SLOVENSKI STANDARD
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Preskusne metode za ugotavljanje prispevka k požarni odpornosti konstrukcijskih elementov - 4. del: Zaščita jeklenih elementov

Test methods for determining the contribution to the fire resistance of structural members - Part 4: Applied protection to steel members

Prüfverfahren zur Bestimmung des Beitrages zum Feuerwiderstand von tragenden Bauteilen - Teil 4: Brandschutzmaßnahmen für Stahlbauteile

Méthodes d'essai pour déterminer la contribution à la résistance au feu des éléments de construction - Partie 4: Protection appliquée aux éléments en acier

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13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
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Test methods for determining the contribution to the fire resistance of structural members - Part 4: Applied protection to steel members

This European Prestandard (ENV) was approved by CEN on 1 March 2002 as a prospective standard for provisional application.

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

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

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Foreword

This document ENV 13381-4:2002 has been prepared by Technical Committee CEN/TC127 "Fire safety in buildings", the secretariat of which is held by BSI.

This document has been prepared under the mandate given to CEN/TC127 by the Commission and the European Free Trade Association.

As there was little experience in carrying out these tests in Europe CEN/TC127 agreed that more experience should be built up during a prestandardization period before agreeing text as European Standards. Consequently all parts are being prepared as European Prestandards.

This European Prestandard is one of a series of standards for evaluating the contribution to the fire resistance of structural members by applied fire protection materials. Other parts of this ENV are:

Part 1: Horizontal protective membranes.

Part 2: Vertical protective membranes.

Part 3: Applied protection to concrete members.

Part 5: Applied protection to concrete/profiled sheet steel composite members.

Part 6: Applied protection to concrete filled hollow steel composite columns.

Part 7: Applied protection to timber members.

Annexes A to J are normative.

Caution

The attention of all persons concerned with managing and carrying out this fire resistance test, is drawn to the fact that fire testing can be hazardous and that there is a possibility that toxic and / or harmful smoke and gases can be evolved during the test. Mechanical and operational hazards can also arise during the construction of test elements or structures, their testing and the disposal of test residues.

An assessment of all potential hazards and risks to health should be made and safety precautions should be identified and provided. Written safety instructions should be issued. Appropriate training should be given to relevant personnel. Laboratory personnel should ensure that they follow written safety instructions at all times.

The specific health and safety instructions contained within this prestandard should be followed.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of this European Prestandard specifies a test method for determining the contribution made by applied fire protection systems to the fire resistance of structural steel members, which can be used as beams, columns or tension members.

The evaluation is designed to cover a range of thicknesses of the applied fire protection material, a range of steel sections, characterized by their section factors, a range of design temperatures and a range of valid fire protection classification periods.

This European Prestandard applies to fire protection materials where the gap between the material and the flange faces of the steel member is less than 5 mm in size. Otherwise, the test methods in ENV 13381-1 or ENV 13381-2, as appropriate, apply.

This European Prestandard contains the fire test which specifies the tests which should be carried out to determine the ability of the fire protection system to remain coherent and fixed to the steelwork, and to provide data on the thermal characteristics of the fire protection system, when exposed to the standard temperature/time curve specified in EN 1363-1.

In special circumstances, where specified in national building regulations, there can be a need to subject reactive protection material to a smouldering curve. The test for this and the special circumstances for its use are described in annex A.

The fire test methodology makes provision for the collection and presentation of data which can be used as direct input to the calculation of fire resistance of steel structural members in accordance with the procedures given in ENV 1993-1-2.

This European Prestandard also contains the assessment which prescribes how the analysis of the test data should be made and gives guidance on the procedures by which interpolation should be undertaken.

The assessment procedure is used to establish:

a) on the basis of temperature data derived from testing loaded and unloaded sections, a correction factor and any practical constraints on the use of the fire protection system under fire test conditions, (the physical performance);

b) on the basis of the temperature data derived from testing short steel column sections, the thermal properties of the fire protection system, (the thermal performance).

The limits of applicability of the results of the assessment arising from the fire test are defined, together with permitted direct application of the results to different steel sections and grades and to different fire protection systems and fixings.

