

Placing and Finishing Concrete





Keys to Project Success

- Project Specifications/Scope
- Owner Expectations
- Designer Expectations
- QC/QA
- Contractor Expectations
- Sub-Contractors



Preconstruction Meeting

- Owner
- Architect/Engineer
- QC/QA Inspector
- General Contractor
- Sub-Contractors



Checklist For Concrete Placement

- Group 1: **Write Checklist of things you should check before the concrete ever arrives**
- (ignore anything to do with ordering the mix).
- Group 2: **Write Checklist of things you should check as the concrete is delivered and placed.**

Quality Concrete Depends on Placing Techniques

- Subgrade prep
- Formwork
- Reinforcement
- Method of Placement
- Consolidation
- Jointing
- Field Testing



Subgrade Preparation



Preparation Before Placing Includes:

- Trimming the subgrade



Moistening the subgrade



Compacting the subgrade



Vapor Retarders



Formwork



Formwork



Reinforcing Steel



Concrete Placement Equipment

- Chutes
- Conveyor
- Dropchute
- Bucket
- Cranes
- Pump
- Wheelbarrow & Buggies



Chutes

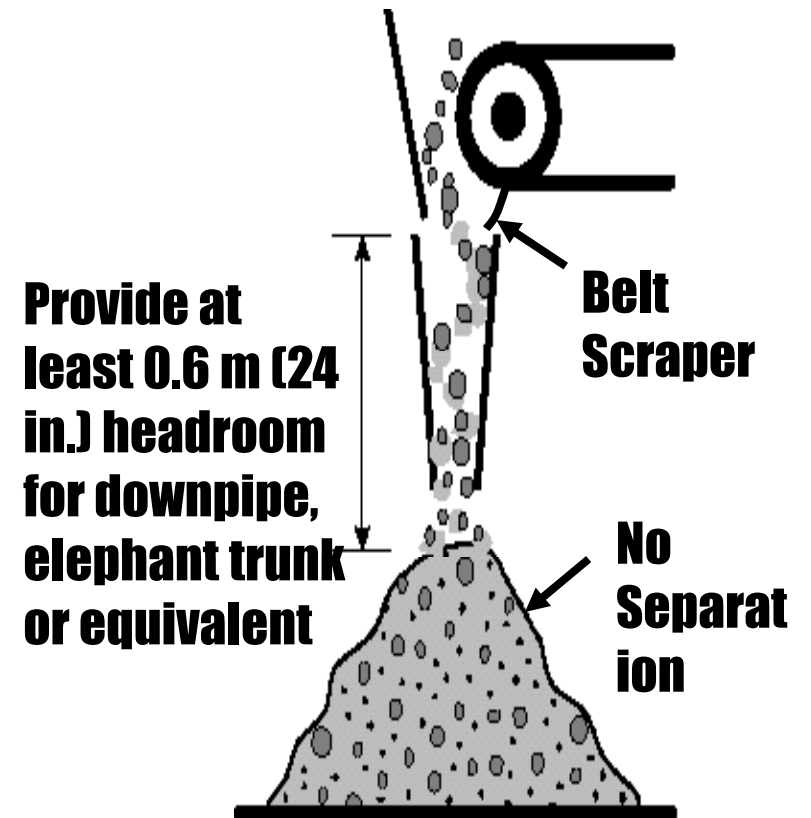


Conveyors

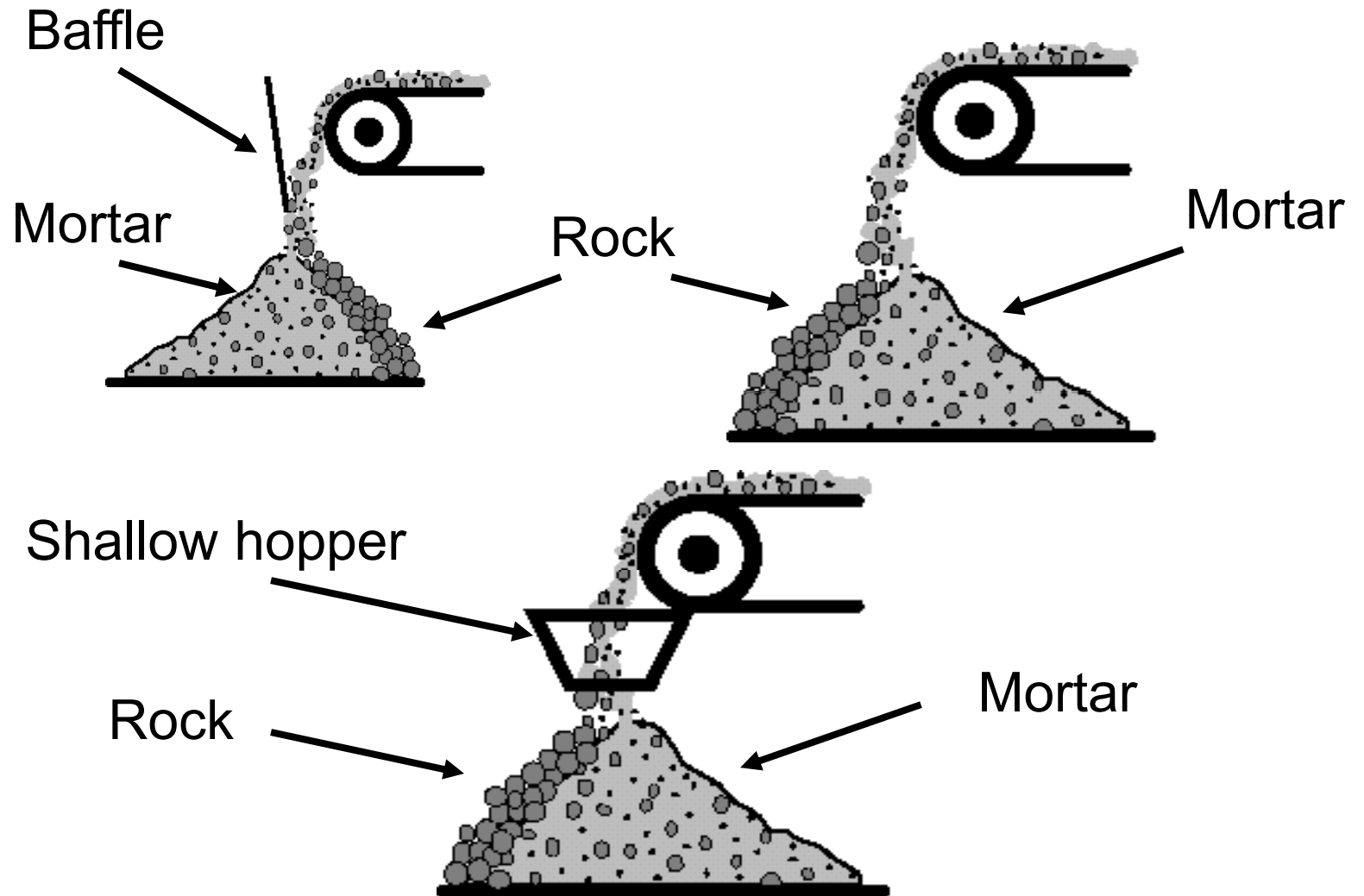




Placement with Conveyor Belt



Incorrect Placement with Conveyor Belt



Cranes



Buckets

- Amount of concrete to match capacity of bucket



