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Earth-moving machinery — Safety — Part 1: General requirements

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Construction Machinery and Construction Association (JCMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS A 8340-1**:2004 is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Ministers and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

JIS A 8340 series consists of the following 7 parts under the general title "*Earth-moving machinery—Safety*":

Part 1: General requirements

Part 2: Requirements for bulldozers

Part 3: Requirements for loaders

Part 4: Requirements for hydraulic excavators

Part 5: Requirements for dumpers

Part 6: Requirements for cable excavators

Part 7: Requirements for graders

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Earth-moving machinery — Safety— Part 1 : General requirements

Introduction

This Japanese Industrial Standard is a type-C standard (machine safety standards) as stated in **JIS B 9700-1**.

When requirements of this type-C standard are different from those which are stated in type-A standard or type-B standard, the requirements of this type-C standard take precedence over the requirements of other standards.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the scope of this Standard.

This Standard has been prepared based on the first edition of **ISO 20474-1** published in 2008 with some modifications of the technical contents. Also in this Standard, requirements applicable to Japan extracted from **ISO/TS 20474-14** which gives information on provisions that are mandatory in particular countries or regions, and related matters thereof as required are added.

The portions with continuous sidelines or dotted underlines are the matters either modified from or not given in the corresponding International Standard. A list of modifications with the explanations is given in Annex JH. Annex JA to Annex JH are not given in the corresponding International Standard.

1 Scope

This Standard specifies the general safety requirements for earth-moving machinery defined in **JIS A 8308** : 2003, which is common to two or more earth-moving machine families. Also this Standard is applicable to attachments and derivated machinery primarily designed to excavate, load, pick-up, transport and distribute, or to grade earth and rock.

This Standard is intended to be used in conjunction with other parts of **JIS A 8340** series which give the provisions of relevant machinery. A particular requirement in other parts of **JIS A 8340** series precedes the relevant requirement in this Standard. For multipurpose machinery, the part for a particular machine family relevant to the function and application of the machinery shall apply. The earth-moving machinery shall comply with the structure standard for vehicle-type construction machinery based on the Industrial Safety and Health Act, and any earth-moving machinery intended to travel on public roads shall comply with the laws and regulations relevant to road traffic provided by the national or local government.

Example : For a compact loader used as a trencher, the relevant requirements in this Standard, **JIS A 8340-3** and **ISO 20474-10** shall apply.

This Standard deals with all significant hazards, hazardous situations and hazard-

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ous events when used as intended or under conditions of misuse reasonably foreseeable by the manufacturer. This Standard practically indicates the appropriate technical measures for eliminating or reducing risks arising from significant hazards, hazardous situations or events during commissioning, operation and maintenance.

This Standard does not deal with the electrical hazards related to the main circuit and the activation of machinery when the principal power source is electrical.

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 20474-1 : 2008 *Earth-moving machinery — Safety — Part 1 : General requirements* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and the revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS A 8301 *Earth-moving machinery — Minimum access dimensions*

NOTE : Corresponding International Standard : **ISO 2860** *Earth-moving machinery — Minimum access dimensions* (IDT)

JIS A 8302 *Earth-moving machinery — Access systems*

NOTE : Corresponding International Standard : **ISO 2867** *Earth-moving machinery — Access systems* (IDT)

JIS A 8304 *Earth-moving machinery — Laboratory evaluation of operator seat vibration*

JIS A 8307 : 2006 *Earth-moving machinery — Guards — Definitions and requirements*

NOTE : Corresponding International Standard : **ISO 3457** : 2003 *Earth-moving machinery — Guards — Definitions and requirements* (IDT)

JIS A 8308 : 2003 *Earth-moving machinery — Basic types — Vocabulary*

NOTE : Corresponding International Standard : **ISO 6165** : 2006 *Earth-moving machinery — Basic types — Identification and terms and definitions* (MOD)

JIS A 8310-1 : 2006 *Earth-moving machinery — Symbols for operator controls and other displays — Part 1 : Common symbols*

NOTE : Corresponding International Standard : **ISO 6405-1** : 2004 *Earth-moving machinery — Symbols for operator controls and other displays — Part 1 :*

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Common symbols (IDT)

JIS A 8310-2 *Earth-moving machinery — Symbols for operator controls and other displays — Part 2 : Specific symbols for machines, equipment and accessories*

NOTE : Corresponding International Standard : **ISO 6405-2** *Earth-moving machinery — Symbols for operator controls and other displays — Part 2 : Specific symbols for machines, equipment and accessories* (MOD)

JIS A 8311 *Earth-moving machinery — Operator's field of view — Test method and performance criteria*

NOTE : Corresponding International Standard : **ISO 5006** *Earth-moving machinery — Operator's field of view — Test method and performance criteria* (IDT)