The results of the test and assessment obtained according to this part of ENV 13381 are directly applicable to steel sections of "I" and "H" cross sectional shape. Guidance is given in annex B on the application of the data obtained from "I" and "H" steel sections to other section shapes.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1363-1	Fire resistance tests - Part 1: General requirements.
EN 1363-2	Fire resistance tests - Part 2: Alternative and additional procedures.
EN 10025	Hot rolled products of non-alloy structural steels - Technical delivery conditions.
EN 10113	Hot rolled products in weldable fine grade structural steels.
ENV 1993-1-1	Eurocode 3: Design of steel structures Part 1-1: General rules and rules for buildings.
ENV 1993-1-2	Eurocode 3: Design of steel structures Part 1-2: General rules - Structural fire design.
ISO 8421-2	Fire protection - Vocabulary - Part 2: Structural fire protection.
EN ISO 13943	Fire safety - Vocabulary (ISO 13943:1999).

3 Terms and definitions, symbols and units

3.1 Terms and definitions

For the purposes of this European Prestandard, the terms and definitions given in EN 1363-1, EN ISO 13943 and ISO 8421-2, together with the following, apply:

3.1.1
steel member
element of building construction which is loadbearing and fabricated from steel

3.1.2
fire protection material
material or combination of materials applied to the surface of a steel member for the purpose of increasing its fire resistance

3.1.3
passive fire protection materials
materials which do not change their physical form on heating, providing fire protection by virtue of their physical or thermal properties. They may include materials containing water which, on heating,, evaporates to produce cooling effects

3.1.4
reactive fire protection materials
materials which are specifically formulated to provide a chemical reaction upon heating such that their physical form changes and in so doing provide fire protection by thermal insulative and cooling effects

3.1.5
fire protection system
fire protection material together with a prescribed method of attachment to the steel member

3.1.6
fire protection
protection afforded to the steel member by the fire protection system such that the temperature of the steel member is limited throughout the period of exposure to fire

3.1.7
test specimen
steel test section plus the fire protection system under test. The steel test section, representative of a steel member, for the purposes of this test, comprises short steel columns, tall columns or beams

3.1.8
fire protection thickness
thickness of a single layer fire protection system or the combined thickness of all layers of a multilayer fire protection system

3.1.9
stickability
ability of a fire protection material to remain sufficiently coherent and in position for a well defined range of deformations, furnace and steel temperatures, such that its ability to provide fire protection is not significantly impaired

3.1.10
section factor

profiled
ratio of the fire exposed outer perimeter area of the steel structural member itself, per unit length, to its cross sectional volume per unit length, see Figure 1

boxed
ratio of the sum of the inside dimensions of the smallest possible rectangle or square encasement which can be measured round the steel structural member times unit length, to its volume per unit length, see Figure 1

3.1.11
design temperature
temperature of a steel structural member for structural design purposes

3.1.12
characteristic steel temperature
temperature of the steel structural member which is used for the determination of the correction factor for stickability

3.2 Symbols and units

Symbol	Unit	Description
LB		loaded beam section
UB		unloaded beam section
LC		loaded 3 metre column section
TC		unloaded Tall (2 metre) column section
SC		short column section
p		fire protection material
a		steel
f		furnace
d		thickness
ρ		density
A_m/V	m^{-1}	section factor of the unprotected steel section
A_p/V	m^{-1}	section factor of the protected steel section
A_p	m^2/m	area of the protected steel section, around the profile (profiled) or over the linear

