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SINGAPORE STANDARD

Specification for personal fall-arrest systems

– Part 6 : System performance tests

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This Singapore Standard was approved by the General Engineering and Safety Standards Committee on behalf of the Standards Council of Singapore on 16 October 2006.

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		Mr Eugene Yong Kon Yoon	*Singapore Contractors Association Limited*

The Technical Committee on Personal Safety and Ergonomics appointed by the General Engineering and Safety Standards Committee and responsible for the preparation of this standard consists of representatives from the following organisations:

		Name	Capacity
Chairman	:	Assoc Prof Foo Swee Cheng	*Member, General Engineering and Safety Standards Committee*
Secretary	:	Ms Barbara Bok	*SPRING Singapore*
Members	:	Mr Choo Choong Huat	*Singapore Institution of Safety Officers*
		Mr Go Heng Huat	*Occupational Safety and Health Division, Ministry of Manpower*
		Mr Ajai Kumar	*Association for Singapore Marine Industries*
		Mr Patrick Ker	*Back Society Singapore*
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Members	:	Ms Ng Kim Lan	*Occupational and Environmental Health Society*
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		Mr Sze Thiam Siong	*SETSCO Services Pte Ltd*
		Mr Tan Jway Kwee	*Institution of Engineers Singapore*
		Mr Raymond Wong	*Singapore Contractors Association Limited*
		Mr Yoong Chi Meng	*Occupational Safety and Health Division, Ministry of Manpower*

The Working Group appointed by the Technical Committee to assist in the preparation of this standard comprises the following experts who contributed in their *individual capacity*:

		Name
Convenor	:	Mr Winston Yew
Members	:	Mr Chin Sze Kiong
		Mr Anthony Lee
		Mr Francis Ng
		Mr Seah Chong An
		Mr Jaymes Tan
		Mr Tan Kai Hong
		Mr Ronnie Tan
		Mr Raymond Wong

The organisations in which the experts of the Working Group are involved are:

Association for Singapore Marine Industries
Institution of Engineers Singapore
Jubilant International Pte Ltd
Ministry of Manpower
PDS International Pte Ltd
QMT Industrial and Safety Pte Ltd
QSS Safety Products (S) Pte Ltd
Singapore Contractors Association Limited
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National Foreword

This Singapore Standard was prepared by the Technical Committee on Personal Safety and Ergonomics under the purview of the General Engineering and Safety Standards Committee.

This standard, which comes in six parts, supersedes the requirements for safety harnesses described in SS 402 : Part 1 : 1997 – 'Industrial safety belts and harnesses – Part 1 : General requirements' and SS 402 : Part 2 : 1997 – 'Industrial safety belts and harnesses – Part 2 : Permanent anchors'. The requirements for safety belts are currently been revised.

The six parts of SS 528, to be read in conjunction, are as follows:

Part 1 : Full-body harnesses
Part 2 : Lanyards and energy absorbers
Part 3 : Self-retracting lifelines
Part 4 : Vertical rails and vertical lifelines incorporating a sliding-type fall arrester
Part 5 : Connectors with self-closing and self-locking gates
Part 6 : System performance tests

This part of SS 528 is identical with ISO 10333-6 : 2004 – 'Personal fall-arrest systems – Part 6 : System performance tests', published by the International Organization for Standardization.

Attention is also drawn to the following:

1. Where the words 'International Standard' appear, they should be interpreted as 'Singapore Standard'.

2. The comma has been used throughout as a decimal marker in ISO 10333-6, whereas in Singapore Standards it is a practice to use a full-point on the baseline as the decimal marker.

3. The reference to International Standards shall be replaced by the following Singapore Standards:

International Standard	Corresponding Singapore Standard
ISO 10333-1 : 2000	SS 528 : Part 1 : 2006 – Specification for personal fall-arrest systems – Full-body harnesses
ISO 10333-2 : 2000	SS 528 : Part 2 : 2006 – Specification for personal fall-arrest systems – Lanyards and energy absorbers
ISO 10333-3 : 2000	SS 528 : Part 3 : 2006 – Specification for personal fall-arrest systems – Self-retracting lifelines
ISO 10333-4 : 2002	SS 528 : Part 4 : 2006 – Specification for personal fall-arrest systems – Vertical rails and vertical lifelines incorporating a sliding-type fall arrester
ISO 10333-5 : 2001	SS 528 : Part 5 : 2006 – Specification for personal fall-arrest systems – Connectors with self-closing and self-locking gates
ISO 10333-6 : 2004	SS 528 : Part 6 : 2006 – Specification for personal fall-arrest systems – System performance tests

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NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions.*

2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR.*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 10333-6 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 4, *Personal equipment for protection against falls*.

ISO 10333 consists of the following parts, under the general title *Personal fall-arrest systems*:

— *Part 1: Full-body harnesses*

— *Part 2: Lanyards and energy absorbers*

— *Part 3: Self-retracting lifelines*

— *Part 4: Vertical rails and vertical lifelines incorporating a sliding-type fall arrester*

— *Part 5: Connectors with self-closing and self-locking gates*

— *Part 6: System performance tests*

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Introduction

Fall arrest equipment has been traditionally manufactured and tested as discrete components, which are then linked together in series to form a personal fall arrest system (PFAS) by the user, before commencing work.

