



**SLOVENSKI STANDARD
SIST-TP CEN/TR 17524:2020**

01-oktober-2020

Požarno inženirstvo v Evropi - Pregled nacionalnih zahtev in uporaba

Fire safety engineering in Europe - Review of national requirements and application

Brandschutzingenieurwesen in Europa - Anforderungen und Anwendung

L'Ingénierie de sécurité incendie en Europe - Revue des exigences nationales et application

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ICS:

13.220.01	Varstvo pred požarom na splošno	Protection against fire in general
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TECHNICAL REPORT

CEN/TR 17524

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

August 2020

ICS 13.220.01

English Version

Fire safety engineering in Europe - Review of national requirements and application

L'Ingénierie de sécurité incendie en Europe - Revue des exigences nationales et application

Brandschutzingenieurwesen in Europa - Übersicht der nationalen Anforderungen und Anwendung

This Technical Report was approved by CEN on 10 August 2020. It has been drawn up by the Technical Committee CEN/TC 127.

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European foreword

This document (CEN/TR 17524:2020) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

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Introduction

On 1 May 2001, the Benefeu project started with a consortium managed by Warrington Fire Research (UK) composed of CTICM (activity transferred to Efectis France), DIFT, IST, RUG and TNO (activity transferred to Efectis Nederland).

The programme was financed by the European Commission (EC contract EDT/01/503480).

With a duration of one year, the programme aimed to identify the potential benefit of Fire Safety Engineering in the European Union.

The CEN TC127 WG8 dedicated to Fire Safety Engineering identified a need of updating the work performed within the BENEFU programme as a benefit for European standardization work and European member states.

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1 Scope

This document gives an overview of the evolution of regulations and application of Fire Safety Engineering (FSE) in Europe. Based on work performed in 2001-2002, a full update of information has been done. A global survey based on questionnaires defined in 2001, the evolution and possible perspectives of the FSE practices within two perimeters are presented:

- The first perimeter is the same perimeter analysed in 2001 corresponding to the European Union defined in 2001 extended to European countries with European Union agreement (Switzerland, Norwegian and Iceland).
- The second perimeter is the European Union perimeter of 2016 extended to European countries with European Union agreement (Switzerland, Norwegian and Iceland).

Conclusions and initiatives of the 2001 proposals were analysed 15 years after, with and without the extension of European Union. New initiatives have since been proposed.

In addition, the state-of-the-art of Fire Safety Engineering is updated.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, no terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
<https://standards.iteh.ai/catalog/standards/sist/b1d19dec-1093-4022-a14c-1d104db865d7/sist-tp-cen-tr-17524-2020>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 The Benefeu programme

4.1 Organization and tasks

On 1 May 2001, the Benefeu project started with a consortium managed by Warrington Fire Research (UK) composed of CTICM (activity transferred to Efectis France), DIFT, IST, RUG and TNO (activity transferred to Efectis Nederland).

The programme was financed by the European Commission (EC contract EDT/01/503480).

With a duration of one year, the programme aimed to identify the potential benefit of Fire Safety Engineering in the European Union.

To satisfy this aim, this programme was organized in three key tasks:

- Task A – Current regulations in member states;
- Task B – State of the art in FSE;
- Task C – Possible initiatives and cost benefit analysis.

The final report [1] dated 19 July 2002 was presented to the European Commission.

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4.2 Task A – Current regulations in member states

In order to collect information from the 15 member states of the European Union plus three countries that signed conventions (Switzerland, Norway and Iceland), a questionnaire [2] was prepared and produced by the consortium.

It was sent to the regulators of the member states and to FSE users with responses collected by the Consortium.

