BS ISO 16653-3:2011

BSI Standards Publication

# Mobile elevating work platforms — Design, calculations, safety requirements and test methods relative to special features

## Part 3: MEWPs for orchard operations

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**National foreword**

This British Standard is the UK implementation of ISO 16653-3:2011.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

**ISO 16653-3**

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# Mobile elevating work platforms — Design, calculations, safety requirements and test methods relative to special features —

## Part 3: MEWPs for orchard operations

*Plates-formes élévatrices mobiles de personnel — Conception, calculs, exigences de sécurité et méthodes d'essai concernant les caractéristiques spéciales —*

*Partie 3: PEMP pour vergers*

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# 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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16653-3 was prepared by Technical Committee ISO/TC 214, *Elevating work platforms*.

ISO 16653 consists of the following parts, under the general title *Mobile elevating work platforms — Design, calculations, safety requirements and test methods relative to special features*:

— *Part 1: MEWPs with retractable guardrail systems*

— *Part 2: MEWPs with non-conductive (insulating) components*

— *Part 3: MEWPs for orchard operations*

# Introduction

The object of ISO 16653 is to define rules for safeguarding persons and objects against the risk of accident associated with the operation of special-application mobile elevating work platforms (MEWPs).

The requirements of ISO 16653 are intended to supplement or modify those of ISO 16368 (see Clause 2). Unless specified otherwise within this part of ISO 16653, all the relevant provisions of ISO 16368 are applicable in addition to the provisions of this part of ISO 16653.

ISO 16653 does not repeat all the general technical rules applicable to every electrical, mechanical or structural component.

The safety requirements of this part of ISO 16653 have been drawn up on the basis that MEWPs are periodically maintained according to manufacturers' instructions, working conditions, frequency of use and applicable regulations.

It is assumed that MEWPs will be checked for function daily before start of work and that they will not be put into operation unless all required control and safety devices are available and in working order. If a MEWP is seldom used, the checks may be made before start of work.

For the application of this part of ISO 16653, it is assumed that operators are trained and competent in the operation of MEWPS in orchards.

Where, for clarity, an example of a safety measure is given in the text, this is not intended as the only possible solution. Any other solution leading to an equivalent level of safety is permissible.

The specification of a MEWP for orchard operation is not intended to limit the use of other categories of MEWPs in orchards, as long as the requirements of ISO 16368 and ISO 18893[1)] are met.

1) *Mobile elevating work platforms — Safety principles, inspection, maintenance and operation*

**INTERNATIONAL STANDARD** **ISO 16653-3:2011(E)**

# Mobile elevating work platforms — Design, calculations, safety requirements and test methods relative to special features —

# Part 3: MEWPs for orchard operations

## 1 Scope

This part of ISO 16653 specifies the design, calculations, safety requirements and test methods relevant to mobile elevating work platforms (MEWPs) suitable for orchard operations. It is intended to be used in conjunction with ISO 16368, whose requirements it modifies, supplements or confirms. Unless otherwise stated in this part of ISO 16653, the provisions of ISO 16368 apply.

This part of ISO 16553 specifies the structural design calculations and stability criteria, construction, safety examinations and tests to be carried out before a MEWP to be used in orchard operations is first put into service. It identifies the hazards arising from the use of MEWPs in orchard operations and describes methods for the elimination or reduction of those hazards.

It is applicable to single-person boom-type MEWPs, controlled from the platform and used to move a person to working positions for picking fruit and maintaining trees and trellis vines in an orchard.

NOTE These are typically non-slewing units, based on a two-wheel drive axle and a castor trailing wheel. The lift height requirements vary depending on the plants grown and climatic conditions. MEWPs used in stone fruit, pip fruit and citrus orchards typically will have a lift height of 2,5 m to 4,5 m. MEWPs used in avocado orchards will typically have a lift height up to 6,5 m with occasional units of 8 m to 10 m. At harvest time, the MEWP for orchard operations is fitted with a picking bag to collect fruit and transport it to a collection point. The rated load, including operator, is typically 170 kg to 200 kg.

## 2 Normative references

The following referenced documents are indispensable for the application 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 16368:2010, *Mobile elevating work platforms — Design, calculations, safety requirements and test methods*

## 3 Terms and definitions

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

**3.1**
**orchard**
defined area where fruit or nuts are grown commercially

# 4 Safety requirements and/or protective measures

## 4.1 Structural calculations

### 4.1.1 Rated load

The following requirements replace those given in ISO 16368:2010, 4.2.1, for calculating the rated load.

