions for the machine.

K.8.2 *Addition:*

Utility machines shall be marked with the following additional safety warnings:

- "⚠ WARNING – Do not use for transporting persons."

Utility machines with lifts,

- "⚠ WARNING – Do not use lift on uneven surfaces or slopes. Secure hopper after lifting."

NOTE: The term "**hopper**" may be replaced by another term used in the instructions manual to describe the structure of the machine intended to carry payloads.

Utility machines with lifts and hopper,

- "⚠ WARNING – Pinch and crush hazard. Keep hands clear during operation." ; or
- The safety sign specified in [Figure AA.1](#).

These markings shall be readily visible to the user and shall not be located on the underside of the machine.

K.8.3 *Addition:*

- The maximum **payload** capacity for each loading condition described in accordance with [K.8.14.2 b\) 101\)](#) and maximum **gradeability** described in accordance with [K.8.14.2 b\) 105\)](#).

K.8.12 *Replacement of the first paragraph:*

Markings required by the standard shall be legible and durable. Signs shall be in contrast such as color, texture, or relief, to their background such that the information or instructions provided by the signs are clearly legible when viewed with normal vision from a distance of (500 ± 50) mm. Signs need not be in accordance with the color requirements of ISO 3864-2. If markings are embossed, stamped or molded, contrasting colors are not required.

K.8.14.1 *Addition:*

The additional safety instructions as specified in [K.8.14.1.101](#) shall be given for all **utility machines**. This part may be printed separately from the "General Machine Safety Warnings".

NOTE "General Machine Safety Warnings" are referred to as "General Power Tool Safety Warnings" in UL 62841-1.

K.8.14.1.1 *Replacement of Item 2) **Electrical Safety** with the following:*

a) Do not expose utility machine to rain. *Water entering a utility machine will increase the risk of electric shock.*

K.8.14.1.1 Addition for Item 3) **Personal Safety:**

i) **Do not operate the utility machine in the rain.** *This may result in the loss of control, slipping and falling which may increase the risk of personal injury.*

K.8.14.1.101 Safety instructions for utility machines

NOTE The term "utility machine" or "machine" can be substituted by "cart", "wagon" "wheelbarrow" or other appropriate term in the safety warnings.

Utility machine safety warnings

a) **Do not use the machine in bad weather conditions, especially when there is a risk of lightning.** *This decreases the risk of being struck by lightning.*

b) **While operating the machine, always wear non-slip and protective footwear.** *Non-skid, closed-toed safety boots and shoes will reduce the risk of injury.*

c) **Inspect pathway before hauling objects/materials.** *Familiarizing yourself with the pathway and ensuring it is wide enough to safely navigate the machine under load will help reduce losing control of the machine.*

d) **Use extreme caution on slippery, loose and unstable terrain.** *Wet and slippery surfaces, such as wet grassy areas, snow or ice, and loose and unstable terrain, such as sand or gravel surfaces, may cause the machine to lose traction and may adversely affect steering, braking and stability.*

e) **Do not operate the machine on excessively steep slopes.** *This reduces the risk of loss of control, slipping and falling which may result in personal injury. Slopes greater than the maximum recommended grade and side grades may increase the risk of instability and may adversely affect the ability to stop safely.*

f) **When working on slopes, always be sure of your footing, always work across the face of slopes, never up or down, and exercise extreme caution when changing direction.** *This reduces the risk of loss of control, slipping and falling which may increase the risk of personal injury.*

g) **Whenever possible, use level areas for stopping, loading and unloading and never leave machine unattended on a slope.** *The machine is more unstable when resting on a slope than when resting on a level surface.*

h) **When stopping on slopes, face the machine uphill or downhill and block unbraked wheels.** *The machine is less stable when facing across a slope. Unbraked wheels, especially those of the castor-type, can potentially turn and roll downhill even while the front wheel parking brake is set.*

i) **When leaving the machine unattended, set parking brake once the machine is located in a safe stopping area.** *The parking brake prevents unwanted movement of the front wheel and can improve stability.*

NOTE The above warning does not apply for machines designed without a parking brake.

j) **Ensure the hopper is in its down position and hoppers and dump-gates are secured in place when not dumping the load and when storing the machine.** *Unsecured hoppers or dump-gates can unexpectedly open or shift.*

NOTE The above warning does not apply for machines designed without a hopper or a dump gate.

