

CE MARKING

UK APPLICATION GUIDE



This Guide forms a link between the CE Marking and UK Building Regulations and construction practice.

EUROMAC 2 INSULATED PERMANENT FORMWORK

Holder

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Generic type of construction product and use

Non-loadbearing permanent shuttering kit based on EPS shuttering elements.

Basis of this Guide

This Guide gives information supporting the CE Marking to enable the product to be incorporated satisfactorily into the construction works according to UK requirements. This Guide must be read in conjunction with the CE Marking and its accompanying information.

It covers regulatory compliance and voluntary aspects where appropriate. The presentation by the manufacturer of the information underwriting CE Marking has been taken as valid and requiring no further corroboration in accordance with the Construction Products Directive.

A Declaration of Conformity against the relevant technical specification has been provided by the manufacturer and as a condition of the issue of this document the BBA requires the manufacturer to confirm the Declaration of Conformity at six-monthly intervals.

Users must satisfy themselves that the product's performance fulfils their requirements and that the product is being used correctly. Readers are advised to check the current validity of the CE Marking with the Application Guide holder and the validity of this document with the BBA website: www.bbacerts.co.uk

Part 1 Product Summary

Product

1.1 Euromac 2 Insulated Permanent Formwork comprises a range of main elements and accessories that are selected to construct formwork for specific projects.

1.2 The main elements comprise an inner and outer leaf of moulded expanded polystyrene (EPS) separated by a series of ladders embedded into the EPS. The external surface of each EPS leaf has moulded, tapered, vertical grooves and the inner surface is ribbed to provide a key to the concrete. The upper and lower surfaces of each EPS leaf are castellated and the vertical mating surfaces are tongue-and-groove to provide a secure joint between adjacent elements. The ladders consist of two outer steel flats with rungs of steel wire, spot welded to the flats at 150 mm centres. The vertical spacing between ladders is 150 mm. The elements are built up to suit the site requirements. Angular and end elements of similar construction are also available.

1.3 The range of elements available gives characteristics of:

Length of element (mm)	from 1000 to 1750
Height of element (mm)	from 200 to 600
Thickness of EPS leaf (mm)	
Inner	45
Outer	from 45 to 245
Concrete core thickness (mm)	from 145 to 160 ⁽¹⁾

(1) One element (designated M121) allows a thickness from 195 mm to 210 mm.

1.4 Accessories include:

- end leaf — inserted at openings to close the gap between the two EPS leaves
- lintel bottom leaf — inserted at openings between the two EPS layers to form the underside of a lintel. Supports must be in place during the concrete pour and curing period
- capsule — used to cover the cut ends of steel flats to give protection against corrosion and personal injury.

Use

1.5 The CE Marking covers the formwork for use in the construction of internal and external, loadbearing and non-loadbearing walls above and below ground, including walls subject to fire regulations. When used below ground, suitable waterproofing must be provided and be protected from damage by an impact-resistant layer.

Part 2 CE Marking — Overview

2.1 CE Marking includes technical information in the form of declared values. It enables a product to be legally placed on the market in any EC Member State. However, this does not necessarily mean the product will be suitable for all end uses in all Member States. A judgement must be made on whether the product is suitable for a particular intended use according to the relevant regulations.

2.2 Technical information given by the CE Marking and the related harmonised technical specification is indicated in this Guide by the prefix 

2.3 BBA opinions on the suitability of the product in relation to UK regulations and construction practice relates to the information as given in the CE Marking and the manufacturer's declaration and are indicated by the prefix 

2.4 The CE Marking (see Figure 1) is affixed to the paperwork accompanying the product. The complete technical information is contained in the manufacturer's declaration of conformity and data sheet.


