

Dear Customer,

Ref: Facing Brick Scheme

We are delighted that you have selected our Facing Brick product for your scheme.

It is in the interests of all concerned that this scheme is successful. With this in mind, we set out guidance below on some areas that we have found to be important for a successful installation.

Where the circumstances allow, it is beneficial to complete one building / structure using bricks taken from one batch and mixed on site from a minimum of 3 packs to avoid colour banding / shading. If the circumstances do not allow for this then it is important to minimise the possibility of banding / shading by always mixing bricks from 3 packs concurrently with some overlap between deliveries. Where the site conditions allow, it will also be beneficial to take receipt of as many bricks as possible at an early stage to maximise colour consistency throughout the site.

Prior to commencement of work (Construction Drawings and Movement Control)

When movement control measures have not been included in the design drawings, or when design drawings have been produced based on the use of clay facing bricks, we strongly recommend that the designers are made aware of the change to masonry units and drawings are updated to reflect this change in materials prior to any work commencing.

1. Professional advice, specific to the project, should be sought before commencement of the building work.
2. Tobermore Concrete Facing Bricks have different properties to clay bricks especially in relation to moisture movement. Please refer to our 'Guide to the Use of Tobermore Concrete Facing Bricks', which is attached to this letter, available on request or at www.tobermore.co.uk.
3. Tobermore recommends that vertical movement joints be spaced at no more than 6m apart. Panels of brickwork where the length:height ratio exceeds 3 are particularly vulnerable to cracking; if they cannot be avoided they should include movement joints at closer centres.
4. Movement joints should be planned prior to any construction so that they can be concealed behind drainpipes etc. Further guidance on moisture movement is available in the 'Guide to the Use of Tobermore Concrete Facing Bricks' and BSI documents BS EN 1996 (Eurocode 6) and PD 6697 (Recommendations for Design).
5. Mortar of strength class M4 will generally be suitable.
6. It is recommended that this guidance is discussed with all persons involved in the design and construction of the building work.

Please note that this letter contains general guidance only, and is neither complete nor definitive. This letter does not vary or supersede our standard terms and conditions of sale (which you can find on www.tobermore.co.uk/terms-conditions/).

Again, we wish you every success with this scheme. Please do not hesitate to contact us with any further queries you might have.

Yours faithfully,
Tobermore Technical Team



Guide to the use of **Tobermore Concrete Bricks**

v2.0



Technical Information

Walling & Masonry

Important Information

Any technical information provided by Tobermore in relation to any product (whether before or after order) is provided by way of GUIDANCE ONLY and, to the fullest extent permitted by law, without liability on the part of Tobermore for any loss or damage suffered as a result of relying upon it.

Such technical information should not be relied upon in substitution for obtaining independent expert advice prior to using any product from both a suitably qualified engineer and building contractor, in particular, as to the suitability of the product for use at the intended site for the intended scheme.

PD 6697:2019

Recommendations for the design of masonry structures to BSEN 1996-1-1 and BSEN 1996-2.

This publication includes the information that was incorporated in BS 5628, which is now withdrawn and which does not contradict that given in EN 1996.

Note

BS guidelines are subject to change and therefore you should refer to www.bsigroup.com for the latest version.

Walling and masonry are well established forms of construction in the UK. The products incorporated are comprehensively covered by British Standards. Guidance is available from BSI to ensure that the products are professionally installed. One issue which is repeatedly raised is the suitability of Tobermore concrete bricks and stone for use below the damp-proof course. Tobermore products have a long history of successful installation below the dpc and provided the guidance for design, installation and maintenance is followed their use in this location is recommended (see Table 1). Refer to the references below for the detail. Tobermore recommend a maximum spacing of 6m for movement joints when used with the correct mortar and design principles in accordance with PD6697.

Vibrant Long Lasting Colours

Tobermore only use high quality Iron Oxide pigments, (which are made to BS EN 12878), to produce our strong, vibrant and deep colours. Our state-of-the-art equipment makes our products extremely dense thus ensuring that our colours remain intact for very long periods. For example, when we examine products which are 10 years old we can see that the colour retention is excellent. Tobermore recommend that to maintain the colour and quality of product a regular maintenance programme is carried out on all projects.



Installation - All products should be installed in accordance with the latest British Standard.

