

SINTEF Building and Infrastructure
P.O.Box 124 Blindern
N-0314 Oslo
Tel. 47 22 96 55 55
Fax 47 22 69 54 38



Authorised and notified according to Article 10 of the Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products

MEMBER OF EOTA

European Technical Approval ETA-10/0082

21th February 2011

Trade name:	Monokote [®] MK-6
Holder of approval:	Grace Produits de Construction SAS ZA Les FOULLETONS 39140 LARNAUD France
Generic type and use of construction product:	Fire Protective Products – Rendering kit intended for fire resisting applications
Valid from:	21-02-2011
to:	21-02-2016
Manufacturing plant:	GRACE Performance Chemical - Irondale, USA AVI - Dammam, Kingdom of Saudi Arabia
This European Technical Approval contains:	40 pages including 3 Annexes which form an integral part of the document



European Organisation for Technical Approvals
Europäische Organisation für Technische Zulassungen
Organisation Européenne pour l'Agrément technique

I LEGAL BASIS AND GENERAL CONDITIONS

- 1** This European Technical Approval is issued by SINTEF Building and Infrastructure, in the following called SINTEF, in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by the Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex of Commission Decision 94/23/EC⁴
 - ETA Guideline 018 Fire Protective Products Part 1: “General” and Part 3: “Renderings and rendering kits intended for fire resisting applications”

- 2** SINTEF is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

- 3** This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1 of this European Technical Approval.

- 4** This European Technical Approval may be withdrawn by SINTEF in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

- 5** Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of SINTEF. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

- 6** The European Technical Approval is issued by the approval body in its official language. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities N° L40, 11.2.1989, p. 12

² Official Journal of the European Communities N° L 220, 30.08.1993, p. 1

³ Official Journal of the European Union N° L 284, 31.10.2003, p. 1

⁴ Official Journal of the European Communities N° L17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the product

Monokote[®] MK-6 is a product of light density, with a hydraulic gypsum based binder and synthetic aggregates. Mixed with water, it gives a light density rendering. The product is delivered in two versions:

- Monokote[®] MK-6/HY: Quick setting rendering
- Monokote[®] MK-6/S: Normal setting rendering

Complementary products are:

- Monokote[®] Accelerator (Aluminium sulphate): accelerator set additive to be used only with MK-6/HY
- Primer Firebond[™], which optimises the adhesion to anticorrosion primers when compatibility tests are not available, and to old concrete. Optional use as a fixative applied on MK 6 surface.
- Spatterkote[®] SK3 which optimises adhesion on composite and cellular decks (*this product is not applied in connection with type 3 and type 4 use categories*)

The rendering kit comprising Monokote[®] MK-6 plus the complementary products mentioned above correspond to “Option 2” (direct application) as described in the foreword of ETAG 018 Fire Protective Products - Part 3 Renderings and rendering kits intended for fire resisting applications.

The basic composition is identical for both Monokote[®] MK-6/HY and Monokote[®] MK-6/S:

- Monokote[®] MK-6/HY is a rendering kit including Monokote[®] Accelerator, Spatterkote[®] SK3 and the bonding primer Firebond[™]
- Monokote[®] MK-6/S is a rendering kit including Spatterkote[®] SK3 and the bonding primer Firebond[™]

The dry mix is delivered in bags, and is mixed with water in a mechanical mixer to produce a mortar. The fresh mortar is applied by machine spraying, except for small areas and areas of repair, where the rendering may be applied by trowel. The fresh mortar may be applied in one or several layers.

Only for Monokote[®] MK-6/HY an accelerator additive is injected into the product. There are two options for injection of the accelerator additive; at the nozzle or in-line. The injection of this additive gives an immediate expansion of the fresh mortar and the product will typically set within 15 minutes (quick setting rendering). Monokote[®] MK-6/S is not used with Monokote[®] Accelerator (normal setting rendering).

The total thickness of the rendering (hardened mortar) ranges typically from 10 to 90 mm, depending on the required fire resistance. The hardened mortar is light grey in colour for Monokote[®] MK-6/HY and off-white for Monokote[®] MK-6/S. The rendering has a rough/irregular surface due to the method of application. Other properties for identification are given in clause 2.8.

1.2 Intended use

Related to environmental conditions the rendering system is intended for internal and semi-exposed environmental conditions; use category Type Y as defined in ETAG 018-Part 3. This includes temperatures below 0 °C, but no exposure to rain and limited exposure to UV (effects of UV exposure are not assessed).

Related to use categories as defined in ETAG 018-Part 1, the fire protective performance of Monokote[®] MK-6 has been assessed for the following applications:

- To protect load-bearing concrete elements (type 3 use category)
- To protect load-bearing steel elements (type 4 use category)

This ETA covers assemblies installed as shown in Annex 1 - 2.

The provisions made in this ETA are based on an assumed intended working life of the product of 25 years, provided that the assembled product is subject to appropriate use and maintenance in accordance with paragraph 5.2 of this ETA. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works. The user of the product must ensure, that the durability assessment made, is relevant to the local conditions of use.

2 Characteristics of products and methods of verification

2.1 Mechanical resistance and stability

Not relevant.

2.2 Safety in case of fire

2.2.1 Reaction to fire

The renderings have a reaction to fire classification A1 according to EN 13501-1.

2.2.2 Fire resistance

The fire resistance classified according to EN 13501-2 for various thicknesses and intended use categories is presented in Annex 1 – 3, and has been determined on the basis of tests according to the relevant parts of EN 13381 and the provisions given in ETAG 018.

2.3 Hygiene, health and environment

2.3.1 Water absorption

No performance determined.

2.3.2 Release of dangerous substances

The holder of the approval has submitted a written declaration stating that Monokote[®] MK6, Firebond[™] (the bonding primer), Spatterkote SK3 and Monokote accelerator contains no dangerous substances according to EC-database, as known at the date of issue.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the product (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements also need to be complied with, when and wherever they apply.

2.4 Safety in use

No performance determined.

2.5 Protection against noise

No performance determined.

2.6 Energy economy and heat retention

No performance determined.

2.7 Aspects of durability

Durability aspects have been evaluated on the substrates listed in subsection 4.2.3, table 6.

2.7.1 Resistance to UV-exposure and deterioration caused by heat and rain

No performance determined. (Not relevant for the intended use; semi-exposed type Y).

2.7.2 Resistance to deterioration caused by high humidity

Monokote[®] MK6 renderings are resistant to high humidity as defined in ETAG 018-Part 3.

2.7.3 Resistance to deterioration caused by heat and cold

Monokote[®] MK6 renderings are resistant to heat/cold cycles as defined in ETAG 018-Part 3.

2.7.4 Resistance to deterioration caused by freezing and thawing

Monokote[®] MK6 renderings are resistant to freeze/thaw cycles as defined in ETAG 018-Part 3.

2.7.5 Resistance to corrosion of a steel substrate by the rendering

The renderings are compatible with and provide protective ability as defined in ETAG 018 Part 3 Annex C for the following steel substrates; bare steel, galvanized steel, and primers of the four generic families (oil alkyd, epoxy, zinc rich epoxy, zinc silicate).

2.7.6 Resistance to corrosion of the fixings by the rendering

No performance determined.

2.8 Serviceability requirements

2.8.1 Mechanical resistance and stability

No performance determined.

2.8.2 Resistance to impact/movement

No performance determined.

2.8.3 Air erosion

No performance determined.

2.8.4 Water vapour permeability

No performance determined.

2.8.5 Water absorption

No performance determined.

2.8.6 Adhesion

In accordance with ETAG 018-3 and EGOLF method SM/5. The adhesion/cohesion of the Monokote[®] MK6 fire protective product depends on the installed thickness and on the preparation of the substrate. Typical values are listed in the following table 1 below.

Table 1: Typical adhesion values

Surface preparation	Thickness of MK6 (mm)	Tensile bond strength * (N/mm ²)	
		Average	Standard deviation
Bare steel	10	0.07128	0.00463
	80	0.03732	0.00593
Galvanized steel	10	0.05974	0.00799
	80	0.03749	0.00257
Primed with alkyd primer on steel	10	0.04422	0.00717
	80	0.02956	0.00432
Primed with epoxy primer on steel	10	0.04824	0.00492
	80	0.02673	0.00474
Bare concrete, release agent: emulsion	13	0.074805	0.015361
	59	0.043241	0.007389
Bare concrete, release agent: mineral oil	13	0.091831	0.016496
	59	0.041936	0.003686

*) The tensile bond strengths apply to both Monokote MK6/HY and MK6/S

2.9 Identification

Table 2 – 5 shows the main material properties used for product identification.

Table 2

Dry mix identification of Monokote[®] MK-6

Property	MK-6/HY	MK-6s	Test method
Description / colour	Light grey	Off-white	Visual
Formulation	Formulation declared	Formulation declared	
Density (kg/m ³)	240 +/- 3.2 kg/m ³		

Table 3
Fresh mortar identification of Monokote® MK-6

Property	MK-6/HY	MK-6s	Test method
Mixing ratio	23 - 32 litres	23 - 32 litres	
Bulk density at mixer*	640 – 795 g/l	600 – 700 g/l	by weighing 1,0 litre
Bulk density at Nozzle*	≥ 500g/l	≥ 620 g/l	by weighing 1,0 litre
pH value	8	8	

*: In case of continuous mixer machine the weight is checked at nozzle.

Table 4
Rendering identification of Monokote® MK-6

Property	MK-6/HY	MK-6s	Test method
Description / colour	Light grey	Off-white	Visual
Average Density; hardened mortar	255 kg/m ³	312 kg/m ³	EN 1015-10
Flexural and compressive strength; hardened mortar	NPD	NPD	EN 1015-11

Table 5
Additives identification :

Properties	Monokote® Accelerator	Primer FIREBOND	Test method
Description / colour	Aluminium Sulphate powder / white	Water based acrylic liquid / white	
Volatile	/	water	
Volatile organic components (VOC)	/	14.3 g/l +/- 10g	
Weight per litre at 25°C	/	1054 g/l	by weighing 1,0 litre
Odor	/	Similar to latex house paint	
Density	(Dry bulk) 993 to 1137 Kg/m ³	/	

Properties	SPATTERKOTE SK3	Test method
Description / colour	Mill-mixed Portland cement based powder / grey	
Density Fresh mortar	700-880 g/l	by weighing 1,0 litre
Mixing ratio	31 - 33 litres	
Covering	80 m ² /bag	

3 Attestation of conformity and CE marking

3.1 System of attestation of conformity

System 1 applies for the product covered by this ETA. This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by a notified certification body on the basis of:

- (a) Tasks for the manufacturer:
 - (1) factory production control;
 - (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;
- (b) Tasks for the notified body:
 - (3) initial type testing of the product;
 - (4) initial inspection of factory and of factory production control;
 - (5) continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of the production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed in accordance with the test plan. This factory production control system ensures that the products are in conformity with the European Technical Approval.

