

Design, preparation and application of external rendering and internal plastering —

Part 1: External rendering

The European Standard EN 13914-1:2005 has the status of a
British Standard

ICS 91.100.10

National foreword

This British Standard is the official English language version of EN 13914-1:2005. It supersedes BS 5262:1991 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/544, Plastering, rendering, dry lining, to Subcommittee B/544/5, External rendering, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This British Standard includes a National Annex NA that provides additional information and guidance. The footnotes in BS EN 13914-1 invite individual nations to give additional advice at various points in the text. Many of the points raised in the national annex relate to individual footnotes.

In addition, information on the ‘Assessment of Finishes’ has been included in National Annex NA, as there is no such information in BS EN 13914-1. (There is a similar clause in BS EN 13914-2 for internal plastering.)

Cross-references

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Foreword

This document (EN 13914-1:2005) has been prepared by Technical Committee CEN/TC125 'Masonry', the Secretariat of which is held by BSI, following preparation by CEN/TC125/JWG5 - Joint Working Group with CEN/TC241 for codes of application for external rendering and internal plastering, in conjunction with CEN/TC241. The first draft was prepared by the European section of International Union of Contractors of Plastering, Dry Lining, Stucco and Related Activities (UIEP) at the request of the CEN Technical Sector Board (Resolution No. BTS1/56/1991).

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

This document gives requirements¹⁾ and recommendations for building details, design and materials considerations, the selection of mixes and the application of cement-based and lime-based renderings on external backgrounds.

NOTE (to English version only) The term 'rendering mortar' is used in the European Standard product specification EN 998-1, but to reflect common usage in relation to this document and for ease of reference the term 'render' (noun) has been used.

A rendered finish may be applied to a variety of backgrounds, either to improve resistance to rain penetration and weathering and/or for aesthetic reasons.

For the purposes of this document (except where stated in relation to a specific product standard) the term 'strength' should be considered in terms of relative strengths between different types of backgrounds compared with the nominal strengths of prescribed render mixes. Although it may be possible to consider this in terms of compressive strength, this standard deals with aspects of a craft as opposed to design calculations. Therefore 'strength' is not considered in terms of numerical values derived from test. Similar considerations also apply to terms such as 'movement', 'absorbency' and 'permeability' etc. used in this document.

This document refers only to the technical suitability of materials and/or procedures. The user will during the application need to observe any legal obligations relating to health and safety at any stage.

The values of certain parameters in this document may be set by CEN members so as to meet the requirements of national regulations. These parameters are designed by [] in the text.

Because this document is a code-like document as opposed to the more conventional EN product standard, it is appropriate to mention that, as with product standards, the use of the verbal form 'shall' denotes a requirement for which verification of compliance has to be able to be demonstrated. Recommendations are denoted by the verbal form 'should' and should be followed unless there is a justifiable reason for not doing so.

It is not the function of this standard to assign responsibility for the design and application of any work or actions mentioned within to any specific party. Such responsibility is a matter for other documentation associated with the work, e.g. the contract.

It has been assumed in the drafting of this document that the application of its provisions is entrusted to appropriately qualified and experienced people, for whose guidance it has been prepared.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

¹⁾ This document contains certain elements of specification and other requirements which are denoted by the use of the verbal form 'shall'.

1 Scope

This document specifies requirements and recommendations for the design, preparation and application of cement, lime or other mineral binders, and/or combinations thereof, masonry cement and polymer modified binder based external renderings, on all common types of backgrounds, to both vertical walls and horizontal soffits. It includes rendering on both new and old backgrounds and the maintenance and repair of existing work. Renders with organic materials as the principal binder are not included in the scope of this document.

This document gives guidance on the use of established site, factory and semi-finished factory made renders.

NOTE 1 Because of the many and varied materials and practices in Europe it is not possible for certain aspects of the document to enter into sufficient detail to be fully usable to practitioners in each country. Such recommendations required to complement, but not alter any basic European recommendation are given in documentation prepared by each country. Aspects of this document which may need to be complemented are indicated where they occur by a footnote referencing this paragraph. Due to the wide range of climatic conditions in Europe, it is not possible to recommend precise drying times for backgrounds and render coats. Any times given are for guidance only.

