EUROPEAN FIRE SPRINKLER NETWORK

A European Fire Safety Coalition

Review of National Quality Assurance Schemes for Fire Sprinkler Systems

13 September 2004

70 Upper Richmond Road
London SW15 2RP
UNITED KINGDOM
Telephone: +44 20 8877 2600 – Fax: +44 20 8877 2642

Executive Summary

The European market for fire sprinkler systems is growing rapidly as building codes recognise the benefits to fire safety of sprinkler systems. The code changes are based on the outstanding performance record of sprinkler systems over more than 100 years. To achieve the improvements in fire safety intended by the new codes it is essential that the performance of sprinkler systems is maintained and improved where possible.

This report reviews the quality assurance schemes for sprinkler systems in operation in fourteen European countries. It shows that most have reasonable schemes in place. However there are significant areas for improvement. Unfortunately Italy does not have any supervision of the quality of sprinkler systems. In addition Belgium, Norway and Spain do not control the quality of sprinkler systems installed to comply with the building code. Since these systems are installed for life safety rather than property protection this is a serious weakness. Although the U.K. requires site inspections of systems installed to comply with the building code it does not ensure that they are installed by competent companies. Many of the European countries not included in this survey are also expected to have major gaps in their quality assurance schemes.

The Netherlands has the most rigorous system of quality control in Europe. Each step is subject to third party review, only approved contractors are allowed to install sprinkler systems and all systems must be periodically inspected. Germany is close behind but not every design is reviewed by a third party and the authorities do not require approved contractors to install systems for code compliance, nor do they insist on regular third party inspections. However, it may not be necessary to review every design made by an experienced contractor. The UK uses this logic to allow large contractors to perform most of their own "third party" inspections of designs and installations, only performing true third party inspections for a sample of systems.

To improve quality this report recommends that:

- Project specifications be written by a third party
- Designs be reviewed by a third party
- Installers be approved by a third party
- Only approved components be used
- Systems be inspected by a third party
- Systems be inspected on a regular basis by a third party
- CEA and others produce a standard for the approval of sprinkler contractors

If the inspections are considered too costly or there are insufficient inspectors the quality scheme could take a statistical approach to design reviews and site inspections.

Background

Fire sprinkler systems have been installed around the world for over 100 years and have built up an outstanding success record in controlling and extinguishing fires. Statistics from many countries and organisations typically report a 98% success rate. However, the range is from 90% to 99.5%. Although at first glance the difference between 90% and 99.5% success may not seem significant, the ratio of the corresponding failure rates is 20.

Part of the difference is due to the skewing of data. For example insurance statistics tend only to include those fires that caused a loss above the excess on the policy: they leave out the many occasions when damage was so slight that an insurance claim was not made. However the general quality of the installed systems also has an impact, if unquantified, on performance.

The elements that contribute to the success of sprinkler systems are:

- the existence of appropriate design standards
- their application by qualified, trained personnel
- the use of appropriate components
- installation by competent, adequately supervised staff
- regular system maintenance by trained staff

Quality does not come without a cost so companies can only apply the above elements and continue to win business if they form part of a quality control scheme that is strictly enforced through third party assessment. The record of sprinkler systems is testament to the fact that such schemes are in place in most countries. Where a quality assurance scheme is not in place we can expect the long-term performance of sprinkler systems to be inferior to elsewhere.

The European Fire Sprinkler Network encourages the wide-spread installation of competently installed and maintained fire sprinkler systems to improve Europe's fire safety. As we increase the application of fire sprinkler systems in Europe it is essential that we do not allow quality to slip but take the opportunity to learn best practice from each other so as to raise quality.

To assist policy makers in the development of building codes and related legislation, and others interested in best practice in quality assurance, the Network has made an overview of the current quality assurance schemes in operation in various European countries. This overview has been split into two parts: the insurance market, where systems are installed because of the influence of insurers; and the code market, where systems are installed because the authorities or the building code require them. The data are presented in Tables 1 and 2.

