
Comparison of worldwide escalator and moving walk safety standards —

Part 2: Abbreviated comparison and comments

*Comparaison des normes mondiales de sécurité des escaliers
mécaniques et trottoirs roulants —*

Partie 2: Comparaison abrégée et commentaires



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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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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/TR 14799-2 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

ISO/TR 14799 consists of the following parts, under the general title *Comparison of worldwide escalator and moving walk safety standards*:

- *Part 1: Rule by rule comparison*
- *Part 2: Abbreviated comparison and comments*

Introduction

At the 1995 Plenary Meeting of ISO/TC 178, the work on a comparison of world-wide standards which includes the American, Australian, European, Russian, and Japanese escalator and moving walk safety code was passed to ISO/TC 178 WG 5 (Resolution Singapore 1995/114). In October 1995, Working Group 5 was officially formed to carry out the task of preparing a cross reference between the relevant sections of these standards and to analyse the differences on selected subjects. The goal at that time was to prepare a technical report which would provide reference information to assist national committees when reviewing and revising individual standards which may initiate a gradual convergence of the technical requirements. In 1996 the study was expanded to include the Korean safety standard.

The content of this report is based on the information provided by the WG 5 members acting in personal capacity.

This Technical Report is intended to aid standards writers in developing their safety requirements, and to help standards users understand the basis for the requirements as they are applied throughout the world.

This Technical Report is not intended to replace existing safety standards which may have been updated. Conclusions are arrived at in some cases, but only where is unanimity amongst the various experts. In other cases, the reasons for the divergent views are expressed.

This Technical Report must be read in conjunction with the various safety standards. Unless approved by the relevant standard writing organisations the information contained in this report does not necessarily represent the opinions of these standards writing organizations (see bibliography for references).

The Technical Report was done with the European Standard EN 115: 1995 and its amendment A1: 1998 as a reference document shown as the only one in its normal sequence. All other codes are not in their normal sequence and logical order. They are structured differently to EN 115. The result incorrectly leaves the impression of incompleteness of these standards. These standards in their original structure inclusive of their references to other standards and requirements are however complete.

Comparison of worldwide escalator and moving walk safety standards —

Part 2: Abbreviated comparison and comments

1 Scope

This Technical Report consists of a comparison of the requirements of selected topics as covered by the following world-wide safety standards (excluding local deviations):

- a) Europe (CEN) – EN 115; Safety rules for the construction and installation of escalators and passenger conveyors (Edition January 1995 and amendment A1: 1998);
- b) USA - ASME A 17.1-1996; Safety Code for Elevators and Escalators

NOTE The requirements for Canada (B 44) are generally the same as for the USA. Any differences are stated in the text.

- c) Australia - AS 1735 parts 5 and 6 for escalators and moving walks (Edition 1996);
- d) Japan – Safety requirements mainly comprised of Building Standard Law Enforcement Order (BSLJ-EO), Notifications of Ministry of Construction (MOC-N, No. 1110-1981) and draft of Japan Elevator Association Standard (JEAS);
- e) Russia – PUBEE 10-77-94, Regulations for the installation and safe use of escalators (Edition 1995);
- f) Korea – The Elevator Inspection Standards, KATS 2001-414 Edition according to the Korea Elevator Law 4482, both cover the safety requirements on the escalator and moving walk.

It should be noted that in addition to the above listed standards and other regulations, escalators and moving walks may be required to conform to the requirements of other standards as appropriate. Where ISO/TC 178/WG 5 was aware of these standards they are mentioned in the bibliography.

2 Acronyms, abbreviated designations and terminology

2.1 Acronyms and abbreviated designations

The following acronyms and abbreviated designations are used by the codes compared when making reference to regulations and organisations:

— ANSI	American National Standards Institute
— AS	Australian Standard
— ASME	American Society of Mechanical Engineers
— BSLJ	The Building Standard Law of Japan
— BSLJ-EO	The Building Standard Law Enforcement Order (Japan)
— CEN/CENELEC	Comité Européen de Normalisation (European Committee for Standardisation)
— CIRA	Commission Internationale pour la Réglementation des Ascenseurs et Monte-charge
— CSA	Canadian Standards Association

— EIS	The Elevator Inspection Standard (Korea)
— EMSIS	Elevator Manufacturing, Safety and Inspection Standard under KOSHA (Korea)
— EN	European Norm (Standard)
— EUIL-MO	Electrical Utilities Industry Law - Ministerial Ordinance of technical standards for electrical equipment
— EXP.	Explanation/ interpretation of BSLJ-EO, MOC-N (Japan)
— IEC	International Electrotechnical Commission
— ISO	International Organization for Standardization
— JEAC	Japan Electrical Association Code
— JEAS	Japan Elevator Association Standard
— JIS	Japanese Industrial Standard
— KATS	Korean agency for technology and standards
— KEL	Korea Elevator Law
— KOSHA	Korean Occupational Safety and Health Act
— MINR	Ministry of Industry and Natural Resources (Korea)
— MITI	Ministry of Trade and Industry (Korea)
— MOC-N	Notifications of the Ministry of Construction (Japan)
— NEC	National Electrical Code
— NFPA	National Fire Protection Association (USA)
— OSHA	Occupational Safety and Health Administration (USA)
— PUBEE	Regulations for Installation and Safe Operation of Escalators (Russia)

2.2 Terminology (List of terms used in the codes)

Table 1 shows those terms which are used differently for the same item in the standards dealt with. Definitions in the Russian, Japanese and Korean standard are based on unofficial translation whereas the terms in European, American and Australian codes are official language.

The items in parenthesis reference the clauses where the terms are used in the various standards.

Table 1 — Differences in terminology (List of terms used in the codes)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
auxiliary brake (12.3.1, 12.4.1, 12.6)	main drive shaft brake (804.3b)	brake (additional) (5.5.2)	main drive shaft brake	emergency brake (5.2.6)	
balustrade decking (5.1.5.1.4)	high deck balustrades (802.3g, 802.3h, 805.1b)		deck board	balustrade cornice	
balustrade exterior panelling (5.1.5.1.5)	exterior panel		exterior panel		
balustrade interior panelling (5.1.5.1.3)	interior panel 802.3a, 802.3d)		interior panel		
brake load (3.9b))	brake rated load (802.9c, 804.3a, 904.3b, 805.1h)	brake rated load (5.5.1 (parts 5 and 6), same as rated load)			
criss-cross (5.2.4, 7.3.1)		crossed-trusses (3.3.6)	criss-cross		
factor of safety (9.1.2, 9.2.1)	design factor of safety (802.10)	factor of safety (2.7, 3.7, 5.2)	safety factor		
height above the steps (7.3.1, 7.6)	head-room (802.12)	head-room (3.6.9)	height above the steps		height from the step (EIS 4.3.2 (10))
inclination (10)	slope/inclination (802.1, 802.9b, 802.9c)	slope (2.157.19 (part 1), 2.3)			3.3.1 (2), (4)
inspection doors and trap door (5.3)	access door/plate (US) (806.1a, 806.1b, 806.3); access (Can)	hatch cover (4.2)			
interior profile (5.1.5.1.2)	low-deck interior (802.3d)	transition (3.3.1.2, Fig. 2.2)			