MEWPs for orchard operations are permitted one person only on the work platform.

The rated load, equivalent to a mass, $m$, shall be determined from the following equation:

$$m = m_{\mathrm{p}} + m_{\mathrm{e}} + m_{\mathrm{b}}$$

where

$m_{\mathrm{p}}$ is the mass of a person, equal to 100 kg;

$m_{\mathrm{e}}$ is the fruit load (minimum 45 kg);

$m_{\mathrm{b}}$ is the mass of the empty fruit carry bag.

The minimum rated load of a MEWP shall be 170 kg.

NOTE The mass of a person is assumed to act at a point on the work platform 0,1 m horizontal distance from the upper inside edge of the top rail.

### 4.1.2 Fatigue stress analysis

As given in ISO 16368:2010, 4.2.4.2.3 b), the number of load cycles for MEWPs used in orchard operations shall normally be $10^5$ cycles for heavy duty.

In place of the load spectrum factor given in ISO 16368:2010, 4.2.4.2.3, the load spectrum factor for MEWPs used in orchard operations shall be 1.

## 4.2 Chassis

### 4.2.1 Maximum travel speed in the elevated position

The following requirements replace those given in ISO 16368:2010, 4.3.17, for maximum travel speeds in the elevated position.

Travel speeds in the elevated travel position shall not exceed the following values:

a) 1,5 m/s at a platform lift height of 4,0 m or below;

b) 1,0 m/s at a platform lift heights above 4,0 m and up to 6,5 m;

c) 0,7 m/s at platform lift heights above 6,5 m.

Travel speed limiting across the specified platform lift height ranges shall be automatic.

Verification shall be carried out by means of a design check and functional testing. Brake and kerb tests are required for each height and speed combination.

## 4.3 Moment and load sensing

The enhanced stability/overload criteria according to ISO 16368:2010, 4.4.1.5 and 4.4.1.6, shall be deemed to have been met by work platforms meeting the dimensional requirements of 4.4.2, 2), below, and by a fruit bag of a volume not exceeding 0,15 $m^3$.

## 4.4 Work platform

### 4.4.1 Level of work platform

The requirements given in ISO 16368:2010, 4.6.1, apply, with the following exceptions/additions.

The work platform shall be permitted to operate off-level up to the chassis inclination limit set by the responsible entity.

Mechanical levelling systems using rods and levers shall be designed to take at least twice the load imposed on them.

### 4.4.2 Guardrail (protection) systems

The requirements given in ISO 16368:2010, 4.6.3, apply, with the following exceptions/additions.

— Protection shall be provided on all sides of the work platform to prevent a person on the platform from falling. The protection shall be securely fastened to the work platform and shall, as a minimum, consist of

  1) a guardrail having a minimum height of 0,9 m from the floor to the top of the rail, designed to reduce the impact hazard to the operator during travel across rough terrain, with a cross-section measured inside the guardrail not exceeding 0,65 m by 0,65 m, and

  2) a lower barrier, 0,1 m above the floor, to resist the operator's feet slipping from the work platform, with an internal cross-section not exceeding 0,7 m by 0,7 m, and openings to facilitate the clearing of orchard debris from the platform (horizontal gaps in the barrier not to exceed 0,1 m), and

  3) an intermediate barrier commencing at a maximum height of 0,55 m above the lower barrier, with an internal cross-section not exceeding 0,7 m by 0,7 m.

— The guardrails shall be constructed to withstand concentrated loads of 500 N per person, applied at the least favourable position and in the least favourable direction at 0,5 m intervals, without causing permanent deformation of the guardrails.

Verification shall be carried out by means of a design check and by visual examination.

### 4.4.3 Anchorages

The requirements for fall arrest anchorages given in ISO 16368 apply.

### 4.4.4 Openings in guardrails for entrance and exit

An opening through the top guardrail to accommodate a gate shall not be permitted.

### 4.4.5 Fruit collection bag

A fruit collection bag, where employed, shall be self-draining and shall be fitted to the outside of the platform.

## 4.5 Controls

### 4.5.1 Activation and operation of foot-operated controls designed for hands-free operation

The requirements given in ISO 16368:2010, 4.7.1, apply, with the following exceptions/additions.