EUROPEAN FIRE SPRINKLER NETWORK

Table 1 Insurance Market

	Belgium	Czech Republic	Denmark	Finland	France	Germany	Ireland	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.
Design														
Which is the usual design standard?	CEA 4001	EN 12845	DBI 251	CEA 4001	R1	CEA 4001	FM	NFPA 13 UNI	VAS	CEA 4001	EN 12845	SBF 120:6 CEA 4001	VKF	LPC
Which other design standards are accepted by insurers?	NFPA 13 NFPA 15 FM	CEA 4001 NFPA 13 FM	EN 12845 NFPA 13 FM	EN 12845 NFPA 13 FM	NFPA 13 FM	NFPA 13 FM	LPCB NFPA 13	FM	NFPA 13 FM CEA 4001	NFPA 13 FM EN 12845	NFPA 13 FM CEA 4001	EN 12845 NFPA 13 FM Res. Std	NFPA 13 FM CEA 4001	NFPA 13 FM EN 12845
Do insurers require project designs and drawings to be reviewed? (NO/YES/SOMETIMES)	YES	SOME-TIMES	Only FM	SOME-TIMES	YES	YES	YES	Only FM	YES	NO	YES	NO	YES	YES
Who carries out this review?	ANPI or the insurer	Insurer	FM	Bodies authorised by VAKES	CNPP	VdS	Insurer LPCB		Certified inspection bodies		CEPREVEN		VKF	BRE approved companies
For what % of projects is this third party review performed (<20; 20-40; 40-60; 60-80; >80)?	>80	<20	<20 Only FM	20-40	60-80	60-80	>80	<20	>80 (100)		<20 (10)	<20 (0)	>80 (100)	20-40
Installers														
Do insurers usually require sprinkler contractors to be approved?	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES
Who carries out the approval?	BOSEC / Certification Body	CI ČAP	DBI	VAKES	CNPP	VdS	LPCB		LPCB and ISO 9001	FG	UNESPA	SBSC	VKF	BRE
How many approved contractors are there?	25	1	18	2	16 + 12 Offices	50	5		28	30	15	20	16	88
For what % of projects do insurers require an approved installer? (<20; 20-40; 40-60; 60-80; >80)	>80		>80 (100)	<20	>80	60-80	60-80		>80 (100)	>80	60-80 (60)	>80	>80 (100)	>80
Site Inspection														
Do insurers usually require site inspection of newly completed sprinkler systems?	YES	SOME-TIMES	YES	YES	YES	YES	YES	NO	YES	YES	NO	YES	YES	YES
Who carries out these inspections?	ANPI	PAVUS	DBI & RM	Tukes inspection bodies	CNPP	VdS	Insurer LPCB		Certified inspection bodies	FG approved companies	CEPREVEN	SBSC approved companies	VKF	BRE approved companies
For what % of projects is this third party site inspection performed? (<20; 20-40; 40-60; 60-80; >80)	>80		>80 (100)	>80	60-80	60-80	>80		>80 (100)	60-80	<20 (10)	>80 (100)	>80	>80
Do insurers require periodic third party site inspection of existing sprinkler systems?	YES	YES	YES	YES	YES	YES	YES		YES	NO	NO	YES	YES	NO
How often?	6 months	1 Year	1 year	1-3 years	6 months	0.25-1 year	1 Year		6-12 months			1 year	1-3 years	

EUROPEAN FIRE SPRINKLER NETWORK

Table 2 Code Market (Where Sprinklers are Required by Law or the Fire Brigade)