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
multiplex chain (12.3.1)	multi-strand chain				
newel (5.1.5.1.6)	newel (802.3a, 802.6d, 805.1b, 805.1t, 805.2b)	newel (2.157.15 (part 1), 3.4.5)		handrail inlet	
not easy to ignite (0.5.1)	non/limited combustible (801.1)	not combustible (3.1, 3.6)			non/limited combustible
passenger conveyor	moving walk	moving walk	moving (side) walk		moving walk
rated load ^a	rated load ^a (802.9, 802.9a, 802.9b, 802.9c, 804.3a(2), 804.3b, 805.1b)	rated load ^a (2.119 (part 1), 2.6 (parts 5 and 6))	rated load ^a		rated load (4.3.1 (2) and (3))
rated speed ^a (3.6)	rated speed ^a (803, 803.1, 805.1c)	rated speed ^a (2.4)	rated speed ^a		- speed of stepping plates (3.3.1 (4)) - rated speed (EIS Inspection Report)
skirting (3.5, 5.1.5.1.1)	skirt (panel) (802.3d, 802.3e, 802.3f, 802.5d, 805.1h)	skirting (2.157.18 (part 1), 3.3.7 (part 5))	skirt guard (panel)	skirting	skirt guard (4.3.1 (11) and (12))
structural load	structural rated load (802.9a)	structural rated load (2.6.1 (part 6))			
supporting structure (5.3)	truss 801, 801.1, 802.7, 802.9a, 802.10, 806.1, 806.1b, 806.3)	truss (2.157.21 (part 1), 3.2)	truss		
supporting structure (of the combs) (8.3.2.4, 8.3.2.6, 16.2.1.1.1)	comb plate (805.1h, 805.1k, 805.1s, 805.1u, 802.4b, 802.6a, 807.3), access plate (806.1b, 806.3)	comb plate (3.5)	comb plate		

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
theoretical capacity (3.8)		full capacity (2.1.1)		carrying capacity	transport capacity (EIS Inspection Report)
underside (5.1.1.3)					
	machinery rated load (802.9b)	machine rated load (same as rated load in part 5), 2.6.2 (part 6)			
	conventional/modular moving walk (802.9b, 802.9c, 802.10)				
	skirt obstruction device (805.3f)	skirt pressure switch (6.16)	skirt guard switch (JEAS-406G (draft), 2.1)		
	skirtless (902.3e)				
		end plate (8.3, part 6)			
					stepping plate (generic term for step, pallet, rubber belt) (3.3.1 (2), 3.3.1 (3), 3.3.1 (4))
					- fixed type handrail (3.3.1 (3), 4.3.2 (7))
					- moving type handrail (4.3.2 (4), 4.3.2 (5))
					surface of stepping plate (3.3.1 (2))

Table 1 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 parts 5 & 6 (Australia)	Japanese Regulations	PUBEE (Russia)	Korean Code
					non-reversal device and/or braking device (3.3.2 (7), 4.3.1 (4), 4.3.1 (5))
(diff. definition)	flat step (802.6e)	(diff. definition)	(flat step)		
^a definitions vary from code to code (see annexes); terms in European, American and Australian code are official language					

3 Basis for escalator and moving walk safety standards

3.1 Historical origin and development of standards

3.1.1 The European Standard EN 115

3.1.1.1 Why do we have EN 115?

The ever increasing number of escalators put in operation in Europe after the Second World War required the drawing up of guidelines for models and safety for escalators, especially as not all European countries had their own standard or National Regulation for escalators.

So, in the early 1960s specialists/experts from 7 European countries joined together and founded the “Commission Internationale pour la Réglementation des Ascenseurs et Monte-charge” (CIRA). The CIRA draft for escalators was produced in June 1972, containing safety guidelines for escalators to protect persons and objects against possible accidents and injury.

The Technical Committee CEN/TC10 “lifts” established the group WG2 in June 1974 with the request to prepare a draft European Standard for escalators and moving walks.

The convenorship of this work group was initially given to a member of the German delegation. In December 1974 the German convenor distributed a first proposal for the construction and installation of escalators founded on the CIRA guidelines, which after careful examination through the “CEN/TC10 WG2” was submitted to all member countries of the CEN for consideration in June 1977.

It should be noted that the EC Committee BTS2 gave the CEN a mandate for drawing up this standard in 1976.

Finally following a second and a third draft the final edition of the European Standard EN 115 was prepared and accepted by CEN on 3rd January, 1995 (firstly amended January 1998).

According to the Internal Regulations of CEN/ CENELEC, the CEN Members are bound to give this EN 115 the status of a National Standard without any national deviations.

The following countries are CEN Members:

Austria, Belgium, Czech Republic, Denmark, Germany, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland, Spain and the United Kingdom.

3.1.1.2 How did we get EN 115?

The drawing up of the harmonised European Standard removed the technical trade restraints on the escalators and moving walks within the CEN countries listed above. The safety level of the CIRA Directives Edition June 1972 and the existing national regulations or standards of the CEN Member States essentially became reference documents which illustrate how the new standard was derived.

Therefore all CEN members are bound to follow the CEN/ CENELEC requirements and all national standards for escalators and moving walks are superseded by the harmonised EN 115 standard.

3.1.1.3 What is the code (law, standard, requirement)?

The purpose of the EN 115 is to define minimum safety requirements in order to reduce the possibility of accidents on escalators and moving walks.

The harmonised standard is essentially a method of demonstrating compliance with the essential safety requirements of the machinery directive which is embodied in the laws of each country member of CEN/CENELEC and therefore demonstrates compliance with the laws of the member states.

3.1.1.4 Is EN 115 a compulsory standard?

Some exceptions are possible (such as sections 0.3 and 1.3).

3.1.1.5 Is EN 115 a technical description, a requirement or a recommendation?

Compliance with EN 115 is one way to satisfy the requirements of the European Machinery Directive.

3.1.1.6 Is EN 115 a performance or a design standard?

EN 115 has to be considered as a minimum requirement for safe operation of escalators and moving walks.

3.1.2 The American Standard A17.1

3.1.2.1 Why do we have A17.1?

A17.1 is intended to enhance public health and safety. It serves as the basis for state, municipal, and other jurisdictional authorities in drafting regulations governing the installation, testing, inspection, maintenance, alteration, and repair of elevators, dumbwaiters, escalators, moving walks, material lifts with automatic transfer devices, wheelchair lifts, and stairway chair lifts. It is also intended as a standard reference of safety requirements for the guidance of architects, engineers, insurance companies, manufacturers, and contractors, and as a standard of safety practices for owners and managements of structures where equipment covered in the Scope of the Code is used.