		dimensions (boxed) of the steel section
A	m^2	cross sectional area of the steel section
V	m^3/m	volume of the steel section per unit length
V_p	m^3/m	volume of the fire protection material per unit length
h	mm	depth of the steel section
b	mm	flange breadth of the steel section
t_w	mm	thickness of the web of the steel section
L_{exp}	mm	length of beam specimen exposed to heating
L_{sup}	mm	length of beam specimen between supports
d_{UB}	mm	thickness of fire protection material on an unloaded beam section
d_{SC}	mm	thickness of fire protection material on an unloaded column section
d_p	mm	thickness of fire protection material concerned
$d_{p(max)}$	mm	maximum thickness of fire protection material used
$d_{p(min)}$	mm	minimum thickness of fire protection material used
$\rho_{protection}$	kg/m^3	density of fire protection material
ρ_{UB}	kg/m^3	density of fire protection material on an unloaded beam section
ρ_{SC}	kg/m^3	density of fire protection material on an unloaded column section
ρ_{LB}	kg/m^3	density of fire protection material on a loaded beam
ρ_a	kg/m^3	density of steel (normally 7850 kg/m^3)
θ_{SC}	°C	mean (or characteristic) steel temperature of a short column (see 13.2.2)
θ_{LB}	°C	characteristic steel temperature of a loaded beam
θ_{UB}	°C	characteristic steel temperature of an unloaded beam
θ_{LC}	°C	characteristic steel temperature of a loaded column
θ_{TC}	°C	characteristic steel temperature of a tall column
$\theta_{c(UB)}$	°C	corrected temperature of an unloaded beam section
θ_t	°C	average temperature of the furnace at time t
θ_{at}	°C	average temperature of the steel at time t
$\Delta\theta_t$	°C	increase of furnace temperature during the time interval Δt
$\theta_{m(SC)}$	°C	modified steel temperature of an unloaded column section
θ_D	°C	design temperature
$k(\theta)$		correction factor for temperature of an unloaded section at a temperature θ
$k(\theta_{LB})_{max}$		correction factor for temperature based on beams for a short section at a temperature θ with maximum thickness of applied fire protection material
$k(\theta_{LB})_{min}$		correction factor for temperature based on beams for a short section at a temperature θ with minimum thickness of applied fire protection material
$k(\theta)_C$		correction factor for temperature based on columns for a short section at a temperature θ with maximum thickness of applied fire protection material
$k_d(\theta)$		correction factor for temperature of a short column section at a thickness of fire protection material d and at a temperature θ
$k_d(\theta_{LB})$		correction factor for temperature based on beams for a short section at a thickness of fire protection material d and at a temperature θ
$k_d(\theta_{TC})$		correction factor for temperature based on tall columns (or loaded columns) for a short section at a thickness of fire protection material d and at a temperature θ
$k_{max}(\theta)$		correction factor for temperature of a short section at maximum thickness of fire protection material d_{max}

$k_{min}(\theta)$		correction factor for temperature of a short section at minimum thickness of fire protection material d_{min}
C_a	J/kg °C	temperature dependant specific heat of steel as defined in ENV 1993-1-2
C_p	J/kg °C	temperature independant specific heat of the fire protection material
μ		ratio of heat capacity of the fire protection material to that of the steel section
t	min	time from commencement of the start of the test
t_e	min	time for an unloaded section to reach an equivalent temperature to the loaded beam at time t
Δt	min	time interval
t_D	min	time required for a short steel column section to reach the design temperature
λ_p	W/m °C	effective thermal conductivity of the fire protection material
$\lambda_{char(p)}$	W/m °C	characteristic value of effective conductivity of the fire protection material
$\lambda_{ave(p)}$	W/m °C	mean value of λ_p calculated from all the short column sections at a temperature θ_{SC}
$\lambda_{\delta(p)}$		standard deviation of λ_p calculated from all the short column sections at a temperature θ_{SC}
$C_{n(\theta)}$		constant derived for short section at temperature (θ)
K		constant applied to $\lambda_{\delta(p)}$

4 Test equipment

4.1 General

The furnace and test equipment shall conform to that specified in EN 1363-1.

4.2 Furnace

The furnace shall be designed to permit the dimensions of the test specimens to be exposed to heating, be they short columns, tall columns or beams, to be as specified in 6.2 and their installation upon or within the test furnace to be as specified in clause 7.

4.3 Loading equipment

Loading shall be applied according to EN 1363-1. The loading system shall permit loading to be applied to beams as specified in 5.2.1 and to columns as specified in 5.2.3.

5 Test conditions

5.1 General

A number of short steel, "I" or "H" test sections, protected by the fire protection system, is heated in a furnace according to the protocol given in Figures 2, 3 and 4.

Loaded and unloaded beams or columns (see Table 1) that are likewise heated provide information on the ability of the fire protection system to remain intact and adhere to the steel test sections (stickability).

The method of testing loaded beams in this part of the test method is designed to provide maximum deflection under the influence of load and heating.