FOR FACING BRICK PRODUCTS (Kingston & Lansdowne)

Installation – Facing Bricks

Concrete bricks have been an established, if small part, of the market for bricks in the UK for well over one hundred years. In 1948, George Bessey of the Building Research Station wrote “The beginnings of the concrete brick industry are vague”. They are related to those for concrete blocks which, although first patented in 1850, did not become properly established until about 1910 and expanded rapidly in the period between the wars. Concrete bricks are made from a mixture of CEM II Cement and aggregate which is tamped or vibrated into molds and subsequently cured at ambient temperature, or in steam, at atmospheric or higher pressures.

British Standard

Concrete bricks are made to comply with BS EN 771-3: 2011+A1: 2015 which is the Specification for Masonry Units Part 3 Aggregate Concrete Masonry Units (Dense and Lightweight Aggregates). The Specification applies to all aggregate concrete masonry units, i.e. bricks and blocks in UK terminology. Tobermore concrete bricks are nominally 215mm long, 100mm wide (thick) and 65mm high, and comply with the traditional UK definition.

Declaration of Performance

Compliance with the Specification BS EN 771-3:2011 + A1: 2015 is demonstrated by Tobermore producing a Declaration of Performance (DoP) for each brick type. This document, which is available on the Tobermore website www.tobermore.co.uk lists the properties of the product as required by the Specification, e.g. compressive strength, dimensions and density are all given by Tobermore in a legal declaration. The CE mark, which gives the same information, accompanies the product and signifies that the declaration has been made and consequently the bricks meet the legal requirements for sale in all of the countries in the European Single Market. Tobermore products bearing the CE mark require no further certification or marking in order to be sold in the UK. Specifically there is no requirement to comply with UKCA marking.

Design Guidance

The way in which the designer uses the declared information and the way the builder constructs the brickwork are covered by guidance in other relevant documents. Key to this is the European Code of Practice, Eurocode 6 - Design of Masonry Structures. This comes in the following parts:

- 1.2 General Rules for Reinforced and Unreinforced Masonry (BS EN 1996-1-1)
- 2.1 General Rules - Structural Fire Design (BS EN 1996-1-2)
- 3.1 Design Considerations, Selection of Materials and Execution of Masonry (BS EN 1996-2)

A further part, Part 3: Simplified Calculation Methods for Unreinforced Masonry Structures exists, but gives very conservative designs and its use is not encouraged in the UK. The Eurocode covers all masonry construction throughout Europe but because of the widely varying traditions, it cannot do that in detail. Consequently, a lot of the detail which is relevant to the UK is given in Published Document; Recommendations for the Design of Masonry Structures to BS EN 1996-1-1 and BS EN 1996-2, PD 6697: 2019.

Whilst there is much that is helpful in the official guidance, manufacturers’ recommendations should be followed in order to achieve successful results.

Tobermore facing bricks are used to provide the appearance of the building, this is generally not the case with concrete blocks and there are important differences between concrete and clay bricks. All masonry units expand or contract to some extent due to temperature and moisture effects. Clay masonry units respond to changes in temperature, they demonstrate a small reversible movement due to wetting and drying but importantly demonstrate a long term irreversible expansion as they adsorb water from the atmosphere. On the other hand, concrete bricks shrink as they dry out. The way to deal with this in concrete brickwork is to subdivide walls into smaller panels by introducing movement joints which should be provided at intervals between 6m and 9m. The length to height ratio of panels should not exceed 3:1. It is also important to not allow concrete bricks to become excessively wet before they are laid, or for new brickwork to do so before it is adequately protected by good architectural details.

There are other differences between concrete and clay units, e.g. Tobermore facing bricks are very consistent in size and hence the brickwork has a regular, precise appearance which, although possible with some clay bricks, is not with others due to natural variability in size due to the making, drying and firing processes. The Tobermore Lansdowne are consistent in size, however they are tumbled which gives softer edges and less precise arises. Concrete bricks have a density towards the top of the range of that for clay bricks and hence weight may be an issue in relation to dead load or for support by scaffolding.

FOR COUNTRY STONE PRODUCTS

Installation - Country Stone

Tobermore’s Country Stone products are designed to re-create traditional stone sizes and to co-ordinate with standard cavity wall construction. When used in housing projects, a clear cavity must be retained.

All work must be protected during construction and must be designed and built in accordance with accepted industry standards and practice. Builders familiar with conventional brickwork will find that similar installation principles apply.