This document does not cover the following:

- a) the use and application of special renders for liquid retaining structures, e.g. coatings, and for backgrounds to cladding systems;
- b) the structural repair of concrete;
- c) the installation of proprietary external thermal insulation composite systems (ETICS);
- d) the specification and use of sealants used to seal joints for use with rendering;
- e) the use of gypsum based renders used externally, but their use may be permitted in some countries;

NOTE 2 Gypsum based products soften when subject to prolonged moist conditions. The use of such products externally will depend upon the climatic conditions where the render will be used and on the local building traditions. With the exception of some drier countries in southern Europe gypsum based renders are generally not recommended for external use and are therefore not included within the scope of this document. Their use may be permitted and controlled locally².

- f) the design and installation of flashings at windowsills and elsewhere.

At various points in this document reference is made to the use of sealants. The specification of sealants and the design of such joints is outside the scope of this document.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 413-1, *Masonry cement — Part 1: Composition, specifications and conformity criteria*.

EN 459-1, *Building lime — Part 1: Definitions, specifications and conformity criteria*

²⁾ Refer to NOTE 1 of Clause 1 for further information.

EN 771-1, *Specification for masonry units — Part 1: Clay masonry units*

EN 771-3, *Specification for masonry units — Part 3: Aggregate concrete masonry units (Dense and light-weight aggregates)*

EN 934-3, *Admixtures for concrete, mortar and grout — Part 3: Admixtures for masonry mortar — Definitions, requirements, conformity, marking and labelling*

EN 998-1, *Specification for mortar for masonry — Part 1: Rendering and plastering mortar*

EN 1008, *Mixing water for concrete — Specifications for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 12878, *Pigments for the colouring of building materials based on cement and/or lime — Specifications and methods of test*

EN 13055 (all parts), *Lightweight aggregates*

EN 13139, *Aggregates for mortar*

prEN 13658-2, *Metal lath and beads — Definitions, requirements and test methods — Part 2: External rendering*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods (ISO 1461:1999)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

render (rendering mortar³⁾) (*noun*)

mixture of one or more inorganic binders, aggregates, water and sometimes admixtures and/or additions used as an external render

3.2

render (*verb*)

action of applying render

3.3

rendering

(i)(verb) application of render

(ii)(noun) render when on the background

3.4

factory made render

render batched and mixed in a factory. It may be 'dry render' which is ready mixed only requiring the addition of water and further mixing or 'wet render' which is supplied ready to use

3.5

wet retarded ready-to use render

wet factory made render (see 3.4) for which the set has been retarded

³⁾ NOTE (to English version only) The term 'rendering mortar' is used in the European Standard product specification

EN 998-1, but to reflect common usage in relation to this document and for ease of reference the term 'render' (noun) has been used.

3.6

ready mixed dry render

dry factory made render(see 3.4)

3.7

semi-finished factory made render

render described either in 3.7.1 or 3.7.2

3.7.1

pre-batched render

constituents batched in a factory, supplied to the building site and mixed there according to the manufacturer's specifications and instructions

3.7.2

pre-mixed lime/sand for render

constituents batched and mixed in a plant, supplied to the building site where further constituents specified or supplied by the factory are added (e.g. cement)

3.8

site made render

render composed from individual constituents batched and mixed on the building site

3.9

render mix

proportions of the constituent materials that are used to make the render

3.10

undercoat

bottom layer or layers of a render system

3.11

designed render

render designed and manufactured to fulfil specified or stated properties and measured by specified or stated test methods (performance concept)

3.12

prescribed render

render made in predetermined proportions the properties of which are assumed from the stated proportions of the constituents (recipe concept)

3.13

render system

coat or sequence of coats to be applied to a background which can be used in conjunction with a support and/or reinforcement and/or a preparatory treatment

3.14

final coat

ultimate coat of a multicoat rendering system

3.15

renovation render

designed render for use on moist backgrounds containing water soluble salts

3.16

reinforcement

material incorporated into a render system to improve resistance to cracking

3.17

furring

material fixed to members to provide a surface at the position necessary to receive a fixing or finishing

3.18

background

normally the surface on to which the rendering is applied, but see 3.19 (support) and 3.20 (metal lath)

3.19

support

material used to support lathing so that it is largely independent of the background

3.20

lathing

mesh which when fixed to a background provides a key for rendering and in some cases support and stability

4 General

4.1 Essential principles

The design shall include working drawings and specifications prepared in sufficient detail to afford proper guidance for the execution of the work. In the preparation of rendering details the design shall take into account all the following points:

- a) the nature and condition of the background;
- b) the nature and conditions of exposure of the rendering;
- c) the functional requirements;
- d) the type of rendering;
- e) the type of finish/appearance.