It is recommended that the tests be continued until the steel temperature reaches the maximum value commensurate with application of the data, usually 750 °C.

Where several test specimens are tested simultaneously, care shall be taken that each is adequately and similarly exposed to the specified test conditions.

The procedures given in EN 1363-1 shall be followed in the performance of this test unless specific contrary instructions are given.

5.2 Support and loading conditions

5.2.1 Loaded beams

Each loaded beam test specimen shall be simply supported and allowance shall be made for free expansion and vertical deflection of the beam. The simply supported span shall be not greater than the length exposed to heating by more than 250 mm at each end.

Loading shall be uniformly and symmetrically applied at two or more locations along its length. Point loads shall be applied directly via loading spacers introduced through the cover slabs, see Figure 5. These spacers may be of any suitable material but if they are of steel or other high conductivity material, unless the contact surface at each loading point is less than or equal to 100 mm × 100 mm or 10 000 mm^2, they shall be insulated from the steel beam by a suitable insulation material.

5.2.2 Unloaded beams

Each unloaded beam test specimen shall be supported as shown in Figure 6.

5.2.3 Loaded columns

For each loaded column provision shall be made for the proper support, positioning and alignment of the column test specimen in the furnace and for ensuring uniform distribution of the loading over the ends of the specimen, see Figure 7.

The ends of the specimen shall be designed and detailed for the proper transmission of the test load from the loading platens to the specimen. The loadbearing faces at top and bottom of the column shall be parallel to each other and perpendicular to the axis of the column to avoid introduction of bending moments.

For protection of the loading equipment against heat, provision shall be made for the attachment of collars at each end of the test specimen. These shall be designed to locate the column and to provide an adequate seal with the furnace walls and shall be suitably attached and supported so that they remain effective and in position throughout the heating period.

The method adopted to provide the seal shall allow the test specimen to move within the furnace walls without significantly affecting the load transmitted from the loading rig to the specimen or the fixity at the ends of the specimen.

5.2.4 Unloaded columns

A tall column test specimen or short column section test specimens shall be supported vertically within the furnace, either installed to the soffit of the furnace cover slabs, (see Figure 8), or stood, directly or on plinths, on the furnace floor.

5.3 Loading

The loaded beam test specimens shall be subjected to a total load which represents 60 % of the design moment resistance, according to ENV 1993-1-1, calculated using the nominal steel strength and the recommended boxed values given in ENV 1993-1-1.

The actual load applied shall be the calculated total load less the dead weight of the beam, concrete topping and fire protection material etc.

The method of loading shall be by a system which will produce a bending moment which is uniform over at least 25 % of the span of the beam around mid-span.

The loaded column shall be subjected to an axially applied test load which represents 60 % of the design buckling resistance, according to ENV 1993-1-1, calculated using the nominal steel strength and the recommended boxed values given in ENV 1993-1-1.

Details of the calculation made to define the test loads shall be included in the test report.

6 Test specimens

6.1 Number of test specimens

6.1.1 General

The standard package of short steel column test sections appropriate to each assessment method, chosen to span the full range of steel section factors which are in general usage, together with section dimensions, are given in Tables 2, 3 and 4.

For both the maximum and the minimum thickness of the fire protection system, a loaded beam shall be tested to examine stickability during maximum deflection of the steel section, up to a maximum anticipated steel temperature.

For each test involving a loaded beam, an equivalent unloaded beam section shall be included and tested in the furnace at the same time.

Where the range of thicknesses for the fire protection system is such that the difference between the maximum and the minimum thickness is less than 50 % of the minimum thickness, then only a single loaded and unloaded beam or column at the maximum fire protection material thickness need to be tested.

6.1.2 Passive fire protection systems

If the assessment is to be made for both three and four sided application of the fire protection system to both beams and columns, then two loaded beams and two unloaded beams and a number of short steel column sections shall be tested, (see Figures 2, 3 and 4).

The minimum number of short steel column sections to be tested is 10. The number may be increased to 18 or 26 in order to satisfy the criteria for validity of the results from the assessment method.

If the assessment is to be confined to four sided protection of columns, the two loaded beam tests shall be replaced by two loaded column tests, one with maximum and one with minimum thickness of applied fire protection material. The two unloaded beam tests are not required.

