CONSTRUCTION JOINTS:

Construction joints occur where two successive placements of concrete meet. They may be designed to permit movement and/or to transfer load.

These are joints that are placed at the end of a day's work. In slabs they may be designed to permit movement and/or to transfer load. Often in reinforced concrete a conscious effort is made to clean the joint and bond the next day's work.

There are three types of joints :

a. Expansion joint.
b. Contraction joint.
c. Construction joint.

Out of these Expansion joint and Contraction joints are stress relieving ones while the construction joint is not. Joints can be vertical or horizontal. Vertical joint in a building is at the beam bottom of the column and wall junctions. These joints-Expansion and contraction joints separate the structures and pavements

Careful preplanning the location is important for minimum crack free structural members. Construction joints key the two edges of the slab together either to provide transfer of loads or to help prevent curling or warping of the two adjacent edges.

Construction joints are needed to accommodate the construction sequence for placing the concrete. The amount of concrete that can be placed at one time is governed by batching and mixing capacity, crew size, and the amount of time available. Correctly located and properly executed construction joints provide limits for successive concrete placements, without adversely affecting the structure.

Ref: ACI 222.3R-95 Joints in Concrete construction

3.2.2.1 ***Beams and slabs***—Desirable locations for joints placed perpendicular to the main reinforcement are at points of minimum shear or points of contraflexure. Joints are usually located at midspan or in the middle third of the span, but locations should be verified by the engineer before placement is shown on the drawings. Where a beam intersects a girder, ACI 318 requires that the construction joint in the girder should be offset a distance equal to twice the width of the incident beam.
Horizontal construction joints in beams and girders are usually not recommended. Common practice is to place beams and girders monolithically with the slab. For beam and girder construction where the members are of considerable depth, Hunter (1953) recommends placing concrete in the beam section up to the slab soffit, then placing the slab in a separate operation. The reasoning behind this is that cracking of the interface may result because of vertical shrinkage in a deep member if the beam and slab concrete are placed monolithically. With this procedure, there is a possibility that the two surfaces will slip due to horizontal shear in the member. ACI 318 requires that adequate shear transfer be provided.

The main concern in joint placement is to provide adequate shear transfer and flexural continuity through the joint. Flexural continuity is achieved by continuing the reinforcement through the joint with sufficient length past the joint to

ensure an adequate splice length for the reinforcement. Shear transfer is provided by shear friction between the old and new concrete, or dowel action in the reinforcement through the joint. Shear keys are usually undesirable (Fintel 1974), since keyways are possible locations for spalling of the concrete. The bond between the old and new concrete, and the reinforcement crossing the joint, are adequate to provide the necessary shear transfer if proper concreting procedures are followed.

Ref: Construction joints for Multistory Structures by BY BRUCE SUPRENANT

Strength.

A construction joint introduces **a weak vertical or horizontal plane** in an otherwise monolithic concrete member. This obvious **slip plane may reduce the strength of beams, columns, and walls.**

Test results show that construction joints reduce a member's shear strength but not the flexural or bending strength. Tests conducted on simply supported beams with a vertical construction joint at the center showed the same load-deflection and ultimate moment characteristics as an unjointed beam (Ref. 1). Measurements of crack widths also indicated similar performance between jointed and unjointed beams. These results held true for a joint that was deliberately debonded between the two concrete pours. The construction joint in these tests was located in a region of negligible shear. In a region where the shear is significant, a construction joint with a smooth surface reduces the shear strength of the member by 40%. But a beam having a joint with a roughened surface has a failure mode and ultimate load similar to an unjointed beam. A 1/16-inch texture over theentire face qualified as a roughened surface in these tests (Ref. 1).

Dura b i l i t y.

The location of construction joints also is affected by whether or not water and salts can easily enter the joint. Although concrete has low permeability to water and salts, construction joints don't. Water and salt leaking through joints may cause rusting of rebar, prestressing tendons, and anchorage hardware in parking structures. Locate construction joints at high points in the floor away from drains.

Where durability is critical, use fewer joints by allowing larger floor pours. Consider using waterstop at some or all joint locations.

ACI requirements for construction joint design

Because construction joints are most likely to reduce shear strength, they should be located where shear forces are low. Under uniformly distributed gravity loads, shear forces are low in the middle of a flexural member span. Thus, the American Concrete Institute (ACI) BuildingCode (Ref. 2, Section 6.4.4) requires that:

"Construction joints in floors shall be located within the middle third of spans of slabs, beams, and girders. Joints in girders shall be offset a minimum distance of two times the width of intersecting beams" (Figure 1).