A global overview of the European Union situation from these 18 countries was drawn. The main topics were:

- fire regulation;
- enforcement of regulations;
- societal goals;
- functional/performance requirements;
- technical details in regulations;
- alternative approval system or derogation;
- changes to regulation; iTeh STANDARD PREVIEW
- no regulatory obligation; (standards.iteh.ai)
- cost-benefit analysis; [SIST-TP CEN/TR 17524:2020](https://standards.iteh.ai/catalog/standards/sist/bfd19dee-1093-4022-a14c-1d104db865df/sist-tp-cen-tr-17524-2020)
- fire safety engineering; <https://standards.iteh.ai/catalog/standards/sist/bfd19dee-1093-4022-a14c-1d104db865df/sist-tp-cen-tr-17524-2020>
- education and training in FSE; and
- other points.

In addition, fire experts or regulators from non-European countries (New Zealand, Australia, USA, Brazil, Singapore, Canada, Japan, and Hong Kong) completed the questionnaire.

The consortium concludes that “the distribution of the answers is generally very similar to the distribution in Europe, but the following main differences are noticed:

- Within fire safety regulations, the goal of business and social activity protection is covered by 30 % of the non-European countries, instead of about 10 % in Europe.
- Concerning the type of requirements, most of the non-European countries have prescriptive or deemed to satisfy requirements, but not both as is observed in Europe.
- Concerning the knowledge of fire safety engineering use in the different subsystems, contrary to Europe where most of the countries consider that SS2 (66 %), SS3 (90 %) and SS4 (70 %) need little work or are mature, 50 % of non-European countries consider that they need much work.

4.3 Task B – State-of-the-art FSE

The state of art of FSE was a worldwide overview including development, standardization and regulations.

The main conclusion from this state-of-the-art review performed in 2001-2002 was:

- need for performance-based code coordination to avoid barriers to services in Europe;
- huge progress on implementation tools was made from 1990, nevertheless “operational and unambiguous standards” are needed to have a common way to assess the safety level;
- need for coordination of standardization and pre-standardization between the various committees;
- evolution of standard tests to represent the “real world” scenario; and
- development of training and education to satisfy the future needs of Fire Safety Engineers in Europe, with a need to mobilise global awareness to support the process.

Next a list of research needs, input data and standardization were attributed to the different technical and scientific topics, describing the level of knowledge.

4.4 Task C – Initiatives and cost-benefit analysis

- From the previous tasks A and B, the consortium listed five main initiatives:
- To create a network of fire regulators to steer concerted action towards the transition from prescriptive codes to performance-based codes, allowing the application of fire safety engineering techniques. This steering should coordinate work from the four following initiatives, verify the implementation of that work and maintain the relationship with the European Commission and CEN.
- To create a harmonized framework within which performance-based codes can function and create a model code. The framework objectives are to define the new EU policy for Fire Safety, introduce the common use of FSEs, share between member states a common view of the development of performance-based codes with regulatory convergence and so avoid the creation of new trade barriers within the EU. The framework could be based on the following scheme (see Figure 1):