JIS A 8312 : 1996 *Earth-moving machinery — Safety signs and hazard pictorials — General principles*

NOTE : Corresponding International Standard : **ISO 9244** *Earth-moving machinery — Machine safety labels — General principles* (MOD)

JIS A 8313 *Earth-moving machinery — Product identification numbering systems*

NOTE : Corresponding International Standard : **ISO 10261** *Earth-moving machinery — Product identification numbering system* (IDT)

JIS A 8314 *Earth-moving machinery — Rubber-tyred machines — Steering requirements*

NOTE : Corresponding International Standard : **ISO 5010** *Earth-moving machinery* — Rubber *tyred machines — Steering requirements* (MOD)

JIS A 8315 : 2010 *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

NOTE : Corresponding International Standard : **ISO 3411** : 2007 *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope* (IDT)

JIS A 8316 *Earth-moving machinery — Electromagnetic compatibility*

NOTE : Corresponding International Standard : **ISO 13766** *Earth-moving machinery — Electromagnetic compatibility* (IDT)

JIS A 8317-1 *Earth-moving machinery — Determination of sound power level — Dynamic test conditions*

NOTE : Corresponding International Standard : **ISO 6395** *Earth-moving machinery — Determination of sound power level — Dynamic test conditions* (MOD)

JIS A 8317-2 *Earth-moving machinery — Determination of emission sound pressure level at operator's position — Dynamic test conditions*

NOTE : Corresponding International Standard : **ISO 6396** *Earth-moving machinery — Determination of emission sound pressure level at operator's*

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position — Dynamic test conditions (MOD)

JIS A 8318 *Earth-moving machinery — Seat index point (SIP)*

JIS A 8319 *Earth-moving machinery — Determination of ground speed*

NOTE : Corresponding International Standard : **ISO 6014** *Earth-moving machinery — Determination of ground speed* (IDT)

JIS A 8320 *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*

NOTE : Corresponding International Standard : **ISO 6016** *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components* (MOD)

JIS A 8322 *Earth-moving machinery — Units for dimensions, performance and capacities, and their measurement accuracies*

JIS A 8323 *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

NOTE : Corresponding International Standard : **ISO 12508** *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges* (IDT)

JIS A 8324 *Earth-moving machinery — Electrical wires and cables — Principles of identification and marking*

JIS A 8325 *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*

NOTE : Corresponding International Standard : **ISO 10265** *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems* (IDT)

JIS A 8326 : 2003 *Earth-moving machinery — Operator's seat — Dimensions and requirements*

NOTE : Corresponding International Standard : **ISO 11112** : 1995 *Earth-moving machinery — Operator's seat — Dimensions and requirements* (IDT)

JIS A 8327 *Earth-moving machinery — Machine-mounted forward and reverse audible warning alarm — Sound test method and performance criteria*

NOTE : Corresponding International Standard : **ISO 9533** *Earth-moving machinery — Machine-mounted forward and reverse audible warning alarm — Sound test method* (MOD)

JIS A 8328 *Earth-moving machinery — Lift-arm support devices*

NOTE : Corresponding International Standard : **ISO 10533** *Earth-moving machinery — Lift-arm support devices* (IDT)

JIS A 8330-2 *Earth-moving machinery — Operator enclosure environment — Part 2 : Air filter test*

NOTE : Corresponding International Standard : **ISO 10263-2** *Earth-moving machinery — Operator enclosure environment — Part 2 : Air filter test*

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JIS A 8330-3 *Earth-moving machinery — Operator enclosure environment — Part 3 : Operator enclosure pressurization test method*

NOTE : Corresponding International Standard : **ISO 10263-3** *Earth-moving machinery — Operator enclosure environment — Part 3 : Operator enclosure pressurization test method* (MOD)

JIS A 8330-4 *Earth-moving machinery — Operator enclosure environment — Part 4 : Operator enclosure ventilation, heating and/or air conditioning test method*

NOTE : Corresponding International Standard : **ISO 10263-4** *Earth-moving machinery — Operator enclosure environment — Part 4 : Operator enclosure ventilation, heating and/or air-conditioning test method* (MOD)

JIS A 8330-5 *Earth-moving machinery — Operator enclosure environment — Part 5 : Windscreen defrosting system test method*

NOTE : Corresponding International Standard : **ISO 10263-5** *Earth-moving machinery — Operator enclosure environment — Part 5 : Windscreen defrosting system test method* (MOD)

JIS A 8331 *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements*

NOTE : Corresponding International Standard : **ISO 10532** *Earth-moving machinery — Machine-mounted retrieval device — Performance requirements* (IDT)