The manufacturer may only use constituent materials stated in the technical documentation of this European Technical Approval.

The factory production control shall be in accordance with the "Control Plan for Monokote[®] MK-6/HY and Monokote[®] MK-6/S" relating to this European Technical Approval. The Control Plan is part of the technical documentation of this European Technical Approval. The Control Plan is laid down in the context of the factory production control system operated by the manufacturer, and deposited at SINTEF.⁵

The personnel involved in the production process shall be identified, sufficiently qualified and trained to operate and maintain the production equipment. Machinery equipment shall be regularly maintained and this shall be documented. All processes and procedures of production shall be recorded at regular intervals.

The manufacturer shall maintain traceable documentation of the production process from purchasing or delivery of raw or basic raw materials until storage and delivery of finished products.

⁵ The "control plan" is a confidential part of the European technical approval and only handed over to the approved body or bodies involved in the procedure of attestation of conformity. See section 3.2.1.2.

The factory production control system for the product includes relevant design specifications, including adequate drawings and written instructions for:

- type and quality of all materials
- packaging and transport protection

The production control system shall specify how the control measures are carried out, and at what frequency.

Products that do not comply with requirements as specified in the ETA shall be separated from the conforming products and marked as such. The manufacturer shall register non-compliant production and action(s) shall be taken to prevent further non-conformities. External complaints shall also be documented, as well as actions taken.

When materials/products are delivered for incorporation into the production process, verification of conformity with specifications in the ETA shall take place.

All testing equipment shall be maintained, calibrated and/or checked against equipment or test specimens traceable to relevant international or nationally recognised reference test specimens (standards).

The manufacturer shall ensure that handling, preservation and storage of test equipment is such that its accuracy and fitness for purpose is maintained. The calibration of all test equipment shall be repeated if any repair or failure occurs which could upset the calibration of the test equipment.

The Evaluation Report with reference to this ETA specifies properties that should be controlled with minimum frequencies. The test method and threshold have been laid down in the Control Plan.

The content of the Control Plan (FPC) and the frequency of tests is described in table 6 below.

Table 6: FPC test plan for Monokote MK-6/HY and MK-6s

Property	Frequency of tests
<i>Dry Mix:</i>	
Incoming materials	Each delivery
Bulk density of aggregate	Once per batch of aggregate
Bulk density of dry mix	five times per day (24h) at regular intervals
<i>Rendering (fresh mortar):</i>	
Apparent density - density of wet mix	five times per day (24h) at regular intervals
Setting time	HY & S: five times per day (24h) at regular intervals
<i>Rendering (hardened mortar):</i>	
Density	Once per month
Adhesion	Once per month
Insulation efficiency test	Once per month
<i>Additives, other components:</i>	
Monokote® Accelerator <ul style="list-style-type: none"> • Total Alumina % • Free Alumina % • Impurities Maximum by weight % • Particles size • Average Dry bulk Density • Insoluble 	Each delivery
SPATTERKOTE® SK3 <ul style="list-style-type: none"> • Incoming material • Wet density • Vicat open time properties • Dry bulk Density 	Each delivery Each batch Each batch start of shift + every 4 hours
Primer FIREBOND™ <ul style="list-style-type: none"> • Viscosity color match by computer • roll out • Weight per gallon • 60° gloss 	Each batch

3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body (bodies) which is (are) approved for the tasks referred to in section 3.1 in the field of fire protective products in order to undertake the actions laid down in section 3.2.2. For this purpose, the Control Plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the notified body or bodies involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European Technical Approval.

3.2.2 Tasks of notified bodies

3.2.2.1 Initial type testing

The approval tests have been conducted by notified bodies in accordance with chapter 5 of ETAG 018-Part 1 and Part 3, as relevant, and the approval body has assessed the results of these tests in accordance with chapter 6 of the ETAG, as part of the ETA issuing procedure. These tests shall be used for the purposes of Initial Type Testing (ITT) and this work shall be validated by the notified body for Certificate of Conformity purposes.

3.2.2.2 Assessment of the factory production control system - initial inspection and continuous surveillance

Assessment of the factory production control system is the responsibility of the notified body. An assessment shall be carried out of the production units to demonstrate that the factory production control is in conformity with the ETA and any supplementary information. This assessment shall be based on an initial inspection of the factory. The relevant production units has been specified in the ETA.

Subsequently continuous surveillance of factory production control is necessary to ensure continuing conformity with the ETA. It is recommended that surveillance inspections are to be conducted at least twice a year.

3.2.2.3 Certification

Once ITT (cf. 3.2.2.1) and the initial inspection of the FPC system (cf. 3.2.1.1) have been performed, and if a favourable decision can be made on the basis of available information, the notified certification body shall issue an EC Certificate of conformity, permitting the ETA-holder to issue an EC Declaration of conformity, allowing CE Marking of the product.


3.3 CE marking

3.3.1 General

The CE marking shall be affixed to the bags of dry mix and accompanying commercial documents. The required information to accompany the CE symbol is:

- a) identification number of the notified body
- b) name/address of the ETA-holder
- c) two last digits of year of affixing CE Marking
- d) number of the EC Certificate of Conformity
- e) number of ETA
- f) reference to the ETAG 018, Parts 1 and 3
- g) indications to clarify the intended use:
 - exposure type(-s), cf. §1.1 of this ETA
 - type(-s) indicating the assembly the fire protective product is intended to protect, cf. §1.1 of this ETA

3.3.2 CE-marking of Monokote[®] MK6

	"CE"-Marking
xxxx	Number of Notified Body
Grace Produits de Construction 1001 Maisonneuve 71580 Saillenard France	Name and address of the producer (legal entity responsible for placing the product onto the market)
xx	Two last digits of year of affixing CE- Marking
1166-CPD-xxxx	Number of EC certificate of conformity (where relevant)
ETA N° XX/XXXX	ETA Number
ETAG 018, Parts 1 and 3 Fire Protective Products	ETAG Reference
Exposure types Y, Z ₁ and Z ₂	Use category related to weather exposure
Types 3 and 4	Use category related to intended use

3.4 Other marking and/or information

Each bag of dry mix is marked with product name and traceability code.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European Technical Approval is issued for Monokote[®] MK-6 on the basis of agreed data/information deposited with SINTEF, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to SINTEF before the changes are introduced. SINTEF will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA, and if so whether further assessment or alterations to the ETA is necessary.

4.2 Installation

4.2.1 General

The fire protection rendering must be installed according to the manufacturer's instructions. It is the manufacturer's responsibility to provide correct information about the application to the users.

Minimum required experience for installation personnel is recognised practice for works with fire protection products. On request of the supplier, the manufacturer carries out a technical training on site for the use of Monokote[®] MK-6 products.

4.2.2 Tool and equipment for application

Monokote[®] MK-6 can be used with any conventional plastering machine. The application of Monokote[®] MK-6 is a wet process. The mixers are either continuous mixers with a helicoidal screw (spiral distributor) or paddle mixers. A conventional pump with rotor/stator (minimum grading 2 mm) or piston pump is used for pumping. The choice of the system is related to the construction site. The spraying lines and the guns are identical to those used for plaster spraying. For Monokote[®] MK-6/HY used with Monokote[®] Accelerator additional GRACE spraying equipment is mandatory. It is composed of an injector for mixing and pumping the additive, a GRACE injection gun or injection module integrated between two lengths of pipes.

4.2.3 Requirements and preparation for substrate

Before application the substrate should be inspected and prepared. The surfaces to be sprayed must be free from :

- oil, grease, excess rolling compounds or lubricants,
- loose mill scale, excess rust, incompatible primer (see below),
- lock down agent,
- run off water (however limited moisture on the substrate is acceptable)
- or of any other substance that will impair adhesion.

Expanded metal or ribbed metal lath are generally used to form hollow encasements around structural steel members. They may also be used to provide a suitable substrate over unacceptable substrates (incompatibility to special paint, paint or any interface between Monokote[®] MK-6 and concrete etc.).

Table 7
Substrate treatment before application of Monokote[®] MK-6

Substrate	MK 6/HY	MK 6 /S
Bare steel	Direct spraying	
Steel with corrosion protection primers : - Short/medium oil alkyd primers - Two component epoxy primers - Zinc rich epoxy primers(containing about 85% by weight of metallic zinc powder) - Zinc silicate primers	Direct spraying	Direct spraying with adhesion checked according to test method EGOLF SM/5 or test methods described in section 4.2.6. or bonding agent Firebond applied before MK 6/S spraying
Steel with Polyurethane primer	Primer removed before MK 6 spraying or Installation of wire mesh type NERGalTO NG1 before MK 6 spraying	
Steel with unknown primer excluding Polyurethane primer	Bonding agent Firebond applied before MK 6 spraying and then adhesion checked according test method EGOLF SM/5 or test methods described in paragraph 4.2.6.	
Galvanized steel	Direct spraying	
Substrate covered by decorative paint	Paint removed before MK 6 spraying or Installation of wire mesh type NERGalTO NG1 before MK 6 spraying	
Concrete	Direct spraying *)	

*) on old concrete, Firebond can be applied as concrete surface sealer before spraying with MK 6.

When spraying on small profiles, types of steel truss and frame, an application tool should be used: The tool consists of a wire mesh type NERGalTO NG1 used to reduce the lateral losses. If an existing rendering is oversprayed, a wire mesh type NERGalTO NG1 should be set up around the existing rendering, secured directly to the substrate. Monokote[®] MK-6 should be sprayed without considering the input of the existing rendering.

4.2.4 Environmental conditions during mixing, application and construction

A minimum air temperature of 4°C shall be present during application of spray applied fireproofing. When air temperature is over 4°C and rising, the minimum substrate temperature shall be 2°C. When air temperature is falling, but still over 4 °C (e.g. end of day), the minimum substrate temperature shall be 4°C. Adequate ventilation must be provided to allow the product to dry after being sprayed. In a closed area where the ventilation is not adequate, it is necessary to install a ventilation and air circulation device sufficient to renew the air at least 4 times per hour. During winter time special considerations must be taken into account, according to recommendations from the manufacturer.

The product is intended for semi-exposed conditions with no exposure to rain. The construction process may however result in the rendering being exposed to direct rain or leakages before the building envelope is closed. The resistance of the rendering to such short term exposure to rain has not been assessed within this ETA. It is therefore assumed that in case of rain special provisions are taken according to the manufacturer's instructions. (e.g. projection on substrate dry or with limited moisture, control of the adhesion of the product) and a quality plan for applicator.

4.2.5 Application of rendering

Each bag of Monokote[®] MK-6 is mixed with potable water in the mixer tank of the spraying machine for 1 to 1 ½ minutes. Amount of water is between 23 and 32 litres per bag (MK-6/HY 21.5 kg and MK-6/S 22.5 kg).

Monokote[®] MK-6 is sprayed on the substrate in one layer for a target thickness up to 25 mm, and successive layers with a thickness of between 25 and 90 mm with no time delay between the layers. Each layer 25/30 mm thick is measured and adjusted continuously during application.