This requires personnel in the supply and use chain who are capable of deciding which combinations of components can be linked together and which of those cannot.

Over the years, a continuous process of fall simulation and strength testing has revealed the dangers of linking incompatible components together, as a result of test failures, near misses and accidents. Examples have included: inadvertent release of connections, localized overloading or overstressing of components, and unexpected decrease in performance levels. These incidents occurred because insufficient analysis and attention had been paid to the particular combination of components in question, and because the interaction between the components in a fall was unknown.

Further investigation showed that the behaviour of a complete system under test could reveal shortcomings which could not be detected when the individual components of the same system were tested separately.

Consequently, in 1979 and 1985, other fall arrest standards with a lineage back to 1947 were revised to ensure that performance tests were conducted on complete systems. This allowed the complete PFAS to be tested in the actual mode of use, and an arrested fall to be simulated as closely as possible under test conditions.

This part of ISO 10333 fully supports the essential requirements of the range of current International Standards written to specify the components that are used to form personal fall arrest systems, i.e. the other parts of ISO 10333, and ISO 14567.

However, in recognizing the importance of complete personal fall arrest system performance tests, this part of ISO 10333 provides test methods for situations where it is both important and desirable to ascertain satisfactory system performance and interactive component compatibility. It goes beyond that required in the above component standards by specifying system performance testing applicable to complete personal fall arrest systems, as opposed to component testing, which only requires tests on individual components.

In cases where the hazard of falling from a height exists and where, for technical reasons or for work of very short duration, safe access cannot be otherwise provided, it is necessary to consider the use of PFAS. Such use should never be improvised and its adoption should be specifically provided for in the appropriate formal provisions for safety in the work place.

PFAS complying with this part of ISO 10333 ought also to satisfy ergonomic requirements and only be used if the work allows means of connection to a suitable anchor device of demonstrated strength and if it can be implemented without compromising the safety of the user. Personnel need to be trained and instructed in the safe use of the equipment and be observant of such training and instruction.

This part of ISO 10333 is based on current knowledge and practice concerning the use of PFAS that incorporate a full-body harness as specified in ISO 10333-1.

This part of ISO 10333 presumes that the manufacturer of the PFAS, subsystems or components will, for the sake of consistency and traceability, operate a quality management system which will comply with national and regional regulations in force at the time. Guidance on the form this quality management system may take can be found in ISO 9000.

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Specification for personal fall-arrest systems – Part 6 : System performance tests

1 Scope

This part of ISO 10333 specifies tests and requirements for complete personal fall arrest systems (PFAS) made up from specific combinations of components and subsystems selected from those conforming to the other parts of ISO 10333 and to ISO 14567, where it is both important and desirable to ascertain satisfactory system performance and interactive component compatibility. It includes PFAS performance tests using a rigid torso test mass as a surrogate for the faller. Examples of personal fall arrest systems, as well as descriptions of how components or subsystems may be connected together to constitute a system, are also given.

This part of ISO 10333 is applicable to PFAS limited to single-person use of a total mass not exceeding 100 kg and, when activated, will arrest the person and limit the arresting force to a maximum of 6 kN.

It is not applicable to

a) PFAS which use waist belts or chest harnesses as the sole body holding component,

b) PFAS incorporating lanyards without energy absorbers or without a means of energy dissipation,

c) subsystems and components outside the PFAS scopes of the other parts of ISO 10333 and ISO 14567, or

d) equipment used for material lifting purposes.

Where other features are integral with components and subsystems which allow them to be assembled into other types of safety system associated with personal fall arrest systems – for example, work positioning systems (WPS), fall restraint systems (FRS), controlled descent systems (CDS), confined space access systems (CSAS) or rescue systems (RS) – this part of ISO 10333 relates only to the fall arrest function of such components and subsystems.

This part of ISO 10333 does not specify those additional requirements that would apply when personal fall arrest systems are subjected to special conditions of use (where, for example, there exist unusual limitations concerning access to the place of work and/or particular environmental factors).

NOTE Personal fall arrest systems outside the scope of this part of ISO 10333 need to be performance tested in the manner in which they are intended to be used, taking into account the workplace geometry. Advice will need to be sought from the equipment manufacturer accordingly.

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 10333-1:2000, *Personal fall-arrest systems — Part 1: Full-body harnesses*

ISO 10333-2: 2000, *Personal fall arrest systems — Part 2: Lanyards and energy absorbers*

ISO 10333-3: 2000, *Personal fall arrest systems — Part 3: Self-retracting lifelines*

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ISO 10333-4: 2002, *Personal fall arrest systems — Part 4: Vertical rails and vertical lifelines incorporating a sliding-type fall arrester*

ISO 10333-5:2001, *Personal fall-arrest systems — Part 5: Connectors with self-closing and self-locking gates*

ISO 14567:1999, *Personal protective equipment for protection against falls from a height — Single-point anchor devices*

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