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ECS-002

Early-Age Cracking in RCC Slabs

Engineering Investigation of Random and Linear Cracking in Cast-in-Situ Concrete Slabs

Project: Multi-Storey Commercial Building

Client: Confidential

Date: July 2026

Engineering Case Study Background

This Engineering Case Study is based on an actual engineering investigation undertaken by DM Strategic Advisors (DMSA). Project and client details have been anonymised to maintain confidentiality.

The investigation was undertaken after cracks were observed at several locations on the soffit of reinforced concrete slabs in a multi-storey commercial building.

The objective was to assess the observed crack patterns, identify their probable causes, determine whether the cracks indicated structural distress and recommend suitable repair and preventive measures.

The assessment was based on visual inspection of accessible RCC slabs and beams, observation of crack patterns and discussions with the project team. No destructive testing was carried out during the investigation.

Site Observations

- Cracks were observed at several locations on the slab soffit.
- Most of the cracks formed an irregular interconnected pattern.
- A few cracks were comparatively straight and extended over longer distances.
- No major cracks were observed in the supporting beams.
- No exposed reinforcement or significant honeycombing was noticed during the visual inspection.
- Overall concrete quality appeared satisfactory except for the observed cracking.

The observed cracking pattern indicated a need to distinguish between early-age concrete behaviour and structural cracking before deciding on the appropriate repair methodology.

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Engineering Assessment

The observed cracks were assessed to be mainly early-age shrinkage and thermal cracks. The crack patterns did not resemble typical structural flexural cracks.

The absence of major cracking in the beams, exposed reinforcement or significant honeycombing, together with the overall satisfactory appearance of the concrete, did not indicate major structural distress during the visual inspection.

The possible contributing factors included plastic shrinkage, drying shrinkage, restrained shrinkage, early-age temperature variation and concreting, finishing and curing practices.

At a few locations, the comparatively straight crack pattern may also have been influenced by embedded electrical conduits. The crack locations may be compared with the electrical conduit layout to verify any correlation.

Probable Causes of Early-Age Cracking

Plastic Shrinkage

Plastic shrinkage can occur when moisture is lost from the concrete surface during the early stage of setting. If the rate of surface moisture loss is high and the concrete cannot compensate for this loss, tensile stresses may develop and result in early-age cracking.

Drying Shrinkage

As hardened concrete loses moisture, it undergoes drying shrinkage. Where this movement is restrained by the surrounding concrete, reinforcement or structural geometry, tensile stresses can develop and may result in cracking.

Restrained Shrinkage

Concrete undergoes volume changes during hardening and drying. When these movements are restrained, the resulting tensile stresses can contribute to cracking, particularly where the tensile strength of the concrete at that age is relatively low.

Early-Age Temperature Variation

Temperature changes during the early stages of concrete hardening can produce expansion and contraction. Where the resulting movement is restrained, thermal stresses may contribute to early-age cracking.

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Embedded Electrical Conduits

The comparatively straight crack observed at one location may have been influenced by an embedded electrical conduit. Where required, the crack location should be compared with the electrical conduit layout to establish whether the two are aligned.

Concreting, Finishing and Curing Practices

Concrete placement, compaction, finishing and curing practices have a significant influence on early-age cracking. Inadequate compaction, excessive moisture loss, inappropriate finishing practices, delayed curing or inadequate curing can increase the possibility of early-age cracking.

Repair Recommendations

- The observed crack locations should be recorded for future reference.
- Where repair is required, the cracks should be repaired using a suitable crack repair material before plastering or other finishing work.
- The repair methodology should be selected based on the observed crack characteristics and site conditions and should be reviewed by the Project Consultant before execution.
- Remaining works should proceed after completion of the required repairs as recommended by the Project Consultant.

Preventive Measures

- Follow the approved concrete mix without adding extra water at site.
- Ensure proper vibration and compaction, particularly around congested reinforcement and embedded conduits.
- Start curing at the appropriate time and continue curing as per project requirements.
- Avoid unnecessary congestion of electrical conduits and maintain adequate concrete cover.
- Follow the recommended formwork removal and re-propping schedule.
- Avoid early loading of newly cast slabs.
- Ensure proper supervision during concreting, finishing and curing.

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Use of Polypropylene Fibres

Polypropylene fibres may be considered in terrace slabs as a measure to help reduce the risk of early-age cracking.

The use of fibres should form part of the approved concrete mix and construction methodology and should not be considered a substitute for proper concreting, finishing and curing practices.

Engineering Outcome

The investigation indicated that the observed slab cracks were mainly early-age shrinkage and thermal cracks.

No signs of major structural distress were observed during the visual inspection.

The assessment demonstrated the importance of considering crack pattern, location and surrounding concrete condition before determining the nature of cracking.

Appropriate repair before plastering or other finishing work, together with good concreting, curing and construction practices, will help minimise the possibility of similar cracks in future.

SM Engineering Insight

A crack should not be judged by its appearance alone.

The crack pattern, location, orientation, surrounding concrete condition and likely timing of crack development should be considered together before deciding whether the crack is structural or related to early-age concrete behaviour.

A systematic engineering assessment helps avoid unnecessary structural concern and leads to more appropriate repair decisions.

Disclaimer

This Engineering Case Study is based on visual observations made during the site investigation and is intended for technical knowledge sharing.

The observations and recommendations are limited to the areas inspected and the information available during the investigation. The case study should not be interpreted as a structural safety certification or as a substitute for project-specific assessment by the responsible design and project consultants.