JIS A 8332 *Earth-moving machinery — Dumper body support and operator's cab tilt support devices*

NOTE : Corresponding International Standard : **ISO 13333** *Earth-moving machinery — Dumper body support and operator's cab tilt support devices* (IDT)

JIS A 8333-1 *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 1 : Test method*

NOTE : Corresponding International Standard : **ISO 14401-1** *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 1 : Test methods* (MOD)

JIS A 8333-2 *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 2 : Performance criteria*

NOTE : Corresponding International Standard : **ISO 14401-2** *Earth-moving machinery — Field of vision of surveillance and rear-view mirrors — Part 2 : Performance criteria* (MOD)

JIS A 8334 *Earth-moving machinery — Operator's manual — Content and format*

NOTE : Corresponding International Standard : **ISO 6750** *Earth-moving machinery — Operator's manual — Content and format* (IDT)

JIS A 8335 *Earth-moving machinery — Performance requirements for non-metallic*

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fuel tanks

NOTE : Corresponding International Standard : **ISO 21507** *Earth-moving machinery — Performance requirements for non-metallic fuel tanks* (IDT)

JIS A 8336 *Earth-moving machinery — Visual display of machine operation*

NOTE : Corresponding International Standard : **ISO 6011** *Earth-moving machinery — Visual display of machine operation* (IDT)

JIS A 8340-3 *Earth-moving machinery — Safety — Part 3 : Requirements for loaders*

JIS A 8345 *Earth-moving machinery — Key-locked starting systems*

NOTE : Corresponding International Standard : **ISO 10264** *Earth-moving machinery — Key-locked starting systems* (IDT)

JIS A 8346 *Earth-moving machinery — Articulated frame lock — Performance requirements*

NOTE : Corresponding International Standard : **ISO 10570** *Earth-moving machinery — Articulated frame lock — Performance requirements* (IDT)

JIS A 8407 *Earth-moving machinery — Zones of comfort and reach for controls*

NOTE : Corresponding International Standard : **ISO 6682** *Earth-moving machinery — Zones of comfort and reach for controls* (MOD)

JIS A 8411-1 *Earth-moving machinery — Definitions of dimensions and codes — Part 1 : Base machine*

JIS A 8422-1 : 2010 *Earth-moving machinery — Dumpers — Part 1 : Terminology and commercial specifications*

JIS A 8910 : 2004 *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*

NOTE : Corresponding International Standard : **ISO 3471** : 2008 *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements* (MOD)

JIS A 8911 *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests*

NOTE : Corresponding International Standard : **ISO 6683** *Earth-moving machinery — Seat belts and seat belt anchorages — Performance requirements and tests* (IDT)

JIS A 8919 : 2007 *Earth-moving machinery — Operator's controls*

NOTE : Corresponding International Standard : **ISO 10968** : 2004 *Earth-moving machinery — Operator's controls* (MOD)

JIS A 8920 *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*

NOTE : Corresponding International Standard : **ISO 3449** *Earth-moving machinery — Falling-object protective structures — Laboratory tests and*

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performance requirements (IDT)

JIS A 8921-2 *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2 : Roll-over protective structures (ROPS) for hydraulic excavators of over 6 t*

NOTE : Corresponding International Standard : **ISO 12117-2** *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2 : Roll-over protective structures (ROPS) for excavators of over 6 t* (IDT)

JIS B 8265 *Construction of pressure vessel — General principles*

NOTE : Corresponding International Standard : **ISO 16528-1** *Boilers and pressure vessels — Part 1 : Performance requirements* and **ISO 16528-2** *Boilers and pressure vessels — Part 2 : Procedures for fulfilling the requirements of ISO 16528-1* (overall evaluation : MOD)

JIS B 8361 *Hydraulic fluid power — General rules relating to systems*

NOTE : Corresponding International Standard : **ISO 4413** *Hydraulic fluid power — General rules relating to systems* (IDT)

JIS B 9700-1 *Safety of machinery — Basic concepts, general principles for design — Part 1 : Basic terminology, methodology*

NOTE : Corresponding International Standard : **ISO 12100-1** *Safety of machinery — Basic concepts, general principles for design — Part 1 : Basic terminology, methodology* (IDT)

JIS B 9700-2 *Safety of machinery — Basic concepts, general principles for design — Part 2 : Technical principles*

NOTE : Corresponding International Standard : **ISO 12100-2** *Safety of machinery — Basic concepts, general principles for design — Part 2 : Technical principles* (IDT)

JIS B 9705-1 *Safety of machinery — Safety-related parts of control systems — Part 1 : General principles for design*

NOTE : Corresponding International Standard : **ISO 13849-1** *Safety of machinery — Safety-related parts of control systems — Part 1 : General principles for design* (IDT)