3.1.2.2 How did we get A17.1?

The use of elevators and escalators began to rapidly expand in the early 1900's, as larger and taller buildings were transforming American cities into high rise population centers. With the growth of the elevator industry, came a proliferation of new manufacturers and maintenance organizations that lacked the knowledge and background of the industry developers. They often, because of this lack of experience, failed to understand or enforce safe practices in the work they performed.

It became apparent that in order for these cities with their high rise buildings to remain viable, the public had to have unwavering faith in the safety of the elevators that made these buildings usable. A safety code developed by experts in the field of vertical transportation would help develop this public confidence.

In 1915, ASME assembled a committee of engineers who were knowledgeable about elevators and charged them with developing a set of standards for elevator manufacturers, architects, consulting engineers, insurance inspectors, and building owners. The committee recognized the harmful influence of wear, rough usage, and atmospheric conditions under which elevator apparatus must operate, particularly on door locks, interlocks, and electrical contacts.

This effort resulted in the first edition of the A17.1 code being developed in 1921. New editions are periodically published, which in recent years has been every third year. An addenda is published annually between editions. The 16th edition is now in the process of being finalized and published.

3.1.2.3 What is the code (law, standard, requirement)?

The A17.1 Safety Code for Elevators and Escalators is a voluntary reference standard that is used by people and organizations involved in the industry. Developed by a consensus of experts in the industry, it is used to guide them in maintaining a high level of safety in their respective functions.

After it is developed by the ASME under the auspices and consensus procedures established by ANSI, it becomes an American National Standard.

3.1.2.4 Is A17.1 a compulsory standard?

As published, A17.1 is a voluntary standard. It is used by authorities having jurisdiction as a basis for the code they enforce and becomes law when the governing legislative body over their jurisdiction, adopts it.

3.1.2.5 Is A17.1 a technical description, a requirement or a recommendation?

A17.1 presents most of its requirements as mandatory when following the standard. However, some rules may be in the form of a permissive recommendation.

3.1.2.6 Is A17.1 a performance or a design standard?

The A17.1 code is developed as a performance standard under the procedures established by the ASME. Because of the unique nature of the industry, some rules are of a design nature, but efforts are continually underway to replace them with performance language.

3.1.3 The Australian Standards AS 1735 parts 5 and 6

3.1.3.1 Why do we have AS 1735 parts 5 and 6?

The mission statement of Standards Australia (The body writing the above mentioned standards in Australia) states the general position relative to having appropriate standards namely:

"To excel in meeting the needs of Australia's technical infrastructure for contemporary, internationally aligned Standards and related services which enhance the nation's economic efficiency, international competitiveness, and fulfil community desire for a safe and sustainable environment"

In the specific case of escalators and moving walks, the accent is on writing standards that provide for a minimum level of safety for the users of these units and for the mechanics servicing the equipment.

All state government safety relevant acts provide for public and employee safety.

The "Occupational Health and Safety Acts", through their regulations and code of practices, require escalators and moving walks comply with the provisions in AS 1735 parts 5 and 6. (In the case of Victoria the requirement is to employ "published technical standards" in the hazard control process and AS 1735 is the example shown in the code of practice tables).

AS 1735 parts 5 and 6 are the "reference tools" employed by the various state inspectorates of lifts, escalators and moving walks and they form the basis of the newly emerging self regulatory legislative frame work.

3.1.3.2 How did we get AS 1735 parts 5 and 6?

Standards Australia was founded in 1922. Its original name was the Australian Commonwealth Engineering Standards Association. It became the Standards Association of Australia in 1929 and in 1950, it was granted a Royal Charter. In 1988 its trading name was changed to Standards Australia.

The workings of the original Australian Commonwealth Engineering Standards Association was to produce hand-written minutes of all meetings in minute books.

The first reference to escalator installations can be found in a record dated 18 July 1932.

The first reference to glass is in the 1935 edition of the standard ASCA3. (ASCA 3 is the predecessor to AS 1735).

In a 1944 minute book there is a reference to A.S.A. 17.1 1937.

Standards were and are produced under the umbrella of Standards Australia and its predecessors by an open process of consultation and consensus in which all interested parties are invited to participate.

Specifically the interested parties in AS 1735 parts 5 and 6 are the lift companies, governmental institutions, consultants, architects and, through an owners association, the users.

3.1.3.3 What is the code (law, standard, requirement)?

The intent and purpose of AS 1735 Parts 5 and 6 is to prescribe uniform requirements for use within Australia and Australian territories that will provide for the safety of the users and mechanics of escalators and moving walks.

3.1.3.4 Are AS 1735 parts 5 and 6 compulsory?

AS 1735 parts 5 and 6 on their own have no legal standing however the standards are cited in all state government safety relevant acts.

The "Occupational Health and Safety Acts" in force in all states and territories with the exception of Victoria make AS 1735 parts 5 and 6, through their regulations and code of practices, compulsory.

(In the case of Victoria the requirement is to employ "published technical standards" in the hazard control process. AS 1735 is an example shown in the Victoria code of practice tables as one standard that may be employed as a specification for hazard control with the design and manufacture of escalators and moving walks)

3.1.3.5 Are AS 1735 parts 5 and 6 technical descriptions, requirements or recommendations?

AS 1735 parts 5 and 6 contain all of the above to form a standard for escalators and moving walks.

Technical descriptions show up in the nomenclature as well as in the clauses. The contents of the clauses are, when the standards are called up, compulsory requirements and the notes may be read as recommendations or as one example of satisfying a particular requirement.

3.1.3.6 Are AS 1735 parts 5 and 6 performance or design standards?

AS 1735 parts 5 and 6 are prescriptive design standards.

NOTE At this point in time (May 1999) a change over to adopting EN 115 as the basis for AS 1735 parts 5 & 6 is nearly complete. The amended standard AS 1735 part 5 will contain both escalators and moving walks.

Part 6 is being reserved for accelerating moving walks and will be revisited in the last quarter of the year 2000. The next version of AS 1735 part 5 will contain as a basis the content of EN 115.

The EN 115 content will be amended to reflect Australian requirements. To indicate a change or an additional requirement to EN 115, appropriate markings are being inserting alongside the EN 115 text. The substance of an amendment of an item indicated will be contained in an amendment section appended at the rear of the publication.

3.1.4 The Japanese Codes

3.1.4.1 Why do we have Japanese Codes?

3.1.4.2 How did we get Japanese Codes?

Japanese codes are comprised of the following laws and standards.

3.1.4.2.1 The Building Standard law of Japan (BSLJ)

3.1.4.2.1.1 Enactment of the law

This law was enacted in May 1950 and has been revised several times.

3.1.4.2.1.2 Purpose of this law

The purpose of the law is to safeguard the life, health, and property of people by providing minimum standards concerning the site, construction, equipment, and, use of buildings and thereby to contribute to the furtherance of the public welfare.

