

THE IMPLICATIONS OF EUROPEAN STANDARDIZATION OF WATERPROOFING SHEETS FOR THE ROOFING INDUSTRY

JIM A. HOOKER
BFRC Services
Nottingham, England

This paper is a personal view of the author and does not represent official policy of the European Commission.

The ten-year development of pan-European Standards for flexible sheets for waterproofing (including roofing) is effectively nearing completion.

For each class of components, there will be a product specification consisting of three sections: test methods that may be legally enforceable in the country of sale, test methods that are not legally enforceable but that assist in the characterization of the product, and requirements relating to the production control system used by the manufacturer.

The drive to create product standards and test methods has been the establishment of European consumer protection legislation in the field of construction products. The intention is to draw a connection between the minimum necessary performance of components (for example, waterproofing membranes, vapor control layers) and the proper functioning of the roof system including such characteristics as durability, that are notoriously difficult to determine.

This paper describes the product specifications and test methods that are being prepared by Technical Committee 254 of the Comité Européen de Normalisation (CEN). It also outlines the parallel development of test methods for innovative materials within the European Organisation for Testing and Approvals (EOTA).

This process has implications for the global roofing market. Because imported products will be subject to the same requirement to declare test data, non-European manufacturers will need to become familiar with the new test methods. The widespread use of European standards within the enlarged European trading area is also likely to influence the voluntary choice of test regime adopted by a large proportion of roof membrane manufacturers elsewhere.

KEYWORDS

Bitumen sheets, building regulations, conformity, European standards, products, test methods, synthetic sheets.

INTRODUCTION: THE CONSTRUCTION PRODUCTS DIRECTIVE AND CE MARKING

On December 21, 1988, the Council of the European Community established the Construction Products Directive (CPD),¹ which became incorporated in the national regulations of member states during the following five years.

It was to be the approximation of laws, regulations and administrative provisions of the Member States relating to

construction products—in other words, a common minimum legal base for the regulation of construction products that allowed individual countries to maintain their existing regulations. The huge range of construction products was to be divided into families according to their function within the works. Their performance in the works was to be assessed against six criteria, known as the essential requirements (ERs) of: 1) mechanical resistance and stability, 2) safety in case of fire, 3) hygiene, health and the environment, 4) safety in use, 5) protection against noise, and 6) energy economy and heat retention. At an early stage, it was decided that waterproofing membranes contributed to safety in the case of fire and to hygiene, health, and the environment (by controlling damp penetration). Although the ERs concerned construction works or building systems, the link to the performance to individual products within those systems was to be established by a series of documents:

- Interpretative documents² that set out in greater detail the requirements of the ERs.
- Mandates that divide construction products into suitable groups and state the characteristics of those products that are to be included in European technical specifications.
- European technical specifications that state the way in which the characteristics of products are to be determined and the controls over the production of those products. There are two types of European technical specification:
 - Harmonized European standards for established products covered by existing national standards are to be developed under a contract between the European Commission and CEN.
 - European technical approval guidelines for innovative products are being developed under a contract between the European Commission and EOTA.

CEN and EOTA members are listed in Appendices 1 and 2. CEN members are the national standards bodies of the member states of the European Community (EC) and the European Free Trade Alliance (EFTA). EOTA comprises approved bodies who have been nominated by European Union member states and certain members of EFTA to issue European technical approvals. These are discussed later.

The directive also introduced for the first time the concept of a conformity mark, the CE mark, for construction products.

The objective of CE marking was to allow construction products to trade freely within the countries of the European union, while ensuring that the products enabled the construction works to meet the relevant essential requirements.

Essentially, CE marking is a deal between manufacturers (or their agents) and national regulators. Manufacturers are free to affix the CE mark to any product that falls within the scope of the mandates. However, by doing so, manufacturers are declaring that their products conform with the European technical specification for that product. Thus, test data on the characteristics of products and certification of the production control system will have to be available before the CE mark is affixed. The policing and prosecution of manufacturers is the responsibility of national trading standards authorities.

There are essentially two elements to a European technical specification:

- test methods, rules for sampling and for the statistical evaluation of results
- rules for the monitoring of factory production control and initial testing of new products.