Boom Pumps



Line Pumps





Problems Pumping?



Excessive High or Low Slump
Excessive Coarse Aggregate

Non-uniform feeding
Segregation

Wheelbarrows & Buggies



Dropchutes



To Avoid Segregation-
Limit Unconfined free-
fall of concrete to 5 ft.
max.





Basic Requirements for Placing Concrete

- Preserve concrete quality:
 - **Water-cement ratio**
 - **Slump**
 - **Air-content**
 - **Homogeneity**
- Avoid separation of aggregate and mortar



Placement

- Deposit as Continuous as Near as Possible to Final Position
- Place in Horizontal Layers of Uniform Thickness
- Start at Low Points in Sloped Members
- Do Not Dump Concrete into a Large Pile



Placing Concrete

- DO NOT —
- (a) disturb saturated subgrades so bearing capacity is maintained
- (b) deposit on frozen subgrade

Deposit continuously and as near as possible to its final position
Rate of placement should be such that previously placed concrete has not set when the next layer is placed upon it



Placement Considerations

- Location: Access, Height, Time
- Temperature
- Setting time
- Productivity
- Segregation
- Form pressure
- Appearance
- Congestion
- Other.....

Finishing Concrete





Placing Concrete

For Slab Construction

- Start placing along perimeter at one end with each batch discharged against previously placed concrete

