Protection of Buildings from saltpetre

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Abstract - *Saltpetre is erosion, corrosion or efflorescence of building materials. When water soluble salts in excessive quantities (like magnesium sulphate, calcium sulphate, chlorides of sodium and potassium etc.) remain present in building materials, and if dampness reaches them, it reacts with these salts, resulting efflorescence appears on the surface of wall and other building components. In case this process continues for a longer time, the brick body become hollow, plaster flakes, concrete starts spalling and reinforcement is corroded. The structural members become weak from inside and continue to disintegrate under chemical attack and structural load. This affects the safety of structures. So, to avoid saltpetre, it is essential that buildings including foundation should be protected from ingress of water (percolation or capillary rise) and made watertight. A watertight structure not only solve saltpetre problems but many other problems are also solved like; health and hygiene, life of structures, stability against various forces and is suitable for all weather conditions. In this article, aspects of protecting buildings from saltpetre will be discussed.*

Main Causes of Saltpetre in Buildings

- Presence of water soluble salts (sulphates and chlorides of magnesium, calcium and potassium etc.) in building components
- Addition of deleterious salts in the building components by surrounding medium (chemically contaminatedsoil and water etc.)
- Porosity in structural members which are sensitive to ingress dampness or atmospheric moisture.

To check the moisture movement in building, first we should know the main reasons of ingress of water in the buildings, so that remedial measures could be taken.

Common Causes of Ingress of Water in Buildings

- Moist soil context with foundations
- Improper slope roof or defective waterproofing treatment
- Defective detailing of parapet walls
- Poor jointing or workmanship of water supply and sanitary works (pipes, fittings and fixtures)
- Sunken floors of toilet and kitchens (it is observed in recent studies that apart from water supply and sanitary fittings, water enters in sunken floors from joints of tile or other floors also, if joints are not properly sealed)
- Improper detailing of sunshade and lintels or slab and walls
- Inefficient layout of drainage system, blockage of drains and pipes, deterioration of pipes due to weathering effect.
- Non approachable ducts (cleaning of these ducts is difficult and become source of storage of garbage and waste materials, which held up the flow of water in it)
- Damaged / defective construction of septic tank near building structures
- Construction of soak-pit near building foundations
- Open drain flowing adjacent to building wall face
- Continuous overflow of water from overhead tank placed on roof terrace of buildings
- Improper treatment of construction or expansion joints provided in the buildings
- Cracks in the structural elements due to design defects, shrinkage, poor specifications or workmanship
- Slab offset from wall surface
- Inadequate copping on parapet walls

Saltpetre Protection Methods

(a) Selection of Appropriate Specifications and Technologies

It is most important aspect to consider specifications and technologies very carefully which may be quite helpful in protecting buildings from saltpetre. A few examples are mentioned herewith;

- Bricks having magnesium sulphate contents higher than 0.05% should not be used in construction works.
- Soluble salt contents in sand (chloride and sulphates) should not exceed 0.10%.
- 1:1:6 (cement: lime: sand) mix mortar is water resistant and may be used for external wall masonry and plastering etc.
- Use the double scaffolding instead of single

- Use machine moulded bricks as these are non porous
- Use of mechanical concrete mixtures and vibrators
- Minimise water cement ratio for concretes by using super-plasticisers etc.
- Replace foundation trench soil and soil fillings under floors (having high salt concentration) with a medium or low salt concentration sand or soil.
- Use of pile foundation with RCC beam at ground/ plinth level (it may also be used in the areas where ground water table is high).
- Give specific attention to make waterproof the main building components like; foundations, walls, terraces / roofs, finishes, sunken floors and plumbing works.

(b) Checking Ingress of Water in to Buildings

Moisture enters the Buildings in following two ways:

- By capillary rise from moist soil or adjoining water body surrounding the building foundation.
- Percolation of water from water supply and sanitary installations or rain water entry in building components

To check ingress of water in building components the following measure may be adopted;

- Use sulphate resistant cement in cement mortar (Portland cement used in mortar contain tai-calcium aluminate and sulphates from bricks or ground, may be carried to the mortar by water, resulting in formation of calcium sulpho aluminate hydrates. This compound has a large specific volume and hence mortar gets disintegrated. The damage caused depends on the amount and nature of sulphate present. The sulphate of sodium, potassium and magnesium produce greater damage than calcium sulphate)

- Use mortars offering high resistance to rain penetration and movement of solvable salts.

  - Mortar 1:1:6(cement: lime: sand) mix is suitable for masonry work of external walls and plastering (care should be taken that sand itself is not a source of salt).

  - Mortar 1:2:9 (cement: lime: sand) mix may be used for internal works in superstructure.

  - Mortar 2:1:9 (cement: lime: sand) mix or 1:3 (cement: sand) mix could be used in foundation &plinth masonry works (plasticisers may be mixed in masonry mortar in case of cement sand mortar to control water cement ratio).

  - Mortar of very rich mixes should not be used for plastering. The surface of plaster cracks due to shrinkage and water gets in through the cracks, because of rich mix.

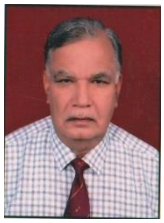
  - For internal plaster of bricks or blocks surface 1:6 (cement: sand) mix with plasticiser or the mixes used for exterior plaster may be used (rich mixes should again be avoided).

- Use non porous stones like basalt, granite or sand stone near the water source.
- Water used in construction should be free from salts and the bricks should be soaked to a minimum. Low strength bricks should not be used in the exposed part of the buildings.
- While applying rendering on wall surface, it should be cleared, joints should be racked out and cleaned and the whole surface should be wetted so as to avoid excessive suction of water from the finishing coat. Heavy troweling and skimming of the surface should be avoided.
- Plaster should be allowed to dry adequately before applying decorative finish.
- Accumulation of water close to walls should be prevented by providing plinth protection.
- All possible sources of water ingress should be carefully checked and rectified.
- On internal walls in old buildings efflorescence some times pushed out the plaster, leaving brick work bare. Such surfaces after removing and cleaning the loose plastered surface should be given a heavy coat of bitumen based material (cold sticker) and the surface should be rendered with gypsum plaster or plaster of appropriate mix.

Conclusion

Saltpetre is dangerous to all type of building structures. So every preventative or remedial measures should be taken appropriately. Building materials should be selected carefully , in order to avoid deleterious salts and harmful substances in it, which are responsible for efflorescence or saltpetre action in structures. In unavoidable circumstances remedial measures should be adopted and buildings be protected with ingress of water. Water tight / resistant buildings are less prone to saltpetre.

BIOGRAPHIES



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