2.5 The CE Marking accompanying this product indicates that it was affixed by the manufacturer, Eurostyrene sàrl and is under supervision of MPA Stuttgart (notified body number 0672). The marking includes the year in which the marking was affixed. The CE Marking also gives the number of the ETA issued by DIBt in Germany relating to this product, states that the reaction to fire classification of


Figure 1 Typical CE Marking



Producert : EUROSTYRENE sàrl. - EUROMAC2 sàrl.
 Year : 2006
 No. of the certificate of conformity : 0672 - CPD - ETA - I 15.01.4
 ETA No.: 05/0001 - : 2005 Deutschland
 Euroclass : F according to EN 13501 - 1
 Protection against noise : NPD
 Thermal resistance :
 Element Thickness internal Thickness external Lamda/di R/di
 polystyrene polystyrene
 M121 45 45 0.035 2.57
 M175/25 45 45 0.035 2.57
 M175/30 45 95 0.035 4.00
 M100/25 45 45 0.035 2.57
 M100/30 45 95 0.035 4.00
 M100/35 45 145 0.035 5.43
 M100/40 45 195 0.035 6.86
 M100/45 45 245 0.035 8.29

the product is Euroclass F and that no performance has been determined for protection against noise. Thermal conductivity and resistance values are also given for various elements in tabular form.

 2.6 ETA-05/001 : 2005 is the harmonised technical specification and specifies the relevant characteristics and appropriate test methods.

 2.7 Additional declared values appear on the accompanying manufacturer's data sheets, relating to:


- bonding quality
- water vapour permeability
- thermal conductivity.

2.8 The reference No Performance Determined (NPD) appears in the manufacturer's data sheets (and in this Guide) and indicates that the manufacturer has exercised the option not to test or assess some aspects of performance under the CE Marking.


Part 3 CE Marking – Detailed interpretation


Of the six Essential Requirements under the Construction Products Directive (CPD), only the following are relevant to the UK in relation to permanent shuttering for concrete in the considered applications.



Essential Requirement 1 – Mechanical resistance and stability

 3.1 Walls constructed using Euromac 2 Insulated Permanent Formwork are of the continuous type as described in ETAG 009 : 2002, Section 2.2, 1 *Continuous type* meaning that the concrete is only penetrated by the spacers in the system and that the sum of the cross-sectional area of the spacers is only a small percentage of the wall area.

 3.2 Buildings should be constructed in accordance with the relevant recommendations of CP 102 : 1973, BS 8110-1 : 1997, BS 8110-2 : 1985, BS 8102 : 1990 and BS EN 1992-1-1 : 2004.



 3.3 When the shuttering is filled with concrete in accordance with the ETA-05/0001 and the manufacturer's instructions, efficient filling without bursting the shuttering and without voids or uncovered reinforcement in the concrete core is possible.

 3.4 The concrete is not easily examined after casting, therefore, as specified in BS 8110-1 : 1997, Section 2, care must be taken to ensure full compaction of the concrete. Voids may be detected during concrete placement by tapping the EPS panels with the palm of the hand and listening for a 'hollow' sound; particular attention should be given to basement walls and areas adjacent to formed openings. Compaction is best checked after setting by viewing the concrete surface by removing a 100 mm x 100 mm section of the EPS leaf and replacing it afterwards.



-  3.5 The method of construction allows installation of steel reinforcement in the walls in accordance with BS EN 1992-1-1 : 2004 or corresponding national standards.
-  3.6 Reinforced walls should be designed and constructed in accordance with BS 8110-1 : 1997, BS 8110-2 : 1985 and BS EN 1992-1-1 : 2004. The nominal cover to the reinforcement should be that appropriate to 'mild' exposure in accordance with BS 8110-1 : 1997, Tables 3.2 and 3.4, or as required for fire resistance in accordance with BS 8110-2 : 1985, Section 4, whichever is the greater.

Essential Requirement 2 — Safety in case of fire





Reaction to fire

-  3.7 The reaction to fire classification is Euroclass F.
-  3.8 Euroclass F is NPD. The reaction to fire of a wall constructed using the insulated formwork will depend on the surface finishes applied to each side of the wall.