3.1.4.2.1.3 Equipment of buildings

Equipment of buildings are electricity, gas, water supply, drain, ventilation, heating, air-conditioning, fire extinguishing, smoke removal or equipment of dirt disposal, chimneys, elevatory equipments, lightning conductors.

3.1.4.2.1.4 Elevatory equipment (Article 36)

Concerning elevatory equipments, technical standards which are required for safety, fire prevention, appropriate sanitation are specified by Cabinet Order.

3.1.4.2.2 The Building Standard Law Enforcement Order (BSLJ-EO)

3.1.4.2.2.1 This order was established in November 1950 and has been revised several times.

3.1.4.2.2.2 Construction of escalators is described in Article 129-11.

3.1.4.2.2.3 Structural calculation for escalators is described in Article 129-13.

3.1.4.2.3 Notifications of the Ministry of Construction (MOC-N)

The notifications describe an indistinct part of BSLJ and BSLJ-EO.

The following notifications relate to the escalators and moving walks:

- No.1110: Case establishing construction standards for escalators of special construction
- No.1825: Case specifying persons, etc. having qualifications for periodical inspection of special buildings

3.1.4.2.4 Japanese Industrial Standard (JIS)

3.1.4.2.4.1 This standard was established by Ministry of International Trade and Industry in 1949. JIS A 4302 (Inspection Standard of Elevator, Escalator and Dumbwaiter) has been published in 1964 as the first edition and revised several times.

3.1.4.2.4.2 This standard stipulates inspection items, inspection apparatus method and standard of judgement in order to inspect the safety concerning traction type elevator, escalator, moving walk and electrical dumbwaiter installed in building, structure, etc.

NOTE Moving walk is treated therein as escalator of special construction.

3.1.4.2.4.3 Escalators and moving walks are described in item 4.4.

3.1.4.2.5 Japan Elevator Association Standard (JEAS)

3.1.4.2.5.1 This standard was established in June 1974 and has been revised several times.

3.1.4.2.5.2 The purpose of this standard is to stipulate the universal standard for elevator and escalator industry unifying the correct application and method of laws, JIS, etc. and thereby to facilitate to the negotiation with the competent authorities.

3.1.4.2.5.3 It is recommended that some of the content stipulated be enacted as law or incorporated into JIS.

3.1.4.2.6 Electrical Utilities Industry Law Ministerial Ordinance of technical standards for Electrical Equipment (EUIL-MO)

3.1.4.2.6.1 The standard was established in July 1965 as the Ministerial Ordinance of the Ministry of International Trade and Industry, and shall be revised if deemed necessary.

3.1.4.2.6.2 The purpose of the standard is to safeguard the applicable electrical apparatus.

3.1.4.2.6.3 This stipulates the facility standard where enclosed electrical apparatus both for commercial and home use.

3.1.4.2.7 Japan Electrical Association Code (JEAC)

3.1.4.2.7.1 This code was established in November 1963 and shall be revised if deemed necessary.

3.1.4.2.7.2 The purpose of this code is to safeguard the applicable electrical apparatus and contribute to the convenient electricity use.

3.1.4.2.7.3 The code shall to electrical apparatus both for commercial and home use. Provided it shall not stipulate anything concerning facilities of vessels, vehicles or air planes.

3.1.4.2.7.4 The code stipulates the technical matters subjected to follow, so that no humans or animals may be exposed to any hazard by electrical apparatus or products.

3.1.4.3 What is the code (law, standard, requirement)?

The codes consist of four kinds of laws (BSLJ, BSLJ-EO, MOC-N, and EUIL-MO) and three kinds of standards (JIS, JEAS and JEAC).

3.1.4.4 Are the Japanese Codes compulsory standards?

The Japanese codes are compulsory standards.

3.1.4.5 Are the Japanese Codes a technical description, a requirement or a recommendation?

The Japanese codes are technical descriptions, requirements, and recommendations.

3.1.4.6 Are the Japanese codes performance or design standards?

The Japanese codes are considered as performances and design standards.

3.1.5 The Russian Standard PUBEE

3.1.5.1 Why do we have the Russian Code?

The Regulations for Installation and Safe Operation of Escalators (PUBEE) of Russia set safety requirements to the design and manufacture, installation and modernisation, repairs and operation of escalators.

PUBEE is compulsory for all organisations and companies independently of forms of property.

3.1.5.2 How did we get PUBEE?

Escalators began to be widely used in the former USSR in the 1930s and the 1940, in the period of construction of the Moscow Metropolitan.

As a result, for the first time during those years there were made effective safety rules for escalators, which were periodically reviewed. The latest edition of PUBEE was released in 1995 to replace the 1977 edition of the document.

Within the whole effective period, PUBEE has been updated and its fulfilment controlled by a special technical service - the technical supervision body. This supervision body changed its official name more than once. Now it is called the Federal Mining and Industrial Supervision Body of Russia (Gosgortekhnadzor of Russia).

3.1.5.3 What is the code (law, standard, requirement)?

PUBEE's level is that of a standard.

3.1.5.4 Is PUBEE a compulsory standard?

PUBEE is the standard obligatory for the application during design and manufacture, installation and operation, repairs and modernisation of escalators.

PUBEE is compulsory for all organisations and companies independently of forms of property.

3.1.5.5 Is PUBEE a technical description, a requirement or a recommendation?

Safety requirements are the main content of PUBEE.

3.1.5.6 Is PUBEE a performance or a design standard?

As far as design requirements are concerned, the latest edition of PUBEE is certainly a design standard.

3.1.6 The Korean Code

3.1.6.1 Why do we have the Korean Code?

In the middle of 1980 the total number of elevators has been increased quite fast. The number of accident has been increasing while the local market restriction was abolished in 1985, so that the necessity to control the elevators and escalators safety had been recognised.

KOSHA, Korean Occupational Safety and Health Act expanded its scope to the elevators and escalators in 1986 in order to secure the occupational safety at the work place.

KEL (Korea Elevator Law) 4482, formulated in 1991, defines its purpose in article 1 that "to improve quality of elevators (including escalators) and ensure the users' safety."

3.1.6.2 How did we get the Korean Code?

The Korean elevator market had been protected by the Korean Government from 1970 to 1985. Through out the period only few suppliers got the business license with the condition to submit technology transfer plan.

Before 1985 the necessity for an elevator code was not so high. But since the market became free and everyone could import or make elevator components or products. It was obvious that a certain elevator code had to be developed in Korea.

The KOSHA expanded the scope into the elevator safety in 1986 led by industrial safety people and developed a system. But the system did not work well.

From 1988 to 1991 the industry had campaigned to develop a special law on elevator. Eventually the efforts made successful results so that KEL 4482 was formulated in December 1991 which became the one of five laws related to industrial standardisation and quality.

3.1.6.3 What is the code (law, standard, requirement)?

3.1.6.4 Is the Korean Code a compulsory standard?

KEL 4482 is the law having mandatory regulations. The technical standards comprise the parts of the law.