— Foot-controlled orchard MEWPs designed for hands-free operation shall be deemed to meet the requirements of ISO 16368:2010, 4.7.1, for the guarding of controls and protection of control devices against activation other than by that initiated intentionally by the operator, by the employment of the following alternative solutions.

1) Foot controls shall be unguarded where the presence of a guard would introduce the risk of the control failing to return to “off” when released by the operator (or the operator being unable to release the control) because of plant and fruit debris becoming wedged between the guard and foot control.

2) Unguarded foot controls shall be mounted at, or below, the floor line of the platform and arranged such that the operator stands continuously on the controls during operation, in order to manage the risk of the controls being actuated other than intentionally by the operator.

3) Where foot controls meeting the above requirements are unguarded, the motion controls shall be automatically deactivated when the operator leaves the platform, in order to manage the risk of the operator or an unauthorized person unintentionally activating the controls when stepping onto the platform. The controls shall be re-activated only by a separate hand control. Stopping the MEWP drive engine when the operator leaves the platform is an acceptable solution.

4) Hydraulic control valves controlling any motions of the MEWP shall be full-flow, mechanically actuated, spring-return to “off”, to ensure reliability. Alternatively, electronic controls shall be designed to meet the category 1 requirements of IEC 60947-5-1[2)].

### 4.5.2 Location, accessibility, protection and selection among duplicate controls

Control handles acting directly on full-flow control valves mounted at the base shall be deemed to meet the duplication requirements of ISO 16368:2010, 4.7.3.

Further motion of the platform may be prevented by operating the emergency stop at the base controls. The platform may be recovered using the overriding emergency system.

### 4.5.3 Overriding emergency system

The overriding emergency system required in ISO 16368:2010, 4.7.8 shall be operable from both the work platform and the base.

The overriding emergency system shall remain active at all times.

### 4.5.4 Simultaneous operation of controls

Travel controls are permitted to operate simultaneously with other controls.

2) *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electro-mechanical control circuit devices*

### 4.6 Boom-lift hydraulic systems

The boom-lift hydraulic systems shall be single-acting (hydraulic pressure lift, gravity lower).

NOTE Double-acting hydraulic systems can contribute to instability of MEWPs in slippery conditions. The platform can be inadvertently forced down on a tree branch that prevents further lowering and causing weight to be lifted off the chassis drive and braking wheels.

The requirement of ISO 16368:2010, 4.10.2, to prevent unintended movement caused by failure of the external pipe also applies for orchard operations. Use of an externally pilot load-holding valve is an acceptable solution.

### 4.7 Marking

MEWPs shall be permanently and clearly marked in a prominent position stating that the MEWP is designed for use in orchards only and use for other purposes is not permitted.

## 5 Verification of safety requirements and/or measures

The following additional stability consideration applies.

Where the MEWP is fitted with a castor wheel assembly, in any applicable test required by ISO 16368 the wheel shall be positioned so as to result in the least stable situation.

# Annex A
(informative)

# List of hazards

The hazards identified by the risk assessment procedure are presented in Table A.1. These hazards are in addition to those specified in ISO 16368.

**Table A.1 — List of hazards**

| Hazards | | Relevant subclauses in this part of ISO 16653 |
|---|---|---|
| **1** | **Hazards due to starting/moving of self-propelled machinery** | |
| 1.1 | Lack of stability | 4.1.1, 4.3 |
| **2** | **Hazards due to lifting operations** | |
| 2.1 | Lack of stability | 4.4.1, 4.3, 4.6 |
| 2.2 | Loss of mechanical strength | 4.1.2, 4.4.1, 4.4.2 |
| 2.3 | Uncontrolled movements | 4.6 |
| **3** | **Hazards due to loading/overloading** | 4.3 |
| **4** | **Hazards due to lifting persons** | |
| 4.1 | Loss of mechanical strength of machinery | 4.1.2 |
| **5** | **Controls** | |
| 5.1 | Movement of work platform | 4.5.1, 4.5.3, 4.6 |
| 5.2 | Safe travel control | 4.5.1, 4.5.2, 4.5.4 |
| 5.3 | Safe speed control | 4.2.1 |
| **6** | **Falling of persons** | |
| 6.1 | Personal protective equipment | 4.4.3 |
| 6.2 | Work platform tilt control | 4.4.1 |
| **7** | **Work platform falling/overturning** | |
| 7.1 | Falling/overturning | 4.1.1, 4.2.1, 4.3 |

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