Resistance to fire




-  3.9 As the minimum thickness of the concrete core can be considered to be 150 mm, the fire resistance of a wall made using the insulated formwork and with concrete at a minimum strength of C16/20, will be 120 minutes — this is classified as REI 120 in accordance with ETAG 009 : 2002, Annex C, Table 1. The classification REI 120 means that the mechanical resistance for loadbearing, integrity of separation and insulation of the concrete wall will resist fire for 120 minutes.
-  3.10 The resistance to fire of reinforced concrete walls may be determined from the relevant tables given in BS 8110-2 : 1985, but this does not take into account the additional protection given by internal and external finishes. The EPS component of the finished wall would not be classified 'non-combustible'. For buildings in Scotland, completed walls with appropriate finishes can satisfy the required durations of fire resistance and, therefore, may be used as separating walls. Where external walls are one metre or less from a relevant boundary, the constructions should comply with the relevant exceptions on the use of combustible materials permitted by the guidance supporting the Building Regulations in Scotland. The risk of fire spread over the external wall surfaces will depend on the finishes applied. The relevant requirements of the national Building Regulations should be observed. It is recommended that designers follow the guidance given in the relevant national Building Regulations to limit the risk of fire spread between floors of a building. Care should be taken to ensure that detailing at junctions adequately maintains the required periods of fire resistance, that cavities formed in the completed walls are appropriately fire-stopped and detailing around openings provides sufficient protection to the EPS.

Essential Requirement 3 — Hygiene, health and environment



-  3.11 According to the manufacturer's declaration, the shuttering elements do not contain dangerous substances.
-  3.12 In accordance with BS EN 12524 : 2000, the water vapour diffusion resistance coefficient (μ) of EPS is 60.
-  3.13 A vapour control layer should be used, unless a condensation risk assessment, in accordance with BS 5250 : 2002, shows it is not required.
-  3.14 Basement walls should be designed in accordance with the recommendations of BS 8102 : 1990 to ensure adequate protection from water from the ground. Waterproofing materials used must be compatible with EPS and be continuous with waterproofing used below the floor. Resistance to precipitation is provided by the external cladding system which must be designed and constructed in accordance with the relevant good practice described in the applicable codes and manufacturer's instructions.

Essential Requirement 4 — Safety in use


-  3.15 The effective bond strength of the concrete to the shuttering is 0.03 Nmm^{-2} .
-  3.16 As the shuttering does not contribute to the structural strength, the strength of bond between the EPS and concrete can be discounted.
-  3.17 When tested for resistance to pressure during the concrete pour, a minimum failure pressure of 0.09 Nmm^{-2} was recorded.

-  3.18 This gives a factor of safety of greater than two when concrete is poured in accordance with the manufacturer's recommendations.
-  3.19 The elements do not have sharp or cutting edges when delivered. If elements are cut on site, a plastic capsule must be placed over each cut edge of steel flats to avoid the possibility of corrosion and personal injury on contact.
-  3.20 The elements are light in weight and may be handled easily. Care should be taken to prevent damage to the elements and the shuttering from site traffic. Contact with solvents or volatile organic compounds, such as newly treated timber, should be avoided. The elements must not be exposed to open flame or other sources of ignition.

Essential Requirement 5 — Protection against noise

-  3.21 The manufacturer chose the NPD option for airborne sound insulation and sound absorption.
-  3.22 The acoustic performance of a wall constructed with the shuttering will depend on the finish applied to the each face of the wall. However, the main factor affecting sound insulation will be the mass per unit area of the the wall. With the Euromac 2 System the mass per unit area of the concrete core will be at least 350 kgm⁻².

Essential Requirement 6 — Energy economy and heat retention

-  3.23 The nominal value of the thermal resistance (R) of the elements when part of a completed wall is calculated in accordance with EN ISO 6946 : 1996 from the nominal value of the thermal resistance of element leaves (R_{DI}) and of the Concrete Core (R_{DC}), less a reduction factor (ΔR) to allow for the thermal bridging effect of the steel ladders used to hold the EPS leaves together.

$$R = R_{DI} + R_{DC} - \Delta R$$

where: R_{DI} is determined from BS EN 13163 : 2001



R_{DC} is determined from BS EN 12524 : 2000

$$\text{and: } \Delta R = \frac{R_{\%}}{100} \times (R_{DI} + R_{DC})$$

where $R_{\%}$ is the percentage reduction of thermal resistance due to thermal bridging effects of the steel ladders for the type of element used as given in Table 1.