As soon as possible there should be an exchange of information between those responsible for the constructional work, the rendering and any subsequent work, and with other trades whose work will affect or be affected by the rendering. Other requirements to be declared are as follows:

- 1) scaffolding;
- 2) any curing required;
- 3) monitoring of progress.

4.2 Building programme

The following items shall be considered by all those involved in planning the programme:

- a) obtaining agreement between all the various parties on the programme times for all the necessary operations;
- b) the suitability of the weather conditions during the application of the render;
- c) sufficient time for the background to be inspected and for it to dry out;

- d) sufficient time for preparation of the background, application and drying out of each coat of rendering. This may be longer than the minimum times referred to in 7.8.3;
- e) the programme should be kept up to date as the project proceeds;
- f) sufficient time for inspection of the work as it proceeds.

A record should be kept of the dates of completion of each area.

5 Materials

5.1 Materials for site-made renders

Constituent materials with established suitability shall be used, as detailed in 5.1.1 to 5.1.4.

NOTE Where there is no European Standard for a particular constituent material or where there is an existing European Standard which does not cover the particular product or where the constituent deviates significantly from the European Standard, the establishment of suitability may result from:

- a European Technical Approval which refers specifically to the use of the constituent material in site-made renders conforming to EN 13914-1;
- a relevant national standard or provisions valid in the place of use of the site-made render which refers specifically to the use of the constituent material in site-made renders conforming to EN 13914-1.

5.1.1 Mineral binders

Mineral binders with established suitability shall be used. Binders shall conform to the relevant standards listed in Table 1.

Table 1 — Mineral binders

Material	Standard	Remarks
Common cements	EN 197-1	Not all types will be suitable for each and every application ⁴⁾
Building lime	EN 459-1	
Hydraulic lime	EN 459-1	
Masonry cements	EN 413-1	

5.1.2 Aggregates

Aggregates with established suitability for use in renders shall be used. Aggregates shall conform to the relevant standard, when suitable. Lightweight aggregates shall conform to EN 13055 and aggregates for mortar shall conform to EN 13139.

5.1.3 Admixtures

Where available, admixtures shall conform to EN 934-3.

Only those admixtures shall be used which do not exert any harmful influence on the render. They shall not impair the strength or durability of the render, or, where applicable, the protection against

⁴⁾ Refer to NOTE 1 of Clause 1 for further information.

corrosion of the reinforcement or of lathing. In addition, they shall not modify, other than in the manner intended, the setting and hardening of the binder.

NOTE It should also be borne in mind that certain types of admixtures, for example water repellent agents, can impair the adhesion of subsequent layers of the render and paint.

With all admixtures the manufacturer's instructions shall be precisely followed. Overdosage shall be avoided.

Proprietary bonding agents shall be compatible with cement and/or lime. They can, for example, be based on styrene-butadiene rubber (SBR), and acrylic polymers. Bonding agents improve the adhesion of renderings to smooth surfaces, and to low or high suction backgrounds if incorporated in spatterdash, stipple, adhesive slurries or in undercoat mixes. They can also reduce the suction of the background when applied to high suction backgrounds. Manufacturers' instructions concerning the use of these products should be carefully followed.

5.1.4 Additions

5.1.4.1 Fibres

The fibres shall not affect the chemical or physical stability of the render.

Natural fibres shall be dry, clean and free from oil or grease.

Alkali-resistant mineral fibres and certain polymer fibres can be used, either as loose fibre or in premixes. Manufacturers' literature should be consulted for likely improvements to the render as well as limitations on use and long term deterioration.

Metal fibres shall have adequate durability. Metal fibres shall not be adversely affected by alkaline or weak acid conditions.

5.1.4.2 Pigments

Pigments shall conform to EN 12878 and be used only if they are proven to be satisfactory. Pigments shall be stable, unaffected by lime or exposure to light. They shall not easily be leached out by water nor shall they have any adverse effect upon the cement or other constituents of the rendering.

5.2 Water

The water shall be of a quality such that it does not adversely affect the render.

Water fit for drinking is suitable for mixes for rendering. Attention shall be drawn to the requirements of EN 1008 in cases where water supplies may be of doubtful quality.