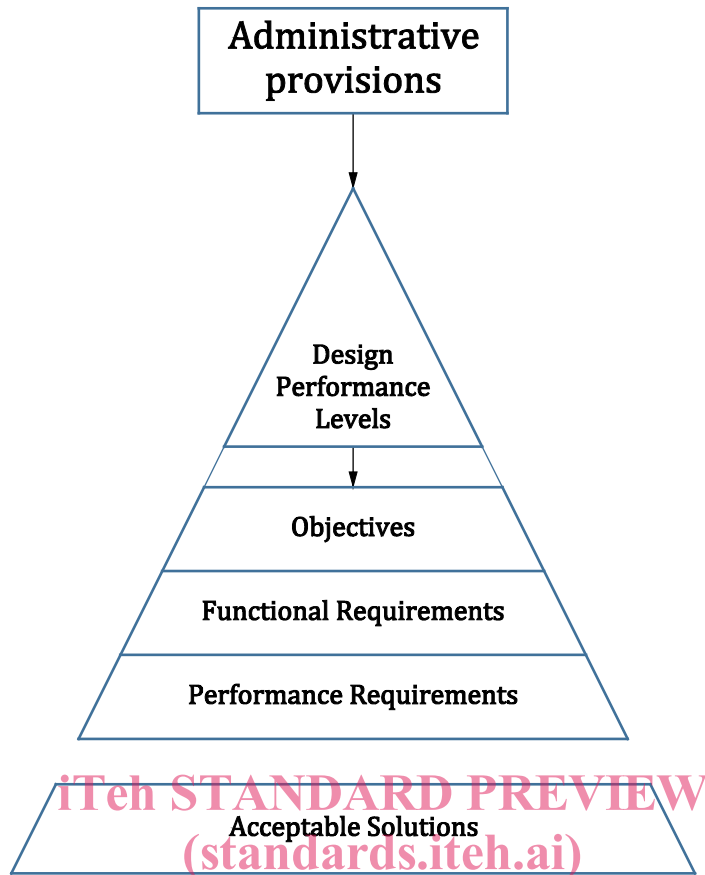


Figure 1 — Framework example

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A ten-year plan was identified to reach a common framework (two years), a model code (one year) and national performance-based codes (five years).

- To set up an advisory committee on research, which will list and prioritise the most urgent and important research needs in support of performance-based regulations. To promote the allocation of sufficient research funds to this subject, use should be made of the European Research Framework programmes. This initiative for FSE was compared to the Reaction to Fire research programme that led to new standardization and European harmonization from 1988 to 2000. A new ten-year plan was proposed to include the development of research in standardization (identification two years, execution six years, introduction in standardization two years)
- To develop a mandate for standardization, building on existing knowledge and the results of the identified, targeted research. This initiative promotes the use of ISO TC 92 SC4 standardization work to avoid duplication of work and identifies the need for standard tests to create extended application data for the performance of construction products to use in FSE calculations. To perform that work, the initiative identifies a need for a mandate for FSE development in CEN. A timing of three years was given to identify standardization requirements and publish specific mandates.
- To undertake all necessary action to define the professional education needs and the conditions for professional recognition. The objectives were the production of structured education and a structure for professional recognition. Practitioners and enforcers should be included in the process. A code of ethics should be part of the structure. A timeframe of about ten years was

anticipated to yield the first educated Fire Safety Engineers (four-year programme) based on a common core curriculum, and thus to reach a full organization of the profession.

From all these initiatives, the consortium presented its cost-benefit analysis for the implementation of FSE in Europe. They concluded:

“Under the condition that fire safety engineering is fully implemented in the EU area, this would correspond to a saving in the order of €0,3 B to €1 B on an EU scale. Compared to these savings, the costs, necessary to introduce and maintain fire safety engineering in the EU (i.e. costs for research, education and standardisation) are marginal” (estimated to €28 M).

5 Additional programme

CEN TC127 WG8 was created in 2014 with the aim of pre-standardisation and standardisation of Fire Safety Engineering. At the time, no mandate had been published for these topics.

The transfer from the CEN TC127 TG1 to CEN TC127 WG8 demonstrated the wish of the European Commission to highlight Fire Safety Engineering in Europe.

Several programmes for pre-standardization have already been identified by CEN TC127 WG8, including a performance-based framework, recognition of the profession, identification of needs, strong relationship with the ISO TC 92 SC4, review of conferences and international exercises, identification of national trends and feedback from some countries.

Thus the work made by the Benefeu Consortium and the initiatives promoted by it were a strong basis for CEN TC127 WG8. Nevertheless, 15 years later (2001-2016), an update of the situation was necessary.

Therefore the tasks performed within the Benefeu programme were updated with a revision of the questionnaire initially completed in 2001. This is presented in Clause 6 for the results of the revision of the questionnaire in the context of EU in 2001; the update concerns the European countries assessed in 2001. The analysis will identify the work performed in the past 15 years in these European countries.