It would, of course, be inappropriate to address an international audience on matters of private concern to European producers alone. However, this is not the case. In practice, any manufacturer wishing to trade freely in any of the countries of the European Union will probably need to display the CE mark on products for which there is a mandate. In the United Kingdom, the importer will be responsible for ensuring that the CE mark is justified. Non-European-community-based manufacturers will be able to affix the CE mark provided that they have met all the requirements relating to their product. This raises three important questions for non-European exporters:

- What new methods will be employed to determine product characteristics?
- What changes to factory production control will be necessary?
- How will third-party certification be achieved for manufacturers outside the European Union?

EUROPEAN TECHNICAL SPECIFICATIONS FOR ROOFING

CEN Technical Committee 254 is developing specifications for factory-made sheets of bitumen and synthetic materials under Mandate M102; EOTA Working Group 04.02/01 is developing those for liquid-applied waterproofing systems. There is also a new EOTA Working Group 04.02/02 that is developing a specification for the evaluation of systems of mechanically fastened single-layer waterproofing. This latter (draft) mandate is unusual because it is characterizing a system rather than a single product, and it has attracted some criticism because it appears to duplicate work already in progress. Both working groups are expected to use existing test methods. Here, the relationship with the European Union of Agrément (UEAtc) is important; many of the widely used test methods for factory-made and liquid-applied membranes were developed by UEAtc. These are being used by both CEN technical committees and EOTA working groups as the basis of their work. Many UEAtc members are themselves approved bodies within EOTA, but the former exist only for the issue of Agrément Certificates in contrast to the legal status of EOTA.

THE WORK IN CEN

Note: It should be emphasized that although Technical Committee 254 has been established for almost seven years, its work program (that is, the list of test methods to be developed in response to the mandates) has not been finally approved by the European Commission. Neither have all the technical issues within existing work items been resolved. The following description of progress and targets should, therefore, be treated with caution.

There are three different product specifications being developed by CEN Technical Committee 254 for factory-made flexible sheet roof waterproofing:

- reinforced bitumen sheets
- unreinforced bitumen sheets
- thermoplastic and elastomeric sheets (reinforced and unreinforced)

The reason for this split is partly technical, partly historical (bituminous and synthetic products used to be managed by different committees), and partly legislative, because of the details of existing national regulation.

These product specifications each consist of:

- A coding system to describe the product (informative).
- A list of test methods to be used to characterize the product. These are subdivided into harmonized test methods (legally enforceable) and voluntary test methods (not legally enforceable, informative).
- rules for the attestation of conformity of the production system (legally enforceable).

The requirement to declare values for characteristics within the harmonized part of the specification is based on the existing national regulations in member states. Although each EU member has implemented the Construction Products Directive, it does not of itself change the technical content of existing regulations. That said, more rapid change is likely in the future as EU members regulations converge on such issues as fire resistance and durability. Non-European exporters with European branch offices or agencies that are familiar with existing national regulations should have sufficient knowledge to predict the content of the mandatory part of the product specifications. However, EU members can expect changes to those test methods used to derive the value for a characteristic in support of those specifications. Instead of using a mixture of, say, DIN, BS and ASTM tests, only harmonized test methods (DINEN, BSEN, etc.) can be used to support CE marking.

The voluntary characteristics are those that the industry considers to be important for the market to assist designers and contractors and to ensure that the difference between high- and low-quality products is clear to the purchaser. They are purely advisory, with no legal status because no country within the EU legislates for them at present. Member states may not incorporate requirements for products in respect of these characteristics within their building regulations. However, they may set such requirements for the works (or system of products) in regulations and in codes of practice.

MINIMUM VALUES

Initially, it was assumed by industry that the product specifi-

cations would set minimum values for characteristics within the harmonized part of the specification. For example, it was assumed that a roofing sheet would have to have a minimum tensile strength or tear resistance. It is now clear that such minimum or limiting values will not be set. The legal reason is that numerical values for characteristics have not been found in any of the existing regulations of the member states; to regulate for them now would involve changes to national regulations, which would be unacceptable. There are also three practical reasons:

- Many waterproofing systems are multilayer, so requirements for individual layers are meaningless unless the other components of the system and the method of attachment are considered.
- Product or system requirements would have to take account of the roof type (for example, whether cold deck or warm deck is being used).
- Such requirements would negate differences of climate and installation tradition existing across Europe.