JIS C 0920 *Degrees of protection provided by enclosures (IP Code)*

NOTE : Corresponding International Standard : **IEC 60529** *Degrees of protection provided by enclosures (IP Code)* (IDT)

JIS C 3663-4 *Rubber insulated cables — Rated voltages up to and including 450/750 V — Part 4 : Cords and flexible cables*

JIS C 3664 *Conductors of insulated cables*

JIS C 8269-1 *Low-voltage fuses — Part 1 : General requirements*

JIS D 1201 *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

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NOTE : Corresponding International Standard : **ISO 3795** *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials* (MOD)

JIS D 5301 *Lead-acid starter batteries*

JIS Z 9101 *Safety colours and safety signs — Design principles for safety signs in workplaces and public areas*

ISO 8084 *Machinery for forestry — Operator protective structures — Laboratory tests and performance requirements*

ISO 12509 : 2004 *Earth-moving machinery — Lighting, signalling and marking lights, and reflex-reflector devices*

ISO 15998 *Earth-moving machinery — Machine-control systems (MCS) using electronic components — Performance criteria and tests for functional safety*

ISO 19472 *Machinery for forestry — Winches — Dimensions, performance and safety*

ISO 20474-10 *Earth-moving machinery — Safety — Part 10 : Requirements for trenchers*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS B 9700-1** and the following apply.

3.1 earth-moving machinery

self-propelled or towed base machine on wheels (including trucks), crawlers or legs fitted, having equipment and/or attachment, primarily designed to perform excavation, loading, transportation, drilling, spreading, compacting or trenching of earth, rock or other materials (**JIS A 8308** : 2003, definition **3.1.1**)

3.1.1 compact machine

earth-moving machinery having an operating mass (see **JIS A 8320**) of not more than 4 500 kg, or in the case of compact excavators, the hydraulic excavators having an operating mass of not more than 6 000 kg

3.1.2 derivated machinery

earth-moving machinery fitted with equipment and/or attachment that modifies its function

NOTE : In the European Economic Area (EEA), an equipment and/or attachment defined in **JIS A 8320** that modifies the function of a machine and that is intended to be assembled by the operator are possible to be "interchangeable equipment" in the sense of the Machinery Directive.

3.2 attachment, working tool

component or assembly of components that can be mounted onto the base machine or

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equipment for a specific use (see **JIS A 8411-1**, **JIS A 8411-2** and **JIS A 8320**)

3.2A equipment

set of components fitted with the base machine that allows an attachment to perform the primary designed function of the machinery (see **JIS A 8320** and **JIS A 8411-2**)

3.3 attachment bracket

device to facilitate quick interchange of an attachment

3.4 object handling

(This term is defined in the corresponding International Standard; however, the object handling is banned in Japan by laws and regulations as the unintended use, therefore this term is not adopted in this Standard.)

3.5 maximum rated operating (lift) capacity

(This term is defined in the corresponding International Standard; however, the object handling is banned in Japan by laws and regulations as the unintended use, therefore this term is not adopted in this Standard.)

3A List of significant hazards

The list of significant hazards is given in Annex JA as reference.

NOTE : Annex JA includes all hazards, hazardous situations and hazardous events specified in this Standard which are common to two or more earth-moving machinery based upon the risk assessment, and require measures to eliminate or reduce the risk thereof.

4 Safety requirements/protective measures

4.1 General

The earth-moving machinery shall comply with the safety requirements and/or protective measures of this clause as far as these are not modified by the specific requirements in other parts of **JIS A 8340** series. In addition, the machinery shall be designed according to **JIS B 9700-1** and **JIS B 9700-2** in the case where other hazard out of the list of Annex JA is found in the machinery based upon the risk assessment.

4.2 Access systems

4.2.1 General requirements

The machinery shall be provided with adequate systems to access the operator's station and areas for the routine maintenance.

Adequate access systems shall comply with **JIS A 8302**.

The routine maintenance defined in **JIS A 8307** : 2006 shall be performed by the operator as described in the instruction handbook.

Effect of mud on the means of access system shall be minimized by adequate design.

4.2.2 Access to articulated machine

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On machines with articulated frames and in the fully articulated steering position, a minimum clearance of 150 mm for the lower limbs shall be provided between firm structures and components with relative movement in the path of the access systems to the operator's station as given in figure 1.