Table 1 Reduction factor for thermal resistance

Element type	Thickness of internal leaf	Thickness of concrete core (mm)	Thickness of external leaf (mm)	Total thickness (mm)	Reduction of thermal resistance (%)
M121	45	210	45	300	12
Jumbo M175, M20, M100, PM100	45	160	45	250	12
Jumbo M175+1, M20+1, M100+1, PM100+1	45	160	95	300	8
Jumbo M175+2, M20+2, M100+2, PM100+2	45	160	145	350	6
Jumbo M175+3, M20+3, M100+3, PM100+3	45	160	195	400	4.5
Jumbo M175+4, M20+4, M100+4, PM100+4	45	160	245	450	4

-  3.24 The values for heat capacity are tabulated in BS EN 12524 : 2000.
-  3.25 The thermal transmittance of the completed wall will depend on the internal and external finishes used. Calculations for the U value for specific constructions and finishes should be carried out in accordance with BS EN ISO 6946 : 1997 and the BRE report (BR 443 : 2006) *Conventions for U-value calculations*. Openings in the wall and junctions should be designed carefully to limit additional heat loss and air infiltration. Detailed guidance can be found in the documents supporting the national Building Regulations.

Aspects of durability, serviceability and identification



3.26 Objects must be fastened into the concrete core and not into the EPS leaves.



3.27 Horizontal perforations (eg for the provision of service ducts) may be made into walls constructed with the insulated formwork, in accordance with the manufacturer's installation instructions. When the formwork is used in close proximity to certain flue pipes and/or heat producing appliances, the relevant guidance in the national Building Regulations must be followed.

Attestation of conformity

3.28 The CE Marking has been affixed on the basis of compliance with the relevant requirements of ETA-05/0001 : 2005. The attestation of conformity level associated with the CE Marking is system 2+. Attestation of Conformity is intended to ensure that the product is made and tested on a consistent basis. It involves tasks for the manufacturer and certification body:

3.29 Tasks for the manufacturer are:

- factory production control
- further testing of samples taken at factory
- initial type-testing or assessment.

3.30 Tasks⁽¹⁾ for the certification body are:

- initial inspection of factory and the factory production control
- continuous surveillance
- assessment and approval of the factory production control.

(1) These tasks have been carried out by MPA Stuttgart, (notified body number 0672). It has issued Certificate of Conformity 0672-CPD-ETA-1 14-03-02 for the Euromac 2 Shuttering Kit.

Part 4 Factors relating to UK Regulations

UK implementation of the CPD

4.1 Statutory Instrument 1991, No 1620. The Building and Building Construction Products Regulations 1991 as amended by the Construction Products (Amendment) Regulations 1994 (Statutory Instrument 1994, No 3051)

4.2 These Regulations implement Council Directive 89/106/EEC of 21 December 1988⁽¹⁾, modified by the Council Directive 93/68/EEC of 22 July 1993 and lay down the criteria for CE Marking of construction products. Where the stated performance values accompanying the CE Marking pass the minimum legal requirements for the intended use, if used appropriately and in satisfactory conditions, a product bearing CE Marking shall be presumed by the building control body to satisfy the relevant requirements unless there are reasonable grounds for suspecting otherwise.

(1) Known as the Construction Products Directive (CPD).