There is little chance of the European Commission extending its mandates into this highly complex area but classification/requirements systems such as the French CSTB F.I.T.³ approach will continue to be of interest to specifiers and may encourage future research.

It is permissible to use the informative or voluntary part of the product specification to state minimum values for any of the test methods but it is unlikely that CEN committees will reach agreement on such a controversial issue within the program time line. The use of national codes of practice to convey this information is more likely, as discussed later.

THE NEW TEST METHODS

Perhaps the only significance of the harmonization process for manufacturers and consumers will be the establishment of common test methods. At present, if a designer is to compare products from different national sources, it is necessary to compare values against, for example, DIN, BSI, or ASTM test procedures. Not only is direct comparison inaccurate, but also many laboratories are unable to carry out comparative testing to the various different national standards. Once the European test methods are available all such national test methods cannot be used to demonstrate conformity with the CPD. In sourcing suitable test methods, existing ISO, UEAtc and national standards were considered initially in order to avoid expensive and lengthy interlaboratory trials.

The harmonized test methods are intended to simulate actual conditions during installation and service. For example, the mandate differentiates between the product in the works and during installation. It also requires certain additional harmonized test methods for products with special applications, such as roof gardens.

Table 1 lists the harmonized test methods that will support CE marking and shows the existing methods from which they were derived.

Table 2 lists the harmonized test methods and gives brief details of the type of specimen, conditions, knowledge of variability, and anticipated availability. It should again be emphasized that technical and target date information could change.

WATERTIGHTNESS

The test method to determine watertightness derives from the UEAtc.⁴ It is a simple water head test using a glass plate to restrain the circular membrane sample and a desiccated sugar/methylene blue dye mixture to detect water transmission. Exposure is for 24 hours to a specified water head. A second apparatus option is available for products with high extensibility. As this will be one of the most important tests in support of CE marking, it is fortunate that there is widespread experience of its use.

THE SPECIAL CASE OF RESISTANCE TO EXTERNAL FIRE

Delegates will be familiar with the ASTM E 108⁵ method of test for resistance of roofs to external fire. The problem for European standardization is that the interpretative documents define two conditions that are to be satisfied by the roof system and, therefore, its components:

- resistance to an external flying brand
- resistance to an external flying brand with wind and radiation (to replicate a burning element/building nearby)

These conditions were derived from existing regulation in member states. In response, it was necessary to develop a test method that could determine the effect of these conditions in terms of:

- fire penetration through the roof or roof light (skylight)
- fire spread over the external surface or within the composition of the roof covering
- the production of flaming droplets or particles which could assist propagation of the fire.

The resulting draft standard developed in CEN Technical Committee 127 consists of two parts:

- Part I—The German basket woodwool test DIN 4102 Part 7
- Part II—the French Arrete test Cahier 2463 developed by CSTB

A limited interlaboratory test program produced repeatability and reproducibility below expectations, and there were widespread representations concerning the cost and environmental impact of these large-scale tests. More recently, the need to characterize membranes fire performance when subjected to externally applied radiation has also been questioned. External radiation is intrinsic to the national regulations of several countries including the United Kingdom and France but it may be that technical arguments will satisfy regulators that membranes can be properly characterized with greater precision and reduced cost by removing this condition. It may be that the level of radiation created by the ignition source itself is considered sufficient; such a development would be similar to the evolution of ASTM E 108 for which there is now no supplementary radiant panel.

An alternative method of test that can create the required conditions in a single apparatus has been developed by the International Waterproofing Association.⁶ It enables smaller specimens to be used, creates less smoke and should be commensurately cheaper to run.