Joints can be finished flush or tooled depending on the overall effect required. Raked joints are not recommended. It is vital that all horizontal and vertical joints between Country Stone blocks must be compacted and free from voids. Shell bedding should not be used.

Design for Movement

The provisions of the Eurocode for masonry are written as a principle followed by a series of application rules to achieve the principle. In the case of movement, the principle is:

“The possibility of masonry movement shall be allowed for in the design such that the performance of the masonry in use is not adversely affected by such movement.”

The way of achieving this situation is by the use of movement joints as described earlier to subdivide large areas of brickwork into smaller panels such that in particular, shrinkage of the brickwork does not allow sufficient tension to build up

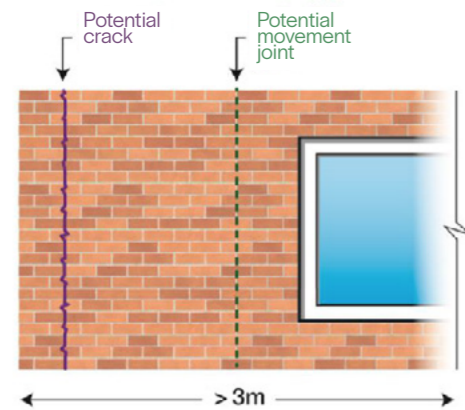


Fig.1: Corners are very stiff joints. A run of brickwork more than half the minimum allowance can lead to cracking near to the corners.

in the wall that it cracks. Consequently, long low panels are to be avoided. The maximum spacing of movement joints is a national matter and the National Annex to BS EN 1996-2 recommends a value of 9m for concrete brickwork with the provision that it may be less if the length: height of the sub-panel created exceeds 3:1. In practice, movement joints are often spaced at 6m - 9m as recommended in PD6697. Tobermore recommend a maximum spacing of 6m.

The following illustrations show some situations where cracking can occur and how it can be alleviated by the introduction of movement joints.

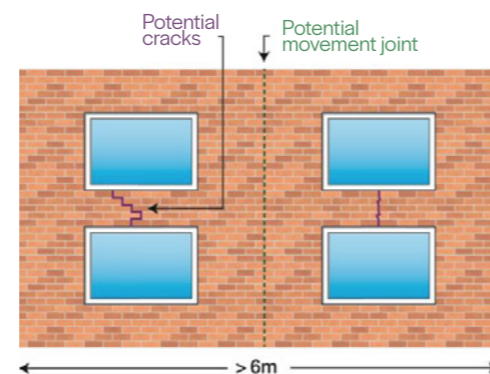


Fig.2: A long uninterrupted run of brickwork between upper and lower windows can lead to cracking at the smallest height, i.e. between the windows either as shown or from the corners of the windows. Cracks may be vertical or stepped – they follow the line of least resistance.

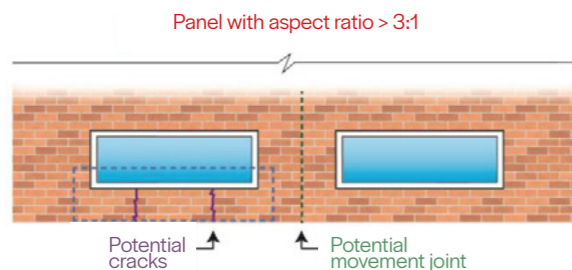


Fig.3: Long, low panels (> 3:1 ratio) should be avoided. These panels shrink between the more heavily loaded brickwork between the windows.

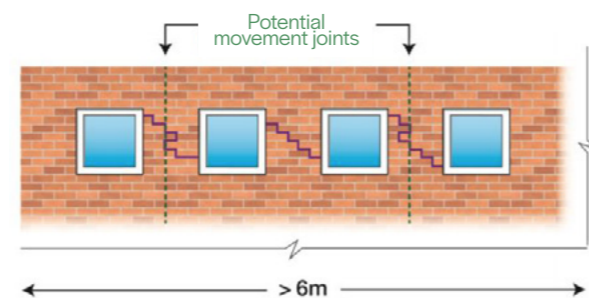


Fig.4: Long runs of uninterrupted brickwork, especially when vertical loading is low, can lead to diagonal cracking of narrow brickwork panels between window openings.

Current guidance focuses on ensuring movement joints are located where they are needed in relation to interaction with other structural elements, restraints, corners, etc. and is based upon experience rather than calculation. Movement joints in concrete brickwork should not be less than 10mm thickness. They must, of course, be free from mortar. Joints in clay masonry are primarily used to control expansion and hence the compressibility of any filler is important.