The Building Regulations 2000 (as amended) (England and Wales)

4.3 In the opinion of the BBA, the CE Marking indicates that Euromac 2 Insulated Permanent Formwork, if used in accordance with the provisions of this Guide and the conditions associated with CE Marking, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Requirement: A1(2)	Loading
Requirement: A2	Ground movement
Requirement: A3	Disproportionate collapse
Comment:	Walls constructed using the formwork as defined by the CE Marking will be satisfactory, provided the design is in accordance with sections 3.1 to 3.6 of this Guide.
Requirement: B3(1)(2)(3)	Internal fire spread (structure)
Comment:	Completed walls are shown by the CE Marking to have a resistance-to-fire class of REI 120. See sections 3.7 to 3.10 of this Guide.
Requirement: C2(a)	Resistance to moisture
Comment:	Walls constructed using the formwork can adequately limit the ingress of moisture from the ground provided the design is in accordance with sections 3.13 and 3.14 of this Guide.
Requirement: C2(c)	Resistance to moisture
Comment:	The water vapour resistance factors accompanying the CE Marking should be used in calculations of the risk of surface and interstitial condensation. See sections 3.12 and 3.13 of this Guide.
Requirement: E1	Protection against sound from other parts of the building and adjoining buildings
Requirement: E2	Protection against sound within a dwelling-house etc
Comment:	Walls constructed using the formwork can meet these Requirements. See sections 3.21 and 3.22 of this Guide.

Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The thermal resistance information accompanying the CE Marking should be used in U value calculations. See sections 3.23 to 3.25 of this Guide.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The CE Marking shows that the product is acceptable. See sections 3.26 and 3.27 of this Guide.

The Building (Scotland) Regulations 2004

4.4 In the opinion of the BBA, the CE Marking indicates that Euromac 2 Insulated Permanent Formwork, if used in accordance with the provisions of this Guide and the conditions associated with CE Marking, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

Regulation:	8	Fitness and durability of materials and workmanship
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The formwork as specified under the CE Marking is deemed to contribute to a construction satisfying this Regulation. See sections 3.26 and 3.27 of this Guide.
Regulation:	9	Building standards – construction
Standard:	1.1(a)(b)	Structure
Standard:	1.2	Disproportionate collapse
Comment:		Walls constructed with the formwork as specified under the CE Marking have sufficient strength and stability to satisfy these Standards, with reference to clauses 1.1.1 ⁽¹⁾⁽²⁾ and 1.2.1 ⁽¹⁾⁽²⁾ . See sections 3.1 to 3.6 of this Guide.
Standard:	2.1	Compartmentation
Standard:	2.2	Separation
Standard:	2.3	Structural protection
Standard:	2.6	Spread to neighbouring buildings
Standard:	2.7	Spread on external walls
Comment:		Walls constructed using the formwork, as shown by the CE Marking, can satisfy the short, medium or long fire-resistance durations, indicated under Annex 2D, with reference to clauses 2.1.2 ⁽²⁾ , 2.1.3 ⁽²⁾ , and 2.1.5 ⁽²⁾ having due regard to related clauses 2.1.6 ⁽²⁾ to 2.1.12 ⁽²⁾ and 2.1.14 ⁽²⁾ in respect of compartmentation in non-domestic buildings; with reference to clauses 2.2.1 ⁽¹⁾ to 2.2.6 ⁽¹⁾ and 2.2.8 ⁽¹⁾ in respect of separation within domestic buildings; and clauses 2.2.1 ⁽²⁾ to 2.2.3 ⁽²⁾ and 2.2.5 ⁽²⁾ in respect of separation within non-domestic buildings; and with reference to clauses 2.3.1 ⁽¹⁾⁽²⁾ and 2.3.3 ⁽¹⁾⁽²⁾ in respect of structural fire protection in domestic buildings and non-domestic buildings. Junctions between walls and openings within walls can maintain the short, medium or long-fire resistance durations, with reference to clauses 2.1.15 ⁽²⁾ and 2.1.16 ⁽²⁾ in compartment walls; 2.2.6 ⁽²⁾ , 2.2.7 ⁽²⁾ , 2.2.9 ⁽¹⁾ and 2.2.10 ⁽¹⁾ in separating walls and 2.3.4 ⁽¹⁾⁽²⁾ and 2.3.5 ⁽¹⁾ in structural walls. The EPS component of the wall would be classified as combustible, however, the completed wall can satisfy the required durations of fire resistance, with reference to clauses 2.1.13 ⁽²⁾ compartmentation; 2.2.4 ⁽²⁾ and 2.2.7 ⁽¹⁾ separation; 2.3.2 ⁽¹⁾⁽²⁾ structural walls; 2.6.5 ⁽¹⁾ and 2.6.6 ⁽²⁾ spread to neighbouring buildings and 2.7.1 ⁽¹⁾⁽²⁾ spread on external walls. See sections 3.7 to 3.10 and section 3.27 in respect of openings, of this Guide.
Standard:	3.14	Moisture from the ground
Comment:		Walls constructed using the system can adequately limit the ingress of moisture from the ground, with reference to clauses 3.4.1 ⁽¹⁾ and 3.4.5 ⁽¹⁾ provided the design is in accordance with sections 3.13 and 3.14 of this Guide.
Standard:	3.15	Condensation
Comment:		The water vapour resistance factors accompanying the CE Marking should be used in calculations of the risk of surface and interstitial condensation, with reference to clauses 3.15.1 ⁽¹⁾ , 3.15.3 ⁽¹⁾ and 3.15.4 ⁽¹⁾ . See sections 3.12 and 3.13 of this Guide.
Standard:	5.1	Resisting sound transmission to dwellings
Comment:		Separating walls constructed using the formwork as defined by the CE Marking can contribute to meeting this requirement, with reference to clauses 5.1.1 ⁽¹⁾⁽²⁾ , 5.1.2 ⁽¹⁾ and 5.1.3 ⁽¹⁾ . See sections 3.21 and 3.22 of this Guide.
Standard:	6.2	Building insulation envelope
Comment:		The thermal resistance information accompanying the CE Marking should be used in U value calculations, with reference to clause 6.2.0 ⁽¹⁾⁽²⁾ . See sections 3.23 and 3.25 of this Guide. (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000