3.1.6.5 Is the Korean Code a technical description, a requirement or a recommendation?

3.1.6.6 Is the Korean Code a performance or a design standard?

The law likely prescribes performance requirement rather than design requirement. But for the major components the law addresses the type approval and registration. The type approval standards are technical requirement specifying the detail of components so that non-compliant parts or components cannot be used in Korea.

In case of escalator inspection standard, non-compatible area between A 17.1 and EN 115 was excluded in order to avoid the trade conflict. As the results the standard has been loosely shaped excluding critical contents.

NOTE The total number of escalator installation shows 5200 units in July 1998. The accident rates are relatively lower than one fatality and 3 injuries were reported since the last 5 years. The accident rates are almost double to the elevators and the higher rates are expected in the future.

The Korean situation shows that the design standard is not preferable because it has mandatory legal system to retrospectively effective to the all escalators even some are exempted by the tenor clauses.

3.1.7 The Canadian Standard B 44

Harmonisation efforts between A 17 and B44 were being made during the time when this report was being produced.

References to B44 were made where B44 differed from A 17.1.

3.2 General - Technical basis and structure of standards

NOTE Committee's comments are shown in italics.

Table 2 — Technical basis and structure of standards

EN 115 (Europe) *	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
Foreword		Preface			
3.2-Foreword: A 17.1 and EN 115 have the same intent of safety. Furthermore, A 17.1 serves as a reference standard for other authorities to draft regulations. The Australian standard sets out uniform requirements for escalators and moving walks. It is not a legal paper in its own right. The Japanese code is a law. The Russian standard is part of the law and applies to escalators only. The Korean code is part of a law (Health and Safety Act). Even when it is not written down in anyone of the above mentioned documents, it is always the intention to deal with safety.					
0 Introduction					
0: safety and construction standard; safe use	construction, alteration; inspection, maintenance	new equipment	described in BSLJ-EO 129-3 for escalators	tunnel and floor escalators, not for moving walks; safe use (see 2.8)	
0.1.1: properly dimensioned	no comparable rule	-	Article 36-2 of BSLJ-EO, structural methods and structural calculations Chapter 4 Materials of important welded components, welding and quality control of the welding in other countries regulated in special welding codes Fastening of detachable joints must preclude self-separation.	ensure the specified strength and reliability	

Table 2 (continued)

EN 115 (Europe) *	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
0.1.1: properly dimensioned (continued)				2.12 Requirements for force fits Requirements for fixed axles 2.13 Corrosion protection Annex 4 Welding	
3.2-0.1.1 This is a general statement. There is no A 17.1 requirement compatible with this EN 115 design clause. This clause as written, is unenforceable since it does not establish any reference that defines what is "proper", "adequate", or "suitable". The A 17.1 code is a performance code and does not specify design conditions in accordance with the ASME policy.					
0.1.2: maintenance referred to work of CEN/TC 10/WG 5	part X, specific description	appendix A, prescription of maintenance, periodic inspection	Article 12-2 of BSLJ	2.8 General design requirement 2.12 No force fits in torque transfer components	3.3.1 (1) General design requirement
3.2-0.1.2 Maintenance, repair, and alteration requirements are in Part X of A 17.1, and are of a specific nature rather than the global generality used in 0.1.2 of EN 115. The Australian comment is of a general nature. It shall be mentioned that the Japanese regulation requests periodic maintenance.					
0.2/0.3: new installations shall meet at least the safety requirements	philosophic description, freedom of design	part 1 (1.2), no unnecessary restrictions	-	-	
3.2-0.2/0.3 ANSI and EN 115 have the same intention. Concerning A 17.1, where present rules are not applicable or do not describe the product or system, the enforcing authority should recognize the need for exercising latitude and granting exceptions where the product or system is equivalent in quality, strength or stability, fire resistance, effectiveness, durability, and safety to that intended by the present code rules.					
0.4: special operational conditions (see also annex D)	performance code gives no design description	-	-	-	
3.2-0.4 A 17.1 is a safety code. The degree of safety does not vary with different installations. Since the code is based on performance and not design, it is applied equally on all types of escalators.					
AGREED UPON: The safety does not vary with different installations. The performance may be different and different criteria may be used.					

Table 2 (continued)

EN 115 (Europe) *	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
0.5 Special indications					
0.5.1: material not easy to ignite Remark: "free of PVC" is nowhere required; details to be defined by national building codes	requirements in the 800.1, 801.1 and 900.1, 901.1 (non/or limited combustible)	part 5/6 clause 3.2.2, non combustible 4.8 sprinkler system	BSLJ art. 2; BSLJ-EO Article 108-2 MOC-N (No.1110-1981); ¹	2.4 compliance with fire safety	
3.2-0.5.1 A 17.1 defines materials and parts of the machine that have to be protected. The Australian code has requirements for some materials to be fire-resistant. The Japanese regulation is similar to EN 115. The intention of all regulations is more or less the same. They refer to specific tests and the specification for material shall be defined. AGREED UPON: Automatic fire extinguisher systems should not be used. Furthermore, any sprinkler head should not reduce maintenance space (no comment of A 17.1).					
0.5.2: special environmental conditions	rules 807.1, 807.2, 807.3 and 907.1, 907.2, 907.3	for slip resistance, see part 5/6, clause 3.6.5	(JEAS XXX (Draft)) NOTE: JEAS attached in parenthesis are draft and mentioned as reference data. These are intended to be replaced later.	2.13 and GOST 9.104	3.3.1 (2), 4.3.2 (18) Outdoor installation
3.2-0.5.2 A 17.1 requires a roof and secure foothold. EN 115 recommends a roof and requires secure foothold (5.2.2). Australia and Russia have no requirements. The Japanese regulation has corrosion aspects in mind.					
0.5.3: misuse with trolleys	escalators and moving walks only for passenger transport	escalators and moving walks for passenger transport only (see 3.9)	MOC-N (No. 1417-2000) 1, EXP. 1 and EXP. (notice of designing) 2, for wheelchair escalator	no note	trolleys allowed (see 4.3.2 (21))
3.2-0.5.3 The use of escalators by other than ambulatory passengers is only permitted by EN 115. Such use is only permitted under special circumstances and modifications as agreed between the manufacturer of the escalator and the transportation means and the owner of the escalator. Moving walks as stipulated in the A.17 may only be used by passengers.					