Unit : mm

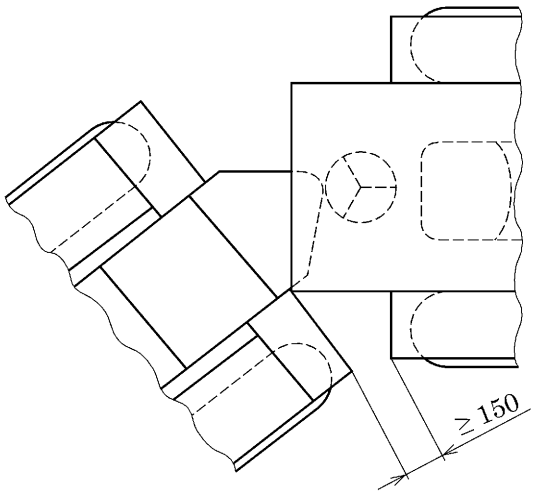


Figure 1 Minimum clearance of lower limbs at access system to operator's station on machines with articulated steering

4.3 Operator's station

4.3.1 General

4.3.1.1 Outfit of machine

Machines with an operating mass of less than 1 500 kg are not required to have a cab.

Machines with an operating mass of not less than 1 500 kg (see **JIS A 8320**) shall be designed and manufactured so that a cab can be equipped.

Machines under the following conditions shall have a cab.

— If the machine is intended for use at the place where the protection for the operator from the severe weather condition is required.

— If the machine is intended for use in unhealthy environment, e.g., contaminated area.

If a hazard due to projection of fractured material exists, e.g., operation with hydraulic- or demolition-hammer, protection such as impact-resistant material, a mesh guard or an equivalent protection are required. The need for additional protection for such applications, based upon the risk assessment, shall be described in the instruction handbook.

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4.3.1.2 Minimum space

The minimum space available to the operator shall comply with **JIS A 8315** : 2010 (except the part given in **4.3.2.5**).

The minimum space and the location of the operator's controls at the operator's station shall meet the requirements in **JIS A 8407**.

For a compact machine, the width of minimum space (not less than 920 mm in figure 4 of **JIS A 8315** : 2010) may be reduced to 650 mm or more.

4.3.1.3 Moving parts

Measures shall be taken to avoid accidental contact from the operating position with moving parts such as wheels, crawlers, or equipment and/or attachment, as defined in relevant requirements given in **4.14**.

4.3.1.4 Engine exhaust

The engine exhaust system shall release the exhaust gas away from the operator and the air inlet of the cab.

4.3.1.5 Storage of instruction handbook

A storing space for keeping safely the instruction handbook and other instruction manuals shall be provided near the operator's station. For a machine without a cab, measures shall be taken to proof the instruction handbook against rainwater.

4.3.1.6 Sharp edges

The operator's working space within the cab and the circumference of operator's station [1)], e.g., ceiling, inner walls, indicator panels and access system to the operator's station, shall not present any sharp exposed edges or acute angles/corners. The radius of corners and the bluntness of edges shall comply with **JIS A 8323**, in order to avoid sharp edges (see also **4.14.6**).

4.3.1.7 Pipes and hoses

Pipes and hoses located within the cab and the circumference of operator's station [1)] in which hazardous fluids of pressure higher than 5 MPa or temperature higher than 50 °C flow shall be guarded according to clause **9** of **JIS A 8307** : 2006.

Pipes and hoses should be placed outside the cab and the circumference of operator's station [1)] as far as possible.

Parts or components placed between pipes or hoses and the operator that divert, for example, a hazardous spray of fluid, may be considered as the efficient protective devices.

Note [1)] Here, this means not only the operator's seat without a cab but the whole space required for the operation.

4.3.2 Operator's station equipped with cab

4.3.2.1 Resistance to weather

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The cab shall be capable of installing an adjustable heating system and a ventilation system, a defrosting system for windows, and the pressurizing means of the cab so as to protect the operator against foreseeable adverse climatic conditions. For details, see **4.3.2.6** to **4.3.2.8**.

4.3.2.2 Pipes and hoses

For pipes and hoses in the cab, see **4.3.1.7**.

4.3.2.3 Primary access opening

The cab shall be provided with a primary access opening, and the dimensions thereof shall comply with **JIS A 8302**.

4.3.2.4 Emergency exit

The cab shall be provided with an emergency exit on the other side than that of the primary access opening. The dimensions of the emergency exit shall comply with **JIS A 8302**. A window panel or other door is acceptable, if it is easy to be opened or to be removed. Latches may be used, if they can be opened from inside without the use of key or tool. The breaking of glass panel is considered to represent a suitable alternative emergency exit, provided that the necessary hammer to break the glass panel immediately accessible to the operator is provided and stored in the cab.

When the window panel is used as an emergency exit, it shall bear an appropriate display (see Annex 2 of **JIS Z 9104** : 2005, diagram number E 001 or E 002 of **ISO 7010**, etc.)