In concrete masonry the principal effect is shrinkage and relatively incompressible materials such as hemp, fiberboard and cork can still be used. The joints must be sealed with a sealant that will resist rain penetration and a guide to the selection of sealants is given in BS 6213.

Durability

Although durability is covered in the Specification for Concrete Bricks (BS EN 771-3: 2011 + A1: 2015) it is rather unsatisfactory from the user point of view. The manufacturer is required to declare the freeze thaw resistance by reference to the provisions valid in the place of use until an appropriate European Standard is available. There were no requirements in the previous Standard, BS 6073-1: 1981 and durability is dealt with by Code of Practice guidance. At the European level, this is limited. Where masonry is exposed to moisture, wetting, or extreme wetting and freeze thaw cycling, but excluding exposure to external sources of significant levels of sulfates or aggressive chemicals, the bricks are required to be freeze thaw resistant. In more aggressive situations, the guidance is to consult the manufacturer. PD 6697 is more helpful and contains a table describing the various locations in buildings. For each location, the minimum compressive strength of a concrete brick that is suitable for that location, together with a minimum mortar classification is required. The only exception to this is that concrete bricks are not considered to be suitable to act as masonry DPC's.

Table 15 in PD 6697 is useful; however there are seven different minimum brick compressive strengths for the various locations. Tobermore facing bricks are declared as frost resistant. In this context, this means that Tobermore facing bricks are suitable for all locations except cappings, copings, sills, earth retaining walls without waterproofing on the retaining face, or in foul drainage. Although not covered in BS EN 771-3, concrete bricks do not contain soluble sulfates and hence the reference in the Eurocode is to sulfates from external sources. In these circumstances, the manufacturer's advice should be sought.

Resistance to Rain Penetration

The principal guidance on the design and detailing of walls is given in PD 6697. This covers the thickness of single leaf walls and cavity walling, including reference to a minimum air space and the introduction of cavity insulation.

The guidance is comprehensive and authoritative. There are no specific provisions that one would make for concrete brickwork. Concrete and clay brickwork are dealt with in the same way.

Selection of Mortars

In general, the common guidance for the selection of mortars in most situations is to use a mortar that is no stronger than is required for structural or durability reasons. This is relevant to concrete brickwork as these are susceptible to drying shrinkage and if this were to cause cracking, it is far preferable that it is contained within the joints. It may then be viewed as negligible or relatively easy to repair by raking out and repointing.

The selection of mortars for durability is covered in table 15 of PD 6697 and for most situations in facing masonry a mortar with compressive strength class M4 is suitable. This is a mortar which would be expected to achieve a compressive strength of 4N/mm² after 28 days. A mortar prescribed by its mix of constituents by volume traditionally considered to be equivalent to an M4 mortar would be a 1:1:5-6, Ordinary Portland Cement:lime:sand mortar, the range of proportions of the sand content reflecting its grading. The designer should be aware that if the cement used is a CEM II the OPC content may be 65% only and the volume proportions may need to be reconsidered. Exceptions to the use of strength class M4 are work near to ground level or in earth retaining structures. Where concrete brickwork is being used in structural situations, the engineer will select a mortar such that the strength when used with the facing will achieve the compressive, flexural and shear strength in the brickwork that is required according to the provisions of Eurocode 6, BS EN 1996 1-1.

Tobermore concrete facing bricks meet the minimum strength requirements for all dwellings constructed using Approved Document A of the Building Regulations and BS 8103-2: 2013 Structural Design of Low Rise Buildings, Part 2: Code of Practice for Masonry Walls for Housing. The mortars should be selected using table 15 of PD 6697 but will generally be an M4 strength class (lower classes are not permitted).

Good Practice on site

Workmanship

Good site practice for the use of Tobermore concrete bricks is no different to that for clay bricks. The only issue worthy of comment is that of adjusting the suction of concrete bricks which is better solved by using a water retentive additive in the mortar. However, the suction of Tobermore concrete bricks is low and this is unlikely to be an issue. The appearance of facing brickwork can be ruined by lack of care on site. In particular care is needed to avoid mortar adhering to the brick face and guidance on good practice is given in 'Good Practice Guide - Facing Bricks' which is available from Tobermore. Normal considerations of good practice include:

Prior to commencement of work (Construction Drawings and Movement Control)

When movement control measures have not been included in the design drawings, or when design drawings have been produced based on the use of clay facing bricks, we strongly recommend that the designers are made aware of the change to masonry units and drawings are updated to reflect this change in materials prior to any work commencing.

