



SLOVENSKI STANDARD

SIST-TS CEN/TS 45545-2:2009

01-april-2009

Nadomešča:

OSIST prEN 45545-2:2005

Železniške naprave - Požarna zaščita na železniških vozilih - 2. del: Zahteve za obnašanja materialov in sestavnih delov v požaru

Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components

Bahnanwendungen - Brandschutz in Schienenfahrzeugen - Teil 2: Anforderungen an das Brandverhalten von Materialien und Komponenten

Applications ferroviaires - Protection contre les incendies dans les véhicules ferroviaires - Partie 2: Exigences au feu des matériaux et des composants

Ta slovenski standard je istoveten z: CEN/TS 45545-2:2009

ICS:

13.220.20	Požarna zaščita	Fire protection
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

SIST-TS CEN/TS 45545-2:2009 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST-TS CEN/TS 45545-2:2009

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009>

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN/TS 45545-2

January 2009

ICS 45.060.01

English version

**Railway applications - Fire protection on railway vehicles - Part
2: Requirements for fire behaviour of materials and components**

Applications ferroviaires - Protection contre les incendies
dans les véhicules ferroviaires - Partie 2 : Exigences du
comportement au feu des matériaux et des composants

Bahnanwendungen - Brandschutz in Schienenfahrzeugen -
Teil 2: Anforderungen an das Brandverhalten von
Materialien und Komponenten

This Technical Specification (CEN/TS) was approved by CEN on 9 June 2008 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN/CENELEC will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN and CENELEC members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN and CENELEC members are the national standards bodies and national electrotechnical committees, respectively, of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[SIST-TS CEN/TS 45545-2:2009](https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009)

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009>



CEN Management Centre:
Avenue Marnix 17, B-1000 Brussels

CENELEC Central Secretariat:
Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
Introduction	5
1 Scope	5
2 Normative references	6
3 Terms and definitions.....	7
3.1 Definition of parameters.....	7
3.2 Explanation of expressions	9
3.3 Hazard levels	11
4 Requirements	12
4.1 Essential	12
4.2 General.....	12
4.3 Listed products	13
4.4 Non listed products	19
4.5 Refurbishment and maintenance requirements	20
4.6 Products to be approved on functional necessity	21
4.7 Set of material requirements	21
5 Test properties	30
5.1 Summary of test methods	30
5.2 Modifications on test methods used in 5.1	33
5.3 Testing rules.....	34
6 Evaluation of conformity	38
Annex A (normative) Standard vandalism test for seat coverings	39
A.1 Introduction	39
A.2 Apparatus	39
A.3 Preparation of test specimen.....	40
A.4 Test procedure	40
A.5 Results	40
A.6 Test report	41
Annex B (normative) Fire test method for seating	42
B.1 General.....	42
B.2 Safety warning.....	42
B.3 Test facility	42
B.4 Test specimens	48
B.5 Test procedure and application of the burner	50
B.6 Early termination of test.....	52
B.7 Test results	52
B.8 Test report	52
Annex C (normative) Testing methods for determination of toxic gases from railway products.....	54
C.1 Introduction	54
C.2 Method 1 – Test apparatus.....	55
C.3 Analysis of fire effluents for Method 1.....	56
C.4 Test environment	57
C.5 Conditioning	57
C.6 Pre-test conditions for the apparatus for Method 1	57
C.7 Warnings.....	58
C.8 Smoke and gas testing using Method 1	58
C.9 Data treatment.....	60
C.10 Test report for Method 1.....	61

C.11	Use of alternative gas analysis techniques to FTIR.....	62
C.12	Method 2 – Test apparatus	63
C.13	Test environment (Method 2)	63
C.14	Conditioning of Samples	63
C.15	Test for gases using Method 2.....	63
C.16	Calculations of CIT	64
Annex D	(normative) Protocol for test specimen preparation in standard tests.....	67
D.1	Protocol for specimen preparation for tests according to EN ISO 5659-2 and ISO 5660-1	67
D.2	Protocol for specimen preparation of upholstered furniture assembled products for tests according to EN ISO 5659-2 and ISO 5660-1.....	67
D.3	Protocol for test specimen preparation for flame spread testing	69
Annex ZA	(informative) Relationship between this Technical Specification and the Essential Requirements of EU Directive 96/48/EC, as amended by 2004/50/EC	70
Bibliography	71

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST-TS CEN/TS 45545-2:2009](https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009)

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009>

CEN/TS 45545-2:2009 (E)**Foreword**

This document (CEN/TS 45545-2:2009) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

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

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EC Directive(s), see informative Annex ZA, which is an integral part of this document.