When quick setting is required, Monokote[®] MK-6/HY is sprayed by using Monokote[®] Accelerator which is diluted in potable water by the ratio of 1 bag accelerator 27.2 kg / 37.9 litres. The accelerator is not used with MK 6/S. Except for this point, the application process is the same for both MK-6/HY and MK-6/S.

If vibration occurs during the drying phase of the rendering, an additional inspection of the concerned areas should be made.

Within two months, no special provisions are necessary for overlapping Monokote[®] MK-6 with Monokote[®] MK-6. Beyond these two months, GRACE technical services shall be contacted in order to evaluate the necessity of special provisions for overlapping Monokote[®] MK-6.

4.2.6 Site tests

The adhesion of the dry rendering to the substrate should be tested on site (Monokote[®] site test method) according to the method described by the manufacturer in Annex 3. Alternatively, and if practical, the method described in EGOLF SM5 could be followed.

Thickness control should be in accordance with national regulations in force where the product is applied. In case there is no existing regulation, the GRACE recommendation must be followed.

The density of the rendering for bulk density at nozzle should be measured and be within the tolerances specified in Table 3.

Hairline cracks in the dry rendering are not acceptable.

4.2.7 Surface treatments and protection

Top coats have not been a part of the test assemblies, thus this ETA covers only rendering without top coat. The resistance to mechanical impact from hard and soft bodies has not been assessed.

The vapour permeability of the product has not been assessed. Monokote[®] MK 6 cannot be considered as a vapour barrier when used in the building envelope (external wall or roof) or in constructions separating warm and cold areas.

5 Indications to the manufacturer and supplier

5.1 Packaging, transport and storage

The material shall be kept in a dry place until use. The bags shall not be stored in direct contact with the floor. The product must be stored under shelter away from wet surfaces. Bags that have been exposed to water must not be used.

Material is suitable for use 8 months from date of manufacture. Material beyond expiry date must be retested prior to shipment (or prior to use by customer if already shipped) according to Grace setting method.

5.2 Use, maintenance and repair

5.2.1 Use and maintenance

For the specified intended use the product does not need any maintenance during the indicated working life. In case of damages the fire protective rendering must be repaired according to the manufacturer's instruction.

5.2.2 Repairing of damages

A limited amount of damage to Monokote[®] MK-6 products already applied on structures can be repaired manually. The damaged areas must be carefully cleaned with a knife, cutter or trowel through the whole applied thickness down to substrate. Dust and particles generated by this operation are carefully removed. A quantity of Monokote[®] MK-6/HY or Monokote[®] MK-6/S material is sampled in a bucket from the mixer tank. For MK-6/HY only, it is mixed manually with accelerator. Once expanded, it is applied with a trowel in order to fill completely the damaged area. The surface is then smoothed out to a thickness corresponding to the original surface of Monokote[®] MK-6/HY or Monokote[®] MK-6/S . The maximum area of repairable damages can be up to 260 mm x 260 mm.

SINTEF Building and Infrastructure
Oslo, 21.02.2011



ANNEX 1**Type 3 : Protection of load-bearing concrete elements - REI 30 to REI 240**

The results of the assessment are valid only according to the following conditions :

- ♦ Protective materials MONOKOTE MK6-HY and MONOKOTE MK6-S composition and application conditions identical as those noted during reference fire tests ;
- ♦ Nominal density of applied protective material MONOKOTE MK6-HY included in [219,297] (kg/m³) range ;
- ♦ Nominal density of applied protective material MONOKOTE MK6-S included in [280,345] (kg/m³) range ;
- ♦ Applied thicknesses of protective materials MONOKOTE MK6-HY and MONOKOTE MK6-S included in [10, 55] (mm) range ;
- ♦ Protective materials MONOKOTE MK6-HY and MONOKOTE MK6-S applied on bare concrete structures cast with following release agents:
 - Mineral oil;
 - Emulsion
- ♦ Protective materials MONOKOTE MK6-HY and MONOKOTE MK6-S can be applied on bare concrete structures preliminary treated with bonding primer FIREBOND;
- ♦ Protective materials MONOKOTE MK6-HY and MONOKOTE MK6-S applied on :
 - Slabs;
 - Beams;
 - Walls exposed on one side only.
- ♦ Density of concrete equal to 2330 kg/m³ ± 15%;
- ♦ Thickness of slabs or walls greater or equal to 120 mm;
- ♦ Width of beams greater or equal to 150 mm;
- ♦ Maximum duration of the exposure to the conventional thermal program as prescribed by EN 1363-1 equal to 5 hours at maximum for application on beams and to 6 hours for application on walls or slabs, depending on the type of concrete structures and the thickness of MONOKOTE MK6-HY and MONOKOTE MK6-S applied.

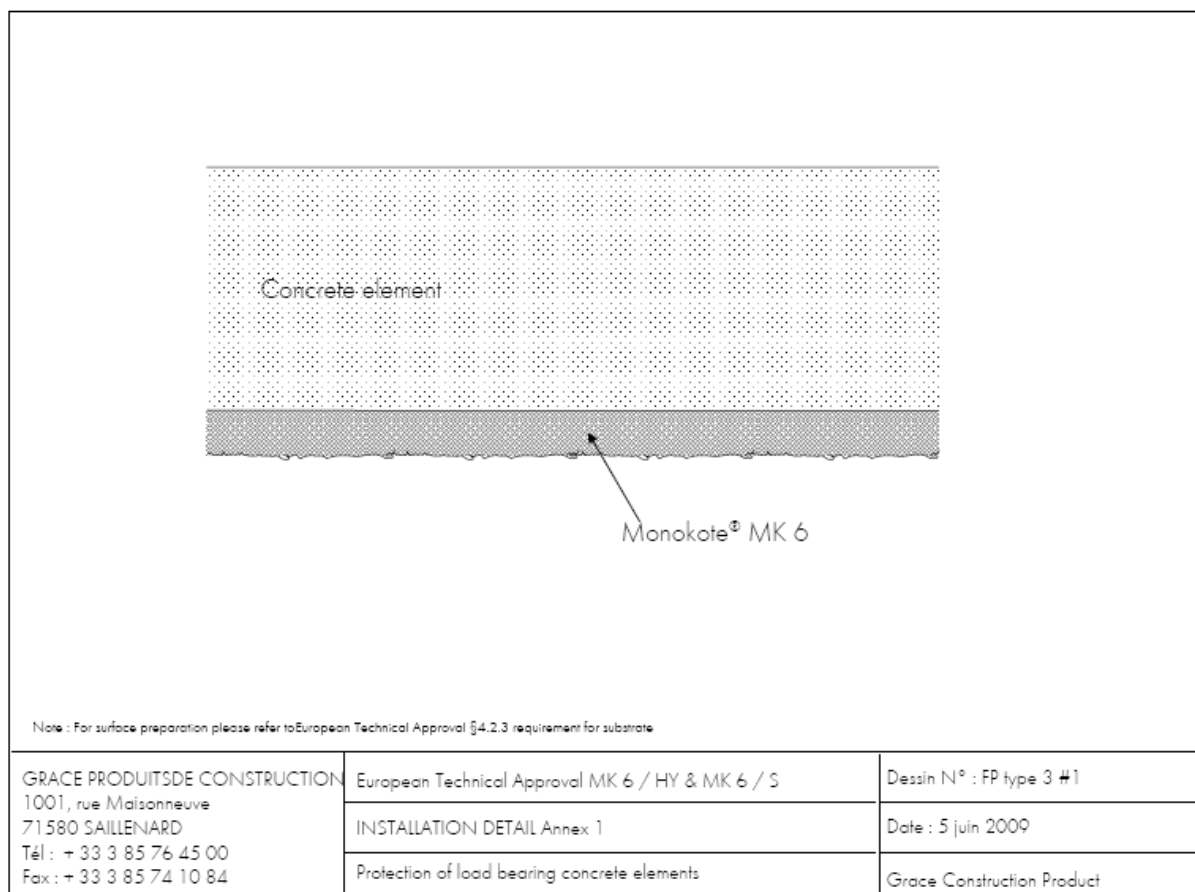


Figure A1.1
Installation details on concrete slabs

Table A1.1 shows the equivalent thickness of concrete induced by Monokote[®] MK-6, determined according to EN 13381-3 Annex C and EN 1992-1-2 Annex A.

Table A1.1

Type of concrete structure	Thickness of Monokote MK-6/HY – MK-6S (mm)	Solid concrete element thickness (mm)						
		Fire resistance						
		30 min.	60 min.	90 min.	120 min.	180 min.	240 min.	360 min.
Slab	11	38	50	53	53	49	40	*
	32	63	78	85	92	99	97	*
	55	84	104	113	124	131	140	133
Beam	10	22	38	45	45	*	*	*
	41	56	72	81	92	104	104	*

*: Exposure duration not covered

Table A1.2 and A1.3 show the thickness of Monokote in regard of the equivalent thickness of concrete based on linear interpolation.

Table A1.2

SLAB	Equivalent thickness of concrete (mm)					
	Fire resistance					
	30 min.	60 min.	90 min.	120 min.	180 min.	240 min.
11	38	50	53	53	49	40
12	39	51	55	55	51	43
13	40	53	56	57	54	45
14	42	54	58	59	56	48
15	43	55	59	60	59	51
16	44	57	61	62	61	54
17	45	58	62	64	63	56
18	46	59	64	66	66	59
19	48	61	65	68	68	62
20	49	62	67	70	70	64
21	50	63	68	72	73	67
22	51	65	70	73	75	70
23	52	66	71	75	78	73
24	53	67	73	77	80	75
25	55	69	74	79	82	78
26	56	70	76	81	85	81
27	57	71	77	83	87	83
28	58	73	79	85	89	86
29	59	74	80	86	92	89
30	61	75	82	88	94	92
31	62	77	83	90	97	94
32	63	78	85	92	99	97
33	64	79	86	93	100	99
34	65	80	87	95	102	101
35	66	81	89	96	103	103
36	67	83	90	98	105	104
37	68	84	91	99	106	106
38	68	85	92	100	107	108
39	69	86	94	102	109	110
40	70	87	95	103	110	112
41	71	88	96	105	112	114
42	72	89	97	106	113	116
43	73	90	98	107	114	118
44	74	92	100	109	116	119
45	75	93	101	110	117	121
46	76	94	102	111	118	123
47	77	95	103	113	120	125
48	78	96	104	114	121	127
49	79	97	106	116	123	129
50	79	98	107	117	124	131
51	80	99	108	118	125	133
52	81	101	109	120	127	134
53	82	102	111	121	128	136
54	83	103	112	123	130	138
55	84	104	113	124	131	140

