Mortar - An Introduction

The selection of mortar for an application is very important and should take into consideration structural requirements, the type of construction, position in the building and degree of exposure. In addition, when specifying Lignacite Facing Masonry, the designer will need to select the appropriate colour of mortar in relation to the colour and texture of the facing units.

Guidance for the specification of mortar for durability can be assessed in accordance with Published Document PD 6697. This provides recommendations for the quality of masonry units and mortar designations for various conditions of use, such as work below or above the external ground level.

Mortars can be specified as design mixes (Strength Performance) or prescribed mixes (Recipe). Mortars can be either factory made or mixed on site. Traditionally, prescribed mixes have been used in the UK and have a proven durability. Design mixes are likely to be increasingly used as a result of designing masonry to the Eurocode.

Where coloured mortars are specified, to avoid inconsistencies, it is advisable to use dry silo mortar or alternatively, retarded ready-to-use mortars.

Eurocode 6 categorises the exposure class by the use of MX numbers. In most cases in the UK the most severe exposure "S" relates to class MX 3.2 - exposure to severe wetting and freeze thaw cycles, but not exposed to external sources or significant levels of sulphates or aggressive chemicals.

Generally the stronger the mortar, the more durable it is. Conversely the weaker the mortar, the greater is its ability to accommodate movement. Where a high strength mortar is required for structural reasons, special consideration should be given to the accommodation of movement. In general terms, for work above DPC, excluding parapet walls, a designation (iii) mortar is suitable for most masonry unit types. However, a degree of caution should be exercised when specifying a designed mortar, as a M4 mortar may well have strength well in excess of 4.0N/mm^2 and as such, is not suitable for masonry units of 3.6N/mm^2 strength. For work below DPC level, mortars of designation (ii) (1:½:4 cement:lime:sand) particularly where there is a risk of freeze/thaw, or (iii) may be used, according to soil conditions.

In the selection of mortars, as a general guide, cement:lime:sand mortars give a stronger bond than plasticised mortars of a similar compressive strength. Incorporating lime into the mix is also beneficial in terms of the mortar's ability to accommodate movement.

Details of the relevant mortar designations are provided in the table below:

Table 7.1 - Masonry mortars

	Mortar designation	Compressive strength class	Prescribed mortars (proportion or materials by volume) (see notes a and b)				Compressive strength at 28 days (N/mm^2)
			Cement[c] lime: sand with or without air entrainment	Cement[c] sand with or without air entrainment	Masonry cement[d] sand	Masonry cement[e] sand	
Increasing ability to accommodate movement, e.g. due to settlement, temperature and moisture changes ↓	(i)	M12	1:0 to ¼:3	1:3	Not suitable	Not suitable	12
	(ii)	M6	1:½:4 to 4½	1:3 to 4	1:2½ to 3½	1:3	6
	(iii)	M4	1:1:5 to 6	1:5 to 6	1:4 to 5	1:3½ to 4	4
	(iv)	M2	1:2:8 to 9	1:7 to 8	1:5½ to 6½	1:4½	2

Notes

a) *Proportioning by mass will give more accurate batching than proportioning by volume, provided that the bulk densities of the materials are checked on site.*

b) *When the sand portion is given as, for example, 5 to 6, the lower figure should be used with sands containing a higher portion of fines whilst the higher figure should be used with sands containing a lower proportion of fines.*

c) *Cement conforming to BS EN 197-1 Notation CEM 1(Portland cement). Cement conforming to BS EN 197-1. Notation CEM II/A-S or CEM II B-S (Portland slag cement); or CEM II/A-L or CEM II/A-LL (Portland Limestone cement); or CEM II/B-V (Portland fly ash cement); or a combination, with equivalent proportions and properties to one of these cements:*

- *Combinations prodcued in the mortar mixer from Portland cement CEM 1 conforming to BS EN 197-1 and ground granulated blast furnace slag conforming to BS 6699 where the proportions and properties confirm to CEM II/A-S or CEM II B-S of BS EN 197-1:2000, except Clause 9 of that standard.*
- *Combinations produced in the mortar mixer from Portland cement CEM 1 conforming to BS EN 197-1 and limestone fines conforming to BS 7979 where the proportions and properties conform to CEM II/A-L or CEM II/A-LL of BS EN 197-1:2000, except Clause 9 of that standard.*
- *Combinations produce in the mortar mixer from Portland cement CEM 1 confirming to BS EN 197-1 and pulverized fuel ash conforming to BS 3892-1, or to BS EN 450-1, where the proportions and properties conform to CEM IIA-V or CEM II/B-V or BS EN 197-1:20000 except Clause 9 of that standard.*

d) *Masonry cement conforming to BS EN 413-1, Class MC 12.5 (inorganic filler other than lime), not less than 65% by mass of Portland Cement clinker as defined in BS EN 197-1.*

e) *Masonry cement confirming to BS EN 413-1, Class MC 12.5 (lime), not less than 65% by mass of Portland cement clinker as defined in BS EN 197-1.*

f) *Table 7.1 is based on data from EC6 and the National Annex.*

Bedding and jointing

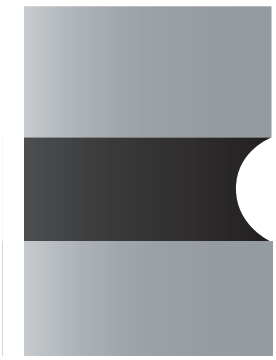
Solid, cellular or hollow units should be laid on a full bed of mortar. Cellular units should be laid with the closed end uppermost to allow for a full bed of mortar to be applied. All perpend joints should be solidly filled with mortar to maintain the built strength, weather resistance and airtightness of the structure.

The joint profile should be specified, taking into account the appearance required and the degree of exposure. Tooled and non-recessed joints provide the greatest resistance to rain penetration. Recessed joints should not generally be specified to exposed walls.

Flush jointing is not normally recommended for fair face blockwork, as a quality finish is difficult to achieve, especially with textured blocks and can result in mortar smears to the block face.

Concave (bucket handle)

This joint usually provides an improved appearance over a flush joint. It is comparatively easy to achieve and is recommended for both internal and external fair face blockwork. Owing to the compressing of the joint and the improved bond, it has good weather resistance and is suitable for all grades of exposure.



Struck or weathered

Weathered bed joints produce an interplay of light and shadow on the blockwork. Such joints when correctly made have excellent strength and weather resistance.

Square recessed

This joint when used with durable masonry units, can produce a very pleasing effect, but its weather resistance and strength will be considerably less than struck, flush or curved recess joints. Recommended in sheltered exposure conditions. The recess should not exceed 3-4mm and is not recommend-ed with full fill cavity insulation.

Flush or bagged joint

This finish can provide the greatest loadbearing area. However flush jointing is not normally recommended for fair face work as a good quality finish is difficult to achieve and can often result in mortar smears to the block face.