4.5 In the opinion of the BBA, the CE Marking indicates that Euromac 2 Insulated Permanent Formwork, if used in accordance with the provisions of this Guide and the conditions associated with CE Marking, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The formwork as specified under the CE Marking shows that the product is acceptable. See sections 3.26 and 3.27 of this Guide.
Regulation :	C4	Resistance to ground moisture and weather
Comment:		Walls constructed using the formwork can adequately limit the ingress of moisture from the ground, provided the design is in accordance with sections 3.13 and 3.14 of this Guide.
Regulation :	C5	Condensation
Comment:		The water vapour resistance factors accompanying the CE Marking should be used in calculations of the risk of surface and interstitial condensation. See sections 3.12 and 3.13 of this Guide.
Regulation:	D1	Stability
Regulation:	D2	Disproportionate collapse
Comment:		Walls constructed using the formwork as defined in the CE Marking will be satisfactory provided the design is in accordance with sections 3.1 to 3.6 of this Guide.

Regulation:	E4 (1)(2)(3)	Internal fire spread — Structure
Comment:		Completed walls are shown by the CE Marking to have a resistance-to-fire class of REI 120.
Regulation:	F2	Building fabric
Comment:		The thermal resistance information accompanying the CE Marking should be used in U value calculations. See sections 3.23 to 3.25 of this Guide.
Regulation:	G2	Separating walls and floors
Comment:		Walls constructed using the formwork can contribute to meeting this Regulation. See sections 3.21 and 3.22 of this Guide.

Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

4.6 Information in this Guide is intended to assist the Client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: *Installation* (section 5.1) and *Health and safety* (section 5.2).

Part 5 Factors relating to UK home warranty providers



NHBC Standards 2005

5.1 In the opinion of the BBA there are no specific requirements within the NHBC Standards relating to Euromac 2 Insulated Permanent Formwork. However it is important that the relevant Standards for concrete wall construction are followed.



Zurich Building Guarantee Technical Manual

5.2 In the opinion of the BBA there are no specific requirements within the *Zurich Building Guarantee Technical Manual* relating to Euromac 2 Insulated Permanent Formwork. However it is important that the relevant Standards for concrete wall construction are followed.