Whichever method(s) is finally adopted, the cost burden on manufacturers to test additionally to ASTM E 108 will

Table 1 HARMONIZED TEST METHODS: Source standards

Harmonized characteristic Declaration of result is mandatory	Product type*			Source standard
	R	U	S	
DURING SERVICE Watertightness Resistance to external fire	✓† ✓	✓ ✓	✓ ✓	UEAtc MOAT 27 (5.1.4) DIN4102 Part 7 and/or CSTB CAHIER 2463 and/or IWA Fire Reaction Test
DURING INSTALLATION Tensile strength (Part 1) Tensile strength (Part 2A)** Tensile strength (Part 2B) Tensile strength (Part 2C) Tear resistance (Part 1) Tear resistance (Part 2A, B, C, D)** Impact resistance Static perforation resistance Low-temperature flexibility (L.T.F.) (Part 1) Low-temperature flexibility (L.T.F.) (Part 2)	✓ X X X ✓ X ✓ ✓ X X	✓ X X X ?‡ X ✓ ✓ ✓ X	X‡ ✓ ✓ ✓ X ✓ ✓ ✓ ✓ ✓	ISO 1184:1983 (6.1) ISO 527-1 ISO 37 ISO 1421 UEAtc MOAT 27 & ISO 1184 ISO 34-1 NS 3547 (Norway) UEAtc MOAT 27 (5.1.9) New mechanical method Cold fold method
TO CHARACTERIZE DURABILITY Heat aging†† UV & water aging††	✓ ✓	✓ ✓	✓ ✓	MOAT 27 New method (ISO 4892 Part 3)
FOR ROOF GARDENS ONLY Root resistance	✓	✓	✓	New method (F.L.L. Munich)
FOR SINGLE LAYER MATERIALS Joint strength (Peel) (Part 1A) Joint strength (Shear) (Part 1B) Joint strength (Part 2)	✓ X X	? ? ?	X X ✓	UEAtc MOAT 3/91 (4P) UEAtc MOAT 27 (5.2.2) New method
NOTES				
* R = reinforced bitumen sheets U = unreinforced bitumen sheets S = thermoplastic and elastomeric sheets (reinforced and unreinforced)				
† ✓ = method suitable for product type				
‡ X = method not suitable for product type				
§ ? = not yet decided whether test is suitable				
** Tensile strength and tear resistance: multiple methods necessary to characterize thermoplastic, thermoplastic/elastomeric and elastomeric products				
†† The test method(s) to be used for evaluation of the effects of artificial aging have not yet been decided.				

remain if Factory Mutual (FM) approval is required, because no technical equivalence or comparison has been established between the various methods.

In parallel with development of a test for resistance to external fire, CEN Technical Committee 127 is also responsible for a test for reaction to fire. Manufacturers of roof membranes are not required to declare results from this test for CE marking. However, the testing of reaction to fire is presently mandated for monitoring of factory production control. In other words, the body designated to inspect the manufacturers plant tests production samples to ensure the consistency of that production. The industry has argued that resistance testing should be used in both cases, not least because the development of a test method for reaction is seriously delayed.

TC127 is also developing a test for resistance to internal fire. It is assumed that elements other than the waterproofing (for example, the structural deck or insulation) will be the determinants of this characteristic, so there is no requirement in the mandate for membranes.

DURABILITY

It is a fundamental objective of the mandate that product

durability or the long-term performance of the harmonized characteristics of fire resistance and watertightness be declared. No service life has been set. This has posed a major problem: a product sample subjected to draft tests for heat aging and UV/water exposure is unsuitable for any of the proposed fire resistance tests. Although aged samples could be subjected to the watertightness test, little useful information would be gained unless the sample was subjected to physical strain or impact. In this latter case, it may be decided to use low-temperature flexibility, impact resistance, or watertightness after stretching at low temperature to evaluate the effect of aging.

No satisfactory means to characterize the durability of fire resistance has been established. This is an important issue because tougher fire resistance tests could cause increased use of fire retardants, whose effectiveness may decrease with exposure. It is anticipated that it will be possible to evaluate the changes to products in terms of their reaction to fire before and after aging.

VARIABILITY

Table 1 demonstrates that many test methods are close derivatives of existing methods.