This series of Technical Specifications *Railway applications — Fire protection on railway vehicles* consists of:

- Part 1: General;
- Part 2: Requirements for fire behaviour of materials and components;
- Part 3: Fire resistance requirements for fire barriers;
- Part 4: Fire safety requirements for railway rolling stock design;
- Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles;
- Part 6: Fire control and management systems;
- Part 7: Fire safety requirements for flammable liquid and flammable gas installations.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This part is based on existing fire safety regulations for railway vehicles from the International Union of Railways (UIC) and different European countries.

In using the operation and design categories defined in CEN/TS 45545-1, the requirements laid down in this part take into account the current operating conditions for European public rail transport.

1 Scope

This part specifies the reaction to fire performance requirements for materials and products used on railway vehicles as defined in CEN/TS 45545-1.

The operation and design categories defined in CEN/TS 45545-1 are used to establish hazard levels that are used as the basis of a classification system.

For each hazard level, this part specifies the test methods, test conditions and reaction to fire performance requirements.

It is not within the scope of this Technical Specification to describe measures that ensure the preservation of the vehicles in the event of a fire.

ITeCh STANDARD PREVIEW
(standards.iteh.ai)
SIST-TS CEN/TS 45545-2:2009
<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009>

CEN/TS 45545-2:2009 (E)**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.

EN 13238, *Reaction to fire tests for building — Conditioning procedures and general rules for selection of substrates*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

CEN/TS 45545-1, *Railway applications — Fire protection on railway vehicles — Part 1: General*

CEN/TS 45545-3:2009, *Railway applications — Fire protection on railway vehicles — Part 3: Fire resistance requirements for fire barriers*

EN 50266-2-4, *Common test methods for cables under fire conditions — Test for vertical flame spread of vertically-mounted bunched wires or cables — Part 2-4: Procedures; Category C*

EN 50305:2002, *Railway applications — Railway rolling stock cables having special fire performance — Test methods*

EN 60332-1-2, *Tests on electric and optical fibre cables under fire conditions — Part 1-2: Test for vertical flame propagation for a single insulated wire or cable — Procedure for 1 kW pre-mixed flame (IEC 60332-1-2:2004)*

EN 60584-1, *Thermocouples — Part 1: Reference tables (IEC 60584-1:1995)*

EN 61034-1, *Measurement of smoke density of cables burning under defined conditions — Part 1: Test apparatus (IEC 61034-1:2005)*

EN 61034-2, *Measurement of smoke density of cables burning under defined conditions — Part 2: Test procedure and requirements (IEC 61034-2:2005)*

EN ISO 1182, *Reaction to fire tests for building products — Non-combustibility test (ISO 1182:2002)*

EN ISO 1716:2002, *Reaction to fire tests for building products — Determination of the heat of combustion (ISO 1716:2002)*

EN ISO 4589-2, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test (ISO 4589-2:1996)*

EN ISO 5659-2, *Plastics — Smoke generation — Part 2: Determination of optical density by a single-chamber test (ISO 5659-2:2006)*

EN ISO 6507-3, *Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks (ISO 6507-3:2005)*

EN ISO 9239-1, *Reaction to fire tests for floorings — Part 1: Determination of the burning behaviour using a radiant heat source (ISO 9239-1:2002)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2002)*

EN ISO 12952-3, *Textiles — Burning behaviour of bedding items — Part 3: General test methods for the ignitability by a small open flame (ISO 12952-3:1998)*

EN ISO 12952-4, *Textiles — Burning behaviour of bedding items — Part 4: Specific test methods for the ignitability by a small open flame (ISO 12952-4:1998)*

EN ISO 13943:2000, *Fire safety — Vocabulary (ISO 13943:2000)*

ISO 5658-2:2006, *Reaction to fire tests — Spread of flame — Part 2: Lateral spread on building and transport products in vertical configuration*