5.3 Types of render

5.3.1 General

Ready mixed renders can be mixed entirely in the factory or partly in the factory and subsequently completed on site. Alternatively, render may be mixed entirely on site.

Further detailed design recommendations and sub-division according to location of manufacture and purpose are given in 6.17.

5.3.2 Factory made and semi-finished factory made renders

Factory made and semi-finished factory made renders shall conform to the requirements of EN 998-1 for those parts of the process either wholly or partly carried out in the factory. For those parts of the process for semi-finished factory made renders completed on site, only materials permitted by the manufacturer shall be used. No addition of any material is permitted for wet, ready-to-use renders. Unless otherwise specified by the manufacturer, no addition, other than water in the recommended proportions, shall be added to dry factory made renders. Where permitted, only materials conforming to the requirements of 5.1 and 5.2 should be used.

5.4 Reinforcement, supports and beads

Reinforcement, supports and beads should conform to recommendations given in Table 2.

Table 2 — Materials for reinforcement, supports and beads

Product	Material	Specification	Remarks
Reinforcement and/or support	Expanded metal (stainless steel or zinc coated steel)	prEN 13658-2	Specify grades 1.4301 or 1.4401 if EN 13658-2 does not limit grades.
	Profiled welded wire mesh (stainless steel or zinc coated steel)	prEN 13658-2	Specify grades 1.4301 or 1.4401 if EN 13658-2 does not limit grades.
Support	Ribbed lathing –expanded metal (stainless steel or zinc coated steel)	prEN 13658-2	Ribs are formed integrally with expanded metal thus providing rigidity in the direction of the rib.
Support	Stainless steel or zinc coated steel, clay pellet lath	prEN 13658-2	
Reinforcement	Plain welded wire mesh of stainless steel or of zinc coated steel	prEN 13658-2	For supports, mesh should be of 10 mm to 40 mm pitch with wires not less than 1 mm diameter. Where the aggregate grain size exceeds 3 mm consideration should be given to using a mesh larger than 15 mm. Welded mesh of this kind is used primarily as a support when rendering over certain backgrounds. For reinforcement the mesh size should be no greater than 25 mm × 25 mm.
	Non-metallic mesh made from alkali resistant mineral fibres	-	With the strands from the two directions connected together.
Support	Slab-type supports, e.g. lightweight woodwool slabs		(Use of materials with established suitability)
Angle beads, corner beads, stop beads and render stops and profiles for special purposes	Stainless steel, polyvinyl chloride or combinations thereof	prEN 13658-2	Should be used under local situations or regional conditions of high humidity and/or salt laden atmospheres or salts in background (see 6.12)
	Zinc coated steel)	prEN 13658-2	Careful consideration should be given to the choice of this type of material for its use in local situations or regional conditions of high humidity and/or salt-laden atmospheres or salts in background (see 6.12)

Metal lathing, reinforcement and beads of whatever type shall be suitable for external use.

Steel other than stainless steel shall be zinc coated after manufacture of the finished product. After fabrication the items shall be hot dip zinc coated.

5.5 Fixings

5.5.1 General

Fixings should conform to the recommendations of Table 3.

Table 3 — Materials for fixings ⁵⁾

Product	Material	Specification
Nails	Stainless steel or zinc coated steel	—
Pins for shot-firing	Stainless steel or zinc coated steel	—
Staples	Stainless steel or zinc coated steel	—
Screws and bolts ^a	Stainless steel or zinc coated steel	—
Soft fixings and ancillary components	Polyamide, polypropylene or polyethylene	—
Washers, ancillary angles and brackets ^b	Zinc coated steel or otherwise suitably coated or thermoplastics	—
Wire	Stainless steel or zinc coated steel	prEN 13658-2
NOTE The fixings for lathing and beads should be made of a material compatible with adjacent materials. ^a Including expanding bolts and drill anchors. ^b Often used in conjunction with shot-fired or screwed fixings.		

5.5.2 Fixing blocks in solid backgrounds

Only dovetailed shaped blocks that can be cast in should be used. Some types of plastics, e.g. high density polyethylene and some cement composite blocks have proved satisfactory. Wooden blocks shall not be used.

5) Materials for fixings⁵⁾

5.5.3 Plugs

Plugs for inserting into pre-drilled holes and to receive screws are available as proprietary products. These may be made from jute fibre or various types of plastics or metal. Wooden plugs shall not be used.