Since 2001 the European Union has been enlarged from 15 to 28. Thus the questionnaire has also been completed by the new member states in the European Union. Clause 7 will analyse the situation across the 28 countries of the European Union in 2016 (some countries did not respond, so the number of countries was reduced to 22).

Clause 8 will identify the state of the art of Fire Safety Engineering in 2016 compared to the state of the art in 2001. It includes examples from the SFPE Performance-Based Conference in 2016 that are representative of the application of FSE in performance-based codes in many countries.

6 Updated survey of EU member states in 2001

6.1 Survey conditions

All the questionnaires filled in 2001 were available as original Excel files. Then the questionnaires were:

- Given to the participants to WG8 in order that they update the content of the questionnaire filled by the regulators of their country in 2001. Members of the WG8 were free to contact any person to help complete the questionnaire
- Sent to TC127 members or regulators to the other countries that are not represented by a member in the WG8.

Then, an updated version was returned to the convenor of WG8 and listed in the WG8 documents.

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The members mentioned sometimes that they disagree with some answers given in 2001, indicating that the answers may include some subjectivity.

In 2001, the questionnaire included the regulators' position and the practitioners' position. In this updated version, a single view is taken into account, considering that only "changes" are indicated.

A large percentage of the eighteen 2001-member states (given as 2001-MS in the following clauses) completed the updated questionnaire:

— 16 countries updated their questionnaire:

- France;
- Luxembourg;
- Germany;
- UK;
- Sweden;
- Norway
- Finland;
- Switzerland;
- Austria;
- Spain;
- Italy;
- Denmark;
- Ireland;
- Portugal;
- Greece; and
- Netherlands.

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— Only two questionnaires were not updated, despite several contacts with experts in those countries. In the analysis it was assumed that no changes occurred in these countries in the past 15 years:

- Iceland; and
- Belgium.

From the different updated questionnaires, the analysis focussed on the changes. If no change was recorded, or very few changes (for example if only one country made changes), the report will not present it.

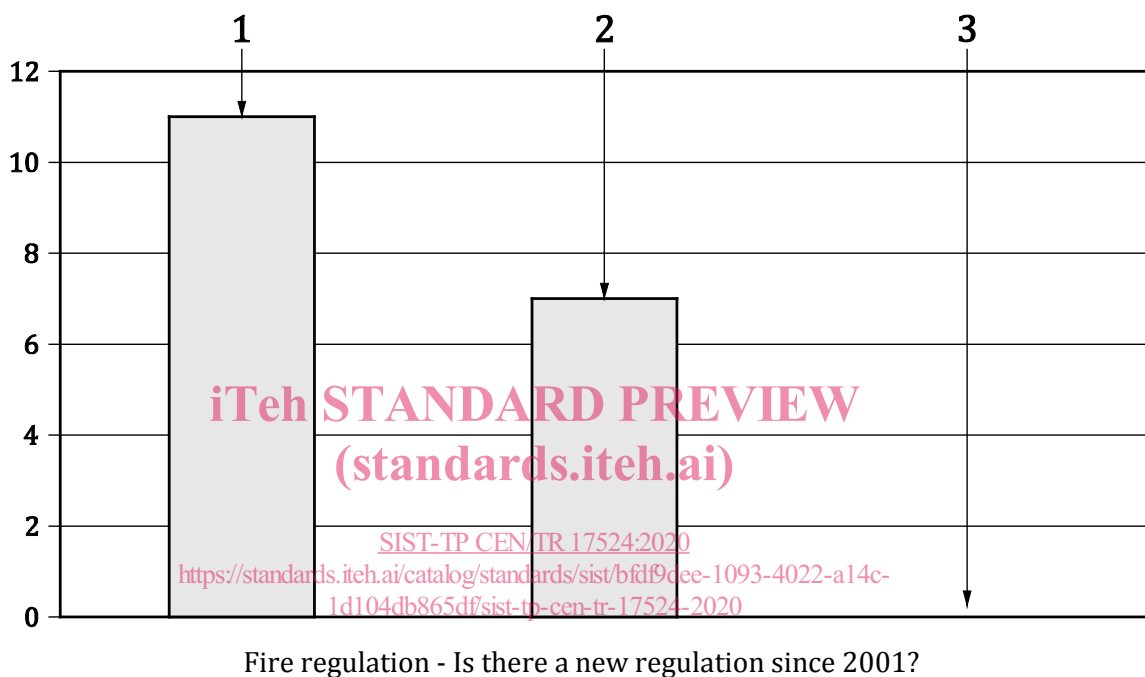
The reader should refer to the Benefeu final report [1] to find the analysis made in 2001.

