
TN – 005 – Technical Notes

Segregation & Bleeding

Engineering Investigation of Segregation and Bleeding in Fresh Concrete

SM Knowledge Hub (SMKH) Technical Notes present practical engineering guidance based on field experience, industry discussions and engineering investigation. This Technical Note explains how segregation and bleeding develop in fresh concrete, helps engineers identify their root causes through a systematic investigation process, and provides practical corrective and preventive measures to improve concrete quality, finish and durability.

Objective

To help engineers identify, investigate and resolve segregation and bleeding problems in fresh concrete before they affect quality and durability.

Problem Statement

Fresh concrete sometimes separates into coarse aggregate, mortar and water. This leads to segregation and bleeding, resulting in poor concrete quality and surface defects.

Background

Concrete is designed to remain homogeneous from batching until placement. If the mix loses stability, aggregates settle while cement paste and water move separately, reducing concrete performance.

Symptoms

- Coarse aggregate settles at the bottom.
- Excess water appears on the surface.
- Uneven concrete appearance.
- Honeycombing after formwork removal.
- Weak surface layer.
- Poor surface finish.
- Difficulty in pumping or placing concrete.

Possible Causes

Material Related

- Excess water content.
- Poor aggregate grading.
- Gap-graded aggregates.
- Low fines content.
- Unsuitable sand proportion.
- Improper admixture selection or dosage.

Production Related

- Incorrect batching.
- Poor mixing.
- Variation in moisture correction.

Transportation & Placement

- Long transportation time.
- Excessive vibration.
- Free fall from excessive height.
- Improper pumping practice.
- Delayed placement.

Site Related

- Congested reinforcement.
- Improper placing sequence.
- Poor compaction technique.

Investigation Checklist

- Check the mix design.
- Verify water-cement ratio.
- Review aggregate grading.
- Check batching records.

Verify admixture dosage.
Observe transportation and placing practices.
Check vibration methods.
Examine concrete after formwork removal.

Root Cause Analysis

Investigate systematically through the complete concreting process.

Materials



Mix Design



Batching



Transportation



Placement



Compaction



Finished Concrete

Recommended Solutions

Optimize aggregate grading.
Reduce excess water.
Increase cohesion where required.
Review sand percentage.
Optimize admixture dosage.
Minimize free fall height.
Avoid over vibration.
Follow proper placing practices.

Preventive Measures

- Use a stable mix design.
- Monitor aggregate moisture regularly.
- Conduct trial mixes before production.
- Train site personnel in correct placement.
- Monitor concrete during pouring.

Important Do's

- Place concrete close to its final position.
- Compact uniformly.
- Monitor workability throughout concreting.
- Investigate immediately if segregation is observed.

Important Don'ts

- Do not add water at site.
- Do not over vibrate.
- Do not allow excessive free fall.
- Do not ignore bleeding water.

Relevant IS Codes

- IS 456
- IS 4926
- IS 10262
- IS 9103

Practical Tips

- Stable concrete always performs better than highly workable but unstable concrete.
- Pumpable concrete should also be cohesive.
- Bleeding is an early warning sign—investigate before continuing the pour.
- Observe fresh concrete continuously during placement, not only after hardening.



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SM Insights

Many engineers believe bleeding indicates that concrete is workable. In reality, excessive bleeding and segregation usually indicate an unstable concrete mix or improper handling. Correcting the root cause early prevents defects, rework and durability problems.

Key Learning

Segregation and bleeding are symptoms—not the problem itself. A systematic investigation of materials, mix design, production and placing practices is the key to producing durable, high-quality concrete.

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