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Building Note 3.

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BRICK

LAYING

IN

WINTER

CONDITIONS



THE BRICK DEVELOPMENT ASSOCIATION

NOTES ON BRICKLAYING IN WINTER CONDITIONS

This note is primarily concerned with measures to protect newly erected brickwork from frost attack during the period immediately after it is laid. It deals with the precautions necessary with bricks and mortar before laying but does not include laying bricks when the temperature of brickwork is near or below freezing point. Under the latter conditions, although it is sometimes said that bricklaying can continue for short

periods when using such measures as heating the bricks, aggregates and water for mortar etc., the only satisfactory method is to carry out the operation with the work and all materials in a permanently heated enclosure. **In the absence of such conditions it is recommended that bricklaying be discontinued when the brickwork temperature falls below 3°C and when frost is imminent.**

MORTARS

Although the stronger, more dense mortars (designations (i) and (ii)) are more resistant to freezing and are normally used in the more exposed situations of buildings, less strong mortars (designation (iii)) are frequently used for the external walls of buildings in more sheltered situations. A 1:1:5-6 cement:lime:sand mortar will normally have reasonable long-term durability as long as it is correctly gauged, but some additional protection may be needed if it is to resist freezing at early age when it is still "green" and before adequate strength has developed. The development of strength takes place more slowly at low temperatures.

The use of accelerators as "anti-freeze" agents is not recommended. In contrast to their use in concrete, it is believed that they will generally prove to be ineffective, as the amount of cement in a given volume of brickwork is relatively small and the additional heat liberated from the accelerated hydration of the cement will be negligible in relation to the thermal capacity of the masonry. In addition, the use of accelerators based on calcium chloride may lead to subsequent dampness or corrosion of embedded metals such as wall ties.

Equally the use of admixtures intended to reduce the freezing point of the mixing water cannot be recommended, since some substances which may be contemplated for this purpose (e.g. ethylene glycol) are known to affect cement hydration adversely.

A better way of obtaining early life frost resistance is to provide air spaces within the mortar into which the ice can expand when

freezing occurs. This may be done by the use of an air-entraining agent in the mortar. However, the use of such an agent will reduce the strength of the mortar and may also affect bond as both depend on the amount of air actually entrained. The amount of air entrained depends on the type and quantity of agent used and on the length of time the mortar is mixed.

IT IS THEREFORE IMPORTANT THAT THE MANUFACTURERS' RECOMMENDATIONS ARE STRICTLY FOLLOWED.

In general, when air-entrained mortars are being mixed it is unwise to discharge part of the mix, then top up the mixer with further materials (even though these are correctly gauged) and continue mixing. This procedure can produce over-entrainment of air.

As a general guide, to give reasonable frost protection the air content needs to be about 12-15%. However, depending on the mortar composition, bond strength is likely to be adversely affected at air contents above 18%.

NOTE: BS5628: Part 1: 1978 and some specifications for structural brickwork state that Plasticizers should comply with the requirements of BS4887 and should be used only with the written permission of the designer.

When ready-mixed lime:sand mixes are used, the manufacturer may add the optimum quantity of air-entraining agent during manufacture. Even so, it is wise to check the mixing time recommended by the manufacturer. When such ready-mixed materials are supplied,

extra unauthorised additions of the admixture should not be made on site.

When ready-to-use *retarded* mortars are used, the specifier should make reference to the manufacturer as regards the air content of such mixes and the manufacturers' recommendations as to their use on site should be strictly adhered to.

In its simplest terms, bond relies on the binder paste in the mortar flowing into the pore structure of the brick. The mortar must, however,

retain sufficient water for its hydraulic properties to develop and hence for setting to occur. In winter, because the brickwork dries more slowly and because the suction rate of the brick is likely to be lower, rather less water will be required in the mortar. The mortar should, therefore, be as stiff as possible compatible with allowing the brick to be correctly positioned without breaking the bond. Laid bricks should not be "trued-up" once initial stiffening has taken place.

PRECAUTIONS WITH MATERIALS

EXCESS OF WATER IS THE GREATEST ENEMY

Stocks of all materials - particularly bricks - should be adequately protected on top from rain, snow and frost, from the ground to avoid contamination and wetting and from splashing by passing vehicles. Bricks left uncovered on scaffolds are particularly prone to saturation by rain and snow.