Table 2 HARMONIZED TEST METHODS: Conditions and availability						
Harmonized characteristic Declaration of a result is mandatory	Product type*			variability (anticipated)	Specimen/conditions	Availability (estimated)
	R	U	S			
DURING SERVICE						
Watertightness	✓ [†]	✓	✓	✓ ^{**}	150 mm sample; 24 hrs. exposure	1998
Resistance to external fire	✓	✓	✓	? [‡]	Radiation probably 10 kW/m ²	?
DURING INSTALLATION						
Tensile strength (Part 1)	× [‡]	✓	✓	?	Rect. 50-mm-wide specimen, modified grips	1998
Tensile strength (Part 2A)	×	×	✓	?	Rect. 15-mm-wide specimen	1998
Tensile strength (Part 2B)	×	×	✓	?	Dumbbell specimen	1998
Tensile strength (Part 2C)	×	✓	✓	?	Rect. 50-mm-wide specimen	1998
Tear resistance (Part 1)	×	×	? [§]	✓	100 mm/min. rect. specimen	1998
Tear resistance (Part 2A)	×	×	✓	?	100 mm/min. trapezoid. specimen	1998
Tear resistance (Part 2B)	×	×	✓	?	100 mm/min. angle test piece with nick	1998
Tear resistance (Part 2C)	×	×	✓	?	100 mm/min. angle test piece without nick	1998
Tear resistance (Part 2D)	×	×	✓	?	100 mm/min. trouser test piece	1998
Impact resistance	✓	✓	✓	✓	10, 20, 30 mm tools/1000 g weight	1998
Static perforation resistance	✓	✓	✓	✓	15 mm ball. Concrete & XEPS	1999
Low-temperature flexibility L.T.F. (Part 1)	✓	✓	×	✓	30 mm mandrill/2C steps	1998
Low-temperature flexibility L.T.F. (Part 2)	×	×	✓	?	90° fold in 1 second/assessment at room temp.	1998
TO CHARACTERIZE DURABILITY						
Heat ageing (evaluation by L.T.F.)	✓	✓	✓	✓	Oven aging	1998
UV & water aging (evaluation by L.T.F.)	✓	✓	✓	?	QUV(B) and water spray	1998
FOR ROOF GARDENS ONLY						
Root resistance	✓	✓	✓	?	two-year test (2 cycles per year)	1999
FOR SINGLE LAYER MATERIALS						
Joint strength (peel) (Part 1A)	✓	?	×	✓	100 mm/min., 50-mm- wide spec.	1998
Joint strength (Shear) (Part 1B)	✓	?	×	✓	100 mm/min., 50-mm- wide spec.	1998
Joint strength (Part 2)	×	×	✓	?	100 mm/min., 15-mm-wide spec.	1998
Key Product type * R = reinforced bitumen sheets U = unreinforced bitumen sheets S = thermoplastic and elastomeric sheets (reinforced and unreinforced) † ✓ = method suitable for product type ‡ × = method not suitable for product type § ? = not yet decided whether test is suitable Variability ** ✓ = similar to source standard †† ? = interlaboratory trials may be necessary						

Because of changed conditions, their repeatability and reproducibility⁷ is unclear. This is shown in Table 2. Because there are few sources of European funding for interlaboratory trials, it is likely that the product specifications and their supporting test methods will be implemented without clear guidance as to variability of results. This could, potentially, lead to disputes with trading standards authorities in the early years.

IMPLEMENTATION

Following a period of public consultation the draft standards are re-edited as necessary and put to a formal vote of CEN members. There is a system of weighted voting for approval of ENs (see Appendix I). If agreed, the standard is then published as an EN with the appropriate national prefix, for example, BSEN, DINEN, etc. Table 4 shows the estimated implementation dates. Existing national standards on the

same subject, whether test methods or product specifications, will be withdrawn. Although they may remain in an advisory role, they cannot be used in support of national regulations affecting construction products covered by the mandates.

It is significant that many manufacturers are already testing their products to the prenormative prEN draft standards.

DECLARATION OF VALUES

The list of mandatory test methods in Table 1 takes account of the national regulations in all member states. If an exporter to the EU wishes to trade in one country only, it will be necessary to declare values only for the product characteristics regulated in that country. If a member state does not regulate for a particular characteristic of a roofing sheet, for example, tensile strength, a manufacturer will state "No performance measured with the CE mark." A master schedule cross-referencing mandated characteristics to national regu-

