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**Mobile elevating work platforms —
Operator's controls — Actuation,
displacement, location and method of
operation**

*Plates-formes élévatrices mobiles de personnel — Commandes de
l'opérateur — Actionnement, déplacements, dispositions et modes de
fonctionnement*

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Control actuating forces and torques	2
5 Control locations	5
5.1 General	5
5.2 Work platform controls	5
5.3 Base or ground level controls	6
5.4 Minimum separation distance	6
5.5 Dividers or shrouds	10
6 Sizing of controls	10
7 Movement of controls	13
7.1 General	13
7.2 Multi-functional joystick controls	13
7.2.1 Combined movements	13
7.2.2 Additional controls located on a multi-functional control	14
7.3 Multi-purpose controls	14
7.4 Mode selection for multi-purpose controls	14
7.5 Activation and operation	15
7.5.1 General	15
7.5.2 Control orientation and operation — Work platform controls	15
7.5.3 Operational characteristics for lever-operated stacked or banked controls located at the work platform	16
7.5.4 Work platform control orientation zones for raising and lowering of the extending structure	16
7.5.5 Work platform control orientation zones for travelling	17
7.6 Function enable controls	19
8 Layout of controls	20
8.1 General	20
8.2 Control panel construction	20
8.3 Grouping of controls	20
8.4 Control groups for Group A MEWPs	20
8.5 Control groups for Group B MEWPs	21
8.6 MEWPs with independent left-hand and right-hand travel controls	21
9 Marking of controls	21
9.1 General	21
9.2 Marking of controls using text	21
9.3 Marking of controls using symbols	22
Bibliography	23

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 214, *Elevating work platforms*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This corrected version of ISO 21455:2020 corrects the value for the width of joystick grip hand in [Table 3](#).

Introduction

This document has been developed to provide methods of operation and requirements for operator's controls on mobile elevating work platforms. These provisions have been derived from experience, current practice, human factors literature and existing standards.

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Mobile elevating work platforms — Operator's controls — Actuation, displacement, location and method of operation

1 Scope

This document specifies the performance requirements, location, marking and method of operation related to operator's controls on mobile elevating work platforms (hereafter referred to as MEWPs) and takes into account operator safety and ergonomics.

It applies to all controls used by an operator and includes provisions for finger, thumb, hand, and foot operated controls.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16368, *Mobile elevating work platforms — Design, calculations, safety requirements and test methods*

ISO 20381, *Mobile elevating work platforms — Symbols for operator controls and other displays*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16368 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

control

device actuated by an operator to affect a response from the MEWP

3.1.1

primary control

control (3.1) used by the operator for travelling or movement of the extending structure

3.1.2

secondary control

any *control* (3.1) of the MEWP other than a *primary control* (3.1.1)

3.1.3

multi-functional control

control (3.1) which is capable of providing two or more functions simultaneously

Note 1 to entry: A multi-functional control can also be a *multi-purpose control* (3.1.4).

EXAMPLE A combination of steering and travel, or a combination of slewing and boom elevation.

3.1.4

multi-purpose control

control which, depending on the mode selected, provides separate and distinct functions using the same actuating movement

EXAMPLE A multi-purpose control can also be a *multi-functional control* (3.1.3).

3.1.5

mode select control

control (3.1) used to select the operating mode of a *multi-purpose control* (3.1.4)

EXAMPLE Travel mode, extending structure mode.

3.1.6

travel support control

control (3.1) used during travel to warn of movements or adapt the MEWP travel configuration

EXAMPLE Horn, steer mode, differential lock, torque.

