Concrete Atlantic béton Atlantique

Concrete Tech-Tip #16

Finishing Concrete Flatwork

What are Joints?

Concrete naturally expands and contracts with changes in moisture and temperature, but its overall tendency is to shrink. This shrinkage can lead to cracking, which is often irregular, unsightly, and difficult to maintain. Joints are intentionally placed locations designed to control where cracks occur.

Common types of joints include:

a. Control (contraction) joints: These joints are designed to control where shrinkage cracks occur as concrete dries and hardens. By creating a weakened plane in the slab, the concrete will crack along the joint instead of randomly. Control joints are typically saw-cut, tooled, or formed and are spaced according to slab thickness and expected shrinkage.

b. Isolation (expansion) joints: Isolation joints separate concrete elements from other structures, such as walls, columns, or footings. They allow independent movement between concrete and adjoining structures, accommodating thermal expansion, shrinkage, or vibration. These joints are often filled with compressible materials to absorb movement.

c. Construction joints: Construction joints are placed where concrete placement is stopped and later resumed. They provide a bonding surface for new concrete to adhere to the previously placed section and may include dowels or keyways to transfer loads across the joint. Proper alignment and preparation are critical to ensure structural integrity.

Why Do We Need Joints?

Joints help manage shrinkage and thermal movements, preventing random cracking, protecting structural integrity, and making maintenance easier.

Example of Contraction joint overtop of induced crack

How to Construct Joints?

Joints must be carefully designed and layed out prior to concrete placement if uncontrolled cracking of concrete flatwork is to be avoided. The following practices are recommended:

Contraction Joints

a. These joints are made in several ways with the most common being is to saw a continuous straight slot in the top of the slab.
b. Sawing must be coordinated with the setting time of the concrete and should started as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. This is usually within 4 to 12 hours after the concrete hardens.
c. Contraction joints should extend into the slab to a depth of at least one-fourth the slab thickness or a minimum of 25mm deep. It recommended the depth not exceed one third the slab thickness.
d. Spacing of joints in floors on ground depends on (1) slab thickness, (2) shrinkage potential of the concrete, (3) subgrade friction, (4) environment, (5) absence or presence of steel reinforcement.

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e. Panels created by contraction joints should be relatively square. The length should not exceed 1.5 times the width. L-shaped panels should be avoided.

The table below provides guidance on spacing of contraction joints in meters based on slab thickness and maximum aggregate size.

Slab thickness, mm	Maximum-size aggregate <19mm	Maximum-size aggregate >19mm
100	2.4	3.0
125	3.0	3.75
150	3.75	4.5
175	4.25	5.25
200	5.0	6.0
225	5.5	6.75
250	6.0	7.5

Isolation Joints

a. Isolation-joint material can be as thin as 6mm or less, but 13-mm material is commonly used.
b. Care should be taken to ensure that all edges for the full depth of the slab are isolated to avoid further cracking.
c. To isolate columns from slabs, form circular of square openings which will not be filled until after the floor has hardened.

Three Rules to Consider:

1. Place contraction joints to control shrinkage cracks. Saw or tool joints to a depth of ¼ to ⅓ of the slab thickness, and space panels to keep them relatively square.
2. Use isolation joints to separate concrete from other elements. Ensure joints extend the full depth of the slab and are filled with compressible material to allow independent movement.
3. Plan and coordinate joints before placement. Time sawing for proper concrete set, align construction joints carefully, and prepare surfaces to maintain structural integrity and prevent random cracking.

References

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d. ***Disclaimer***
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