Characteristic Declaration of result is voluntary	Product type*			Public inquiry (achieved)	Estimated dates Implementation
	R	U	S		
Dimensional stability at elevated temperature Part 1	✓†	?§	×†	(1996)	1998
Dimensional stability at elevated temperature Part 2	×	×	✓	(1993)	1998
Watertightness after stretching at low temperature	✓	✓	✓	1997	1998
Water vapor transmission properties	✓	✓	✓	(1995)	1998
Hail resistance	✓	✓	✓	1997	1999
Length, width, straightness Part 1	✓	✓	×	(1996)	1998
Length, width, straightness and flatness Part 2	×	×	✓	(1995)	1998
Thickness and mass per unit area Part 1	✓	✓	×	(1996)	1998
Thickness and mass per unit area Part 2	×	×	✓	(1995)	1998
Form stability under changing temperature	✓	✓	×	(1996)	1998
Flow properties at elevated temperature	✓	✓	×	(1996)	1998
Loss of granules	✓	?	×	(1995)	1998
Compatibility with bitumen	×	×	✓	(1995)	1998
Resistance to microorganisms	×	×	✓	1997	1999
Chemical resistance (method of exposure)	×	×	✓	1997	1999
Laminar strength (non-homogeneous materials)	×	×	✓	(1995)	1999
Resistance to ozone cracking	×	×	✓	1997	1999

Key	
* R	= reinforced bitumen sheets
U	= unreinforced bitumen sheets
S	= thermoplastic and elastomeric (synthetic) sheets
† ✓	= method suitable for product type
‡ ×	= method not suitable for product type
§ ?	= not yet decided whether test is suitable

lations is not yet available to facilitate this process.

Declaration will be to a standard format on which mandated and voluntary characteristics will be clearly delineated. Predictions may be unwise at this stage but it is likely that manufacturers will seek to declare values for all the mandated and voluntary characteristics (except those for specialist applications, such as roof gardens, or climatic regions, such as hail resistance).

A standard coding system (see Figure 1) that will be used to define the products has been developed. This is presently available for bitumen products but will be extended to the other product types.

WILL CODES OF PRACTICE BE HARMONIZED?

There is no sign of priority being given by the European Commission to harmonization of codes of practice for roofing. Therefore, it is very important to understand what role existing national codes will play in the market. It will be illegal under European law for countries to require products to meet

nonharmonized characteristics within national (legal) regulations. It will be possible for countries to set minimum or limiting values for harmonized and voluntary characteristics:

- within national (advisory) codes of practice
- for public procurement
- within (legal) building regulations governing complete building elements or systems of products

Thus, although there will be no legal or technical barriers to trade, each country will be able, in practice, to control the use of imported products by influencing the market. It remains to be seen how much impact this will have to existing patterns of trade and import penetration. Certainly, many EC members are now revising their codes of practice to build in more quantitative requirements related to the European technical specifications. It is to be expected that these requirements will be based upon national construction traditions and will be designed to protect each country's products.

Flexible sheets for waterproofing: Product type	ESTIMATED DATES	
	Public inquiry	Implementation
Reinforced bitumen sheets for roofing	1998	2000
Unreinforced bitumen sheets for roofing	2000	2002
Thermoplastic and Elastomeric sheets for roofing	1998	2000

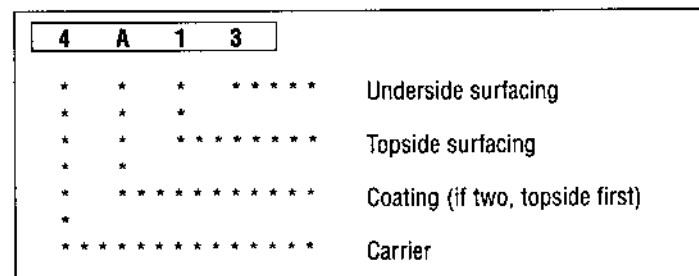


Figure 1. Product code (example): reinforced bitumen sheets.

WHAT WILL SPECIFIERS DO?

Experience in the United Kingdom suggests that many powerful, nonregulatory bodies, such as the insurance industry and housing authorities, are requiring levels of performance in excess of those in national regulations. Because many specifications are now presented in performance terms, they are also requiring declaration of an ever wider range of product characteristics. Some local authorities require the declared values to be endorsed by third-party testing. It will be very tempting for a specifier/designer to require values for all the harmonized and voluntary characteristics, with commensurate cost to the supplier. Although this will not be legally enforceable, it will be difficult for suppliers to refuse.