3.1.7

bi-directional foot control

rocker-type foot operated pedal *control* (3.1) capable of being operated in two directions

3.2

control actuating force

force exerted at the centre of the manufacturer's specified *control* (3.1) contact surface in order to activate a *control* (3.1) function

3.3

inadvertent activation

any *control* (3.1) activation other than that intentionally initiated by the operator

3.4

operation

performance of functions of a MEWP within the scope of its specifications and in accordance with the manufacturer's instructions, work rules, and applicable governmental regulations

[SOURCE: ISO 18893:2014, 3.7]

3.5

primary working configuration

configuration of a MEWP, when in the elevated position identified by the manufacturer for *control* (3.1) orientation

3.6

primary travel configuration

configuration of a MEWP, when in the travel position identified by the manufacturer for *control* (3.1) orientation

4 Control actuating forces and torques



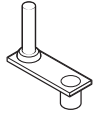
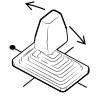
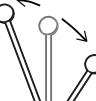
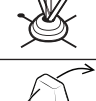
4.1 The control actuating forces and torques shall be in accordance with the values given in [Table 1](#).

4.2 The minimum strength of each control shall be sufficient to withstand at least five times its maximum actuation force without sustaining permanent damage (for example, deformation, fracture) or having its primary function impeded.

In addition, hand-operated joysticks shall be capable of withstanding a minimum force of 350 N without sustaining permanent damage (for example, deformation, fracture) or having its primary function impeded.

NOTE This additional strength requirement does not apply to additional control mechanisms as described in [7.2.2.1](#).

Table 1 — Control actuating forces and torques

Control type	Operator interaction	Force N		Torque N mm		Example Illustration
		Min.	Max.	Min.	Max.	
Push button	One finger	2,8	11	N/A	N/A	
	Thumb	2,8	23	N/A	N/A	
Toggle switch	Thumb and finger	2	20	N/A	N/A	
Crank	Wrist and finger	9 ^a	22 ^a	N/A	N/A	
	Arm movement	22 ^a	45 ^a	N/A	N/A	
Lever (forward/back)	Thumb and finger	7	50	N/A	N/A	
	Hand	9	135	N/A	N/A	
	2 hands	9	220	N/A	N/A	
Lever (left/right)	Thumb and finger	7	50	N/A	N/A	
	Hand	9	90	N/A	N/A	
	2 hands	9	135	N/A	N/A	
Joystick	Thumb and finger	2	22	N/A	N/A	
	Thumb	2	22	N/A	N/A	
	Hand	2	118	N/A	N/A	

^a Represents tangential force.
N/A Non-applicable.

Table 1 (continued)


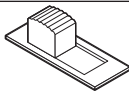





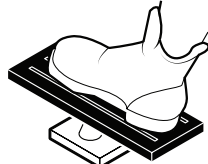
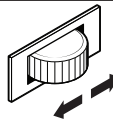
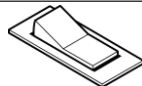




Control type	Operator interaction	Force N		Torque N mm		Example Illustration
		Min.	Max.	Min.	Max.	
Slide switch – Small (≤9 mm × 10 mm × 10 mm) (H × W × L)	Finger and thumb	2,8	4,5	N/A	N/A	
Slide switch – Large (>9 mm × 10 mm × 10 mm) (H × W × L)	Finger and thumb	2,8	11	N/A	N/A	
Knob ≤25 mm diameter	Finger and thumb	N/A	N/A	14	32	
Knob >25 mm diameter	Finger and thumb	N/A	N/A	14	42	
Rotary selector	Fingers, hand	N/A	N/A	115	680	
Key switch	Thumb and finger	N/A	N/A	115	680	
Foot control	Foot not resting on control	18	90	N/A	N/A	
	Foot resting on control	45	90	N/A	N/A	
	Bi-directional	45	135	N/A	N/A	
Thumbwheel – Discrete	Finger, thumb	1,7 ^a	5,6 ^a	N/A	N/A	
Thumbwheel – Continuous adjustment	Finger, thumb	1,7 ^a	3,3 ^a	N/A	N/A	
Rocker switch	Finger, thumb	2,8	11	N/A	N/A	
Push pull control	Two fingers	2	18	N/A	N/A	
	Hand	2	45	N/A	N/A	
Legend/membrane - Snap action contact	Finger	1,5	8	N/A	N/A	
^a Represents tangential force. N/A Non-applicable.						