ISO 5660-1, *Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method)*

ISO/TR 9705-2, *Reaction-to-fire tests — Full-scale room tests for surface products — Part 2: Technical background and guidance*

ISO 11054, *Cutting tools — Designation of high-speed steel groups*

ISO 19702, *Toxicity testing of fire effluents — Guidance for analysis of gases and vapours in fire effluents using FTIR gas analysis*

IEC/TS 60695-1-40, *Fire hazard testing — Part 1-40: Guidance for assessing the fire hazard of electrotechnical products — Insulating liquids*

NF X70-100-1, *Fire tests — Analysis of gaseous effluents — Part 1: methods for analysing gases stemming from thermal degradation*

NF X70-100-2, *Fire tests — Analysis of gaseous effluents — Part 2: tubular furnace thermal degradation method*

STANDARD PREVIEW
(standards.iteh.ai)

3 Terms and definitions SIST-TS CEN/TS 45545-2:2009

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23->

For the purposes of this document, the following terms and definitions apply.

3.1 Definition of parameters

3.1.1

average rate of heat emission at time t

ARHE

cumulative heat emission from $t = 0$ to $t = t$ divided by t

ARHE is generated as follows:

Given that the rate of heat emission data comprises pairs of data points where the first data point is (t_1, q_1) where t is the time and q is the rate of heat emission, ARHE is given by (using a trapezoidal area assumption):

$$ARHE(t_n) = \frac{\sum_{n=1}^n (t_n - t_{n-1}) \frac{\dot{q}_n + \dot{q}_{n-1}}{2}}{t_n - t_{n-1}}$$

Generally $t_1 = 0$ and $q_1 = 0$, or at least can be rescaled to meet this condition; the expression above can be further simplified.

The heat emission for each time element (h_n) is calculated assuming a scan rate at 2 s for burns of less than 3 min and at 5 s for longer burn times (ISO 5660-1). The first heat element is obtained from data points 1 and 2 and assigned to data point 2 as h_2 :

CEN/TS 45545-2:2009 (E)

$$h_n = (t_n - t_{n-1})X \frac{\dot{q}_n + \dot{q}_{n-1}}{2}$$

Summing these elements from $n = 2$ to $n = n$ and dividing by the interval of time from t_1 to t_n :

$$ARHE(t_n) = \frac{\sum_2^n h_n}{t_n - t_1}$$

3.1.2**maximum average rate of heat emission****MARHE**

maximum value of ARHE during the time period $t = 0$ to $t = t_{\text{end}}$

For the cone calorimeter (ISO 5660-1) listed in Table 8 as T03.1 and T03.2, results of ARHE and MARHE are expressed as kW/m^2 (heat emission rate per unit area) whilst, for the furniture calorimeter (T06), heat emission rate is measured as kW

3.1.3**specific optical density of smoke** **$D_s(n)$**

optical density in the test chamber multiplied by a factor, which depends on the instrument and on the specimen size; n indicates "at time n minutes into the test"

D_s is dimensionless

3.1.4**cumulative value of specific optical densities in the first 4 min of the test****VOF₄**

area under D_s vs. time curve during the test period $t = 0$ to $t = 4$, using a trapezoidal area assumption and a finite element (t) of 1 min

With $D_s(0) = 0$ and $t = 1$,

$$VOF_4 = D_s(1) + D_s(2) + D_s(3) + \frac{D_s(4)}{2}$$

VOF_4 has dimensions of minutes

3.1.5**conventional index of toxicity****CIT**

specific meaning for specific materials/products but in all cases *CIT* comprises two terms:

$$CIT = [\text{Precursor Term}] \times [\text{Summation Term}]$$

The Summation Term is produced from the ratios of the emission level to the reference level of the gas component.

If the emission level and reference level do not have the same dimensions, then the Precursor Term has dimensions so as to cancel the dimensions of the Summation Term: *CIT* is always dimensionless.

Details of the derivation of *CIT* for structural products, non-listed products and cables are specified in Annex C.

For the scope of this Technical Specification, the following 8 gas components need to be analysed: CO_2 ; CO; HF; HCl; HBr; HCN; SO_2 ; NO_x .