Table 2 (continued)

EN 115 (Europe) *	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
0.6: no life performance requirements	no life performance requirements Remark: there is an industry standard for performance requirements	5.13 Design life ≥ 50000 h for escalator and moving walks with machine inside, treadway or step band	no note	no note	
0.7: respect foreseeable misuse	no note	no note	no note	no note	
3.2-0.6/0.7 Customer specifications and life of the equipment are all part of the design and commercial requirements and are not part of A 17.1. Concerning imprudent act of the user, there are no similar statements in A17.1 since this is the responsibility of the designer. It should be noted that there is a legal responsibility in the USA and in the European Union's Directives for the designer to compensate for reasonable foreseeable abuse in the design of the equipment AS 1735.5 and 6 require a design life of at least 50 000 h for escalators and moving walks with a machine inside the treadway or step band.					
0.8: establishment of Interpretation Committee	procedures for interpretations are described	Committee exists, not mentioned in the standard	in practice there are requests	in practice there are requests, a committee exists but is not mentioned in the standard	
3.2-0.8 The interpretation procedures are different for each code. Committees are not always mentioned in a standard, but requests exist and description of solutions are reviewed.					
1 Scope					
1.1: standard is applicable on new installation	like EN 115 and additionally for operation, maintenance and alteration	only for new escalators and new moving walks carrying passengers	see BSLJ-EO 129-3 for escalators and special constructions	applies to escalator design, modernisation and repair	applies to retrospective modernisation and repair
1.2: recommendation for retrospective	A 17.3 code applies to existing installations	not retrospective	no note	similar to EN 115	
1.3: permission of alternative requirements (for e.g. existing buildings)	purpose and exception are described in Section 2	not addressed	no note	no note	

Table 2 (continued)

EN 115 (Europe) *	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
3.2-1.1, 3.2-1.2, 3.2-1.3					
AGREED UPON: The design and operation of new escalators (moving walk) is covered as well as maintenance. Existing installations, installation procedures, code deviations, testing, inspection, repair and alteration vary in different codes and are not part of the agreed upon points.					
(1.4)	in process for the A 17.1 2000 edition	4.3 Limitation on use Escalator - Building			
AGREED UPON: Components not used directly in connection with the escalator/ moving walk are prohibited to be installed on, in or through the escalator/ moving walk.					
2 Normative references					
2: see Bibliography 1.1	reference list exists	see Bibliography 1.3	reference list exists	see Bibliography, 1.5	

3.3 Definitions

NOTE Committee's comments are shown in italics.

AGREED UPON: *Instead of “passenger conveyor” the term “moving walk” shall be used.*

FUNDAMENTAL DIFFERENCES:

- AS 1735 is using some definitions which are self-explanatory in the rules;
- A 17.1 uses definitions to clarify unique terminology used within the code/ rules.

AGREED UPON: *Definitions have to clarify specific escalator/moving walk terminology without introducing extra requirements. If rules are self-explanatory as to the meaning of their headings, additional definitions are not required.*

Table 3 — Definitions

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
3.1: definition of escalator	conventional and modular escalator	part 1, 2.57	BSLJ-EO 129-12, EXP. 1	similar to ANSI, see Appendix 1.01	definition escalator
3.3-3.1					
AGREED UPON: <i>An escalator is a power-driven, inclined, continuous stairway used for raising or lowering passengers.</i>					
3.2: definition of passenger conveyor	the description of moving walks includes in Section 3 six different types	part 1, 2.107 three types: edge supported belt type, rollerbed type, sliderbed type	BSLJ-EO 129-12, EXP. 1	-	definition of horizontal moving walk
3.3-3.2					
AGREED UPON: <i>A moving walk is a power-driven installation for the conveyance of passengers in which the passenger-carrying surface remains parallel to its direction of motion and is uninterrupted</i>					
Remark: ANSI and AS 1735 definitions should be taken into account when revising EN 115					

Table 3 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
3.3: definition of handrail	no definition	part 1, 2.157.13	no definition	appendix 1, no. 76/77	
3.3-3.3					
AGREED UPON: A handrail is a power-driven moving rail for passengers to grip while using the escalator or moving walk.					
3.4: definition of comb	no definition	part 1, 2.157.9	no definition	appendix 1, no. 56	
3.3-3.4					
AGREED UPON: A comb is a pronged section at each landing that meshes with the grooves in the passenger carrying surface. A comb plate is a platform at each landing to which the combs are attached.					
3.5: definition of deflector device	no definition	no definition	no definition	no definition	
3.3-3.5 There is no need for discussion.					
3.6: definition of rated speed means: no load condition	rated speed means full load condition	part 1, 2.157.17 no load condition)	(BSLJ-EO 129-12)	operational speed (with load) rated speed (without load); see appendix 1, nos. 12 and 13	
3.3-3.6					
FUNDAMENTAL DIFFERENCES: Rated speed is defined differently in various standards and effects many code requirements fundamentally. The American and Japanese code defines the rated speed as the speed at which the escalator can lift the rated load. Rated load is the load that the escalator is designed to lift at the rated speed [EN 115 and AS 1735 do not define a rated load. EN 115 is using the brake-load and structural load (for the passenger weight)]. EN 115, AS 1735 and PUBEE define the rated speed as a (design) speed in direction of the moving steps, pallets or belts for unloaded conditions. The reasons for the Europeans to do so was the possibility to carry out practical measurements.					
3.7: definition of angle of inclination (for maximum see 10)	no definition, slope/inclination is used;	part 1, 2.157.19	no definition	definition for escalator, appendix 1, no. 8	
3.3-3.7					
AGREED UPON: The angle of inclination is the angle made between the line the passenger travels between transitions and the horizontal, measured along the centre line of the steps.					

Table 3 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
3.8: definition of theoretical capacity	rated load is mentioned, no definition of theoretical capacity	rated load is mentioned in part 1, 2.119, no definition of theoretical capacity	BSLJ-EO; Art. 129-12, EXP. 1(4)	carrying capacity is mentioned in Appendix 1, no. 10	
3.3-3.8 Only EN 115 and PUBEE use the term „theoretical capacity“. This theoretical value will never be reached (the real limit is 6.800 persons/h) and depends on the behaviour of the user. AGREED UPON: Real load conditions have to be defined. Definitions like theoretical capacity are not related to general safety codes. NOTE: the results of EN 115 investigation shows for a step width of 1000 mm: - v = 0,5 m/s down max.. 4900 pers/h counted - v = 0,7 m/s up max. 6800 pers/h counted					
no definition	definition controller	2.35	no definition	no definition	
no definition	definition driving machine	2.102	no definition	no definition	
no definition	definition flat steps	no definition	no definition	no definition	
no definition	definition landing	no definition	no definition	no definition	
no definition	definition pallet, moving walk	2.157.16	no definition	no definition	
no definition	definition slope, moving walk	2.157.19	no definition	no definition	
no definition	travel (rise)	2.149	no definition	no definition	
no definition	definition treadway, moving walk	2.157.20	no definition	no definition	
no definition	definition width	2.157.22	no definition	no definition	
	other definitions :	2.2 alteration; 2.32 Contactor; 2.32 control; 2.50 enclosure drip-proof; 2.60 fire resistance rating; 2.61 fire resistance construction; 2.70 installation; 2.103 machine room; 2.105 may; 2.112 passenger; 2.119 rated load;			