Part 6 Additional factors



Installation

6.1 The slab/foundation should be smooth finished and as level as possible. The slab/foundation should be swept clean and the position of the insides of external walls, both sides of internal walls and positions of openings, marked, prior to placing the Euromac 2 elements.

6.2 Two layers of elements should be placed in position and locked together initially. The highest point is then found and the rest of the elements brought up to this level. Any gap between the elements and the slab/foundation should be filled with expanding foam. At corners and junctions with internal walls the EPS should be removed inside the wall to ensure a solid concrete wall is formed, the steel ladders should not be removed. Once the first two layers are level the wall is built up to the first floor level.

6.3 Any reinforcement should be accurately positioned to ensure that the minimum required concrete cover is provided.

6.4 It is essential that walls are effectively braced and propped during construction to ensure stability, level, straightness and plumb of walls.

6.5 Where openings are present lintel boards and stoppers should be used as appropriate, secured with isopics (plastic nails). The required reinforcement should be positioned over the openings and adequate support must be provided around the opening until the concrete has cured.

6.6 The concrete should be of the correct strength class as specified by the designer and of consistency class F3 according to BS EN 206-1 : 2001. The maximum aggregate size must be between 8 mm and 16 mm.

6.7 The concrete should be pumped into the shuttering starting at corners and working towards the centres of the walls in 1 m lifts at a maximum velocity of 3 m h⁻¹. Particular care must be taken to ensure concrete is fully compacted under openings and into corners. The first lift should be allowed to stiffen prior to placing the second lift. The maximum fall height of the concrete is 2 m so provision must be made to allow access for discharge pipes or concreting tubes.

6.8 Horizontal day joints should ideally be at floor levels. Where this cannot be achieved, vertical composite reinforced bars should be installed, staggered along the plane of the wall at 100–500 mm centres, with a minimum of 200 mm anchorage each side of the day joint, and with a total cross-sectional area at least 1/2000 of the cross-sectional area of the concrete.



Health and safety

6.9 The elements do not pose any particular safety risks in use. However care should be taken to avoid sharp edges when cutting the steel ladder sections. Plastic caps are provided by the guide holder to cover the cut ends of steel ladders in order to avoid injury by contact with sharp edges.

6.10 The supporting props for the walls must be sufficiently strong to maintain the wall's stability until the concrete has cured.

Part 7 Bibliography

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 8102 : 1990 *Code of practice for protection of structures against water from the ground*

BS 8110-1 : 1997 *Structural use of concrete — Code of practice for design and construction*

BS 8110-2 : 1985 *Structural use of concrete — Code of practice for special circumstances*

BS EN 1992-1-1 : 2004 *Eurocode 2 : Design of concrete structures. General rules and rules for buildings*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

BS EN 12524 : 2000 *Building materials and products — Hygrothermal properties — Tabulated design values*

BS EN 13163 : 2001 *Thermal insulation products for buildings — Factory made products of expanded polystyrene (EPS) — Specification*

BS EN ISO 6946 : 1996 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

ETAG 009 : 2002 *Guideline for European Technical Approval of non-loadbearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete*

Part 8 Terms and Conditions

Conditions

8.1 This Guide:

- relates only to the product that is named, described, installed, used and maintained as set out in this Guide;
- is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Guide;
- is valid only within the UK;
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- is copyright of the BBA;
- is subject to English law.

8.2 References in this Guide to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Guide.

8.3 This Guide will remain valid for an unlimited period provided that:

- the product, the manufacture and/or fabrication remain unchanged;
- the CE Marking remains valid;
- it is reviewed by the BBA as and when it considers appropriate: and
- the manufacturer confirms the Declaration of Conformity at six-monthly intervals.

8.4 In granting this Guide, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;
- the right of the Guide holder to market, supply, install or maintain the product;
- the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works: and
- the accuracy and validity of the information relating to the CE Marking.

8.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Guide are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Guide or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Guide, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.

On behalf of the British Board of Agrément



Date of issue: 27th September 2006

Chief Executive

**Guide amended 6th August 2008 to change Marketing and Certificate holder's addresses and contact details.*

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