6.2 Fire regulations

The date of the main fire regulations in the countries is mentioned. A date later than 2001 shows that a change of the regulation has been made. Figure 2 indicates the number of countries mentioning a date later than 2001, so introducing a change in regulations since 2001.

Where countries updated their regulations but without fundamental changes, the initial date is mentioned, as in France, with the 1980 decree.

It appears that 11 countries of the 18 substantively changed their regulations since 2001. These national initiatives indicate possible regular adaptation of the regulations to the latest knowledge, to the innovative construction and systems, field experience and data from fires.



Key

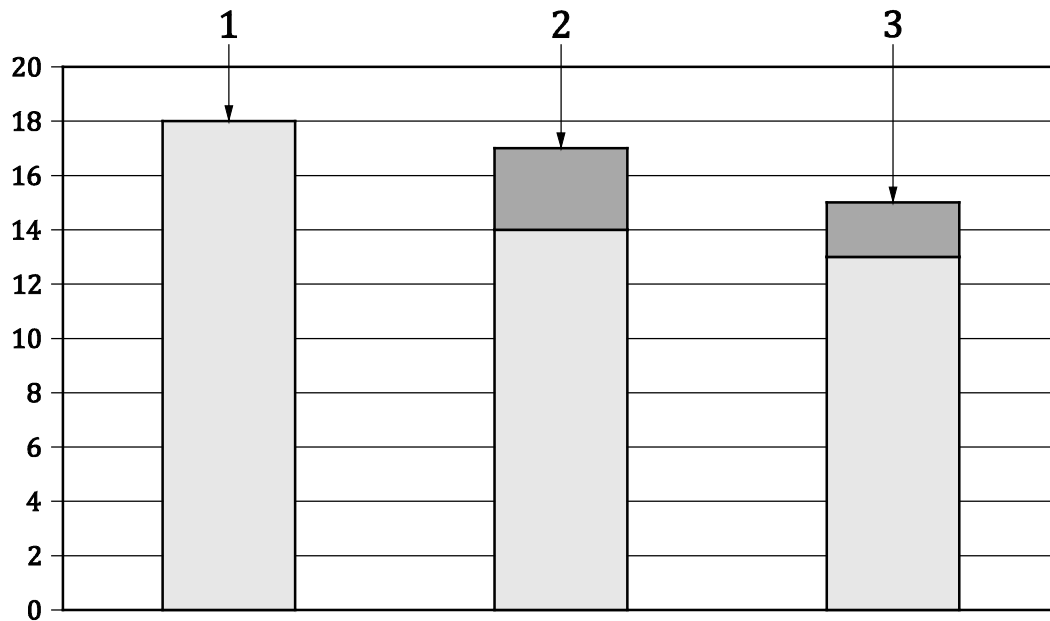
- 1 Yes
- 2 No
- 3 No answer

Figure 2 — Change of regulation

6.3 Enforcement of the fire regulations

The enforcement of the regulations was already in place in 2001 by all countries at the planning stage. Nevertheless, it is noticed that controls have been strengthened by some countries during construction and use. Figure 3 shows that three new countries (Denmark, Portugal and Norway) have introduced controls during construction and two countries have introduced controls during the use of the building (Italy and Denmark). Thus a very limited number of countries have no controls during the construction phase (Italy) or during use (UK, Finland and Austria).