k) **Ensure all locking screws are tightly secure before using.** *Locking screws on the wheels and open-type carrier front and side walls must be secure to prevent unwanted movement of these adjustable parts of the machine.*

- l) **Never operate the machine in an overloaded condition.** Make sure the machine has the proper capacity rating for the objects or materials that have to be hauled. Excessive loads will make the machine more difficult to maneuver and stop, will increase stopping time and distance, and may increase the risk of instability.
- m) **Never operate your machine in an over stacked condition.** Stacking material above the tray rim or over the sides of the tray can cause the machine to be uncontrollably out of balance and control.
- n) **Use containers and tie-downs to secure loads.** Loose and/or insecure loads are more likely to shift which can result in loss of stability and control.
- o) **Always maintain a firm grip on handles.** Loss of control can increase the risk of personal injury.
- p) **Engage the lock-out system when not in use.** The lock-out system prevents unwanted, powered use of the machine, such as by children or other untrained or unauthorized persons. With the lock-out system engaged, electric power cannot be turned "on".
- q) **Remove safety disabling device when not in use or performing maintenance.** The safety disabling device prevents unwanted, powered use of the machine, such as by children or other untrained or unauthorized persons, or when performing maintenance. Without the safety disabling device, electric power cannot be turned "on".

NOTE The instruction above may be omitted when the lockout system does not include a **removable disabling device**.

K.8.14.1.102 Safety instructions for utility machines with lifts

Lift safety warnings

- a) **Do not reach into the lifting mechanisms with your hands, other parts of the body, or insert any other objects into it while operating the lift.** Contact with the lift mechanism while in use may increase the risk of serious personal injury or death.
- b) **Never operate the lift when the machine is on sloped, uneven, slippery, loose, or unstable terrains.** When the lift is elevated the machine may more easily become unstable when it is not on a level, stable and solid surface.
- c) **Never operate the lift without first setting the parking brake.** The parking brake prevents unexpected movement of the machine.
- d) **Avoid motorized transport operation with the lift elevated due to greater instability, except for small movements to reposition the machine for safer loading and unloading.** The machine may collapse or tip-over causing severe bodily injury to the operator or nearby bystanders.

K.8.14.1.103 Safety instructions for utility machines with hoppers

Hopper safety warnings

- a) **Do not reach into the hopper mechanisms with your hands, other parts of the body, or insert any other objects into it while operating the hopper.** Contact with the hopper mechanism while in use may increase the risk of serious personal injury or death.
- b) **When dumping, be alert for unexpected movement of the machine, either moving backward or the handles coming upward. It is recommended to brace the machine by using braking systems and operator control of the handles.** Parking and service brakes help prevent unexpected movement of the machine. Upward movement of the handles can increase the risk of serious personal injury.

c) **Ensure the intended dumping zone and sufficient area around it is clear and safe for dumping. Provide barriers to persons and property as necessary to limit spread of dumped materials.** *Dumped materials, such as rocks and bricks, can quickly and easily spread or roll away from the intended dumping zone and increase the risk of serious personal injury or damaging nearby property.*

K.8.14.2 a) Addition:

101) Instructions on **brake system**.

102) Instructions on **lock-out system** and **disabling device**.

K.8.14.2 b) Addition:

K.8.14.2 b)

This clause of UL 62841-1 is applicable, except the part of K.8.14.2 b) 8) regarding "lifting" is not applicable.

Also in Addition:

101) Instructions for proper loading.

102) Instructions on securing loads

103 Instructions on using ramps.

104) Instructions on use of latches (i.e hooks, fasteners) when in motorized transport operation.

105) Instructions regarding the maximum **gradability** for which the machine is recommended for safe use. Including where appropriate, **gradability** in each different configuration or condition of use described in accordance with K.8.14.2 b) 5).

106) If provided, instructions for checking **brake systems** before use to assure they are in safe operating condition and free of apparent damage that could cause failure while in use.

107) For machines with dumping type **hoppers** or dump-gates, instructions to secure the **hopper** or dump-gate before motor-operation.

108) For machines with **lifts**, instructions to return the **lift** to its down position and, if applicable, to secure it before regular motor-operation. If low speed motor operation is permitted with the **lift** elevated, instructions to secure the load, and to move and brake the machine carefully to avoid instability of the machine or the load.

109) For machines with **lifts**, instructions to set the parking brake before operating the **lift**.