Storage and Handling on site

Masonry units should be stored in dry conditions. Tobermore products are supplied in shrink wrapped packs which should remain sealed until they are required. The shrink wrapping provides protection from the weather. If this is removed, it should be replaced, or alternative protection provided. Bricks should be stored on sound, level ground and raised so that they are clear of any wet / muddy areas. This prevents the possibility of contamination and staining. Masonry units should be kept in storage areas which are close to where they will be required. This helps to reduce unnecessary handling which will minimise any damage or waste. Best practice is to ensure units are protected from the weather during storage on site and during construction.

Protection During Construction

Newly constructed work should be protected from rain, snow, frost and excessive drying out using waterproof coverings which allow air to circulate. Best practice precautions will help to reduce the likelihood of subsequent efflorescence, shrinkage, patchy mortar colour, staining, and movement. Any materials which are used in conjunction with masonry units should also be stored under protection.

Material stacked out on scaffolding should also be fully protected whenever rain causes an interruption to work and overnight.

Distribution of Units on Site

Distributing the units to the area of work is best carried out using mechanical methods to reduce the possibility of damage and wastage. Best practice is to lift and place the units. They should always be kept as dry as possible. Opened packs and units that have been stacked out ready for use should be protected from the weather.

Other Important Practices

- Tobermore concrete bricks should be laid on a full bed of mortar with all cross joints filled and vertically aligned.

- No lift should exceed 1.5m in height in a single day. The joint profile should be finished to the specified profile. The specified joint profile should be formed after leaving the mortar to harden slightly. Tooling is recommended to compact the joints, improve weather resistance and to reduce shrinkage in the mortar. Recessed or flush pointing is not recommended in high exposure areas.
- Tobermore concrete brickwork should not be built in temperatures below 3°C and frozen materials should not be used. Masonry units should be constructed in areas that are greater than 10m away from de-icing salts.

Selecting Bricks on Site for Use

To achieve the best possible finish, we recommend the following advice is followed to evenly distribute any slight variations in shade, colour and texture over a large area. When the circumstances allow complete one house / building by using masonry units taken from the same batch. This is achieved by checking the batch code label displayed on the packs. Always, thoroughly mix products from a minimum of three packs. Where products are supplied in packs with vertical slices always take them "vertically slice by slice" this ensures that colours are distributed evenly. When the circumstances do not allow the use of products from the same batch then it is extremely important to minimise possible colour banding / shading by always, thoroughly mixing products from a minimum of three packs concurrently with some overlap between deliveries / batches. If a noticeable variance in colour / shade or texture is visible, do not proceed with the installation and contact your supplier for further guidance. Best practice is to make regular visual checks to ensure the blending of colours is consistent.

Bed Joint Reinforcement

To control stresses within the brickwork Bed joint reinforcement (BJR) may be used in certain instances. We would recommend taking project specific advice from a qualified engineer.

Wall Ties

Wall ties in accordance with PD 6697: 2019 should be used. Please refer to the tables regarding exposure zone, cavity width and type of structure. As work progresses wall ties should be built into both leaves simultaneously. They should be placed so that they fall towards the outer leaf and the drip is central, facing downwards. The number of wall ties per m² should be in accordance with BS EN 1996-1-1:2012 +A1 2005.

Completed Work

The finished appearance should be agreed between all relevant parties which may include the specifier, client, house builder or end user. Best practice is to construct sample panels between 1 to 1.5 square metres in size. These panels should be viewed from a distance of at least 3 metres. The brickwork should be viewed as a whole rather than viewing individual bricks. Inevitably some individual units may have small chips caused by transporting to site or movement and handling on site. However, the generally accepted industry standard is that no individual chip should be greater than 15mm. Tobermore masonry units are coloured all the way through which provides an added benefit meaning any small chips are less visible.