It is recommended that those responsible for the rendering should satisfy themselves on the adequacy of any method of fixing before commencing work (see 4.1 and 4.2).

NOTE Some countries may limit the types of material permitted for use as plugs⁶⁾.

5.6 Furring

Firrings may consist of galvanised or stainless steel or timber. Galvanising shall be in accordance with the EN ISO 1461. Timber shall be given an appropriate preservative treatment (see also 7.4.3.1).

6 Design considerations

6.1 General factors affecting the design of the rendering system

6.1.1 Choice of render type, mix, number of coats and thickness

The choice will depend upon the appearance desired, exposure conditions (see 6.5), nature of the background (see 6.3) and the functional requirements. These factors should therefore receive consideration together.

The render type and mix shall be chosen to be compatible with the characteristics of the background, particularly its strength⁷⁾ and whether it will move (see 6.2). Inter-coat compatibility should also be considered.

A rendering system normally comprises at least two layers, namely an undercoat and a final coat, except for specially formulated products, e.g. one-coat renders that conform to the requirements of EN 998-1 (see 6.18, Table 5 and Table 6)

Recommended thicknesses are given in 6.18 and Table 5⁸⁾.

6.1.2 Preparation of the background

The method adopted will be dictated by the type and characteristics of the background (see 6.2). Consideration should be given as to whether the background provides:

- adequate strength and rigidity for support of the render and
- adequate and uniform key and suction for adhesion of the rendering.

If these characteristics of the background are inadequate, then other means of providing support and/or key will be required (see 7.4).

⁶⁾ Refer to Note 1 of Clause 1 for further information.

⁷⁾ Refer to NOTE 1 of Clause 1 for further information.

⁸⁾ Refer to NOTE 1 of Clause 1 for further information.

6.2 Characteristics of backgrounds

6.2.1 General

The background characteristics described in 6.2.2 to 6.2.6 should be considered when designing a rendering system. The backgrounds and their constituent materials should conform to their relevant standards. For existing buildings see Clause 8.

6.2.2 Strength of background

The background should adequately support and restrain the rendering. Masonry backgrounds, including the mortar joints, should be no weaker and preferably slightly stronger than the rendering. On weaker backgrounds, rendering mixes should be restricted to weaker mixes⁹⁾.

6.2.3 Suction of the background

Adhesion of a rendering is determined to a great extent by the suction of the background, especially where there is no adequate key. Both high suction (which removes mixing water quickly) and low suction tend to impair the development of a good bond. It should be appreciated that the suction of a background can be significantly affected by its moisture content at any given time.

6.2.4 Key of the background

Keys may be provided naturally or artificially and should be regularly spaced over the whole surface. Backgrounds should be clean, dust-free and free of all deposits that might impair the key of the render. For backgrounds which do not provide a natural key, methods of supplying a key are given in 7.4.

6.2.5 Joints in the background

The design shall specify the type and execution of joints. Joints in the render shall be coincident with movement joints in the structure and allow for the same degree of movement.

Other backgrounds, e.g. walls with insufficient movement joints, or junctions between dissimilar materials have the potential to crack after they have been rendered.

6.2.6 Cracks in the background

Special measures shall be taken when rendering backgrounds with existing cracks, such as using reinforcement or supports (see Table 2). Cracked backgrounds cannot be rendered without risk. Backgrounds should be stable, (but see also 6.13 and 7.4.3).

6.2.7 Dimensional stability of the background

Dimensional changes of the background should have largely taken place prior to rendering.

Render applied to backgrounds which may move are likely to crack, e.g. with movement of the structure, deflection of floor slabs, shrinkage of concrete, high moisture content of masonry (but see 6.2.5 and 6.13.2).

⁹⁾ Refer to NOTE 1 of Clause 1 for further information.

6.2.8 Durability of the background

The durability of the various types of background to which renderings may be applied is dealt with in the relevant European codes of application dealing with those materials or types of structures. The influence of the nature of the background upon the type of rendering recommended is dealt with in 6.3.

If the background is not resistant to frost, special precautions are required.

The background should not contain harmful amounts of soluble salts (see also 6.8) or corrosive components. Special precautions are required if this is not the case. The failure of only a few units in the background of a rendered wall can lead to an unacceptable appearance and progressive deterioration.