110) Hazards which may be encountered when using the **lift** function, such as greater instability due to higher center of gravity.

111) For machines with non-manually operated **hoppers**, instructions to provide proper downward pressure on the handles to maintain control while dumping loads.

112) Instructions for the use and adjustment of any means of support for separable battery packs in accordance with [K.21.302](#) and instructions for release or removal.

K.8.14.2 c) *Addition:*

101) If provided, instructions how to maintain **brake systems**.

102) Instructions for proper tire inflation, if inflatable.

103) For machines with **lifts** and **hoppers**, instructions how to maintain their mechanisms, and any specification for the rest time between **lift** operations. See [K.20.301.4](#).

104) For machines with **integral batteries**, instructions on how to disable the machine during maintenance or servicing.

K.12.1 *Addition:*

*For machines with electro-mechanical **lifts** or **hoppers**, the **lift** or **hopper** mechanism, as applicable, is operated for 10 continuous cycles or until thermal equilibrium is reached, whichever is achieved first, each cycle comprising of:*

- lifting then lowering the **lift** with no payload,*
- dumping then lowering the **hopper** with no payload*

K.14 Moisture resistance

This clause of Part 4-1000 is applicable, except as follows:

K.14.1 This subclause of Part 1 is not applicable.

K.14.2 **Utility machines** shall protect the user against risk of shock due to the presence of water on the machine.

Compliance is checked by the tests of [K.14.2.1](#) and [K.14.2.2](#)

K.14.2.1 A **utility machine** is tested with the detachable battery pack or separable battery pack connected, as applicable, and then retested with any battery removed.

Electrical components, covers and other parts which can be removed without the aid of a tool are removed and subjected, if necessary, to the testing in Clause [K.14.2.2](#) with the machine and or battery as applicable.

K.14.2.2 The sample is subjected to the test of 14.2.4 a) of IEC 60529:2013, except that the machine is placed at the center of an unperforated turntable in its most unfavorable operating position in accordance with [K.8.14.2 b\)](#). The tube is oscillated through an angle of 175° to 180°, approximately 90° on either side of the vertical;

- a) The turntable is then turned continuously at approximately 1 rev/min during the test
- b) The test is conducted with a new sample with the battery attached and the machine turned on and then repeated with a new sample with the machine turned off and any detachable battery pack or separable battery pack removed.

For machines that do not fit under the oscillating tube while placed on the unperforated turntable, the conditions in 14.2.4 b) shall be applied instead.

NOTE When the machine is turned on, a means may be provided to prevent movement of the machine. Examples are by lifting the wheels of the machine off the ground or turntable or by placing the drive wheels on roller wheels.

During and after the appropriate treatment, the machine shall not start with the **control devices** in the “off” position with the **battery** installed. An inspection shall show that there is no trace of water on any electronic component and electronic circuits that may affect the correct function of any relevant SCF. Afterwards, inspection shall show that there is no trace of water on insulation which could result in a reduction of **creepage distances** between bare conductors below the values specified in Clause K.28.1, where shorting of the conductors would result in the machine starting or a risk of fire. In order to evaluate the risk of fire due to traces of water on insulation, the test of item f) of Clause K.18.1 is applied between the bare conductors.

K.14.3 to K.14.5 These subclauses of Part 1 are not applicable.

K.18.8.1 Replacement of Table 4 by the following:

Table 4
Required Performance Levels

Type and purpose of SCF	Minimum Performance Level (PL)
Motor-Propulsion Control – prevent unwanted switch-on	b
Motor-Propulsion Control – prevent unwanted switch-on at higher speed (see 21.101) for machines with lifts when the lift is not in the fully “down” position	b
Motor-Propulsion Power Switch – provide desired switch-off	b
Lift or hopper control – prevent unwanted switch-on	a
Lift or hopper control – prevent exceeding lift or hopper travel	a
Prevent exceeding thermal limits as in clause 18	a
Service brake – provide desired stopping as in K.19.301.1.2	b
Electronic Parking brake as in K.19.301.1.4	b
Prevent exceeding the maximum speeds as in K.21.301	b
Prevent self-resetting as required in 23.3	a

K.19 Mechanical hazards

This clause of UL 62841-1 is applicable, except as follows.

K.19.3 This subclause of UL 62841-1 is not applicable.

K.19.4 This subclause of UL 62841-1 is not applicable.