NOTE 1 NO_x includes both NO₂ and NO quoted as NO₂.

Table 1 — Reference concentrations of the gas components

Gas component	Reference concentration mg/m ³
CO ₂	72 000
CO	1 380
HBr	99
HCl	75
HCN	55
HF	25
NO _x	38
SO ₂	262

NOTE 2 These reference values are based on IDLH (Immediately Dangerous to Life and Health), recognised as a limit for personal exposure to the gas component by NIOSH (National Institute for Occupational Safety and Health) (1997 version).

3.2 Explanation of expressions

3.2.1 General

Fire terms and definitions used in this Technical Specification and not otherwise defined are given in EN ISO 13943. Expressions used in this Technical Specification are explained in Table 2.

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009>

Table 2 — Table of expression

Expressions	Explanation	References
Armrest	An element which may function as a support for a seated person's arm but which may also be part of a seat which defines the width of a seat place.	5.3.5
Coating	Product applied as liquid or powder to a substrate that will cure or dry into a continuous surface to the substrate.	
Exterior of the body shell	If the path taken by the fire effluent to reach a passenger or staff area uses only space outside of the physical envelope of the vehicle, then the product or surface is exterior else the product or surface is interior. A gangway area between fire resisting vehicle ends is defined as an exterior area.	
Listed product	Product included in the Table 4.	4.3
Non-listed product	Any product which is not listed in Table 4.	5.4
Material	Single basic substance or uniformly dispersed mixture e.g. metal, stone, timber, concrete, mineral wool with uniformly dispersed binder, polymers.	
Functionally suitable product	A functionally suitable product is one which will meet the required static, dynamic and mechanical properties for use in the specified operating environment, (e.g. temperature, chemicals, humidity) and have a life consistent with normal industry maintenance schedules.	4.6
Product	The material or assembly about which information is required.	
Test specimen	A test specimen is the product that is subjected to a procedure of assessment or measurement. It shall be representative of the product installed on the train.	
Substrate	A material or materials that are used immediately beneath the product.	
Cable conduits and ducts	Linear electrical products such as flexible circular conduits, rigid rectangular ducts or trays.	

3.2.2 Limited surfaces and strips

3.2.2.1 General

Surfaces compliant with the following rules shall qualify individually as limited surfaces. Surfaces which are grouped as a result of their non compliance with the separation rules shall be considered as a single grouped surface for the purposes of further analysis.

Only surfaces being considered for "limited" status shall be considered in the grouped surface.

The boundary between a wall and a ceiling is at the 45° angle.

The maximum area of a ceiling, which may be of "limited" status within each passenger or staff compartment is 15 % of total ceiling area.

The maximum area of walls (vertical surfaces including windows and transverse partitions) which may be of "limited" status within each passenger or staff compartment is 15 % of total wall area.

3.2.2.2 Ceilings

Longitudinal limited surfaces with a width < 200 mm (strips):

- shall not have length limitation;
- shall be separated from another limited surface by > 200 mm of R1 compliant material.

Other limited surfaces:

- shall have an area < 0,20 m²;
- shall have a maximum dimension in any direction on the surface < 1 m;
- shall be separated from another limited surface by a distance of R1 compliant material greater than the dimension of the limited surface, measured in the same horizontal direction as the separation direction.

3.2.2.3 Walls

Vertical limited surfaces with a lateral width < 200 mm (strips):

- need not have a maximum vertical dimension limitation;
- need to be separated laterally from another limited surface by > 200 mm of R1 compliant material.

Other limited surfaces:

- need to have a maximum dimension measured in a vertical direction < 1 m;
- need to be separated from another limited surface, vertically above, by a distance of R1 compliant material greater than the vertical extent of the lower surface.

Limited Surfaces have the product number IN 2 in Table 4 and strips have the product number IN 3 in Table 4.

3.3 Hazard levels

Hazard levels (HL 1 to HL 3) are the relation between operation categories and design categories defined in part 1 and based on the different dwell times defined in part 1.

Hazard levels defined in Table 3 are used in Table 7 for requirement classification.

