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Factory produced mortar for use at low and high temperatures

General Information

If the temperature of recently laid mortar falls below 0ºC there is a probability of some degree of frost attack. The water may freeze and expand thus disrupting the mortar by forcing the material apart and breaking the bond.

It used to be thought that this process was completely irreversible. However, the presence of free lime in the mix imparts to some degree the property of self-healing and any hairline cracks formed will tend to seal, over a short period of time.

It is obviously desirable to take precautions to minimise frost attack. Special precautions should therefore be taken when using mortar in winter conditions.

The inclusion of carefully controlled air entrainment under factory conditions in mortar increases the frost resistance in its hardened state and it is for this reason that MPA Mortar members supply specially modified factory produced mortars for winter usage.

Precautions

The ability to continue masonry construction in both hot and cold weather conditions requires consideration as to how these conditions may affect the quality of the finished masonry. In some cases, extreme weather conditions may warrant the use of special construction techniques or protective measures to ensure that the masonry work is not adversely affected.

Summer working

Laying masonry units

The masonry contractor's primary concern during hot weather is evaporation of water from the mortar. If sufficient water is not present, the bond between the mortar and masonry unit may be reduced. However, the effects of high temperatures are not as damaging as those of low to the performance of masonry. The increased rate of hydration of the cement and favourable curing conditions in warm, humid weather will help develop masonry strength if sufficient water is present at the time of construction.

Masonry units - good practice

Bricks and blocks that are used in masonry construction are generally little affected by hot weather. However, the interaction between these materials and the mortar is critical, as warmer bricks and blocks will generally absorb more water from the mortar. During periods of hot weather, the temperature of the materials should be controlled for best results. Storing bricks and blocks in the shade or under cover will help control heat gain. Reducing the suction rate of bricks and blocks by spraying or docking with potable water may be necessary in extremely hot and drying conditions, but care should be taken to avoid excessive wetting and the manufacturer's advice should first be sought. The effect of windy, drying conditions may also have to be considered.

Lower bond strength may potentially result if there is an incorrect amount of water present in the mortar when the units are laid. Excessively wet or excessively dry extremes are undesirable. Furthermore excessive water loss shortly after laying should be avoided. This may potentially occur when there are hot, drying weather conditions or when the units being laid have a high suction rate.

Mortar - good practice

In hot weather, mortar will tend to lose its plasticity more rapidly due to evaporation of water from the mix and the increased rate of hydration of the cement. Mortar mixed at high temperatures may have a higher water content, a lower air content, and a shorter board life than those mixed at normal temperatures, unless compensatory measures are taken. Mortar with a high lime content and high water retention characteristics is sometimes considered for use in these conditions.

In hot summer conditions, materials and mixing equipment should be shaded from direct sunlight prior to use. Mortar tubs and mortar boards should be rinsed with cool water before they come into contact with mortar.

Masonry protection

Under hot, dry and windy conditions, bricks and blocks should be laid more rapidly after placing the mortar. Following final tooling it may be necessary to protect newly erected masonry against excessively rapid drying by sheeting, shading or similar.

Winter working

Laying masonry units

Hydration and strength development in mortar generally occurs at temperatures greater than 4°C. This means that when the temperature at the time of laying is less than 4°C, the characteristics of the mortar may be affected. Consequently, masonry construction should stop when the air temperature falls below 3°C, unless the mortar temperature can be maintained at a minimum of 4°C until it has hardened. This may mean working in heated enclosures. If work is suspended laying may be resumed when the air temperature rises to 1°C and is expected to continue rising to above 3°C over the bricklaying period.

Masonry units - good practice

All stocks of bricks and blocks should be adequately covered to provide protection against rain, frost and snow. Bricks or blocks that are saturated should not be laid, nor should they when there is a danger of freezing.

Mortar - good practice

Mortar stored in containers should be adequately covered to provide protection against rain, frost and snow. During prolonged periods of very cold weather, it is best practice to protect containers storing mortar.

If mortar freezes during storage, remove and discard any frozen material prior to use of the remainder. Do not use mortar that contains ice particles or lay mortar on frozen surfaces. The inclusion of anti-freeze agents for masonry mortars is not generally recommended, as these admixtures are not recognised in any British or European Standard.

Masonry - good practice

Mortar hardens and develops strength more slowly in cold weather, so all newly erected masonry, and masonry under construction, should be covered to provide protection against rain, frost and snow. Unless this is done, there is always the risk that the water in the mortar and masonry units will freeze with the consequent possibility of damage to the masonry such as loss of bond or joint spalling and disintegration.

Newly erected brick and block masonry should be covered to protect it from extremes of weather and at all times when work is not proceeding. If there is any danger of the work being frozen, insulating covers should be used. Ensure any insulating layer, e.g., hessian or quilting, is kept dry by covering with plastic sheeting or other waterproof material. Position protective covers away from masonry facework to avoid sweating and consequent staining. Secure the covers to prevent them from being dislodged by wind on exposed sites and allow the masonry to dry out before removing them.

References	
BS EN 197-1	Cement composition, specification and conformity criteria for common cements
BS EN 459-1	Building lime. Definitions, specifications and conformity criteria
BS EN 934-2	Concrete admixtures - Definitions, requirements, conformity, marking and labelling
BS EN 934-3	Admixtures for masonry mortar - Definitions, requirements, conformity, marking and labelling
BS EN 998-1	Specification for mortar for masonry - Part 1: Rendering and plastering mortar
BS EN 998-2	Specification for mortar for masonry - Part 2: Masonry mortar
BS EN 13139	Aggregates for mortar
GBG 34	Building in winter - BRE publication
PD 6678	Guide to the selection and specification of masonry mortar
PD 6682-3	Aggregates for mortar - Guidance on the use of BS EN 13139

For a full list of British and European Standards see the MPA Mortar data sheet of technical references.

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MPA Mortar is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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Factory produced mortar products will contain either cement or lime, both of which have properties which are hazardous to health. Please refer to the manufacturers or suppliers Material Safety Data Sheet for the specific product/grade to find more information on the nature of the hazardous properties, the risks and health effects of exposure and the recommended safe use and handling procedures.