6.3 Adequacy of the background

General advice as to whether the various types of background are likely to necessitate the use of special renders, preparatory treatments or additional support is given in Table 4. Advice for the preparation of existing and old backgrounds is given in Clause 8 and Annex B.

Details of the various preparatory treatments and of additional supports are given in 7.4.2 and 7.4.3 respectively.

A spatterdash or a stipple or mineral bonding agent may be used to provide a key for the undercoat (see 7.4.2.1 and 7.4.2.2). On absorbent backgrounds the spatterdash or stipple or mineral bonding agent should be used to reduce or to even out varying suction. These preparatory treatments give a rough-textured surface.

Table 4 — Summary of the measures to be taken prior to rendering on to various types of backgrounds

	Background	Precaution ^a
a)	Clay, concrete and calcium silicate brickwork	Depending on suction and key; may need use of a spatterdash or stipple preparatory treatment or key with polymer modified cement mortar or metal lathing
b)	Lightweight clay blockwork	The suction should be checked to ensure that it is similar to that with normal clay bricks. If not, special precautions may be necessary
c)	Lightweight blockwork: lightweight aggregate concrete	Ordinary suction- no pre-treatment necessary High suction- use a spatterdash or stipple treatment or metal lathing
d)	Large lightweight concrete elements	Special precautions in accordance with the recommendations of the manufacturer of the element or render
e)	Lightweight blockwork: autoclaved aerated concrete	May need to use a suction reducing treatment
f)	Normal weight and dense aggregate concrete blockwork	Depending on suction and key; may need use of a spatterdash/stipple treatment key with polymer modified cement render or support
g)	Sandstone blockwork	Use a spatterdash and a water-resistant or renovation render
h)	Dense concrete	If the surface is not rough then use a preparatory treatment, e.g. key with polymer modified cement render
i)	No-fines concrete	No pre-treatment necessary
j)	Formwork blocks – cement/aggregate based	Use a special preparatory treatment as recommended by the block manufacturer
k)	Cement/wood based blockwork	a) lime/cement render: use spatterdash or stipple coat b) lime/cement lightweight render; none, but use glass fibre mesh c) lime/cement thermal insulating render: use spatterdash or stipple coat and glass fibre mesh. A metal support is recommended
l)	Woodwool boards (with or without thermal insulation) ^{b c}	a) lime/cement render: use spatterdash or stipple coat and glass fibre mesh b1) on small areas lime/cement lightweight render: no pre-treatment necessary, but use glass fibre mesh in the undercoat (if single coat). For two coat work see b2) b2) on large areas Lime/cement light weight render: no pre-treatment necessary. The first undercoat is unreinforced and after sufficient drying time ¹⁰⁾ apply second thin undercoat reinforced with glass fibre mesh. c) lime/cement thermal insulating render: use spatterdash/stipple coat and glass fibre mesh or metal support

¹⁰⁾ Refer to NOTE 1 of Clause 1 for further information.

Table 4 (concluded)

	Background	Precaution ^a
m)	Extruded and expanded polystyrene and polyurethane boards ^c	Use a special preparatory treatment. For rendering see woodwool (items b and c)
^a The manufacturer of the background material/product may recommend special preparatory treatments. ^b Wood wool should be dry and protected from wet weather. ^c Board joints should be tight. Methods of preparing board surfaces are: i) Overlaying with reinforcement as described in 7.4.3.3 and 7.4.3.4; ii) For boards made of polystyrene and polyurethane that have rough surfaces, proprietary pre-treatment systems are available using thin layers of polymer modified cement based renders. Such products should be left for at least one day before application of the rendering system.		

6.4 Durability of the rendering

External rendering that has been correctly designed will perform satisfactorily. However in the design, consideration should be given to the factors that influence the durability of a rendering. These are:

- design and choice of suitable render or render system for the intended purpose;
- e.g. damage from abrasion and impact (see 6.11);
- corrosion of embedded metal (see 6.12);
- appropriate design of joints;
- compatibility of render with the background and adequate adhesion;
- deformation of adjacent components or building elements;
- cracking and crazing (see 6.13);
- rain penetration and rising damp (see 6.6);
- problems associated with soluble salts (see 6.8);
- effects of atmospheric pollution and frost action (see 6.9 and 6.10).

Durability of the rendering will also be dependent upon the type of background, the type of rendering, mix proportions and the method of application.