Table A1.3

BEAM thickness of MONOKOTE (mm)	Equivalent thickness of concrete (mm)			
	Fire resistance			
	30 min.	60 min.	90 min.	120 min.
10	22	38	45	45
11	23	39	46	47
12	24	40	47	48
13	25	41	48	50
14	26	42	50	51
15	27	43	51	53
16	29	45	52	54
17	30	46	53	56
18	31	47	54	57
19	32	48	55	59
20	33	49	57	60
21	34	50	58	62
22	35	51	59	63
23	36	52	60	65
24	37	53	61	66
25	38	54	62	68
26	40	56	64	69
27	41	57	65	71
28	42	58	66	72
29	43	59	67	74
30	44	60	68	75
31	45	61	69	77
32	46	62	71	78
33	47	63	72	80
34	48	64	73	81
35	49	65	74	83
36	51	67	75	84
37	52	68	76	86
38	53	69	78	87
39	54	70	79	89
40	55	71	80	90
41	56	72	81	92

ANNEX 2**Type 4 : Protection of load-bearing steel elements – R15 to R240**

The results of the assessment are valid only according to the following conditions :

- ♦ Protective materials MONOKOTE MK6-HY / MONOKOTE MK6-S composition and application conditions identical as those noted during reference fire tests ;
- ♦ Protective material MONOKOTE MK6-HY / MONOKOTE MK6-S applied on bare or galvanized steel or steel members painted with a primer belonging to following chemical families :
 - Alkyd;
 - Epoxy;
 - Epoxy rich in zinc;
 - Silicate of zinc
- ♦ Density of applied protective material MONOKOTE MK6-HY included in [219, 291] (kg/m^3) range ;
- ♦ Density of applied protective material MONOKOTE MK6-S included in [280, 345] (kg/m^3) range ;
- ♦ Applied thicknesses of protective material MONOKOTE MK6-HY / MONOKOTE MK6-S included in [10, 90] (mm) range ;
- ♦ Shape factors of steel members protected by MONOKOTE MK6-HY / MONOKOTE MK6-S included in [50, 410] (m^{-1}) range ;
- ♦ Maximum duration of the exposure to the conventional thermal program as prescribed by EN 1363-1 equal to 4 hours ;
- ♦ Assessment results valid for both loaded beams and columns exposed on 3 or 4 sides ;
- ♦ Assessment results valid for only « H » or « I » sections ;
- ♦ Assessment results valid for steel hollow sections (SHS) (rectangular, square or circular sections) if protective material required thicknesses are corrected as indicated in paragraph B.1.1.3. - Annex B of EN 13381-4 ;
- ♦ Steel members with shape factors inferior to 50 m^{-1} can be protected with the thickness of protective material MONOKOTE MK6-HY / MONOKOTE MK6-S determined for steel members with shape factors equal to 50 m^{-1} ;
- ♦ Assessment results valid for steel limit temperature included in [350, 750] ($^{\circ}\text{C}$) range.

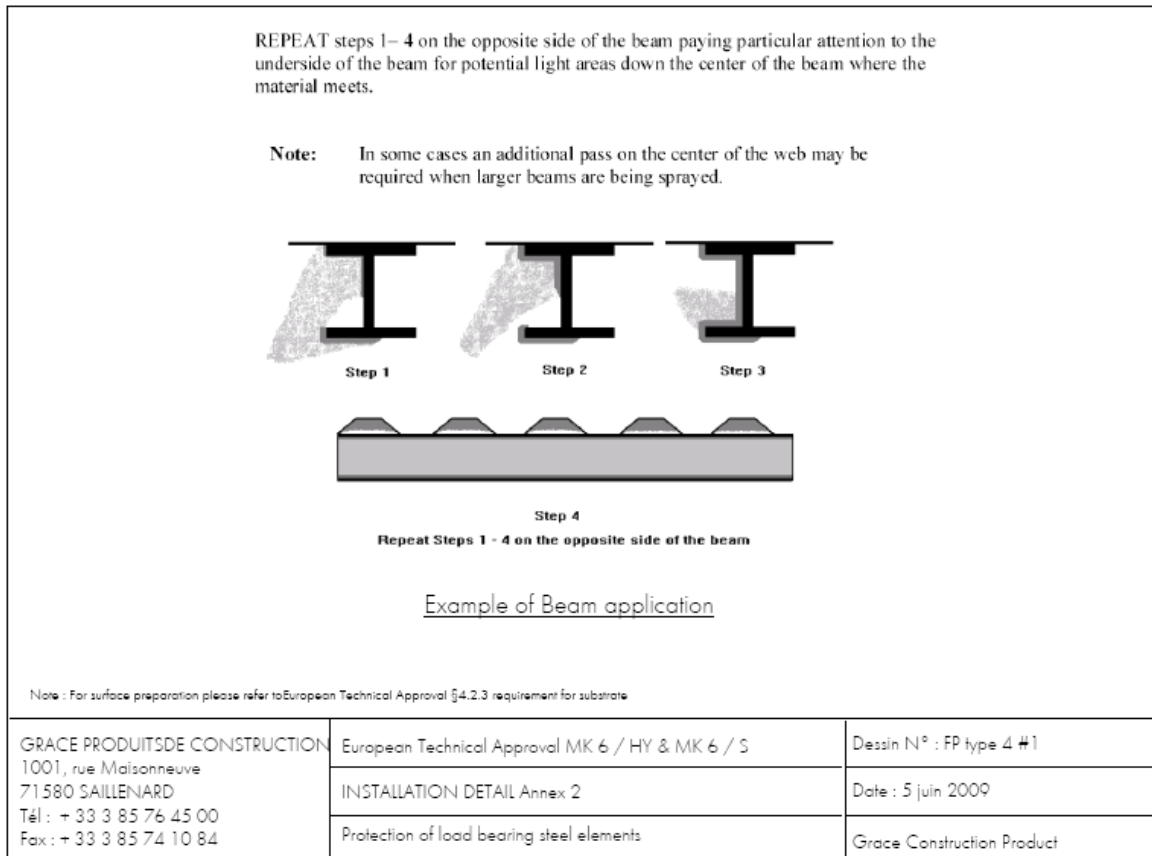


Figure A1.2
Beam application

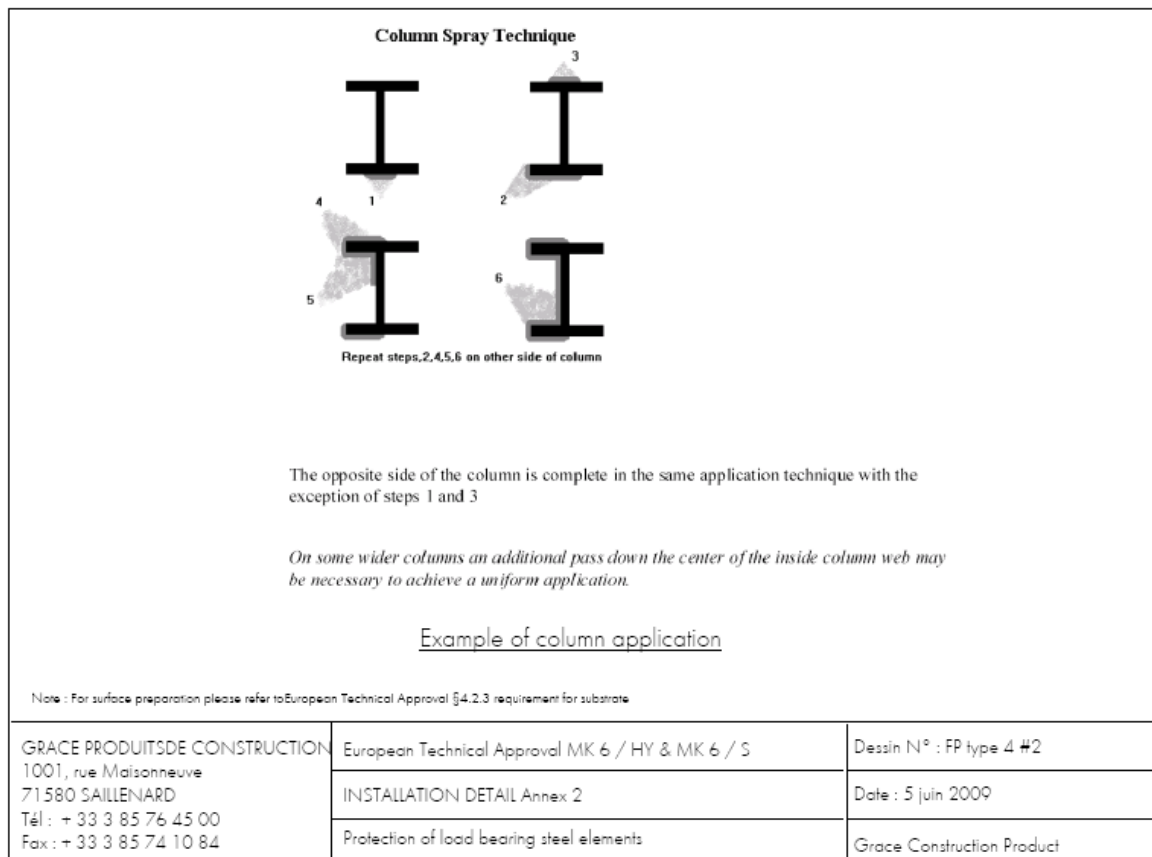


Figure A1.3
Column application

Required thicknesses of Monokote[®] MK-6/HY and Monokote[®] MK-6/S

The required thickness of Monokote[®] MK-6/HY and S in order to obtain the declared fire resistances based on the duration of the thermal exposure under the conventional thermal program is as follows:

Fire resistance R 15

A thickness of **10 mm** is sufficient to obtain R 15 fire resistance for all combinations of shape factors S/V of the steel members up to 410 m^{-1} and standard steel temperatures up to 750 °C .

Fire resistance R 30 – R 240

Table A2.1 – A2.7 show the required minimum thickness.

The minimum required thickness of protective material is determined in function of :

- the shape factor S/V (m^{-1}) of the steel members ;
- the standard steel limit temperature comprised between $[350,750]$ (°C) ;
- the duration of the thermal exposure under the conventional thermal program.