NOTE Requirements for **utility machine** handles are given in K.19.102.1.

K.19.5 This subclause of UL 62841-1 is not applicable.

K.19.6 This subclause of UL 62841-1 is not applicable.

K.19.7 This subclause of UL 62841-1 is not applicable.

K.19.8 Replacement:

Utility machines shall have adequate stability during transportation.

Compliance is checked by the following test.

The test shall be performed with the most unfavourable battery in accordance with K.8.14.2 e) 2).

The **utility machine** shall be tested in the unloaded condition and then repeated while loaded to the maximum payload as specified in [K.8.3](#) distributed equally in the **hopper**.

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

The machine shall be placed in its normal transportation position while standing still and also traversing in both directions perpendicular to the slope of a plane inclined at an angle 10° to the horizontal. The machine shall not tip over.

The test shall be conducted on a fully assembled machine:

– With the legs, wheels, casters, or similar means of support arranged in the position most likely to result in tip-over such as turning the caster so that the caster axle is under the machine frame versus outside of the frame area. The wheels and casters that may roll during the “standing still” portion of the test may be locked or blocked to prevent them from rolling; and

– For **utility machines** with a lift, the **utility machine** unloaded and loaded to the maximum payload as specified in K.8.3, at its maximum lift height, and standing still, except on the maximum grade as specified in [K.8.14.2 b\)](#) 105, but without traversing.

– For machines with **hopper**, unloaded and loaded to the maximum payload as specified in [K.8.3](#) in the most unfavorable position, and standing still, except on the maximum grade as specified in [K.8.14.2 b\)](#) 105, but without traversing.

K.19.8.1 **Utility machines** with **hopper** mechanisms shall have adequate stability while dumping their maximum **payload** as specified in [K.8.3](#).

Compliance is checked by the following test.

The **utility machine** shall be tested in the unloaded condition and then repeated while loaded to the maximum payload as specified in [K.8.3](#) distributed equally in the **hopper**. Prior to starting the test, each grasping handle(s) as identified in 8.14.2, is fitted with a load of 12 ± 0.1 kg applied over a 75 mm width at the center of the handle. If only one handle is intended to be grasped while activating the **hopper** mechanism, then the 12 ± 0.1 kg mass is applied to the one handle that results in the most unfavorable condition. The **hopper** operation shall be followed as specified in [K.8.14.2 a\)](#).

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

The **hopper** is operated to its maximum extension while placed on a relatively smooth/flat concrete/asphalt surface. The machine shall not tip over.

The test is to be conducted on a fully assembled machine with the legs, wheels, casters, or similar means of support arranged in the position most likely to result in tip-over such as turning the caster so that the caster axle is under the machine frame versus outside of the frame area.

K.19.301 Requirements for utility machines

K.19.301.1 Brake requirements and test method

K.19.301.1.1 General

A **utility machine** that is only supported by wheels that exceeds a combined payload and mass of 78 kg shall be equipped with a **service brake system** and a **parking brake system**.

Utility machines requiring a **service brake system** and a **parking brake system** shall fulfil the requirements of [K.19.301.1.2](#) and [K.19.301.1.3](#).

If steering-assist brakes are also used for the **service brake system** it shall be possible to connect them in a way that they apply both brakes with equal force.

Service brake systems shall be operable without requiring the operator to release the handle(s) required in [K.19.302.1](#).

Compliance is checked by inspection and by the requirements of [K.19.301.1.2](#) and [K.19.301.1.3](#).

K.19.301.1.2 Service brake system

The **service brake system** shall meet all of the following requirements:

- The **service brake system** performance shall only rely on the effectiveness of the braking system;
- The **service brake system** control shall be hand-operated;
- The **service brake system** control device shall be located within the operator's normal work position and its position shall not interfere with the position of other controls; and
- if the utility machine is equipped with combined traction clutch and brake controls, the **service brake system** engagement shall simultaneously disengage the traction clutch.

NOTE Examples of **service brake systems** include mechanical, electric and hydrostatic means.

Compliance is checked by inspection and by manual test.

The test is performed with the most unfavourable battery in accordance with K.8.14.2 e) 2).

K.19.301.1.3 The **service brake system** shall be capable of stopping the motion of the **utility machine** so that the average measured stopping distance does not exceed 0,19 m for each 1 km/h of the maximum forward speed and maximum reverse speed, if a reverse traction drive is provided.