Technical Information

References

1. British Standards Institution
 - a. BS EN 771-3: 2011 + A1: 2015
 - b. Specification for Masonry Units Part 3: Aggregate Concrete Masonry Units (Dense and Lightweight Aggregates)
2. BS EN 1996: Eurocode 6: Design of Masonry Structures
 - a. BS EN 1996-1-1: 2005 + A1 2012
 - b. Part 1.2: General Rules for Reinforced and Unreinforced Masonry Structures
 - c. BS EN 1996-1.2: 2005
 - d. Part 1.2: General Rules - Structural Fine Design
 - e. BS EN 1996-2: 2006
 - f. Part 2: Design Considerations, Selection of Materials and Execution of Masonry
 - g. BS EN 1996-3: 2006
 - h. Part 3: Simplified Calculation Methods for Unreinforced Masonry Structure
3. PD 6697: 2019 Published Document Recommendations for the Design of Masonry Structures to BS EN 1996-1-1 and BS EN 1996-2
4. BS EN 845-3: 2013 + A1: 2016 Specification for Ancillary Components - Part 3: Bed Joint Reinforcement of Steel Meshwork
5. BS 6213: 2000 + A1: 2010 Selection of Constitution Sealants - Guide
6. BS 8103-2: 2013 Structural Design of Low Rise Buildings - Part 2: Code of Practice for Masonry Walls for Housing
7. BS EN 772-14: 2002 Methods of Test for Masonry Units
 - a. Part 14: Determination of Moisture Movement of Aggregate Concrete and Manufactured Stone Masonry Units
8. HM Government The Building Regulations 2010 Approved Document A Structure
9. HMSO National Building Studies: Bulletin No 4 1948 Sand Lime and Concrete Bricks
10. Building Research Station Digest No 6 1957 The Avoidance of Cracking in Masonry Construction of Concrete or Sand-Lime Bricks
11. Roberts, J.J, Tovey; A.K, Cranston; W.B and Beeby, A.W

Table 1

Specification for Concrete Bricks for Durability

Masonry Condition or Situation	Tobermore Masonry	Mortar Type
(A) Work below or near external ground level		
A1 Low Risk of Saturation with or without Freezing	Kingston, Lansdowne, Country Stone	Mortar M4
A2 High Risk of Saturation with or without Freezing		
(B) Masonry DPC's		
B1 In Buildings	Not Suitable	N/A
B2 In External Works		
(C) Unrendered External Walls (other than chimneys, cappings, copings, parapets and sills)		
C1 Low Risk of Saturation	Kingston, Lansdowne, Country Stone	Mortar M4
C2 High Risk of Saturation		
(D) Rendered External Walls (other than chimneys, cappings, copings, parapets and sills)		
Rendered External Walls	Kingston, Lansdowne, Country Stone	Mortar M4
(E) Internal Walls and the Inner Leaves of Cavity Walls		
Internal Walls and Inner Leaves of Cavity Walls	Kingston, Lansdowne, Country Stone	Mortar M4
(F) Unrendered Parapets (other than cappings or copings)		
F1 Low Risk of Saturation e.g. low parapets in some single story buildings	Kingston, Lansdowne, Country Stone	Mortar M4
F2 High Risk of Saturation e.g. where a capping only is provided		Mortar M6 for Country Stone in F2
(G) Rendered Parapets (other than cappings or copings)		
Rendered Parapets	Kingston, Lansdowne, Country Stone	Mortar M4
(H) Chimneys		
H1 Unrendered with Low Risk of Saturation	Kingston, Lansdowne, Country Stone	Mortar M4
H2 Unrendered with High Risk of Saturation		Mortar M6 for Country Stone in H2
H3 Rendered		
(I) Cappings, Copings and Sills		
VCappings, copings and sills	Country Stone	Mortar M6
(J) Freestanding Boundary Walls and Screen Walls (other than cappings and copings)		
J1 With Coping	Kingston, Lansdowne, Country Stone	Mortar M4
J2 With Capping		Mortar M6 for Country Stone in J2
(K) Earth Retaining Walls and Screen Walls (other than cappings and coping)		
K1 With Waterproofing on Retaining Face and Coping	Kingston, Lansdowne, Country Stone	Mortar M6
(L) Drainage and Sewerage e.g. Inspection Chambers and Manholes		
L1 Surface Water	Kingston, Lansdowne, Country Stone	Mortar M4

Table 1 indicates the conditions of exposure for which Tobermore Concrete Bricks and Country Stone are suitable for use, together with the minimum Mortar Classification. This guidance is consistent with that given in PD 6697:2019, Table 15.





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Paving



Walling & Retaining Walls



Facing Brick