ATTESTATION OF CONFORMITY

In 1993, research was carried out to establish the role of roof membranes in the integrity of the works as a whole against two criteria:⁸

- the effect of product variability in achievement of the essential requirements in the works
- the likelihood of variability in the production process

It was agreed that roof membranes were moderate risk products that are somewhere between those determining structural integrity and safety, such as concrete or steel, and those that determine only durability and appearance, such as paints. The state of the art in production of roof membranes is such that variability is restricted and its effect is small.

For roof waterproofing membranes, the system will be as follows:

- initial testing of product—certification by manufacturer
- factory production control—certification by a designated inspection body—with continuous surveillance, assessment and approval

How, then, will non-EC manufacturers attest to their conformity with the standards?

CERTIFICATION BODIES

At present, it is assumed that only EC-approved notified inspection bodies within the EC will be allowed to certify the factory production control system.⁹ One reason for this is the assumption that products tested abroad may not be to the same standard when they are supplied in the EC for reasons of natural weathering or drying out (e.g., timber). Such arguments may not apply so readily to roofing sheets, and it seems reasonable to assume that non-EC manufacturers will be able to test locally providing their national certification bodies are suitable accredited to EN45000 series.¹⁰ Clearly such non-EC certification bodies will have to be capable of running the EN test methods. The mandate is very clear in respect of which characteristics are to be monitored by the approved body:

- for ongoing certification of factory production control: reaction to fire
- for initial inspection of factory production control: watertightness

As stated above, there is technical merit in testing the same fire characteristic for the manufacturers' declared value as

for the monitoring of production control; it is likely that fire resistance will be monitored rather than reaction, but this has not been decided finally.

Regarding the monitoring of factory production control, it is anticipated that any ISO 9001⁸ or 9002 quality management system will be deemed to satisfy the requirements.

LIQUID-APPLIED WATERPROOFING: EUROPEAN TECHNICAL APPROVAL

Non-EC manufacturers of liquid-applied coatings that wish to trade in the EC will not have recourse to European Standards. Their route to CE marking will be by compliance with a European Technical Approval Guideline (ETAG). This rather confusing title describes a specification similar to an existing Agrément Certificate. In other words, it describes not just the essential characteristics of the product but also its method of installation. Unlike an Agrément Certificate, a European Technical Approval (ETA) obtained in one country is deemed to apply in all other member states without reconfirmation. It is valid for five years and renewable thereafter. It is very unlikely that ETAs will be obtainable outside the EC but EOTA members may accept testing to the ETAG carried out by suitable non-EC bodies. The ETAGs for liquid waterproofing systems, which use many of the test methods being developed in CEN, are structured as follows:

- Part 1—General stipulations
- Part 2—Systems based on liquid-applied polymer modified bitumen emulsions and solutions
- Part 3—Systems based on liquid-applied, glass-reinforced resilient unsaturated polyester resins.
- Part 4—Systems based on liquid-applied flexible unsaturated polyester.
- Part 5—Systems based on hot-applied elastomeric bitumens
- Part 6—Systems based on liquid-applied polyurethane
- Part 7—Systems based on unmodified bitumen solutions and emulsions
- Part 8—Systems based on liquid-applied unmodified bitumen solutions and emulsions

If, as expected, these ETAGs have completed public inquiry by the end of 1997, implementation can be estimated for late 1998.

DISPUTES

Manufacturers and their agents are expected to keep up-to-date through trade bodies or government authorities. If a public inquiry document is overlooked or not requested, it is, in practice, extremely difficult to make technical representations to amend standards. Thus, non-EC manufacturers used to ASTM testing regimes and prescriptive product specification will need to keep a close eye on the development of the new standards.

Should one country reject a correctly CE marked product, it will be necessary for the manufacturer to take up the matter with its national member of the EC Standing Committee for Construction.