Table A2.2

Required minimum thicknesses of protective material to justify R 30

Shape factor (m ⁻¹)	Minimum required thickness to justify R30 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	10	10	10	10	10	10	10	10	10
60	10	10	10	10	10	10	10	10	10
70	10	10	10	10	10	10	10	10	10
80	10	10	10	10	10	10	10	10	10
90	10	10	10	10	10	10	10	10	10
100	10	10	10	10	10	10	10	10	10
110	10	10	10	10	10	10	10	10	10
120	10	10	10	10	10	10	10	10	10
130	10	10	10	10	10	10	10	10	10
140	10	10	10	10	10	10	10	10	10
150	10	10	10	10	10	10	10	10	10
160	10	10	10	10	10	10	10	10	10
170	10	10	10	10	10	10	10	10	10
180	10	10	10	10	10	10	10	10	10
190	12	10	10	10	10	10	10	10	10
200	12	10	10	10	10	10	10	10	10
210	12	10	10	10	10	10	10	10	10
220	13	11	10	10	10	10	10	10	10
230	13	11	10	10	10	10	10	10	10
240	14	12	10	10	10	10	10	10	10
250	14	12	11	10	10	10	10	10	10
260	15	13	11	10	10	10	10	10	10
270	15	14	12	10	10	10	10	10	10
280	16	14	12	11	10	10	10	10	10
290	16	14	13	11	10	10	10	10	10
300	16	15	13	12	10	10	10	10	10
310	17	15	14	12	10	10	10	10	10
320	17	15	14	12	11	10	10	10	10
330	17	16	14	13	11	10	10	10	10
340	17	16	15	13	12	10	10	10	10
350	18	16	15	13	12	11	10	10	10
360	18	17	15	14	13	11	10	10	10
370	18	17	15	14	13	11	10	10	10
380	18	17	16	14	13	12	10	10	10
390	19	18	16	15	14	12	11	10	10
400	19	18	16	15	14	12	11	10	10
410	19	18	16	15	14	12	11	10	10

Table A2.3

Required minimum thicknesses of protective material to justify R 60

Shape factor (m ⁻¹)	Minimum required thickness to justify R60 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	10	10	10	10	10	10	10	10	10
60	10	10	10	10	10	10	10	10	10
70	13	11	10	10	10	10	10	10	10
80	15	13	11	10	10	10	10	10	10
90	16	15	13	12	10	10	10	10	10
100	18	16	15	13	12	10	10	10	10
110	18	17	16	14	13	11	10	10	10
120	19	18	16	15	14	12	11	10	10
130	20	18	17	16	14	13	12	10	10
140	21	19	18	16	15	14	12	11	10
150	23	20	19	17	16	14	13	11	10
160	24	22	19	18	16	15	13	12	10
170	25	23	20	18	17	15	14	12	10
180	26	24	22	19	18	16	14	13	11
190	27	25	23	20	19	17	15	14	12
200	28	26	24	22	20	18	16	14	13
210	29	27	25	23	21	19	17	15	13
220	29	27	25	23	22	20	18	16	14
230	30	28	26	24	22	20	18	16	14
240	30	28	27	25	23	21	19	17	15
250	32	29	27	25	24	22	20	18	16
260	32	30	28	26	24	22	21	19	16
270	33	30	28	26	25	23	21	19	17
280	33	31	29	27	25	23	22	20	17
290	34	31	29	27	26	24	22	20	18
300	34	32	29	28	26	24	22	21	18
310	35	32	30	28	26	25	23	21	19
320	35	33	30	28	27	25	23	21	19
330	36	34	31	29	27	25	23	21	19
340	36	34	32	30	28	26	23	21	19
350	37	35	32	30	28	26	24	22	20
360	37	35	33	31	28	26	24	22	20
370	37	35	33	31	29	27	25	22	20
380	38	36	34	32	30	28	25	23	20
390	38	36	34	32	30	28	26	23	21
400	38	37	35	33	31	28	26	24	21
410	39	37	35	33	31	29	26	24	22

Table A2.4

Required minimum thicknesses of protective material to justify R 90

Shape factor (m ⁻¹)	Minimum required thickness to justify R90 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	17	16	14	13	11	10	10	10	10
60	19	18	16	15	13	12	11	10	10
70	21	19	18	16	15	13	12	11	10
80	25	22	20	18	16	15	13	11	10
90	27	25	22	20	18	16	15	13	11
100	29	27	25	22	20	18	16	14	13
110	31	28	26	24	22	20	18	16	14
120	32	29	27	25	24	22	20	18	16
130	34	31	29	27	25	23	21	19	17
140	36	33	31	29	26	24	22	20	18
150	37	35	32	30	28	26	23	21	19
160	38	36	34	32	29	27	24	22	19
170	39	37	35	33	31	28	25	22	20
180	41	38	36	34	32	29	26	23	20
190	42	39	37	35	33	31	28	24	21
200	42	40	38	36	34	32	29	26	22
210	44	41	39	37	35	33	30	27	24
220	45	43	40	38	36	33	31	28	25
230	46	43	41	39	37	34	32	30	26
240	46	44	42	40	37	35	33	30	27
250	47	45	43	41	38	36	33	31	28
260	47	45	43	41	39	37	34	31	29
270	48	46	44	42	40	37	35	32	29
280	48	46	44	42	41	38	35	32	29
290	48	46	45	43	41	39	36	33	29
300	49	47	45	43	41	39	36	33	30
310	49	47	46	44	42	40	37	34	30
320	49	48	46	44	43	41	38	34	31
330	50	48	46	45	43	41	39	35	32
340	50	48	47	45	43	42	40	36	32
350	51	49	47	45	44	42	40	37	33
360	51	49	47	46	44	42	41	38	34
370	52	50	48	46	44	43	41	38	34
380	52	50	48	46	45	43	41	39	35
390	52	50	48	47	45	43	41	39	36
400	53	51	49	47	45	44	42	40	36
410	53	51	49	47	46	44	42	40	37

Table A2.5

Required minimum thicknesses of protective material to justify R 120

Shape factor (m ⁻¹)	Minimum required thickness to justify R120 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	25	22	20	18	17	15	15	15	15
60	28	26	24	22	20	18	16	15	15
70	32	29	27	25	23	20	18	16	15
80	36	33	30	27	25	23	21	18	15
90	38	35	33	30	28	25	23	21	17
100	40	38	35	33	30	28	25	22	19
110	43	40	37	35	33	30	27	23	20
120	46	43	40	37	34	32	29	25	21
130	47	44	42	39	36	34	31	28	24
140	48	46	43	41	38	35	33	30	26
150	49	47	44	42	39	37	34	31	28
160	50	48	46	43	41	38	35	32	29
170	52	50	47	45	42	40	36	33	29
180	52	50	48	46	44	41	38	34	30
190	53	51	50	47	45	42	40	36	31
200	54	52	50	48	46	43	41	37	33
210	54	53	51	49	47	45	42	39	35
220	55	53	52	50	48	45	43	40	36
230	55	54	52	51	49	46	44	41	38
240	56	54	53	51	50	47	44	42	38
250	56	54	53	52	50	48	45	42	39
260	56	55	53	52	51	48	45	42	39
270	56	55	54	52	51	49	46	43	40
280	57	55	54	53	51	50	47	44	40
290	57	56	54	53	52	50	48	44	41
300	57	56	55	53	52	51	49	45	41
310	57	56	55	54	52	51	50	46	42
320	57	56	55	54	53	51	50	47	43
330	58	56	55	54	53	52	50	48	44
340	58	57	55	54	53	52	51	48	45
350	58	57	56	54	53	52	51	49	46
360	58	57	56	55	53	52	51	50	46
370	58	57	56	55	54	53	51	50	47
380	58	57	56	55	54	53	51	50	48
390	58	57	56	55	54	53	52	51	48
400	59	58	56	55	54	53	52	51	49
410	59	58	56	55	54	53	52	51	49