Bricks will generally be resistant to frost attack whatever their category of frost resistance as long as they are not allowed to become virtually saturated. In winter, it is not likely to be necessary to wet the bricks to reduce suction because the rate of evaporation from brickwork is low in cold weather.

Stock piles of ready-mixed lime: sand for

mortar, besides being placed on clean banker boards, should be carefully protected from the weather. Failure to do so will result in changes to its bulk density (weight to volume relationship) and this in turn will lead to variation in cement gauging on site. Protection will also reduce the amount of material which has to be discarded due to drying out and to carbonation.

Ready-to-use retarded mortar is normally delivered to site in containers and it is important that these are covered to protect the contents against the weather.

Variation in the moisture content of mortars will frequently lead to colour changes and this is most marked in the case of coloured mortars particularly where joints have been tooled.

PROTECTION

All newly erected brickwork and brickwork under construction, must be protected from rain and snow and from frost. In most cases this is achieved by covering the wall head but problems can arise in some situations as for example in brickwork facing to concrete construction where rain may frequently run off the concrete in quantity and penetrate behind the facing brickwork.

Hessian is frequently used as an insulating layer but is useless if it becomes wet. Apart from the loss of its value as insulation, Hessian which is soaking wet will frequently cause serious staining and efflorescence of the brickwork and it must, therefore, be covered with plastic or other waterproof material.

However, every opportunity must be taken to allow the brickwork to dry out when conditions

permit. To encourage drying out, the cover should be supported clear of the face(s) of the wall either by laying it over a wooden framework or over projecting bricks, so that ventilation of air can take place beneath the cover. Unless this is done, condensation may occur on the underside of the cover resulting in mortar staining of the brickwork. Mortar splashing and staining of brickwork will also occur in wet weather unless the inner scaffold board is turned up when work is left.

Covers must be secured to prevent them being dislodged by wind.

On exposed sites driving rain can be a serious hazard and it may become necessary to provide side screens to protect the work. It may be possible to attach these to battens secured to the scaffold.

BRICKLAYING

Although some guidance can be obtained from air temperature, it is the temperature of the brickwork that is important. When bricklaying is discontinued overnight or during a weekend or longer holiday period, the temperature both of brick stocks and of partly completed brickwork may fall below freezing point even though protected. Under these conditions, when bricklaying recommences, the mortar bed may immediately freeze and no bond will form.

On some sites a "Spear" thermometer may be available and this may be used to check the temperature of the mortar bed after laying a trial

course of bricks. If, when the immersed thermometer gives a constant temperature, the mortar joint is above freezing point, work may continue other factors being favourable. If it is not, work must cease and the course laid must be taken down.

In the absence of a suitable thermometer some indication of whether or not brickwork is below freezing point may be obtained merely by applying a small quantity of water (e.g. by paintbrush or similar). If the film of water freezes, then clearly bricklaying may not recommence.

CHECK LIST

DO

In Great Britain freezing conditions during winter are to be expected and provision should be made in readiness.

DO Make provision to protect stocks of all materials from saturation by rain and snow, from contamination by the ground or any other source, and from splashing by passing vehicles.

DO Carry out the recommendations of the manufacturer of ready-mixed building mortar as regards protection and site handling.

DO Pay attention to weather forecasts particularly as regards risk of freezing and

ensure that protective materials are available to hand.

DO Make provision to cover up new and unfinished work during the winter period, and if there is a frost risk cover with hessian or other material that will serve as insulation beneath the waterproof covering.

DO Prop the protective covers away from the face of facing brickwork to avoid "sweating" and consequent mortar smearing.

DO Take every opportunity of allowing the brickwork to dry out by removing covers whenever it is safe to do so.

DO NOT

DO NOT Lay bricks under freezing conditions. The mortar will almost certainly become damaged by frost and the work may have to be taken down.

DO NOT Recommence bricklaying after an overnight or longer break period without first checking that the temperature of the concrete or brickwork on which the new work is to be placed is above freezing point.

DO NOT Use "anti-freeze" agents in mortar even

though they are known to be satisfactory in concrete.

DO NOT Use air-entraining admixtures without the approval of the specifier. Where their use is agreed, make certain the manufacturer's recommendations regarding dosage and mixing are closely adhered to.

DO NOT Assume that when air-entrained mortar mixes are used there is no need to provide protection from saturation and freezing.

Further references obtainable from BDA Publications:

Building Note 1. - "Bricks and Brickwork on Site", Building Note 2. - "Cleaning Brickwork", Design Note 7. - "Durability of Brickwork".

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