Table 3 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
		2.122 relay; 2.132 shall and should; 2.157.2 balustrading; 2.157.3 broken drive belt device; 2.157.4 broken drive chain device; 2.157.5 broken pallet chain device; 2.157.6 broken step chain device; 2.157.7 broken treadway belt device; 2.157.8 ceiling intersection guard; 2.157.10 comb plates; 2.157.12 governor; 2.157.14 handrail guard; 2.157.21 truss			
3.9: definition of public service escalators/passenger conveyors	no definition	no definition	no definition	for tunnel/floor escalators see 1.2	
3.3-3.9 FUNDAMENTAL DIFFERENCES: The ANSI safety code applies equally to all escalators regardless of their use. The loading pattern and useful life is a commercial issue, not one of safety. In that matter EN 115 was influenced by public transport needs and it defines and recommends different requirements for heavy duty and for commercial escalators. AGREED UPON: The safety codes should apply equally to all escalators regardless of their use.					
4 Symbols for quantities					
4.0: symbols for quantities	not included, mentioned where necessary	mentioned where necessary	not mentioned in a list	see Appendixes 2 and 3	
3.3-4.0 In Europe, it is common to add a list of symbols and quantities, e.g. in parenthesis. Korea sees problems in using such a list because escalator regulations are a law. Other countries think that too much information gets lost and symbols should be placed close to the corresponding drawing or formula. Recommendation: The list of symbols and their units is very helpful in understanding the code. It should therefore be included.					

4 Selected topics

General

This comparison laid down in tables 4 to 20 is between EN 115 and the rules in A 17.1, AS 1735, PUBEE (Russia), Japanese and Korean Code. There are other standards, see listed in Scope, in the countries concerned that have requirements not shown in the escalator/moving walk standards compared, but are addressing some requirements in EN 115.

When symbols are used to compare principal dimensions (e.g. L₁, b₈, h₆ etc.), always those of EN 115 (see Figures 1 to 3 and 5 in annex A) are used independent of the designation in other standards.

NOTE 1 EN 115 clause numbers in brackets serve only as a reference point. They do not exist in the real EN 115.

NOTE 2 Committee's comments are shown in italics.

4.1 Enclosure, inspection doors

Table 4 — Enclosure, inspection doors

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.1 General					
5.1.1.1: complete enclosure	see 801.1 and 802.3a (2)	same intention in 3.2.2.2 and 4.4	BSLJ-EO; Art. 129-12, 1(1)	see 2.15 and 5.6.1/2	
4.1-5.1.1.1					
FUNDAMENTAL DIFFERENCES: A 17.1 requires that sides and undersides of a truss shall be enclosed with materials defined as either non combustible or limited combustible to protect both the escalator or the environment. The Australian code requires material which is deemed not combustible. <i>Australia considers only the fire inside the machine and Japan requires non-combustibility, too. It does not only require non-combustible material, but explains in 0.5 what it means.</i>					
AGREED UPON: The truss sides and undersides should be covered with material that will contain combustion within the truss. These materials are determined by individual building or fire codes in each country.					
5.1.1.2: omission of enclosure	no content	3.2.2.2	no note	no comment	
4.1-5.1.1.2 The omission of enclosure is only mentioned in EN 115. The protection in case of fire should be in accordance to the agreed upon point to 4.1-5.1.1.1.					

Table 4 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.1.3: cleaning of underside enclosure	like EN 115 and cleaning periods are defined 1206.6a	no comment	no comment	similar (see 2.17)	
4.1-5.1.1.3 The term "underside enclosure" is wrong in EN 115 and shall be replaced by "underside" as a structural part of the truss.					
5.1.2: strength and rigidity of enclosure	not mentioned, defined in building code	4.4/3.2	no comment	2.8 General design requirement 2.11 Fastening of detachable points 2.12 No force fits in torque transfer components 2.13 Corrosion protection Annex 4 Welding	
4.1-5.1.2: Adequate mechanical strength and rigidity needs detailed definition and performance criteria.					
RECOMMENDATION: To adopt the Australian specification (see AS 1735, 4.4; 440 N horizontal force applied on 50 mm by 50 mm with max. deflection of 25 mm).					
5.1.3 Inspection doors and trap doors					
5.1.3.1 inspection/trap doors for inspection and maintenance	reasonable access to interior is required similarly (806.3 / 906.3)	4.2 deals with access and guarding of the machine room	no requirement	3.10 Deflection of floor slab (plate) $\leq 1/600$ 6.3	
4.1-5.1.3.1 Inspection and trapdoors (see figure 1 for explanation) are part of the enclosure. The general access to the interior is treated in 6.2 and it is required for maintenance and inspection.					
RECOMMENDATION: Stop switches should be located in these areas which when activated prevent the operation of the escalator or moving walk.					

Table 4 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.3.2 closing/opening requirements for inspection/trap doors	same intention in 806.3 / 906.3	no requirement	no requirement	see 6.7 and 6.8 for tunnel escalators	
4.1-5.1.3.2 (see also 6.2)					
FUNDAMENTAL DIFFERENCES: A 17.1 and EN 115 require to lock the access door with a key. In A 17.1 the key shall be removed only when in the locked position. EN 115 requires to open the access door from the inside even when the door is locked.					
A 17.1 is related to access doors in escalator/moving walk trusses; EN 115 is related to external machine rooms and access plates for trusses. EN 115 requires the use of a tool or a key for trap doors like floor plates on escalator machine rooms.					
5.1.3.3 Inspection doors with safety contact	not required	not defined	not defined	not defined	not defined
5.1.3.4 Inspection door, material same as for enclosure	806.3 / 906.3	same as for enclosure 3.2.2.1	not defined	not defined	not defined
4.1-5.1.3.3, 4.2-5.1.3.4 (defined in 6.2 Accessibility)					
5.1.4 Apertures for ventilation					
5.1.4 Apertures for ventilation	801.1	4.7 ventilation	no requirement	no requirement	no requirement
4.1-5.1.4					
AGREED UPON: Escalators/ moving walks should be effectively ventilated to dissipate the heat generated. Apertures should not enable contact with moving parts.					

4.2 Balustrade

Table 5 — Balustrade

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.5 Balustrade					
5.1.5.1 Balustrades on each side	see 802.3 / 902.3	see 3.3.1.1 same 2.2 Width of escalator; nominal width	BSLJ-EO Art. 129-12 1.(3) same	5.6.1 Definition and general requirements of balustrades	3.2.C same
4.2-5.1.5.1					
AGREED UPON: The balustrade provides the passenger's safety by providing stability, protects the passenger from moving parts of the escalator and supports the handrail.					
5.1.5.1.1 Definition skirting see Fig.2	Skirt panel see Appendix D, Fig.D3; A17.1 Section 3 not defined for moving walks	Skirting Fig.2.2; Part 1 2.157.18	Skirt guard panel BSLJ-EO fig. 1-36 and 1-37	Appendix 1 term 74 Skirting	not defined
4.2-5.1.5.1.1					
AGREED UPON (see AS 1735, 2.157.18): The skirting is a vertical part of the balustrade interfacing with the outer edge of the escalator steps and moving walk treadway.					
5.1.5.1.2 Definition interior profile see fig.2	Low-deck interior see Appendix D, fig. D3; A17.1 Section 3	Transition Fig.2.2	not defined	Appendix 1 term 73 Interior profile	not defined
4.2-5.1.5.1.2					
AGREED UPON: Lower inner decking is a profile that connects the skirting with balustrade interior panel when they do not meet at a common point.					
5.1.5.1.3 Definition balustrade interior panelling see fig.2	Interior panel see see appendix D, fig.D3; A17.1 Section 3	not defined	Interior panel BSLJ-EO fig. 1-36 and 1-37	not defined	not defined
4.2-5.1.5.1.3					
AGREED UPON: The interior panel is a panel located between the skirting or lower interior decking and the handrail support profile or upper inner decking.					