CONCLUSIONS

The following is a summary of implications for non-EC manufacturers of membranes:

- Products bearing the CE mark should be allowed free movement within the EEC and EFTA.
- To support CE marking, manufacturers of membrane products will have to comply with the appropriate harmonized European standard; those producing liquid-applied products will have to obtain the appropriate European technical approval.
- European technical approvals can be issued only by an EOTA member, but it is likely that suitably accredited non-European bodies will be allowed to certify compliance with the ETA guideline.
- An ISO 9002 quality management system will be the easiest way to ensure conformity of the factory production control system.
- It is likely that certain suitably accredited non-European bodies will be able to evaluate conformity of factory production control systems.
- It will be desirable to have the apparatus for the fire resistance test and watertightness test method ENs available within the plant.
- Existing national standards (European or non-European) cannot be used to support CE marking.
- Mandatory limiting values for product characteristics will not be set in CEN product specifications. However, test methods for watertightness, impact resistance and static indentation resistance will be such that low performance products are unlikely to pass the tests.
- Product specifications are performance-based and should not contain prescriptive references to the composition of the products.
- Familiarity with both the harmonized and voluntary test methods will be useful because EC-based manufacturers are likely to declare more information than is strictly required by the mandate.
- The EN test methods are likely to be widely used outside the European Community.
- EU and EFTA members may increasingly set minimum or limiting values on product characteristics within codes of practice and on roof systems within regulations.
- Mandates for the development of harmonized codes of practice are not anticipated.
- EOTA may play a role in the future in developing performance standards for multilayer membranes and complete roof systems.

REFERENCES

1. Construction Products Directive 89/106/EEC 21.12.88, *Official Journal of the European Communities*, No. L40 of 11 February 1989.
2. Communication of the Commission with regard to the Interpretative Documents of Council Directive 89/106/EEC, *Official Journal of the European Communities*, C62 Volume 37, 28 February 1994.

3. Centre Scientifique et Technique du Bâtiment/Chambre Syndicale Nationale de l'Étanchéité: F.I.T. Classification for roofing systems September 1989 (and International Symposium 1991).
4. European Union of Agreement M.O.A.T. No. 27 : 1983 General Directive for the Assessment of Roof Waterproofing Systems.
5. American Society of Testing and Materials E108 Test Methods for Fire Tests of Roof Coverings.
6. International Waterproofing Association Fire Resistance Test (7th draft as at 1.11.96).
7. ISO 5725:1986 Accuracy of measurement methods—Determination of repeatability and reproducibility of specified test methods by interlaboratory tests.
8. UK Building Research Establishment Digest 408 : 1995 A Guide to attestation of conformity under the CPD.
9. Guide for the Definition of Factory Production Control in Technical Specifications for Construction Products, Guidance Paper 7 (European Commission 95/135 Rev.1).
10. EN45000 Series: 45001—General criteria for the operation of testing laboratories, 45002—General criteria for the assessment of testing laboratories, 45003—Calibration and testing laboratory accreditation systems, 45004—General criteria for the operation of various types of bodies performing inspection.
11. ISO 9000 Series: Quality management and quality assurance standards: 9001 quality systems Model for quality assurance in design, development, production, installation and servicing, 9002 quality systems Model for quality assurance in production, installation, and servicing.

APPENDICES

Country	Weighting	Member
France	10	Association française de normalisation
Germany	10	Deutsches Institut für Normung e.V.
Italy	10	Ente Nazionale di Unificazione
United Kingdom	10	British Standards Institution
Spain	8	Asociación Española de Normalización y Certificación
Belgium	5	Institut Belge de Normalisation
Greece	5	Ellinikos Organismos Typopoiisis
Netherlands	5	Nederlands Normalisatie-instituut
Portugal	5	instituto Portugues da Qualidade
Switzerland	5	Schweizerische Normen-Vereinigung
Austria	4	sterreichisches Normungsinstitut
Sweden	4	Standardiseringskommisionen i Sverige
Denmark	3	Dansk Standard
Finland	3	Suomen Standardisoimislitto r.y.
Ireland	3	National Standards Authority of Ireland
Norway	3	Norges Standardiseringsforbund
Luxembourg	2	Inspection du Travail et des Mines
Iceland	1	Technological Institute of Iceland

Appendix 1. Members of CEN (as at 1.2.97) and weighted voting (as per CEN/CENELEC Rules 1996-06).

Austria	Ireland
Germany	Italy
Spain	Luxembourg
Finland	Netherlands
France	Norway
Greece	Portugal
Iceland	Sweden
United Kingdom	
Switzerland (EMPA) is an observer to the Technical Board.	

Appendix 2. Members countries of EOTA (as at 1.2.97).