6.1.3 Reactive fire protection systems

If the assessment is to be made for both three and four sided application of the fire protection system to beams and columns, the number of test specimens required is the same as for passive fire protection materials plus an additional test upon a single unloaded column of two metre height minimum, (named a tall column hereafter). This column shall be tested with maximum thickness of fire protection material.

If the assessment is to be confined to four sided protection of columns, the two loaded beam tests shall be replaced by two loaded column tests, one with maximum and one with minimum thickness of applied fire protection material. The two unloaded beam tests are not required. The additional tall column is not required, since adequate data would be obtained from the behaviour of the fire protection material upon the two loaded columns.

These column tests are required to provide information on stickability and the ability of the reactive fire protection material to resist slumping and flowing.

6.1.4 Precautions against erroneous results

In the event that there should be a loss of valid results from the package of short steel sections tested, (through failure of thermocouples, abnormal behaviour of fire protection etc), then the conditions given in 11.1 shall be applied and a further number of short steel sections may be required to be tested.

6.2 Size of test specimens

6.2.1 Loaded beam test sections

Loaded beam test sections shall have an "I" cross sectional shape, a section height of (400 ± 20) mm and a profiled section factor of (150 ± 10) m^{-1} (boxed section factor of (110 ± 10) m^{-1}).

Each beam shall have a total length which shall provide for a length exposed to heating of not less than 4 000 mm. The supported length and specimen length shall be specified as follows:

The span between the supports [L_{sup}] shall be the exposed length plus up to a maximum of 250 mm at each end. The length of the specimen [L_{spec}] shall be the exposed length plus up to a maximum of 350 mm at either end (see Figure 5).

The additional length, required for installation purposes, shall be kept as small as practically possible.

6.2.2 Unloaded beam test sections

Each unloaded beam test section shall be taken from the same length of steel as its equivalent loaded beam, thereby ensuring that it is of the same dimensions and characteristics.

The length of each unloaded beam shall be (1 000 ± 50) mm.

6.2.3 Loaded column test sections

The loaded column test sections shall be of overall dimensions (300 ± 10) mm × (300 ± 10) mm with a profiled section factor of (150 ± 10) m^{-1}. [Boxed section factor of (100 ± 10) m^{-1}]. It shall have a minimum height, exposed to heating, of 3 000 mm.

6.2.4 (Unloaded) Tall column test sections

The (unloaded) tall column test sections shall be of overall dimensions (300 ± 10) mm × (300 ± 10) mm with a profiled section factor of (150 ± 10) m^{-1} (boxed section factor of (100 ± 10) m^{-1}). It shall have a minimum height of 2 000 mm.

6.2.5 Short column test sections

The short column sections shall have a height of (1 000 ± 50) mm.

The short column test sections equivalent to the loaded or tall column test sections shall be taken from the same length of steel, thereby ensuring that they have the same dimensions and characteristics.

6.3 Construction of steel test specimens

6.3.1 Loaded beam test sections

Steel test sections used in loaded beam tests shall be constructed according to Figure 5.

To give web stiffness and torsional restraint, the beams shall be provided with:

a) web stiffeners in the form of steel plates, welded at each loading point. These shall be of thickness at least equal to the thickness of the web and of depth at least 10 mm less than the beam flange depth. Details are shown in Figure 9;

b) web stiffeners in the form of steel plates or channels, welded at each support point. These shall be of thickness at least equal to the thickness of the web. Web stiffeners comprising steel plates shall be trapezoidal in shape to provide additional torsional restraint. Details are shown in Figure 9.

6.3.2 Unloaded beam test sections

Steel test sections used in unloaded beam tests shall be constructed according to Figure 6.

To minimize heat transfer at the ends of the unloaded beams, the ends shall be protected with insulation board or similar which at elevated temperatures is capable of providing an equivalent insulation to at least twice that of the particular thickness of the fire protection material provided over the length of the test specimen, (see Figure 6).

The linear dimensions of the end protection shall be greater than the total overall dimensions measured over the fire protected steel member. Arrangements shall be made to ensure that any gaps caused by expansion of the steel beam in a boxed fire protection system are closed with fire resistant packing.