6.5 Conditions of exposure

This document does not contain specific recommendations for particular products, mix proportions and admixtures for various exposure situations¹¹⁾. The design should always take into consideration local knowledge and experience for the decision on which category of capillary water absorption given in EN 998-1 and which render to specify.

¹¹⁾ Refer to NOTE 1 of Clause 1 for further information.

Whenever possible, advantage should be taken of architectural features that protect the rendering (see 6.16 and Figures 1, 2 and 3). Such protective features become more important in more severe conditions).

6.6 Resistance to rain penetration

The structure should be designed and constructed so that the background remains as dry as practicable during construction. The purpose of the completed render is to restrict rain penetration into the background. Therefore rendering should be as free from cracking as practicable (see 6.13). The design of the structure should take into account any special precautions needed when the outer leaf of a fully filled insulated cavity wall is to be rendered.

For backgrounds which are dependent upon the rendering for protection, the following general principles should be adopted:

- a) for site made renders, especially when using prescribed mixes, the mix proportions and numbers of coats for any given condition of exposure to rain should be chosen based upon a knowledge of local successful use¹²⁾. The use of two undercoats will give better rain resistance.
- b) for factory made renders:
 - 1) in severe conditions of exposure, where the rendering is subject to much rain, renders which conform to the requirements of EN 998-1 and having a capillary water absorption Class W2 should be used.
 - 2) in moderate and sheltered conditions, renders which conform to the requirements of EN 998-1 with a capillary water absorption Class W1 or W0 should be sufficient.

6.7 Resistance to water rising from the ground without pressure

Special waterproofing measures are required where the masonry is in contact with the ground.

Special renovation renders conforming to the requirements of EN 998-1 can be effective when used on masonry backgrounds susceptible to dampness and could be used in conjunction with other measures to minimize dampness (see also Annex B).

6.8 Soluble salts

Soluble salts, particularly sulfates, may occur in backgrounds consisting of some types of clay brick or block, some types of aerated concrete blocks and in old backgrounds where they may also occur from a variety of extraneous sources e.g. rising damp. Salts have certain harmful effects that may lead to, disintegration of the background, cracking and loss of adhesion with the rendering and corrosion of any non corrosion-resistant metals.

Backgrounds containing soluble salts which are likely to remain wet for prolonged periods, may adversely affect the render, so consideration should be given to either limiting salt content in new construction or reducing its effects.

¹²⁾ Refer to NOTE 1 of Clause 1 for further information.

The following methods may be used to reduce such a risk:

- design the structure to keep the background dry, (see 6.6) in which case any soluble salts in the background are unlikely to have a harmful effect on the rendering.
- for new structures, specify clay masonry units with a category S1 (where there is a risk of prolonged saturation) or S2 (normal exposure to weather and the masonry is protected by the design detailing of the building) soluble salt content in accordance with EN 771-1 and specify concrete units to conform to EN 771-3.
- use a renovation render conforming to EN 998-1. These are designed for use on backgrounds of limited moisture content and which contain salt.

6.9 Effects of atmospheric pollution

The possibility of atmospheric pollution should be considered with regard to all materials used in building facades such as stone, brick, concrete, paint, metal, etc. The main effect of atmospheric pollution is localized surface discoloration due to airborne dirt and dust. This can be minimized if the building is well designed and incorporates good architectural features (see 6.16).

6.10 Effects of freezing

In order to minimize problems associated with frost attack, particular attention should be given to the correct detailing of architectural features which can afford a high degree of protection (see 6.16), and also to the correct choice of render product and/or mix proportions (see 6.17). In addition, increasing the volume of air pores by the incorporation of an air entraining admixture can have a beneficial effect on the durability of the render in freezing conditions.

6.11 Resistance to impact

Where there is a significant risk of impact damage, precautions which in addition to the appropriate selection of rendering system, may include the provision of rails, posts, barriers or external special protective corners.

6.12 Corrosion of metals

To minimize the risk of corrosion, metal lathing and fixings, and metal beads shall consist of stainless steel or zinc coated steel. Zinc coated steel components complying with 5.4 and 5.5 can be used in renderings in moderate conditions and in renovation work of buildings except in certain regions and specified circumstances¹³⁾.

The risk of corrosion can be reduced by allowing adequate drying times of backgrounds (see also 6.6) and between render coats¹⁴⁾.