4.3.2.5 Space height of operator's station

The value of minimum space height R_1 measured from the seat index point (hereafter referred to as "SIP", see **JIS A 8318**) defined in **JIS A 8315** : 2010 shall be as given in table 0A.

Table 0A Space height of operator's station according to division of machinery

Unit : mm

Division of machinery	Minimum space height from SIP R_1
Compact machine	920
All other machinery	1 000

Minimum dimensions given in table 0A are required for the machinery under the condition where a front window (or a rear window) is retrieved overhead of the operator's station.

4.3.2.6 Heating and ventilation system

The case where the cab is provided with a heating system shall be as follows.

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a) It shall comply with **JIS A 8330-4**.

b) The heating capacity may be determined by calculation alternative to the measurement of heating capability.

The ventilation system shall be capable of providing the cab with filtered fresh air at a minimum of 43 m^3/h. The filter shall be tested according to **JIS A 8330-2**.

NOTE : The selection of filter element depends on the intended operating environment conditions.

c) It shall have a capability of raising the temperature inside the cab and keeping it at +18 °C under an expected atmospheric temperature. The heating system shall have a capability to raise the temperature by 25 °C within at least 30 min. This test shall be performed in such a way that the engine is activated at the working temperature designated by the manufacturer.

The heating capability shall be measured at three points. These three points shall be located on a vertical plane through SIP and parallel to the lengthwise axis of the machine as follows (see figure 2).

1) Filament position centre-point defined in **JIS A 8311**

2) SIP defined in **JIS A 8318**

3) 100 mm above floor and 600 mm forward SIP

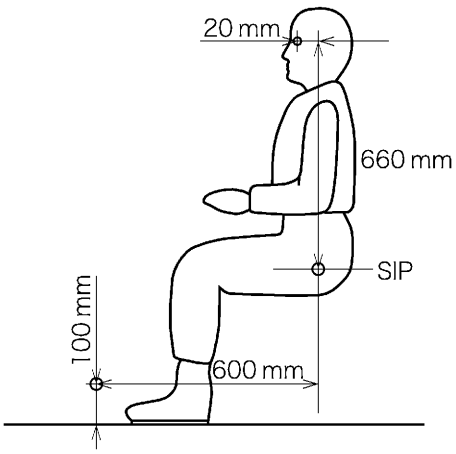


Figure 2 Location of measuring points

4.3.2.7 Defrosting system

The defrosting system shall have the capability to defrost front window and rear window, for example, by means of a heating system or a particular defrosting device.

The test method for windscreen defrosting system shall be according to **JIS A 8330-5**.

4.3.2.8 Pressurization system

Where a cab is provided with a pressurization system, it shall be tested according to **JIS A 8330-3**, and shall provide an interior relative pressure of at least 50 Pa.

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4.3.2.9 Doors and windows

Doors and windows shall be capable of holding in their functional positions, and measures shall be taken for preventing inadvertent opening. Doors shall be held at their intended operating positions by an engagement device mechanically. The door of primary access opening that is designed to be held securely open at an intended operating position shall be releasable from the operator's station or the entry platform to the operator's station. Windows shall be made of safety glass or other material having similar safety performance (e.g., see **JIS R 3211**).

Roof windows do not require additional mechanical safeguard.

The front window and the rear window shall be equipped with an electric windshield wiper and washer.

4.3.2.10 Inner lighting

The cab shall be provided with a fixed inner lighting system capable of illuminating the operator's enclosure such that the operator can read the instruction handbook, even if the engine is stopped.

4.3.3 Operator-protective structure

4.3.3.1 General

The earth-moving machinery having a operator's seat shall be equipped with a roll-over protective structure (hereafter referred to as "ROPS"). The ROPS shall comply with **JIS A 8910** : 2004 or **JIS A 8921-2**, whichever is applicable.

4.3.3.2 ROPS for derivated machinery

The earth-moving machinery equipped with the work piece for derivated machinery shall be equipped with ROPS which is designed by taking into account the operating mass defined in **JIS A 8320** corresponding to the heaviest configuration designated by the manufacturer.

4.3.4 Falling-object protective structure (FOPS)

The earth-moving machinery excluding the exceptions given in **JIS A 8920** shall be so designed that the falling-object protective structure (hereafter referred to as "FOPS") can be equipped when it is intended for applications where there is a risk of falling objects.

The FOPS to be fitted shall comply with **JIS A 8920**.

If a FOPS is required by other part of **JIS A 8340-3**, the manufacturer shall provide the corresponding FOPS according to the demand thereof.

4.3.5 Elevating operator's station

The requirements on the elevating operator's station shall be as given in Annex JB.