6.3.3 Loaded column test sections

Steel test sections used in a loaded column test shall be constructed according to Figure 7.

6.3.4 Unloaded tall column test section

Steel test sections used in an unloaded column test shall be constructed according to Figure 8.

When the test is to be carried out on an unloaded tall column section, provision shall be made to minimize heat transfer from the exposed end. The exposed ends shall be protected with insulation board or similar which at elevated temperatures is capable of providing an equivalent insulation to at least twice that of the particular thickness of the fire protection material provided over the height of the column. The linear dimensions of the end protection shall be greater than the total overall dimensions of the fire protected steel section, (see Figure 8). Arrangements shall be made to ensure that any gaps caused by expansion of the steel column in a boxed fire protection system are closed with fire resistant packing.

6.3.5 Short steel column test sections

Steel test sections used in a loaded column test shall be constructed according to Figure 8.

To minimize heat transfer from the ends of short steel column sections, the ends shall be protected with insulation board or similar material as specified in 6.3.4 and Figure 8.

6.3.6 Application of the fire protection material to the steel test section

The surface of the steel shall be prepared and the fire protection system shall be applied to the beams and to the columns in a manner representative of practice. The method of application to columns shall not be significantly different to that for beams, otherwise separate tests and assessment shall be needed incorporating loaded columns.

Any variability of density of the fire protection system applied to the loaded and equivalent unloaded beams shall be within the limits specified in 6.5.2.

For boxed fire protection systems the loaded beams and tall steel column section shall incorporate examples of all constructional and peripheral joints of the design and spacing intended in practice.

The fire protection system shall be supported from the steel test section or the concrete deck as appropriate. Where the fire protection system is to be fixed to the lightweight concrete deck by artificial means, e.g. bolting through, the laboratory in carrying out the assessment shall make reference to expected performance if supported from normal concrete.

The fire protection material shall be applied to loaded steel test sections before the load is applied.

The fire protection material shall extend beyond the heated length and to within 50 mm of the supports of each loaded beam and shall extend the full height of each column section.

Where the fire protection system is of the box type, the ends of the cavity between the material and the steelwork shall be sealed at the point where the test specimen exits the furnace wall to prevent any flow of gases beyond the heated length of the specimen (see Figure 10).

Care shall be taken to ensure that during installation of the test specimens into the furnace, or as a result of any movement of the test specimens during the test, the fire protection system is not subjected to any expansion or restraint stresses contrary to its use in practice.

6.4 Composition of test specimen component materials

6.4.1 Steel sections

The steel beams shall be of "I" cross section and the columns of "H" cross section. The grade of steel used shall be any structural grade (S designation) to EN 10025 or EN 10113, (excluding S 185). Engineering grades (E designation) shall not be used.

6.4.2 Fire protection system

The composition of the fire protection system shall be specified by the sponsor and shall include, at least, its expected nominal density, moisture content and heat capacity.

For confidentiality reasons the sponsor may not wish detailed formulation or composition details to be reported in the test report. Such data shall, however, be provided and maintained in confidence in laboratory files.

6.5 Properties of test specimen component materials

6.5.1 Steel

The dimensions and cross-sectional areas of the steel sections shall be measured, neglecting any internal and external radii. These values shall be used to determine the steel section factors, according to the equations given in Figure 1, which shall then be used to calculate the applied load according to 5.3.

6.5.2 Fire protection materials

6.5.2.1 General

The actual thickness, density and moisture content of the fire protection material shall be measured and recorded at the time of test for each test specimen. The properties of materials shall be determined on test materials or test samples conditioned as defined in clause 8.

The procedures appropriate to different types of fire protection material are given in annex C.

6.5.2.2 Thickness of fire protection materials

The thickness of panel or board type fire protection materials should not deviate by more than 15 % of the mean value over the whole of its surface. The mean value shall be used in the assessment of the results and in the limits of applicability of the assessment. If it deviates by more than 15 % then the maximum thickness recorded shall be used in the assessment.

The thickness of sprayed or coated passive and reactive fire protection materials shall be measured at the locations specified in C.2.4. Thickness measuring points shall not be closer than 150 mm to web stiffeners in loaded beams.