There may be high shear forces even at midspan, for instance, where a beam intersects a girder. That's why the code requires joints to be located at least two beam widths away from a beam-girder intersection. It's a good idea to keep construction joints away from point loads (such as heavy equipment) for the same reason.

Locate construction joints in walls and columns on the underside of floor slabs, beams, or girders, and at the tops of footings or floor slabs.

Designing concrete members for lateral forces may require special design treatment of construction joints. Shear keys, diagonal dowels, or the shear transfer method (ACI Code, Section 11.7) may be used.

SHEAR WALLS NEED CONSTRUCTION JOINTS TOO.

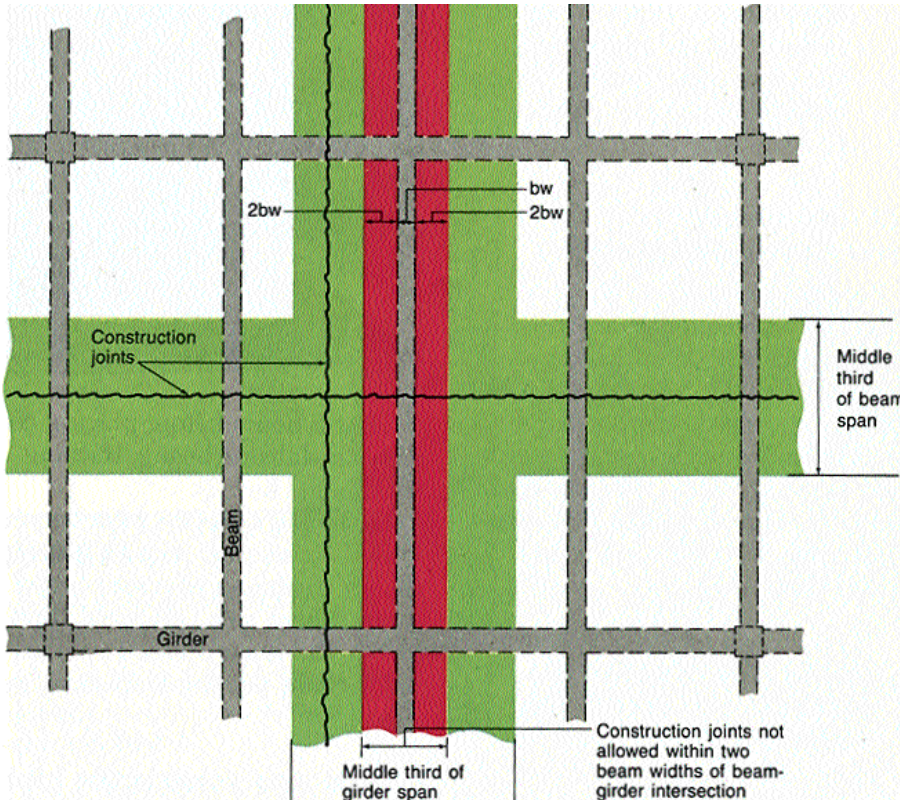
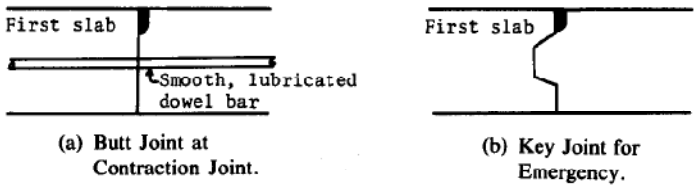
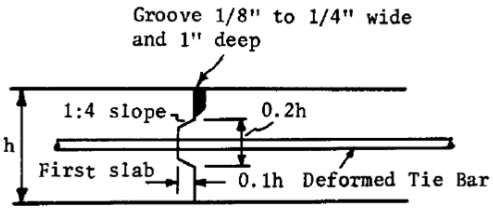


Figure 1. The ACI Code requires construction joints in elevated slabs to be located within the middle third of spans of slabs, beams, and girders. Joints must be located at least two beam widths away from beam-girder intersections.

Typical Construction Joint in Concrete Pavement:





Typical Longitudinal Joint Details

Lane- at- time Construction

Compiled By T.RangaRajan.

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