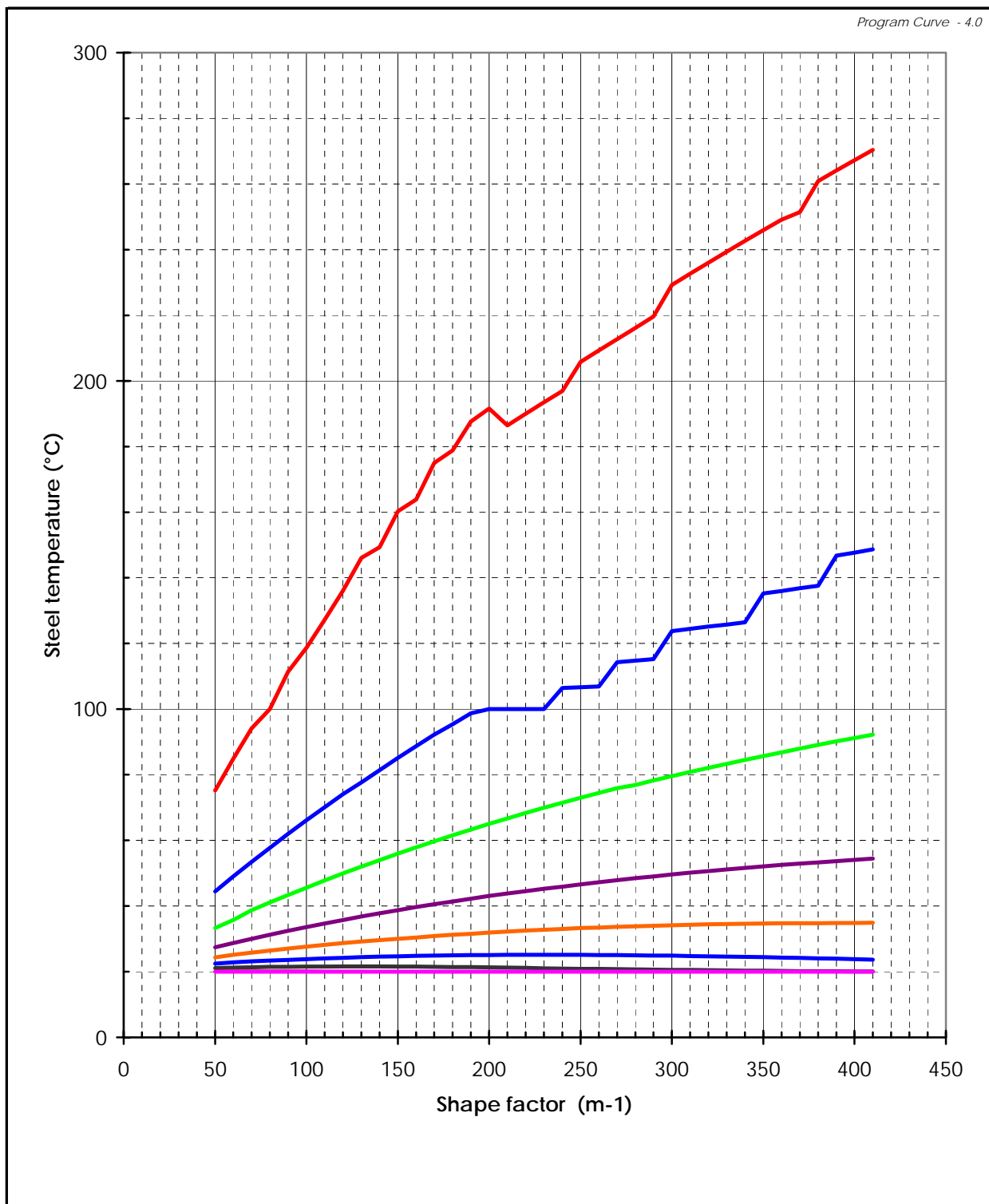
Table A2.6


Required minimum thicknesses of protective material to justify R 180

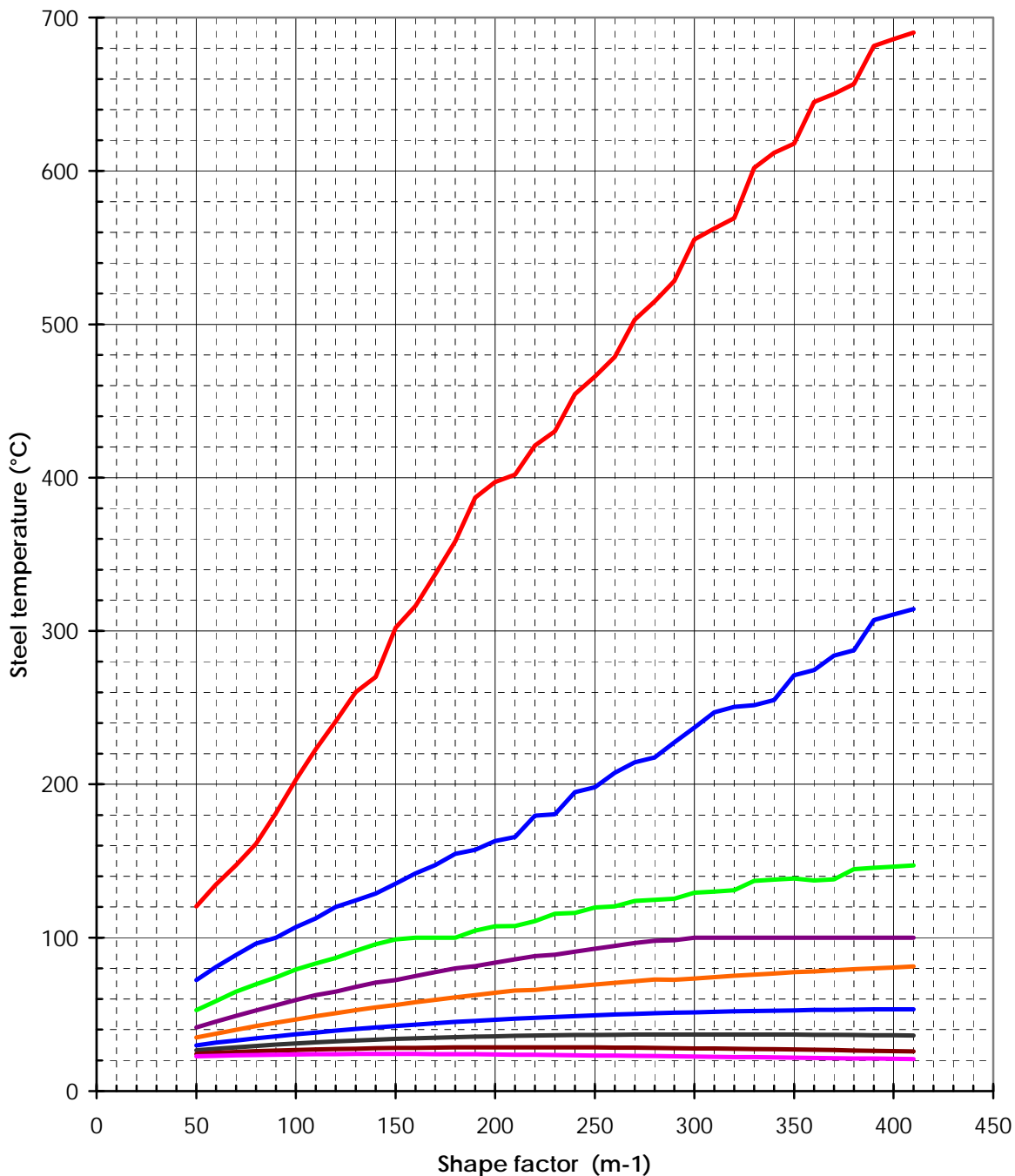
Shape factor (m ⁻¹)	Minimum required thickness to justify R180 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	43	39	36	33	30	27	25	25	25
60	48	45	41	38	35	32	28	25	25
70	52	49	46	43	39	36	32	29	25
80	54	52	50	46	43	40	36	32	27
90	55	53	52	50	47	43	39	34	29
100	56	54	53	51	50	46	42	38	33
110	57	55	54	52	51	49	45	41	36
120	58	56	55	53	52	51	47	43	39
130	58	57	55	54	53	51	50	45	39
140	59	57	56	55	53	52	51	47	41
150	60	58	57	55	54	53	51	50	44
160	61	59	58	56	55	53	52	51	47
170	63	60	58	57	55	54	52	51	48
180	64	61	59	57	56	54	53	51	49
190	65	62	59	58	56	55	53	51	50
200	67	63	60	59	57	55	54	52	50
210	68	65	61	59	57	56	54	53	51
220	69	66	63	60	58	56	55	53	51
230	69	66	63	61	59	57	55	54	52
240	71	67	64	61	59	58	56	54	53
250	71	68	65	62	60	58	56	55	53
260	72	69	66	63	60	59	57	55	54
270	73	70	67	64	61	59	57	56	54
280	74	71	68	65	62	59	58	56	55
290	74	71	69	66	63	60	58	57	55
300	75	72	69	66	63	60	59	57	55
310	75	73	70	67	64	61	59	57	56
320	76	73	70	68	65	62	59	58	56
330	76	74	71	68	65	62	60	58	56
340	76	74	72	69	66	63	60	58	57
350	77	74	72	69	66	63	60	59	57
360	77	74	72	70	67	64	61	59	57
370	77	75	73	70	67	64	61	59	58
380	77	75	73	71	68	65	62	59	58
390	78	75	73	71	68	65	62	60	58
400	78	76	73	71	69	66	63	60	58
410	78	76	74	71	69	66	63	60	58


Table A2.7
Required minimum thicknesses of protective material to justify R 240

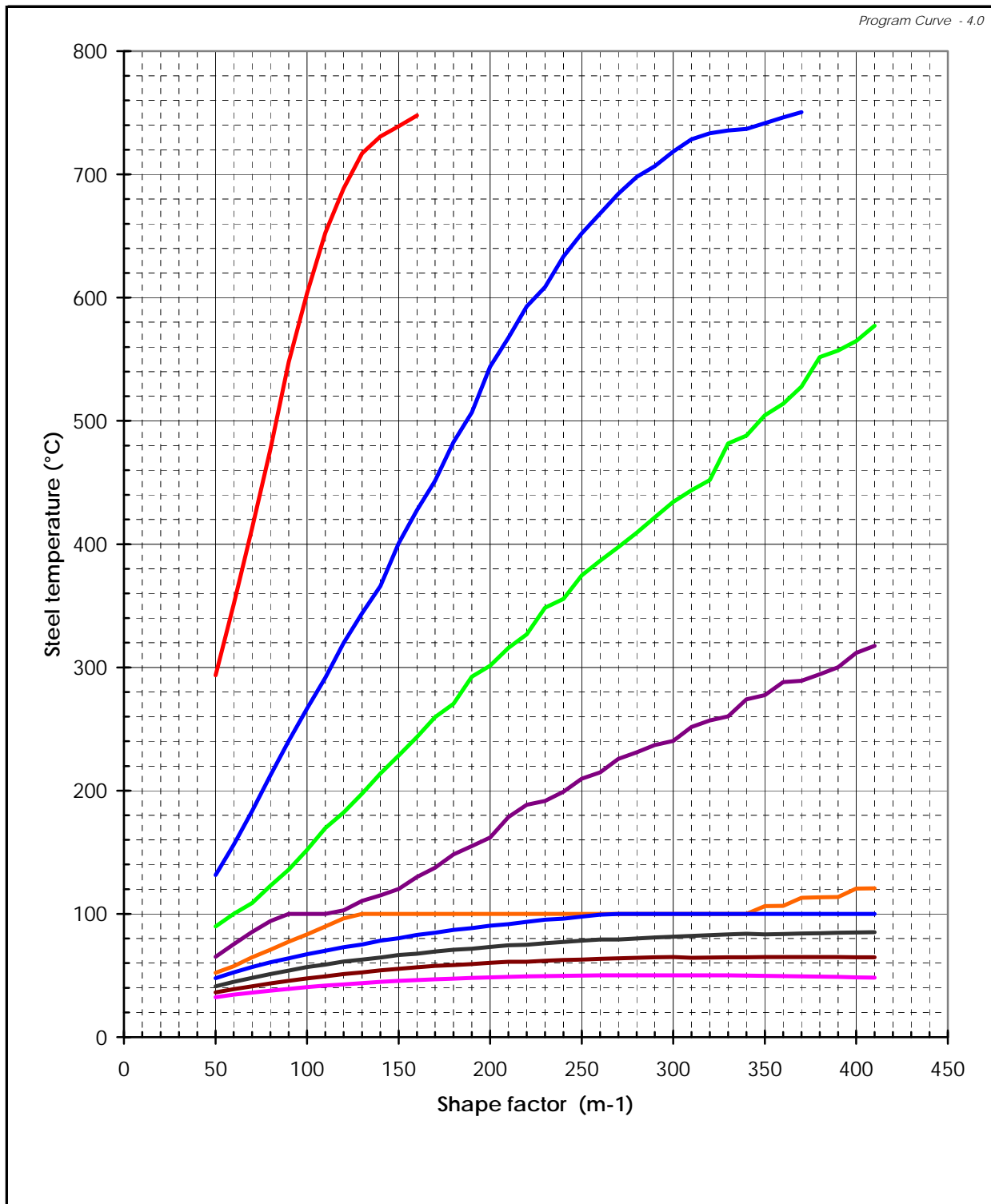
Shape factor (m ⁻¹)	Minimum required thickness to justify R240 (mm)								
	Standard steel temperatures (°C)								
	350	400	450	500	550	600	650	700	750
50	54	53	51	48	44	40	36	32	30
60	56	55	53	52	50	46	42	36	30
70	58	56	55	53	52	50	47	42	37
80	60	58	56	55	53	52	50	45	39
90	63	59	58	56	55	53	52	50	43
100	67	62	59	57	56	54	53	51	48
110	70	65	61	58	57	55	53	51	49
120	73	68	64	60	58	56	54	52	51
130	75	71	66	62	59	57	55	53	52
140	78	73	69	64	60	58	56	55	53
150	80	75	71	67	62	59	57	56	54
160	81	77	73	69	65	60	58	57	55
170	83	79	75	71	67	62	59	57	56
180	84	80	76	72	68	64	60	58	57
190	85	81	78	74	70	66	61	59	57
200	86	83	79	75	71	67	63	59	58
210	87	84	80	77	73	69	64	60	58
220	88	85	81	78	74	70	66	61	59
230	89	86	82	79	75	71	67	62	59
240	90	87	83	80	76	72	68	63	59
250	*	87	84	81	77	73	69	64	60
260	*	88	85	82	78	74	70	65	60
270	*	89	85	82	79	75	71	66	60
280	*	89	86	83	80	76	72	67	60
290	*	90	87	84	80	77	73	68	62
300	*	*	88	84	81	77	74	70	63
310	*	*	88	85	82	78	74	71	64
320	*	*	88	85	82	79	75	71	66
330	*	*	89	86	83	79	76	72	67
340	*	*	89	86	83	80	76	72	68
350	*	*	90	87	84	80	76	72	68
360	*	*	*	87	84	81	77	73	68
370	*	*	*	87	84	81	77	73	69
380	*	*	*	88	85	82	78	73	69
390	*	*	*	88	85	82	78	74	69
400	*	*	*	88	85	82	79	74	70
410	*	*	*	89	86	83	80	75	70