This indicates the current mandatory controls to ensure the application of the regulations. None of the countries has reduced its level of controls.



Enforcement of the regulation - At what stage is enforcement used? (answer yes)

Key

- 1 Planning
- 2 Building
- 3 Use

■ Yes-answer in 2001

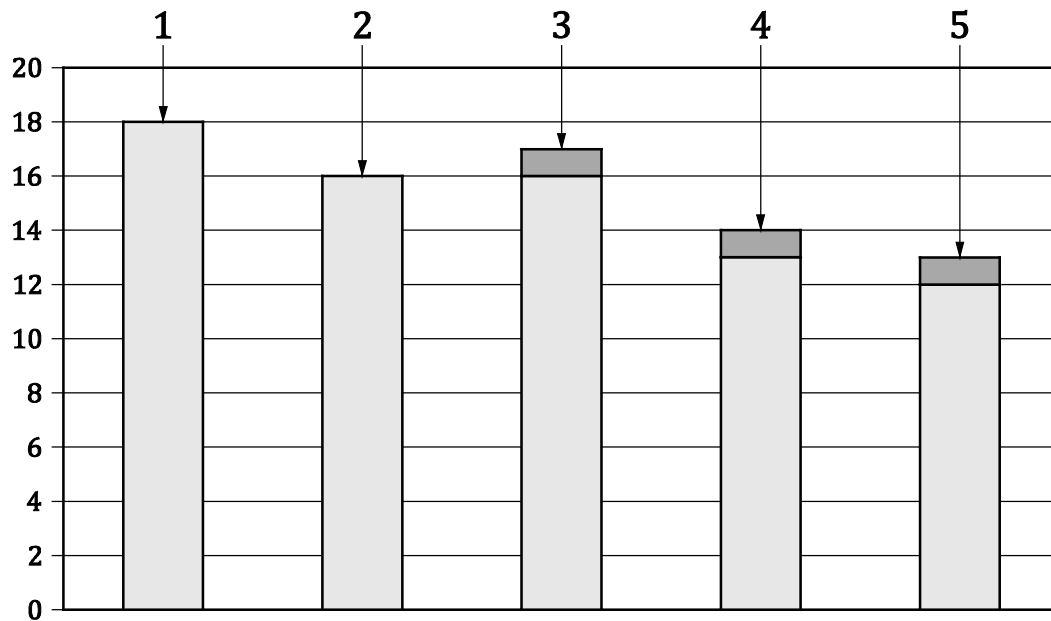
■ Difference of yes-answer between 2001-2016

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Figure 3 — Enforcement of the regulation - Stages

The type of supporting documents (plans, tests, calculations, expert judgement) or supporting assessment (third-party) required by the regulation was already strong in many countries in 2001, but has been reinforced 15 years later in some countries (Italy and Greece) by introducing in the regulations requirements for calculations, expert judgement and third-party assessment (see Figure 4).



Enforcement of regulation: what information is provided by the owner/user of the building for acceptance by the enforcement authority (answer Yes)?

Key

- 1 Plans
- 2 Test results
- 3 Calculation
- 4 Expert judgement
- 5 Third-party approval

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Figure 4 — Enforcement of the regulation - Documentation

6.4 Societal goals and functional requirements

While the main regulatory goals (safety of occupants, firefighters and neighbours) are unchanged in all countries, other possible goals were not covered in the 2001 report. Few changes in the regulatory goals were recorded since 2001. Denmark has focussed the goals of its regulation by excluding property and structure protection as a regulatory goal. Finland has extended its regulatory goals to include protection of business, heritage and social activity (see Figure 5).

Descriptions of the conditions to achieve these goals have been reinforced in the regulations by a better description of the functional requirements (see Figure 6).