4.3.6 Replacement of operator-protective structure

In the case where any part of the protective structures such as ROPS, FOPS and TOPS (tip-over protective structure) is affected by plastic deformation or rupture as a

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consequence of roll-over, falling-object impact, tipping-over or the like, the protective structure shall be replaced according to manufacturer's specifications (see **6.2**).

4.4 Seats

4.4.1 Operator's seat

4.4.1.1 General requirements

Machinery with provision for a seated operator shall be provided with an adjustable seat that supports the operator in a position allowing the operator to control the machine under the intended operating conditions.

4.4.1.2 Dimensions

The seat dimensions shall comply with **JIS A 8326** : 2003.

4.4.1.3 Adjustment

All adjustments to accommodate the operator's size shall comply with **JIS A 8326** : 2003, and shall be adjustable without the use of any tool as follows.

a) Front-back direction adjustment (l_2 in table 1 of **JIS A 8326** : 2003) shall be at least ±35 mm, or the frequently used operator's controls shall be adjustable.

b) Vertical adjustment allowance (h_1 in table 1 of **JIS A 8326** : 2003) is not required.

4.4.1.4 Vibration

For the operator's seat, the damping capacity of vibration transmitted to the operator's body shall meet the requirements in **JIS A 8304**.

4.4.1.5 Restraint system

Machinery provided with the operator-protective structure shall be equipped with an operator restraint system (e.g., seat belt) which meets the requirements in **JIS A 8911**. Other machines should also be equipped with a seat belt.

4.4.2 Additional seat

4.4.2.1 Instructor's seat

If an additional seat for an instructor is installed in the operators enclosure, it shall be padded and shall provide adequate space for the instructor. The instructor shall also have available a conveniently placed handhold. This seat shall also meet the requirements for safety structures in **4.3.3** for ROPS and **4.3.4** for FOPS.

4.4.2.2 Second operator's seat

If, for particular machinery, a second operator's seat is required, which can be frequently or alternatively used by the operator to operate the machine, this seat shall meet all the requirements for seats given in **4.4** as well as those for safety structures in **4.3.3** for ROPS and **4.3.4** for FOPS.

4.5 Operator's controls and indicators

4.5.1 General

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The operator's controls (levers, joysticks, pedals, switches, etc.) and indicators of the machine, equipment and attachment shall be according to **JIS A 8919**, and chosen, designed, constructed and arranged according to the following.

a) The operator's controls and indicators shall comply with **JIS A 8407** and **JIS A 8919** : 2007, and easily accessible to hands or feet.

b) The neutral position of operator's controls shall correspond to **5.1.3** of **JIS A 8919** : 2007.

c) The operator's controls and indicators shall be clearly identified according to **JIS A 8310-1** : 2006 and **JIS A 8310-2** in the operator enclosure, and explained in the instruction handbook (see **6.2**).

d) The movement of operator's controls for activating functions and indicators shall correspond to the intended effect or common practice whenever possible.

e) The normal engine stop device shall be within the zone of reach as defined in **JIS A 8407**.

f) When an operator's control such as a keyboard or joystick lever (see the requirements for joysticks defined in **JIS A 8919** : 2007) is designed and constructed to perform several of the machine's functions, the activated functions shall be clearly identified.

g) For the safety functions of control system(s) having no electronic components, the principles given in **JIS B 9705-1** shall be followed, or methods giving similar protection shall be applied.

NOTE : See **4.17.1** for the safety functions of control system(s) using electronic components.

4.5.2 Starting system

The starting system of earth-moving machinery shall be provided with a starting device (e.g., a key), and shall comply with **JIS A 8345** or have similar safety system.

The earth-moving machinery shall be so designed that hazardous movement of the machine, equipment or attachment shall not occur by starting the engine.

4.5.3 Inadvertent activation

The operator's controls that can cause a hazard due to inadvertent activation shall be so arranged, deactivated or guarded as to minimize the risk, particularly while the operator is getting into or out of the operator's station. The deactivation system shall either be the self-acting or shall act by the compulsory actuation of the relevant system.

4.5.4 Pedals

The pedals shall be of an appropriate size and shape, and shall be adequately spaced. They shall have a slip-resistant surface and be easy to clean. If the pedals of earth-moving machinery have the same function (clutch, brake and accelerator) as those of vehicles, they shall be arranged in the same manner in order to avoid the risk

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of confusion.

4.5.5 Emergency lowering of work piece

Even if the engine is stopped, the following are required to be performed.

a) The operator shall be capable of lowering equipment and/or attachment to the ground or the frame.

b) The operator shall be capable of seeing the lowering equipment and/or attachment from the operating position where the lowering operation is activated.

c) The operator shall be capable of releasing residual pressure in each of hydraulic circuit and pneumatic circuit which causes a risk.