Compliance is checked by the following test.

*The tests are conducted on a **utility machine***

- *With the **utility machine** filled to its maximum **payload** as specified in [K.8.3](#); and*
- *With pneumatic tires (if any) inflated to the maximum recommended pressures for the **utility machine** in accordance with K.8.14.2; and*
- *With brakes adjusted in accordance with K.8.14.2.*

The tests shall be conducted on a relatively smooth/flat concrete/asphalt surface.

*The **service brake system** is first conditioned by running the **utility machine** for 10 min during which 10 stops shall be performed from the maximum forward speed.*

*If a reverse traction drive is provided, this break-in period shall be extended to 20 min during which the **service brake system** shall be applied to stop the machine 10 times from maximum forward speed, and 10 times from maximum reverse speed.*

If the **utility machine** is equipped with separate traction clutch and **service brake system** controls, the traction clutch is simultaneously disengaged with the **service brake system** engagement.

After the conditioning procedure has been completed, the **service brake system** test is conducted three times in the forward direction of travel and, for a **utility machine** with a reverse traction drive, repeated three times in the reverse direction of travel.

While the **utility machine** is operating at its maximum ground speed, release the traction-drive control and apply a maximum force of 220 N to the center of the grip area of the hand control for the **service brake system**. The stopping distances are measured for each test and the average value is calculated for each direction tested.

K.19.301.1.4 Parking brake system

A **utility machine** equipped with a **service brake system** shall also be equipped with a **parking brake system**. For **utility machines** that are suitable for operation on other than flat, non-graded surfaces, the **parking brake system** shall be capable of holding the **utility machine** facing both uphill and downhill on a slope at the rated **gradability** in accordance with [K.8.14.2 b\) 101](#)).

To allow the removal of initial slack in the system, a distance of 50 mm movement is allowed during the first 30 s after the **parking brake system** has been applied. There shall be no further movement after the 30 s.

The **parking brake system** may be combined with the **service brake system**.

The maximum force to actuate the **parking brake system** shall not exceed

- 220 N for a hand-grip **parking brake system**, actuated by hand gripping motion only; or
- 330 N for a hand-lever **parking brake system**, actuated by arm motion with a hand on a lever; or
- 450 N for a foot-operated **parking brake system**.

The unlocking force shall not exceed the maximum specified actuating force.

NOTE The forces 220 N, 330 N and 450 N are considered as maximum forces that can be applied to meet the test requirements below. The operating forces during normal use would in general be less.

Compliance is checked by inspection, by measurement and by the following test.

The tests are conducted

- On the same **utility machine**;
- Under the same conditions as in [K.19.301.1.2](#);
- If applicable, place the transmission in neutral and the motor stopped;
- If so equipped, with the hydrostatic bypass valve in the normal position;
- On a smooth flat surface with a slope at the rated **gradability** in accordance with [K.8.14.2 b\) 101](#)) and a coefficient of friction such that the **utility machine** does not slide down the slope;
- With the **parking brake system** applied; and
- For a period of 5 min, or if the **parking brake system** is hydrostatic, for a period of 60 min.

K.19.302 Particular requirements for utility machines

K.19.302.1 Handles

K.19.302.1.1 Utility **carts** and **wagons** with four wheels shall have at least one handle or grasping surface and utility **carts** and **wagons** with less than four wheels shall have at least two handles or grasping surfaces fastened to the machine to prevent loss of control while in operation.

Compliance is checked by inspection.

K.19.302.1.2 Utility **wheelbarrows** shall have at least two handles or two grasping surfaces, which can ensure safe handling during use. The two handles may be connected to a single central shaft (i.e. "T" type) or interconnected and located on opposite sides of a U-shaped handle. The handles shall be rigidly attached, located at the rear of the machine, on each side of and equidistant from a centerline bisecting the **wheelbarrow**, and shall allow the operator to control the **wheelbarrow**.

Compliance is checked by inspection.

K.19.302.1.3 The handles described in [K.19.302.1.1](#) and [K.19.302.1.2](#) shall be located such that the user can operate the **motor-propulsion controls** described in K.21.18.1 of this Part 4 without releasing the handles.

K.19.303 Wheels and skids

K.19.303.1 Front wheels for single wheel type wheelbarrows shall not be of the caster-type.

