Hygroscopic Salts and Rising Dampness

The Salt Problem

When dampness has been rising in a wall for some time, the soluble salts contained in the ground become concentrated where the water evaporates, i.e. within the plaster and within the wall itself near the apex of rise. These deposits of salts can absorb water directly from the air to such an extent that the wall can become visibly wet. This dampness effect is entirely separate from that caused by capillary rise of water and is usually referred to as "hygroscopic" dampness. An example of the pattern (or distribution) of salt accumulation is shown in Figure (1).

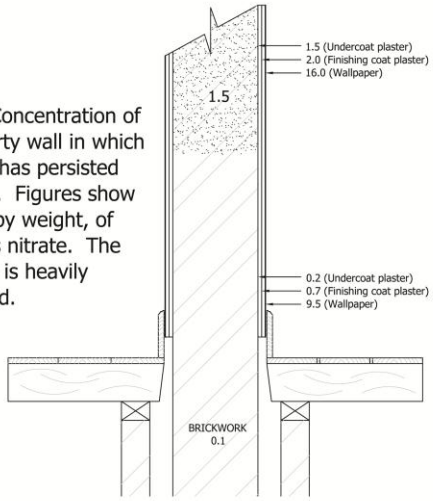

Figure (1): Concentration of salts in a party wall in which rising damp has persisted for 80 years. Figures show percentage by weight, of chloride plus nitrate. The shaded area is heavily contaminated.

Chloride and Nitrate Salts

The salts which cause the dampness problem are chloride and nitrate salts of sodium and sometimes, calcium. The salts are hygroscopic (or in some cases, deliquescent) and because of this they are seldom visible. The dampness, due to their presence, becomes apparent when the humidity in the building is high. Sometimes the dampness will appear when the room is humid and disappear when the air is dry. Salts which are visible as efflorescence are seldom hygroscopic and are usually sulphates.

In uncontaminated building materials the amount of chloride or nitrate salt is usually less than 0.01% by weight. If the wall has been affected by rising dampness for some time, the concentration may increase to as much as between 1 and 2%. The highest concentrations are found at the position when water evaporates, i.e. all the wall Surface (e.g. in wallpaper or skim plaster) and within the masonry near the apex of rise.

The Degree of Hygroscopicity

The amount of water absorbed by salt contaminated masonry, mortar or plaster will vary with the humidity of the air and the amount and character of the salt. A typical distribution of dampness in a wall affected by rising dampness is shown in Figure (2). The diagram shows in graph form, the moisture content of a wall affected by rising dampness:

A shows the total moisture content.

B shows the hygroscopic moisture content measured at 75% relative humidity. This represents the amount of water absorbed by the masonry from air at 75% relative humidity.

C shows the difference A-B and represents water in the wall due to capillary flow.

Others Sources of Salt Contamination

Other sources of salt contamination of masonry and plaster are:-

(i) Combustion gases in chimney flues contain traces of acids which form chlorides, nitrates and sulphates in the masonry. This is a common source of contamination at the surface of chimney breasts and reveals at all levels (upper floors as well as ground floor level).

(ii) Prolonged leakage of tap water or central heating water.

(iii) Sea spray (or flood).

(iv) De-icing salt, de-ionising salt.

(v) Leakage of soil water or contamination with urine.

(vi) Direct rain penetration

through walls can results in an accumulation of sulphate on the internal face of walls.

Replastering

The salt contamination problem is dealt with by removing the salt contaminated plaster and replastering with a salt resisting plaster mix. It should be noted that removal of plaster does not remove the salt accumulated within the wall itself near the apex of rise. There is no economic method of removing this salt and this is the reason why special plastering is used for walls affected by rising dampness (refer PCA DP2).

Apparent Failure of Replastering

If the replastering is not carried out with salt resistant plaster or render, both residual water remaining in the wall after treatment and hygroscopic salt will migrate to the new decorative surface. Frequently damage occurs at the higher level, e.g. the upper half of the original extent of rising dampness, and appears as a dampness pattern reflecting the bricks or mortar joints.

Where failure of new plastering is suspected, it may be confirmed by analysis of the skim plaster or wallpaper for chloride and nitrate salts. If these salts are present above the normal levels (about 0.01% it is most probable that the salts have passed from the wall to the skim plaster indicating that the replastering has failed to perform its intended function. Further confirmation of failure can be obtained by the analysis of the plastering base coat for compliance with the specification.

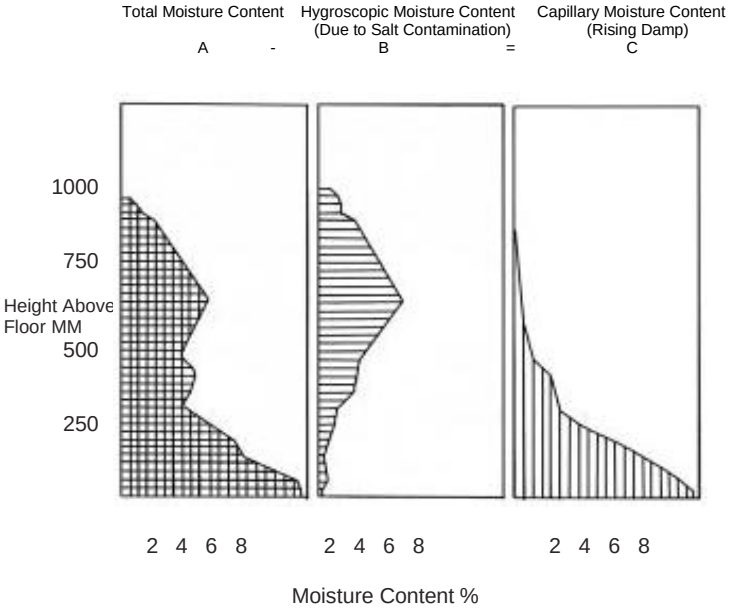

Figure (2): Graph (b) shows that the amount of water absorbed by the masonry from air is about 5% at 600mm above floor level. The hygroscopicity of uncontaminated masonry is 0.1-0.2%. The additional water absorption is due to salt contamination.

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