Stainless steel lath and beads shall be used in splash zones.

The advice of the manufacturer of laths and beading should be sought where using these products in contact with special renders (see 6.18.6).

¹³⁾ Refer to NOTE 1 of Clause 1 for further information.

¹⁴⁾ Refer to NOTE 1 of Clause 1 for further information.

6.13 Resistance to cracking

6.13.1 General

The design of the structure should take into account possible movements of the background as they will affect the performance of the rendering. The use of joints in the background and rendering can reduce the incidence of cracking (further details are given in 6.13.4).

6.13.2 Movements of the background

Movements in the building or in the background upon which a rendering is applied may arise from many different causes, according to their nature. Such movements may lead to cracking or debonding of the render. The design of the rendering system should take into account the following:

- movement of the structure;
- shrinkage from the initial drying out of the background, especially when made from cementitious and calcium silicate based materials;
- differential shrinkage between backgrounds;
- long term creep of concrete;
- subsequent wetting and drying of the background during the life of the building;
- thermal movement of metal lathing and/or drying shrinkage of the timber studding.

Such cracking may commonly occur at positions of higher stresses, such as the corners of openings. Some typical positions are shown in Figure 4.

6.13.3 Movement of the rendering

Cement and lime-based renders shrink on hardening and drying. It is important to achieve a good bond. To minimize shrinkage stresses:

- each coat should be allowed to dry out sufficiently before applying the next coat. The building programme shall allow for a specified drying time for the render¹⁵⁾. Consideration of climatic conditions, background suction and strength of mix may vary this rate;
- except for thermal insulating renders and certain lightweight renders, the first render coat should be weaker than the background, and each successive coat should not be stronger than the one to which it is applied (see 6.2).

Some thermal movement may occur in renders applied to non-rigid backgrounds, especially over thermal insulation.

6.13.4 Methods of minimizing the occurrence of cracks

6.13.4.1 General

To minimize background movement and subsequent cracking of the renders the design should take into account:

¹⁵⁾ Refer to NOTE 1 of Clause 1 for further information.

- the likely climatic conditions and hence whether it may be necessary to keep the background materials dry and;
- the allowance of sufficient time¹⁶⁾ between the construction of the background and the application of the rendering.

For less stable backgrounds additional precautions should be taken (see 6.13.4.3 and 6.13.4.4).

6.13.4.2 Joints

A straight joint should be formed in the rendering coincident with the joint in the background and having the same freedom of movement. See Figure 5. This may be formed by rendering up to proprietary metal stop beads. A suitable joint sealant should be specified to fill the resultant gap.

Rendered metal lathing is subject to movement due to temperature or moisture changes. To limit the tendency to crack, large uninterrupted areas of rendering on lathing (see Table 2) should be divided at specified intervals¹⁷⁾.

6.13.4.3 Dissimilar backgrounds that cause differential movement

Where a rendering is to be continued across dissimilar background materials the possibility of differential movement at their junction should be considered. Any anticipated movement should be accommodated by forming a straight joint right through the rendering in line with the change of background (see 6.13.4.2).

In cases where differential movement is a remote possibility and it is deemed not necessary or appropriate to provide a joint in the rendering, the effect on the rendering of any movement in the background can be minimized by one of three methods:

- a) embedment of an alkali-resistant mineral fibre mesh in the undercoat;
- b) following the application of the undercoat the incorporation of an alkali-resistant mineral fibre mesh in a thin embedding layer. This layer may consist of polymer modified cement based render;
- c) provision of a strip of metal lathing not less than 300 mm wide with an isolating membrane behind fixed across the junction and with the lathing embedded in the undercoat of the rendering.

6.13.4.4 Backgrounds that may move

For backgrounds that may move, e.g. mixed brickwork or over insulation (see 7.4.3.3), alternative methods of minimizing cracking are described under (a) and (b) in 7.4.3.4. Method (b) is particularly recommended for work under concrete soffits.

6.13.5 Cracking

Cracking is caused by differential shrinkage of the render surface consisting of micro-fissures with a width equal to or less than 0,2 mm. These do not impair the performance of the render as they do not extend far below the surface of the rendering.

Smooth surfaces are more prone to cracking.

¹⁶⁾ Refer to NOTE 1 of Clause 1 for further information.

¹⁷⁾ Refer to NOTE 1 of Clause 1 for further information.