	Belgium	Denmark	Finland	France	Germany	Ireland	Italy	Netherlands	Norway	Romania	Spain	Sweden	Switzerland	U.K.
Design														
Which is the usual design standard?	CEA 4001	DBI 251	CEA 4001	R1	CEA 4001	BS 5306 Part 2	UNI	VAS	EN 12845	P 118-99	EN 12845	SBF 120:6	VKF	BS 5306 Pt 2
Which other design standards are accepted by government?	EN 12845 NFPA 13 NFPA 15	EN 12845	EN 12845 NFPA 13 NFPA 15 FM	NFS 62210 EN 12845	Designs approved by accredited experts	NFPA FM	NFPA	NFPA FM CEA		I9 - 94		EN 12845 NFPA 13 FM Res. Std	NFPA 13 FM CEA 4001	EN 12845 DD 251
Does the government require project designs and drawings to be reviewed by a third party? (NO/YES/SOMETIMES)	SOME-TIMES	NO	SOME-TIMES	SOME-TIMES	YES	YES	NO	YES	NO	YES	NO	NO	YES	NO
Who carries out these reviews?	ANPI		Tukes inspection bodies	Veritas /Socotec /Apave /CNPP	Accredited experts/VdS /TÜV	Fire Officer		Certified inspection bodies		Local accredited verifiers			VKF or certified inspection bodies	
For what % of projects is this third party review performed (<20; 20-40; 40-60; 60-80; >80)?	20-40		<20	?	>80 (100)	<20		>80 (100)		>80 (100)			>80 (100)	
Installers														
Does the government usually require sprinkler contractors to be approved by a third party?	NO	YES	YES	YES	NO	NO	NO	YES	NO	NO	NO	YES	YES	NO
Who carries out the approval?		DBI	Tukes inspection bodies	CNPP				LPCB				SBSC	VKF	
For what % of projects does the government require an approved installer? (<20; 20-40; 40-60; 60-80; >80)	<20	>80 (100)	>80	>80				>80 (100)				>80	>80 (100)	
Site Inspection														
Does the government usually require third party site inspection of newly completed sprinkler systems?	NO	YES	YES	YES	YES	NO	NO	YES	NO	YES	NO	YES	YES	YES
Who carries out these inspections?	ANPI	DBI	Tukes inspection bodies	Veritas /Socotec /Apave /CNPP	Accredited experts/VdS/ TÜV			Certified inspection bodies		Committee & accredited expert		SBSC approved companies	VKF or certified inspection bodies	BRE approved companies
For what % of projects is this third party site inspection performed? (<20; 20-40; 40-60; 60-80; >80)	<20	>80 (100)	>80	>80	>80 (100)			>80 (100)		>80 (100)		>80	>80	60-80
Does the government require periodic third party site inspection of existing sprinkler systems?	SOME-TIMES	YES	YES	YES	YES	NO		YES	NO	YES	NO	YES	YES	YES
How often?	Variable	1 year	1-3 years	1 year	Variable			6-12 months		Unclear		1 year	1-3 years	6 months

Insurance Market

At present the majority of fire sprinkler systems are installed in Europe either to obtain an insurance discount, or because insurance cover is not otherwise available.

Design
The design standard used in a number of countries is the European insurers standard CEA 4001, although many countries have their own insurance design standard. Insurers in all countries allow the use of the internationally recognised NFPA or FM design standards. All these standards are based upon many years of experience, which have shown that if a system is designed in accordance with the standard and maintained ready to function, it will control or extinguish fire in all but the most exceptional circumstances.

In half the countries insurers do not require a third party review of system designs. This can allow designers to make errors, either through ignorance or to cut costs. However, the requirement by insurers in most countries that installers be approved could reduce this risk if the approval process includes a review of a sample of installed systems against design standards. Alternatively insurers can find design errors by a site inspection of all systems, as in Finland. Only in Italy do insurers not have a quality system in place to ensure that designs are correct.

Installation
Site inspection of finished systems will uncover most errors made during installation but not all errors, since some will be hidden. Most insurance associations recognise this and so in addition to site inspections of finished systems they supervise the competence of installers through an approval scheme. In the U.K. many third party inspections are performed by the contractor under a supervised scheme, so that only a sample of sites is actually inspected by a true third party. This reduces the cost of the scheme and accommodates the reality of an insufficient number of inspectors.