Table 3 — Hazard level classification

Operation category	Design category			
	N: Standard vehicles	A: Automatic vehicles having no emergency trained staff on board	D: Double decked vehicle	S: Sleeping and couchette cars double decked or single deck
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

4 Requirements

4.1 Essential

The design of rolling stock and the products used shall be aimed at limiting fire development should an ignition event occur in order that a sufficient level of safety is achieved.

Given the objectives defined in CEN/TS 45545-1 it should be possible for passengers and staff to survive within any area impacted by the products of fire so that allowing them eventually to leave unaided and reach a place of safety.

4.2 General

SIST-TS CEN/TS 45545-2:2009

<https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2009>

The following principles are applicable to all products: [sist-ts-cen-ts-45545-2-2009](https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2009)

- a) products which comply with the highest level of reaction to fire performance by definition and therefore need no further testing are:
 - products classified as A1 according EN 13501-1;
 - all products described in commission decision 96/603/EC (as amended) with the exception of laminated glass;
- b) where a product has a continuous aluminium or steel surface in the end use condition and where the thickness of the metal is greater than defined in Table 9, it is sufficient to test the product with the thickness given in Table 9;
- c) a homogeneous product meeting a requirement at two different thicknesses complies with the requirement by definition at all intermediate thicknesses;
- d) where a product has a continuous glass surface in the end use condition, it shall be possible to qualify related products without testing from the qualification of one product subject to the following rules:
 - the glass thickness on the exposed surface is not greater than the glass thickness of the assessed product;
 - the glass on the exposed surface has the same generic composition as the glass of the assessed product;

- the glass on the exposed surface has the same generic stress levels; defined generically as "annealed", "heat strengthened (semi-tempered)" and "toughened" (fully tempered);
 - the plastic layer immediately below the exposed surface glass is of the same generic chemical type;
 - the thickness of the plastic layer immediately below the exposed surface is similar or less than the thickness of the same layer of the assessed product;
- e) the content of technical cabinets located inside the body shell which comply with the requirements of CEN/TS 45545-3 shall be considered to be exterior in respect of this part. Technical cabinets containing low power equipment shall be considered to be exterior, if they comply with the same requirements;
- f) mechanical or electrical products, which are contained in a technical cabinet according to the following rules are permitted to comprise unclassified products:
- either the technical cabinet is made from E10 fire barrier and the enclosed volume is $\leq 2 \text{ m}^3$; or
 - the technical cabinet is made from E15 I15 fire-barrier; or
 - the technical cabinet is protected by an automatic fire detection and fire extinguishing system;
- g) a test which qualifies any product or surface shall also qualify any product or surface which differs only in colour. A test which qualifies any product or surface shall also qualify any product or surface which differs only in the nature of the patterned surface;
- h) interior and exterior coatings shall be tested in end use condition. Where a coating is applied to aluminium or steel in the end use condition and where the thickness of the metal is greater than those defined in Table 9 it is sufficient to test the coating on the reference substrate defined in Table 9.

4.3 Listed products

SIST-TS CEN/TS 45545-2:2009

[https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-](https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009)

[2d98dac99581/sist-ts-cen-ts-45545-2-2009](https://standards.iteh.ai/catalog/standards/sist/82261bf8-c0dd-47e7-ab23-2d98dac99581/sist-ts-cen-ts-45545-2-2009)

The reaction to fire performance requirements of materials and components depend on their intrinsic nature but also:

- on the location of the materials or components within the design;
- on the shape and the layout of the materials;
- on the direct surface exposed and the relative mass and the thickness of the materials.

It is on this basis that the listed products have been classified and further differentiated into subgroups as follows:

- their general location (interiors or exteriors);
- their specific use (furniture, electro technical equipment, mechanical equipment).

Within the sub groupings, for each of the listed products, a set of requirements has been given which defines the ability of products to contain fire development to an appropriate degree considering the location, the exposed surfaces, their geometry and general disposition. For example: ceiling panelling, floor composites, interior lighting, curtains, external body shell walls and underside and parts of the drive and suspension system.

The content of the requirement sets is listed in Table 4 and the name of the requirement set is given in the column "Requirement" for each listed product.

If ISO 5658-2 is required as part of a requirement set, but the end use condition of a product does not allow preparation of test specimens to the size defined in ISO 5658-2, then in the case of interior use R5 is