Table 5 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.5.1.4 Definition balustrade decking see fig.2	High deck interior, high deck exterior, low deck exterior see appendix D, fig.D3; A17.1 Section 3	2.157.11	Deck board BSLJ-EO fig. 1-37	Appendix term72 balustrade decking	not defined
4.2-5.1.5.1.4 The A 17.1 definitions for high deck exterior/interior and low deck exterior are more precisely than the one for balustrade decking in EN 115. FUNDAMENTAL DIFFERENCES: A 17.1 prevents any change in width. AS 1735 allows a gradual change to a maximum of 8%. AGREED UPON: Deck (interior/exterior) is the transverse members of the balustrade. A low deck is located immediately above the skirting. A high deck meets with the handrail support profile.					
5.1.5.1.5 Definition balustrade exterior panelling see fig.2	Exterior panel see Appendix D, fig.D3; A17.1 Section 3	not defined	Exterior panel BSLJ-EO fig. 1-36	not defined	not defined
4.2-5.1.5.1.5 AGREED UPON: The exterior panel is a panel enclosing the exterior sides of the escalator or moving walk.					
5.1.5.1.6 Definition Newel	Newel, see Appendix D, fig.D3; A17.1 Section 3	Newel, see Fig.2.1.1 same	not defined	Term 78 App.1 Newel	not defined
4.2-5.1.5.1.6 AGREED UPON: The newel is the end of the balustrade. RECOMMENDATION: All definitions of EN 115, clause 5.1.5.1 should be placed in the chapter „Definition“.					

Table 5 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.5.2 Prevention of climbing on balustrades	802.3i / 902.3h deck barricades, 802.3h Anti-slide device, special requirements	Side guarding, 3.3.8 (AS 1735.5-1996)	(JEAS 406H (Draft) 2.1.6) NOTE: JEAS attached in parenthesis are draft and mentioned as reference data. These are intended to be replaced later.	no requirement	no requirement
4.2-5.1.5.2 (see figure 2): The general intention is to prevent climbing and sliding by appropriate devices. These devices should be precisely defined as for example done in A 17.1 in future editions of escalator safety codes.					
AGREED UPON: Deck barricade is a barricade to discourage climbing on the lower exterior outer deck. An anti-slide-device is a device to discourage sliding on the high exterior decks.					
5.1.5.3 Force on handrail, vertical force of 900N per 0.5 m (no deformation)	802.3b / 902.3b vertical load 730 N/m, lateral load 584 N/m; simultaneously different	Amendment 1 1997 same AS 1170.1(b) loading code	no requirement	Appendix 4	no requirement
4.2-5.1.5.3 A 17.1 requires to consider forces over the whole length of the balustrade. These typical forces are created when people are leaning against balustrades (handrails) and act simultaneously in the vertical and horizontal directions. EN 115 takes into account only a single vertical force as does the Australian code.					
AGREED UPON: Balustrades should be designed to resist the simultaneous (vertical plus horizontal) application of a static lateral force of 585 N/m and a vertical load of 730 N/m, both applied to the top of the handrail stand (agreed for A 17.1 only in seismic zones 1 and 2, zone 3 and 4 require higher values). Further it is agreed when applying a vertical force of 900 N distributed over the surface of the handrail for a length of 0,5 m there shall be no permanent deformation, no breakage or displacement of any balustrade parts.					
5.1.5.4 Balustrade construction, mouldings, cover joints etc	802.3a similar 902.3a	3.3.1.1 similar Change in width between balustrades 3.3.2	MOC-N (No. 1417-2000), EXP.(1) similar; no specific dimensions	5.6.4 same, 5.6.6 same, 5.6.5 additional	no requirement
4.2-5.1.5.4 EN 115, AS 1735 and PUBEE limit the gaps between panels to 4 mm. A 17.1 limits the gap between panels to 4,8 mm.					

Table 5 (continued)

EN 115 (Europe)	A 17.1 (USA)	AS 1735 (Australia)	Japanese Codes	PUBEE (Russia)	Korean Code
5.1.5.4 Force applied on the balustrade interior panelling 500N over 25 cm ² => Gap ≤ 4mm no deformation	no requirement	Amendment 1; 1997 same	no requirement	5.6.6 Gap requirement	no requirement
4.2-5.1.5.4 FUNDAMENTAL DIFFERENCES: EN 115 and AS 1735 give limits to permanent deformation and permissible gap ≤ 4 mm for a defined load. The PUBEE code limits the gap to 4 mm. A 17.1, JIS and Korea have no load and deformation requirement. AGREED UPON: Balustrades should be parallel to the travel path.					
5.1.5.4 Glass balustrade, one-layer safety glass t ≥ 6mm	802.3c / 902.3c ANSI Z97.1 or 16CFR Part 1201	3.3.3 AS 2208 t ≥ 6mm	no requirement	no requirement	no requirement
4.2-5.1.5.4 Terminology problems are raised when discussing the use of glass for balustrades. For example, safety glass means (and is used as) laminated glass in the A 17.1. with reference to national glass standards (the use of polycarbonate is also permitted). AS 1735 permits both tempered and laminated glass; also poly carbonate is accepted. EN 115 requires for glass balustrades with self supporting panels tempered glass only. The Russian, Japanese and Korean codes contain no requirements on glass balustrades. The minimum thickness of glass panels are determined by real load conditions, safety factors and vandalism conditions. All calculations are based on technical data provided by the glass manufacturers. FUNDAMENTAL DIFFERENCES: A 17.1 and AS 1735 define a possible change in width between the balustrades. All other codes have no definition for that subject.					
5.1.5.5 Sharp edges	802.3a / 902.3a	3.3.3(d) same	no requirement	no requirement	no requirement
4.2-5.1.5.5 No discussion					
5.1.5.6 Skirting h ₂ ≥ 25 mm	802.3f(1) h ₂ ≥ 25 mm 902.3f(2)	no dimension	no dimension	no requirement	3.3.1 (6) skirting h ₂ ≥ 25 mm
4.2-5.1.5.6 Comment: To define the height of skirting A 17.1 is using the nose-line (path of the traces by the nose of the step as it moves around the escalator) as reference line. EN 115 is using the tread surface of steps, pallets and belt as a reference. The meaning of each code is exactly the same. AS 1735 has no requirement for skirting height.					