Table 1 (continued)

Control type	Operator interaction	Force N		Torque N mm		Example Illustration
		Min.	Max.	Min.	Max.	
Legend/ membrane - Membrane contact	Finger	2	8	N/A	N/A	
^a Represents tangential force. N/A Non-applicable.						

5 Control locations

5.1 General

Access to controls shall be in accordance with ISO 16368:2010, 4.7.3.

5.2 Work platform controls

5.2.1 The control panel is positioned in the normal location and orientation as defined by the manufacturer.

5.2.2 Primary controls, travel support controls and emergency stop controls operated by the hand, finger or thumb shall be located at a height between 845 mm and 1 250 mm. Measurements shall be taken from the work platform floor to the point of application of the control actuating force with controls in the neutral position (see [Figure 1](#)).

5.2.3 Hand operated controls shall be located at a maximum of 500 mm from the edge of the control panel closest to the operator (see [Figure 1](#)).

5.2.4 For MEWPs operated in countries where National or other MEWP regulations allow a minimum guardrail height of 0,9 m, the controls described in [5.2.1](#) are permitted to be located at a height 155 mm below the top of the guardrails.

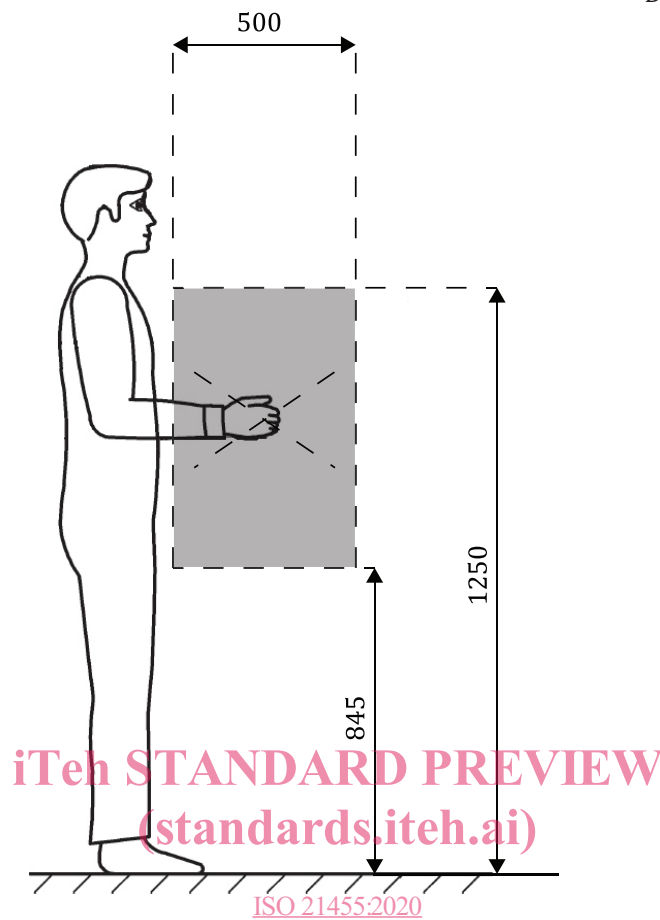


Figure 1 — Dimensions for typical standing operator relative to the operator workstation

5.2.5 Foot controls shall be positioned to minimize the operator having to twist and/or turn to reach the controls.

5.3 Base or ground level controls

Base or ground level controls, including emergency overriding system controls, shall be located in accordance with ISO 16368:2010, 4.7.3 and 4.7.8.

5.4 Minimum separation distance

5.4.1 When hand-operated controls need to be operated simultaneously, their separation distance shall not be greater than 760 mm.

5.4.2 The minimum separation distance between controls (without dividers or shrouds) shall be in accordance with [Table 2](#).

NOTE The values in [Table 2](#) take into consideration an operator wearing gloves and are based on standard cotton flame resistant anti-flash gloves [in other words, Navy flash gloves (as defined in MIL-G-2874E)].