In Situ

Constructive Tidings from Nuvoco Vistas Corp. Ltd.

ISSUE:15th JANUARY, 2021

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Dear Friends

Season's Greetings! We have seen off the eventful 2020, probably the worst year in our lifetime. However, amidst lots of negativity, it has also taught us many positive lessons regarding our lifestyle, habits, practices and conservation of nature, and most importantly, about sustainable development. Day by day, restrictions on more and more things and activities are being relaxed, but we have no room to get relaxed. We are all required to stick to our hygiene habits to keep ourselves, our families and our all associates/colleagues protected from COVID-19, since it is not yet fully under control. Rather, new strains of the same are being reported in a few parts of the world. Thus, we all need to be highly attentive and careful.

We would like to extend our sincere gratitude to the readers who have already enriched and encouraged us with their valuable suggestions, advice and requests.

In this issue, on the backdrop of the ongoing winter, we shall continue with our discussion on good home building practices and related aspects during winter. Apart from that, we shall be continuing with a serial write-up on cracks in buildings.

Hope you shall enjoy reading. Keep giving us your valuable feedback and suggestions for further improvement.

Happy reading! Keep well. Keep safe.

BUILDING CRACKS: CAUSES AND REMEDIES

Cracks in concrete have several causes. They may show the total extent of damage or problems of a greater magnitude.

In addition to that, they may signify critical structural distress, lack of durability, or they might influence appearance only. The seriousness depends on the nature of crack and the type of structure.

Causes of different types of building cracks and their remedies will be discussed below.

The principal causes of cracks in a building are as follows:

1. Permeability of concrete
2. Thermal movement
3. Creep movement
4. Corrosion of reinforcement
5. Moisture movement
6. Poor construction practices
7. Improper structural design and specifications
8. Poor maintenance
9. Movement due to chemical reactions
10. Other factors

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3. CREEP MOVEMENT

Gradual and slow, time dependent deformation of a concrete structure under sustained loads is known as creep. It may generate excessive stress and leads to development of crack.

Creep increases with an increase in water and cement content, water-cement ratio and temperature.

In addition to that, admixtures and pozzolana will increase creep. The increase of temperature in steel bars may also increase creep.

However, it decreases with an increase in humidity of surrounding atmosphere and age of material at the time of loading.

Remedial Measures

- Use minimum possible quantity of water
- Employ a large course aggregate
- Provide compression reinforcement if possible
- Avoid formwork removal at early ages
- Cure the concrete properly
- Assign a proper cross-section for the concrete element

Fig. 4: Concrete building cracks due to creep movement

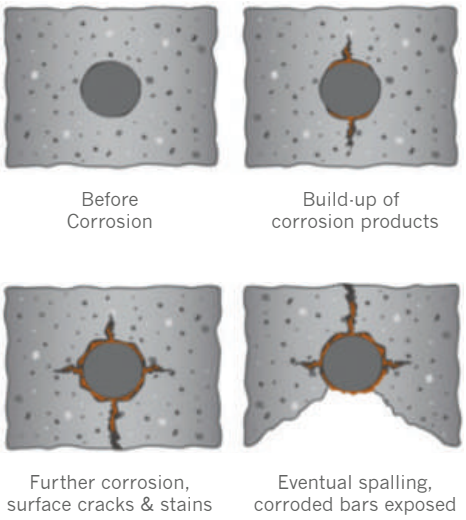
4. CORROSION OF REINFORCEMENT

Reinforcement corrosion will produce iron oxide and hydroxide on the surface of the steel bar, consequently its volume increases.

This increase in volume causes high radial bursting stresses around reinforcing bars and results in local radial cracks. These splitting cracks result in the formation of longitudinal cracks parallel to the bar.

Reinforcement corrosion will occur unless it is protected properly. Steel reinforcement can be protected by providing adequate impervious concrete cover. This will prevent the ingression of moisture and other aggressive elements.

Steel corrosion will also not occur as long as the concrete surrounding it is alkaline in nature with a high pH value.



Remedial Measures

- Use low permeable concrete
- Provide adequate cover thickness
- Make sure concrete–steel bond is as good as possible. This is because concrete alone is not capable of resisting the tensile forces to which it is often subjected. Otherwise, the concrete may crack and allow harmful substances and materials to attack the steel bars

Fig. 5: Cracking due to corrosion of reinforcement

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5. MOISTURE MOVEMENT

Most building with pores in their structure, in the form of inter-molecular space, expand on absorbing moisture and shrink on drying.

These movements are cyclic in nature and are caused by increase or decrease in inter-pore pressure with moisture changes.

Shrinkage can be of plastic or dry. Factors that cause cement or mortar to experience shrinkage include excessive water and cement quantity; rich cement mixtures suffer greater shrinkage.

Fig. 7: Crack above window due to shrinkage

Remedial Measures

- Provide movement joints
- Use minimum possible quantity of water for mixing cement concrete or cement mortar
- Compact concrete properly; vibrated concrete suffers less shrinkage compared with manually compacted concrete
- Finally, avoid the use of excessive cement

Fig. 8: Concrete cracking due to moisture movement

To be continued in the next issue...

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