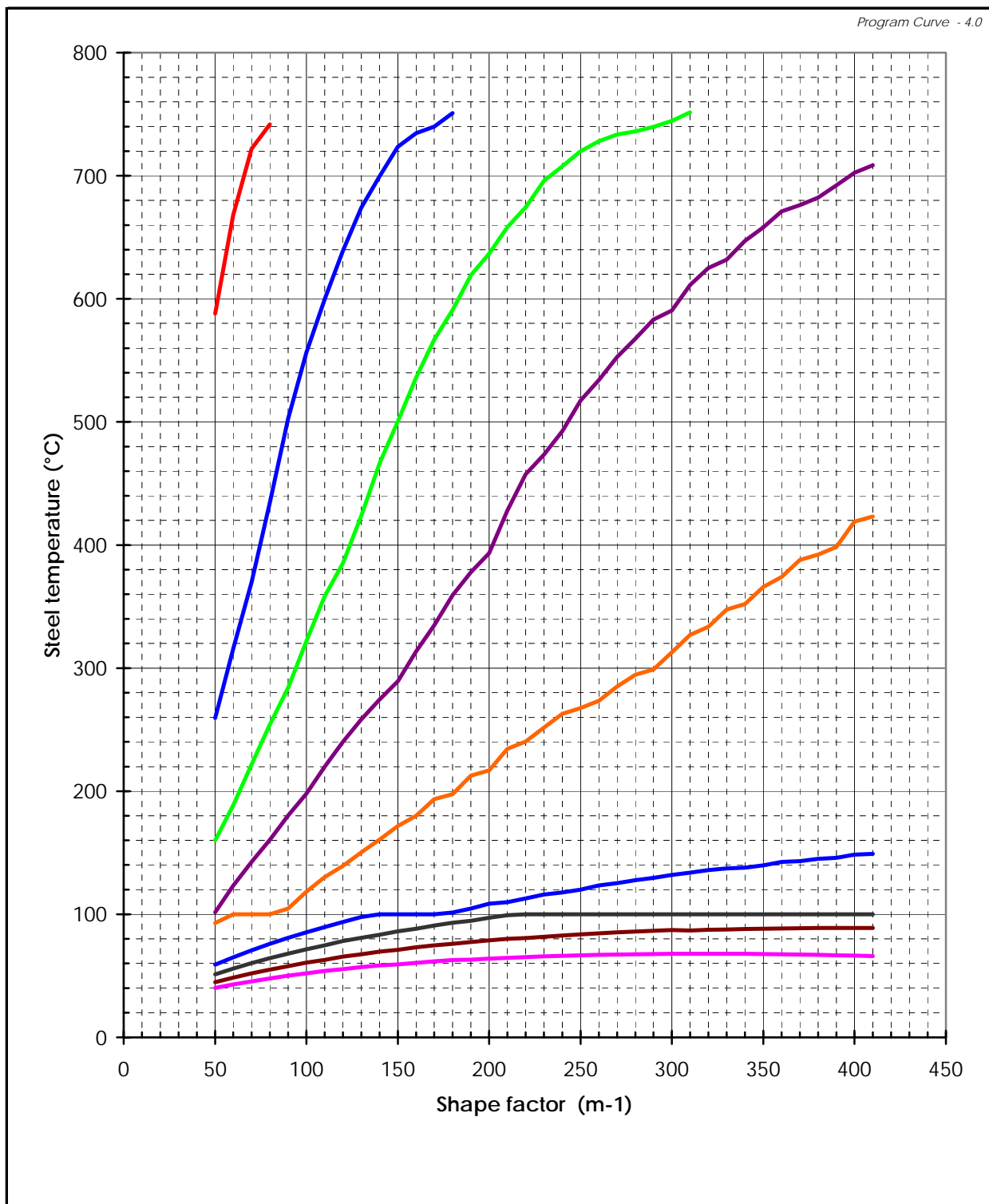
10 mm	20 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm
90 mm							
		Title Exposure time : 15 minutes				Assess 07-U-198	
						Plate 8	




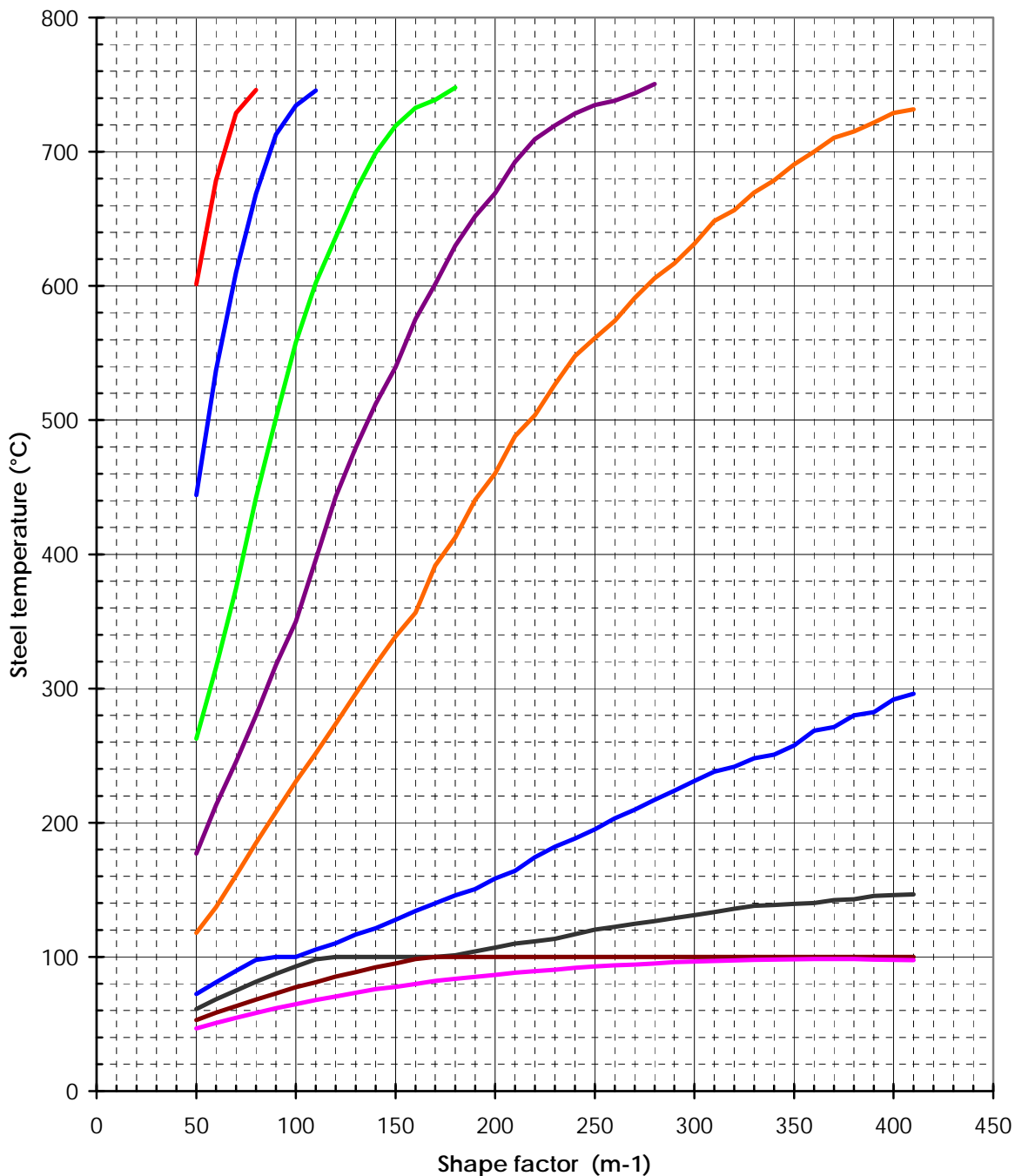
10 mm	20 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm
90 mm							
	Title Exposure time : 30 minutes					Assess 07-U-198	
						Plate 9	




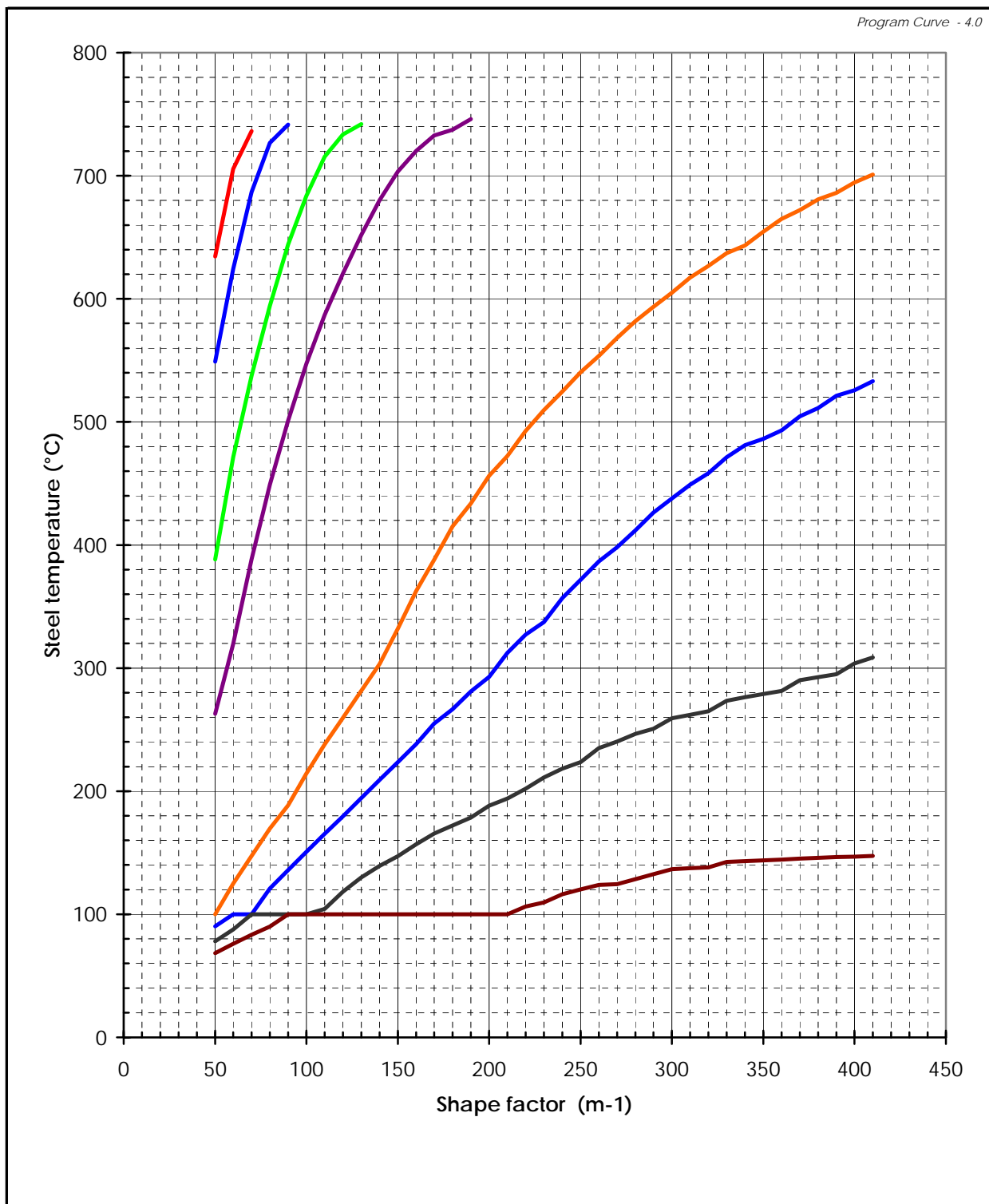
10 mm	20 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm
90 mm							
		Title Exposure time : 60 minutes				Assess 07-U-198	
						Plate 10	