Periodic Third Party Site Inspection
Insurers in Norway, Spain and the U.K. do not require periodic site inspections by third parties. There is then a risk that systems may through negligence become inoperable, or that the hazard may change so that the sprinkler system is no longer designed to protect it. In the U.K. the LPC standard requires inspections every three months. This is seen as unreasonable by owners for what is claimed to be a robust, reliable technology. A move to six monthly inspections, which are expected to be more acceptable to the market, is under discussion. The new European standard, EN 12845, also requires quarterly reviews of the hazard and extensive inspections.

Code Market

Relatively fewer fire sprinkler systems are installed because they are required by building codes but this part of the market is growing as legislators recognise the role that sprinklers can play in improving fire safety.

Design
In over half the countries the national insurance or European insurance standard is accepted by the authorities as a design standard. However authorities in a number of countries do not accept insurance standards or NFPA standards. Instead they accept national or European (CEN) standards.

In half the countries the authorities never require a third party review of designs and in three other countries only occasionally. Only in four of the fourteen countries do the authorities usually require a third party review of designs.

Installation
In six countries the authorities require that sprinkler contractors be approved by a third party and in eight of the fourteen countries installed systems must undergo a third party site inspection. In countries where insurers take a much stricter approach than the authorities the code market is served by different companies than the insurance market. The quality of the systems installed in the code market is then suspect.

Periodic Third Party Site Inspection
In nine of the fourteen countries the authorities require periodic site inspection of all sprinkler systems, while in Belgium this is required in some cases. The frequency of these inspections varies around Europe from every six months to every three years. Without periodic inspection and the enforcement of necessary remedial action, systems may become inoperable or the hazard may change so that the sprinkler system is no longer designed to protect it. These are the most common causes of sprinkler system failure.

Components

There are European and international product standards for key sprinkler system components such as the fire sprinklers themselves, alarm valves, water turbine alarms and flow switches. Installers of sprinkler systems all use products that have been independently tested and approved against these standards by third party laboratories. There are relatively few suppliers and the quality of their supply is tightly controlled. This is the most rigorously and consistently enforced part of the quality assurance system.

Other components such as pumps, pipe, fittings and pipe supports are supplied to comply with national or international standards. Installers have little incentive to use sub-standard supply of these products and quality issues are rare.

Recommendations

1) Countries seeking to reduce the risk of sprinkler system failure even further should study the Dutch scheme, which offers the highest level of quality control of sprinkler systems. The essential elements are:

- Project specifications are written by a third party so all contractors compete on an equal basis
- All designs are reviewed by a third party
- All installers are approved by a third party
- Every system is inspected by a third party
- Every system is inspected on a regular basis by a third party

2) If this scheme is considered too costly one way to lighten the impact is to take a statistical approach to design reviews and site inspections, as in the U.K.

3) Periodic inspection of installed systems by technically competent personnel must form an essential part of any quality assurance scheme.

4) Since the EN and other design standards do not specify what skills or experience sprinkler contractors must have, the CEA insurance association and other interested parties should produce a common, best practice scheme for the approval of sprinkler contractors.

EUROPEAN FIRE SPRINKLER NETWORK

The European Fire Sprinkler Network

Set up in 2002, the European Fire Sprinkler Network www.eurosprinkler.org is open to membership by all those with an interest in improving fire safety through encouraging the fitting of fire sprinkler systems. Its members include fire protection associations from several countries; the Chief Fire Officers' Association from the UK; insurance companies (ACE, AXA, FM Global, XL); sprinkler manufacturers, contractors and their associations; the main laboratories in Europe which certify fire protection products and systems (ANPI, BRE, CNPP, SINTEF, SP, TÜV, VdS and VTT); and a number of consulting companies.

The current membership is drawn from a dozen European countries and represents thousands of fire safety professionals across Europe.