K.19.303.2 **Utility machines** shall be capable of maintaining stability of movement when resting, without operator intervention, on slopes having the maximum **gradability** recommended in [K.8.14.2](#) b) 101). Wheels, skids or other structural elements may be used to provide necessary support and stability of machines at rest. When used, caster type wheels without locking mechanisms and caster type wheels with locking mechanisms engaged, shall not be required to be placed in a specific orientation by the operator for the machine to remain stable at rest once the operator lets go of the handles used for controlling the machine.

*Compliance is checked by inspection and by manual test with no **payload** and maximum **payload** and with wheels and the machine configuration in their most unfavourable position(s).*

K.19.303.3 The movement, direction and stability of **utility machines** shall be easily controllable by the operator, and shall not be influenced by unintentional movement of the wheels when the machine is in motion.

*Compliance is checked by inspection and by manual test. Wheels which freely rotate, such as caster type wheels, shall be easily controlled by the operator when the machine is operated with no **payload** and maximum **payload**.*

K.19.304 Control devices

K.19.304.1 **Control devices** shall be clearly marked, visible to and accessible by the operator from the operator's normal work position(s). **Control devices** shall not be located in the front of the machine.

K.19.304.2 **Direction controls** and **motor-propulsion controls** shall be located where they can be operated from the operator's position at the handles and shall be clearly, visibly discernable before commencing and during motor-propulsion.

Compliance is checked by inspection and test.

K.19.304.3 **Lift and hopper control devices** are not required to be located where they can be easily operated from the operator's position at the handles. However, when they are not in this location, the operator shall not be required to maintain stability of the machine while operating these controls.

Compliance is checked by the following test.

*The **utility machine** shall be placed on a **gradability** slope as recommended in [K.8.14.2 b\) 101](#)) with no payload and a maximum payload and with wheels and the machine configuration in their most unfavorable position(s). The **lift** or **hopper** is to be operated by the **control device** within its full range of motion, permitted by the control device, without the operator maintaining stability of the machine. The machine shall not tip over.*

K.19.305 Latches and securing devices

K.19.305.1 **Hoppers** which are hinged for dumping shall be equipped with a latch or other device to secure them in the normal "down" position and prevent accidental tipping. The latching system shall have sufficient endurance for extended use.

Hopper gates shall be equipped with a latch or other device to secure them, and trip handles shall be so arranged that, in dumping, the operator will be in the clear.

Compliance is checked by inspection and the following test.

The latching system shall be opened and closed as intended during normal operation for 5 000 cycles at a rate not less than 6 cycles per min. After the completion of the cycling test, the latch shall remain mechanically functional.

K.19.306 Lifts

K.19.306.1 **Lifts** shall not exceed 1.6 m (5.25 ft) in height, measured from the ground to the level of the primary load bearing surface.

K.19.306.2 **Lifts** shall operate smoothly, without jerking motions, and the average lowering speed of a lift shall not exceed 100 mm/s (0.33 ft/s).

Compliance is checked by observation and the following test:

*The machine is placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface. Parking brake systems shall be engaged to prevent movement of the machine under test. An additional force is gradually increased to the maximum **payload** as specified in [K.8.3](#), distributed equally in the **hopper**. Any latches are released. The **lift** is then operated for 5 cycles of operation from the full down position to the maximum up position allowed by the construction, then back to the fully down position. The lowering operation speed is recorded for each cycle and the average speed for all 5 cycles is determined.*

K.20.3 Replacement:

For utility machines, the test of 20.3.2 applies.

K.20.5 This subclause is not applicable.

K.20.301 Requirements for utility machines

K.20.301.1 Wheelbarrow Handles

The handles of **wheelbarrows** as required in [K.19.302.1.2](#) and their mountings shall be of durable construction and adequate strength to withstanding stress in working conditions.

Compliance is checked by inspection and the following test:

A sample of the **wheelbarrow** shall be overloaded to 150 % of the maximum specified **payload** as specified in [K.8.3](#) distributed equally in the **hopper** and placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface contamination with a coefficient of static friction between tire and surface sufficient to prevent wheel slippage. The **parking brake** may be engaged to prevent movement of the machine under test. The **wheelbarrow** shall be lifted from the grasping surfaces specified in 8.14.2 b) 6), through a vertical distance that allows the rear support wheels / skids to be lifted off the ground. The lift shall consist of a gradual application of the lifting force and shall be maintained for 1 min. The handles and their mountings shall not break loose from the equipment and there shall not be any permanent distortion, cracking or other evidence of failure which could impair compliance with this standard. If the lifts are performed using mechanical devices, superficial damage caused by fixing of cables, ropes, etc. to the handles themselves is permitted.