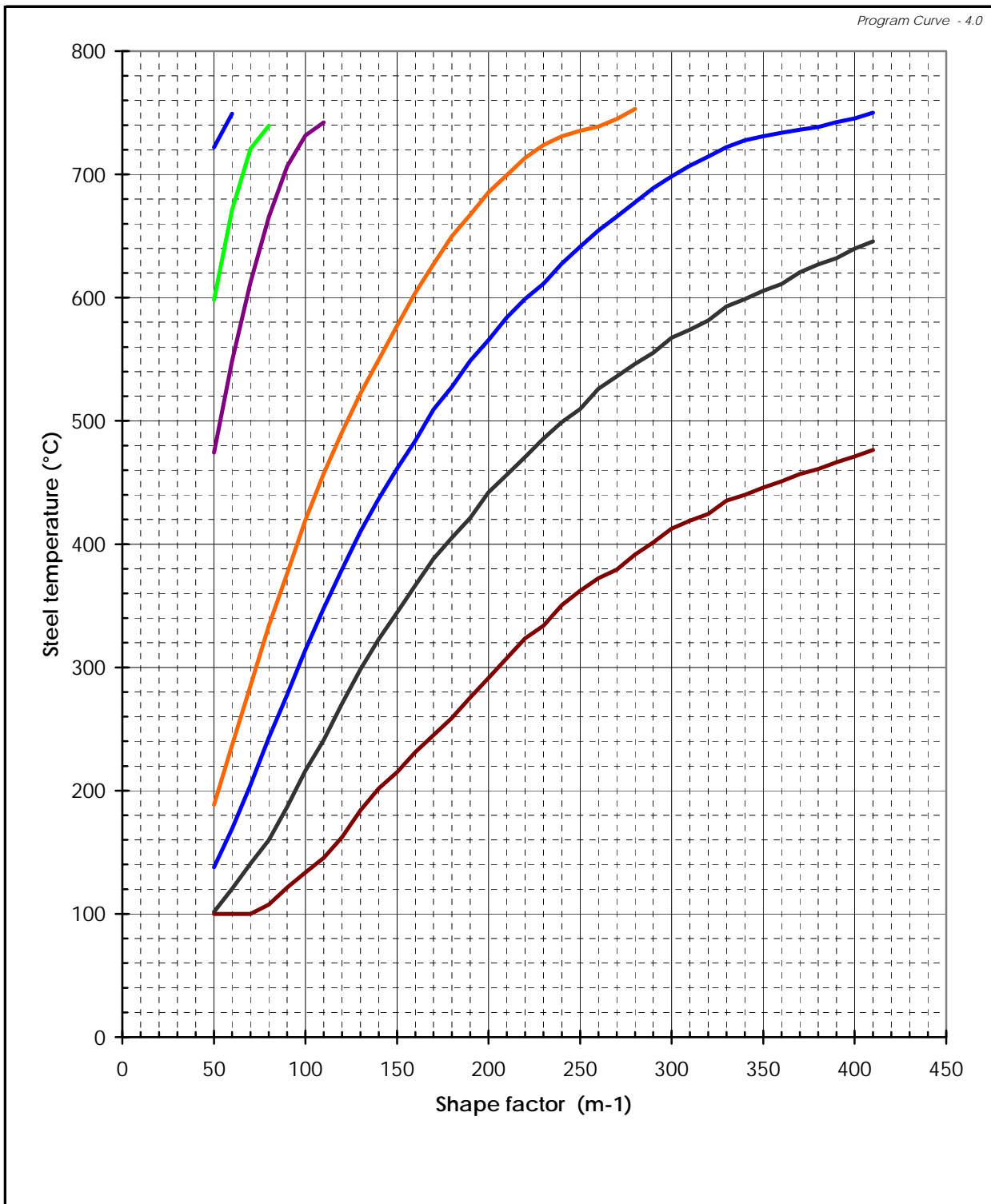
10 mm	20 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm
90 mm							
		Title Exposure time : 90 minutes				Assess 07-U-198	
				Plate 11			



15 mm	20 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm
90 mm							
		Title Exposure time : 120 minutes				Assess 07-U-198	
						Plate 12	



25 mm	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm	90 mm
		Title Exposure time : 180 minutes				Assess 07-U-198	
						Plate 13	



	30 mm	40 mm	50 mm	60 mm	70 mm	80 mm	90 mm
Title Exposure time : 240 minutes Assess 07-U-198							
						Plate 14	

ANNEX 3**Site test method for measurements of bonding properties**

The site test method to check the bonding properties is described by the manufacturer in the document with title Monokote® site test method Bonding properties (copy below).

See section 3.5 “Meaning of test” in the document regarding assessments of results.

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1 Scope

The purpose of this procedure is to provide a Quality Control of adhesion - cohesion test method on site of sprayed Fire Resistive materials Monokote®, applied to structural members.

This material test procedure is made by Grace Construction Products, based on EGOLF / SM /5 testing method.

2 Responsibilities

QC inspector is responsible for the implementation of this procedure. Record keeping and completing reports reflecting adhesion test results shall fall under the duties of Q.C. inspector.

3 Testing Procedure**3.1 Principle**

It is a non destructive test. Tensile bond strength is made perpendicular to the surface. Test runs till maximum load according Monokote® grade specification is reached.

3.2 Apparatus

1. Plywood square of 1 cm thick and 10 cm x 10 cm, with a hook screwed in center,
2. Suitable adhesive that it will be applied on plywood and will cover it's whole surface (100 cm²), i.e. polyurethane adhesive SIKABOND T2,
3. Traction device (tensiometer- weighing scale) or receptacle/container with its mass known (Fig.1), hung to hook, allowing load till 25 kg
4. Scale, accuracy +/- 2 g,
5. Sand,
6. Few containers with a capacity of 1kg minimum.

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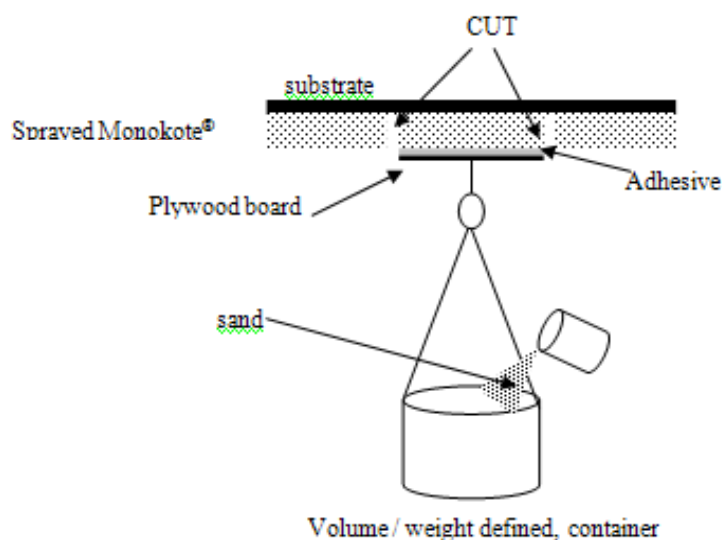


Figure 1

3.3 Test Conditions

Sprayed material should be fully dry.
Monokote® requirement is 3 to 4 weeks when datasheet specification for air renewal is respected.

If testing area is not available for the 100 cm² plywood board, such as fluted deck (profiled sheet for composite-slab), size of plywood could be reduced to 5 cm x 5 cm. In that case maximum load must be divided by four.

3.4 Testing Process

1. Let spray material gets dry
2. Bond plywood board on coating according adhesive manufacturer instruction and wait 24 hours
3. Cut down sprayed Monokote® till substrate, following perimeter of plywood board
4. In receptacle/container add progressively sand in steady rate (1kg per 30 seconds) using container capacity of 1 kg*
The first container must weight:
(Weight target less its whole number plus one) less (weight of container + string+100 cm² plywood + hook)
5. After each container dropped record the load added
6. re-start to point 4 till total load is reached
7. When total load is reached, wait one minute and stop the test.

* prepared 1kg containers with scale prior to start test

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When using tensiometer tensile force shall be applied manually or automatically at steady rate according to the performance rating of load cell. Force is displayed on tensiometer.

3.4.1 Record

If total load is reached, record the load and "Fully pass".
If adhesion fails before end of test, record the load reached before failing and "Pass till".
Tell if adhesion failure or cohesion failure within mortar or any relevant notice.

3.5 Meaning of test

The person responsible for the actual works have to assess the site tests results taking into account the reference values given in the ETA, section 2.8.6, table 1. The assessment of the site tests results must be carried out according to recommendations given in ETAG 018-3, §7.3.1. If known, other existing criteria (e.g. ETA applicant's instructions or information based on experience or testing) can be applied for this assessment. The works, including the mentioned assessment, must be supervised by responsible personnel.

3.6 Report

- a. Reference to this method
- b. Name of QC inspector and company
- c. Date of test
- d. Monokote® type , spray cementitious Fireproofing product gypsum or cement base, manufactured by Grace Construction Product, plant.
- e. Pump Machine:
- f. Estimation of dry density:
- g. Cure time:
- h. Specification value
- i. Type of substrate of structural members protected
- j. Apparatus:
Plywood plate: thickness mm, x mm.
Weight of empty pulling equipment
Adhesive:
Brand Name: Nature: Bonding time
- k. Job name & address
- l. Applicator
- m. Location of test on job
- n. People present
- o. Individual test record (see § 3.4.1 Record)
- p. Average value
- q. State if specification is reached or not (see §3.5 meaning of test)

END OF PROCEDURE