The means to lower the work piece and the device to release the residual pressure may be located outside the operator's enclosure. In this case, it shall be described in the instruction handbook.

4.5.6 Uncontrolled motion

Machine and equipment/attachment movement from the holding position — other than by actuation of the controls by the operator — due to drift or creep (e.g. by leaking) or when power supply stops, shall be limited to the extent that it cannot create a risk to exposed persons.

4.5.7 Remote control

(Requirements specified in the corresponding Standard are not adopted.)

4.5.8 Control panels, indicators and symbols

4.5.8.1 Control panels

The operator shall be able to see from the operator's station, in either daylight or darkness, the necessary indicators allowing a check of the proper function of the machine. Glare shall be minimized.

4.5.8.2 Indicators

Control indicators for the safe and proper operation of the machine shall be according to **JIS A 8336** in respect of the use of safety colours and requirements.

4.5.8.3 Symbols

Symbols used on operator's controls and other indicators of earth-moving machinery shall be according to **JIS A 8310-1** : 2006, **JIS A 8310-2** and the like.

4.5.9 Operations of ride-on machinery accessible from ground level

On the ride-on machinery where the operator's controls are accessible from the ground, means shall be provided to minimize the possibility of the operation from the ground.

Example : Latches on door, protection by guard or interlocking

4.6 Steering system

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4.6.1 General

The steering system shall be such that the movement of the steering control corresponds to the intended direction of steering according to **JIS A 8919** : 2007.

4.6.2 Wheeled (rubber-tyred) machines

The steering system of wheeled machines with the forward/reverse travel speed over 20 km/h shall comply with **JIS A 8314**.

4.6.3 Crawler machines

The steering system of crawler machines with the forward/reverse travel speed over 20 km/h shall be gradual.

4.7 Braking systems

The earth-moving machinery shall be provided with a service brake system, a secondary brake system and a parking brake system being efficient under all conditions of service, load, speed, terrain and slope according to the intended use of the machine.

Braking systems shall comply with the following.

a) For wheeled machines, Annex JF

b) For crawler machines, **JIS A 8325**

c) For pedestrian-controlled machines, Annex JG

In addition to above, the braking systems of machines not intended to travel on public roads shall comply with the structure standard for vehicle-type construction machine based on the Industrial Safety and Health Act, and any earth-moving machinery intended to travel on public roads shall comply with the laws and regulations relevant to road traffic.

4.8 Visibility

4.8.1 Operator's visibility

The earth-moving machinery shall be designed so that the operator has sufficient visibility according to **JIS A 8311** from the operator's station in relation to the travel and work areas of the machinery necessary for its intended use.

NOTE 1 The travel mode according to **JIS A 8311** is considered to be representative for testing visibility in both the travel mode and the work mode.

The earth-moving machinery shall be provided with rear view mirrors complying with **JIS A 8333-1** and **JIS A 8333-2**.

NOTE 2 Measurement should be performed with the most challenging attachment within the limits of the intended use.

4.8.2 Lighting, signalling and marking lights, and reflectors

The lighting, signalling and marking lights, and reflectors shall comply with the relevant items in **ISO 12509** : 2004.

4.9 Audible warning alarm and safety labels

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The earth-moving machinery shall be equipped with the following.

— An audible warning alarm (horn) with a sound pressure level of not less than 93 dB (A) measured at 7 m from the front end of base machine defined in **JIS A 8411-1**, which is capable of operating from the operator's station. The test method shall be according to **JIS A 8327**.

— Safety labels as given in Annex JC (see also **6.1**).

4.10 Tyres and rims

The wheeled earth-moving machinery shall have the load performance of tyres and rims according to the machine's purpose and application. The rims shall be easily identified according to **4.10A**.

4.10A Identification of rims

4.10A.1 In order to identify the following **a**) to **c**), codes shall be used.

a) Nominal diameter of rim (see table 0B)

b) Nominal width between flanges

c) Nominal height of flange or nominal profile of rim

4.10A.2 Codes shall be marked on the rim by using the codes of **a**) to **b**).

a) Nominal diameter of rim

b) Nominal width between flanges

The marking shall be on the conspicuous position even after the tyre is mounted.

When the manufacturer of rim/wheel mounts a disk, the code shall be marked on either the disk or the rim.

The code shall be marked on the surface visible from outside for the separable flange. The height and the nominal diameter shall be marked.

Table 0B Rim diameter of tyre for earth-moving machinery

Unit : mm

Code of rim diameter	Nominal diameter *D*
24TG	614.4
25	635.0
29	736.6
33	838.2
35	889.0
39	990.6
43	1 092.2
45	1 143.0
49	1 244.6
51	1 295.4
56.5	1 435.1
57	1 447.8
59.5	1 511.3
63	1 600.2

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