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

K.20.301.2 Loading strength

A **utility machine** shall have adequate loading strength.

Compliance is checked by the following test.

The **utility machine** with the **hopper** in the full “down” position is placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface. The **parking brake** may be engaged to prevent movement of the machine under test. An additional force is gradually increased to 150% of the maximum **payload** as specified in [K.8.3](#), distributed equally in the **hopper**, and applied for 1 min. During the test the **utility machine** shall not collapse, and after removing the force it shall not show any permanent deformation.

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

K.20.301.3 Machine lift strength

Machine **lifts** shall have adequate strength.

Compliance is checked by the following test.

The machine with the **lift** in the full “down” position is placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface. Parking brake systems shall be engaged to prevent movement of the machine under test. Without load, the **lift** is set in the maximum up position allowed by the construction. An additional force is gradually increased to 150% of the maximum **payload** as specified in [K.8.3](#), distributed equally in the **hopper**, and applied for 1 min. During and after the test the **utility machine** shall not collapse or show any permanent deformation.

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

K.20.301.4 Machine lift endurance

Machine **lifts** shall have adequate endurance.

Compliance is checked by the following test.

The machine, with the **lift** in the full “down” position, is placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface. **Parking brake systems** shall be engaged to prevent movement of the machine under test. An additional force is gradually increased to the maximum recommended **payload** as specified in [K.8.3](#), distributed equally in the **hopper** or on the pallet. Any latches are released. The **lift** is then operated for 1,000 cycles of operation from the full down position to the maximum up position allowed by the construction, then back to the fully down position. The machine shall be allowed to rest for 60 ± 1 s between cycles. Forced cooling of components that heat up during the test is allowed. During and after the test the **utility machine** shall not collapse or show any permanent deformation, hydraulic portions of **lift** mechanisms may leak fluid. After the cycling, the lowering speed of the **lift** shall not exceed the speed shown in [K.19.306.2](#).

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

K.20.301.5 Machine hopper strength

Machine **hoppers** shall have adequate strength.

Compliance is checked by the following test.

The machine with the **hopper** in the full “down” position is placed on a relatively smooth/flat concrete/asphalt surface that is dry and free from loose material or surface. There shall be sufficient height or space in front of the machine to dump the contents without any interference to the **hopper** system. **Parking brake systems** shall be engaged to prevent movement of the machine under test. The **payload** is gradually increased to 150% of the maximum **payload** as specified in [K.8.3](#), distributed equally in the **hopper**. Prior to starting the test, each grasping handle(s) as identified in 8.14.2 is fitted with a load of 12 ± 0.1 kg applied over a 75 mm width at the center of the handle. If only one handle is intended to be grasped while activating the **hopper** mechanism, then the 12 ± 0.1 kg mass is applied to the one handle that results in the most unfavorable condition. The **hopper** is set to its maximum up position. During and after the test, the **utility machine** shall not collapse, tip over, or show any permanent deformation, hydraulic portions of **hopper** mechanisms shall not rupture.

NOTE Equal distribution of the additional force can be achieved by using bags of sand or other similar means.

K.20.301.7 Hydrostatic pressure

Pressure-confining components of pneumatically powered systems, including hoses, fittings and hydraulic cylinders, shall withstand a hydrostatic pressure test without sustaining damage that would result in a risk of injury to persons.

Compliance is checked by the following test.

A hydrostatic strength test is to be performed by connecting the sample to a hydraulic pump, gradually increasing the pressure to 150% of the maximum measured working pressure of the system operated at 120% of the maximum **payload** as specified in [K.8.3](#) and holding the maximum attainable test pressure for a period of 30 min. Parts subject to pressure shall withstand the pressure without rupture.

K.21.18 Replacement:

Additional requirements for **motor-propulsion control** for **utility machines** are given in 21.18.301.

K.21.18.301 A **utility machines** shall be fitted with a momentary contact **motor propulsion control** which can be switched on and off from the operator's position. The **motor-propulsion control** shall not be equipped with a lock-on device.

Compliance is checked by inspection.