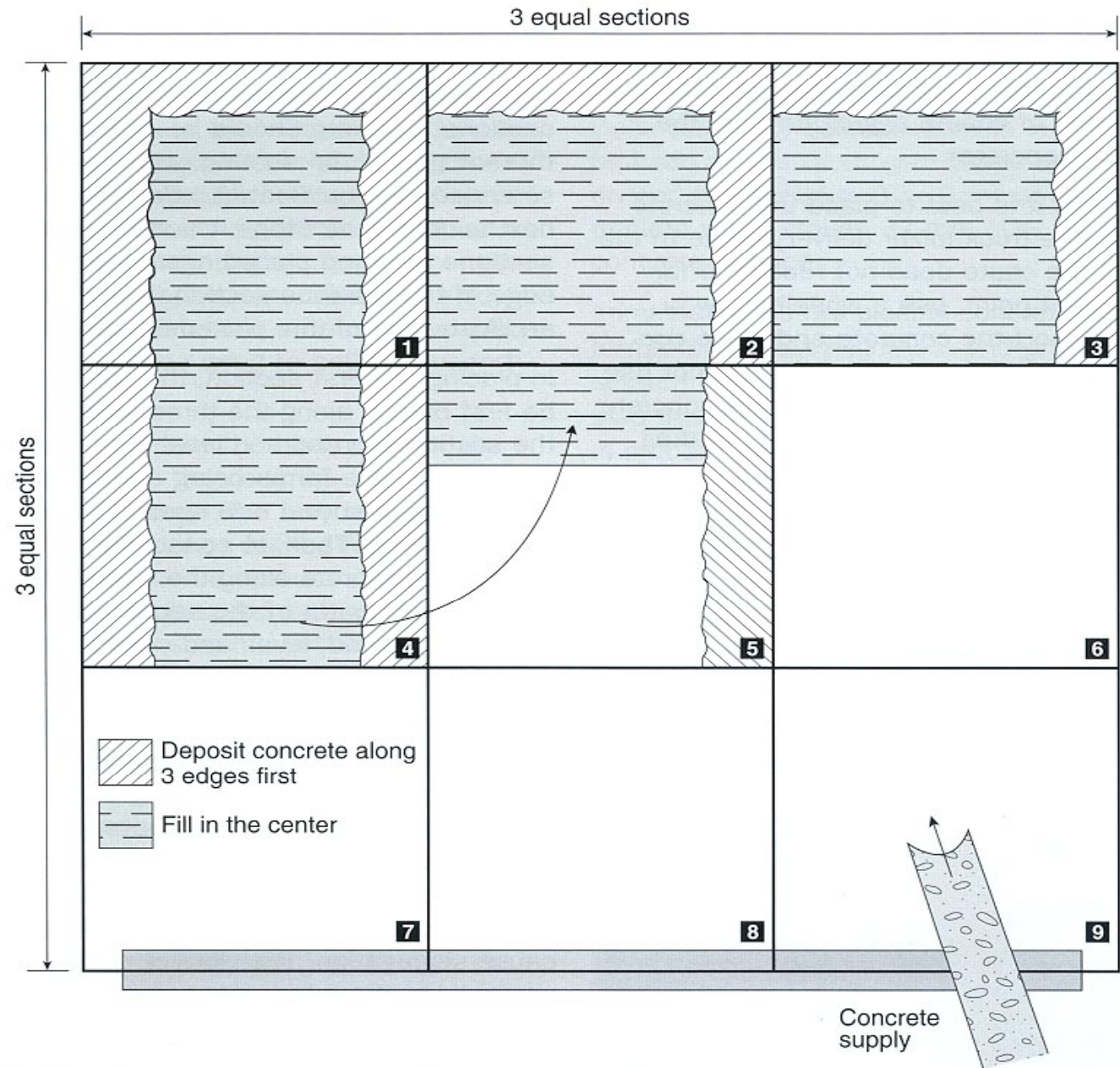
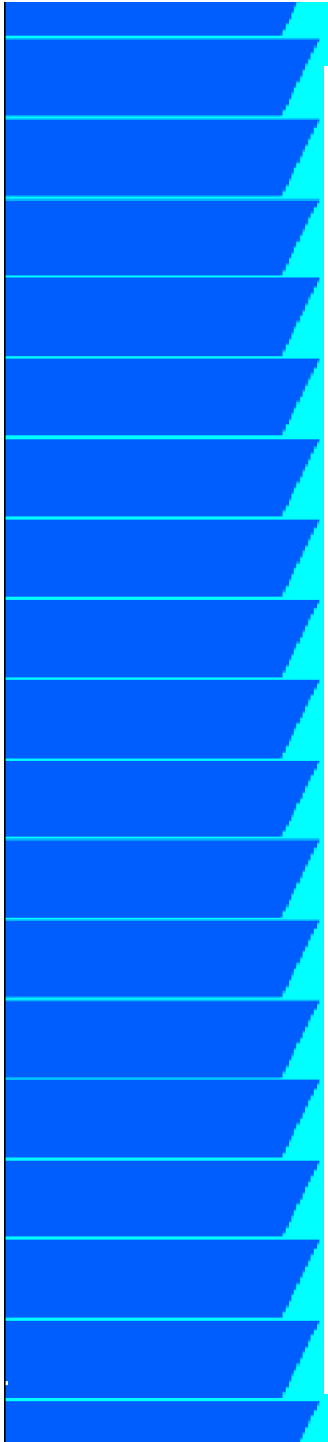
- Deposit continuously and as near as possible to its final position

Do not —

- (a) dump in separate piles & then level and work together
- (b) deposit in large piles & then move horizontally into position

These practices result in segregation

(mortar flows ahead of coarser material)





Finishing Operations - Exterior Slabs Sidewalks, Driveways etc.

- Consolidation
 - Strike-off
 - Darbying or Bull floating
 - Establish locations and make first tool pass for hand tooled joints (Grooving)
 - and edges
- ***Lapse of time***
 - Float
 - Re-edge and Groove
 - ***Lapse of time***
 - Texture:
 - Broom finish
 - swirled float finish
 - Curing



Finishing Operations

Single Course Floors

Consolidation

Strike-off

- Darbying or Bull Floating
- Edging and Grooving
- ***Lapse of Time***
- Floating (power or hand)
- Edging and Grooving
- (second pass)

Troweling (power or hand)

Lapse of Time

Second Troweling (power or hand)

Final Troweling (hand)

Curing



Window of Finishability

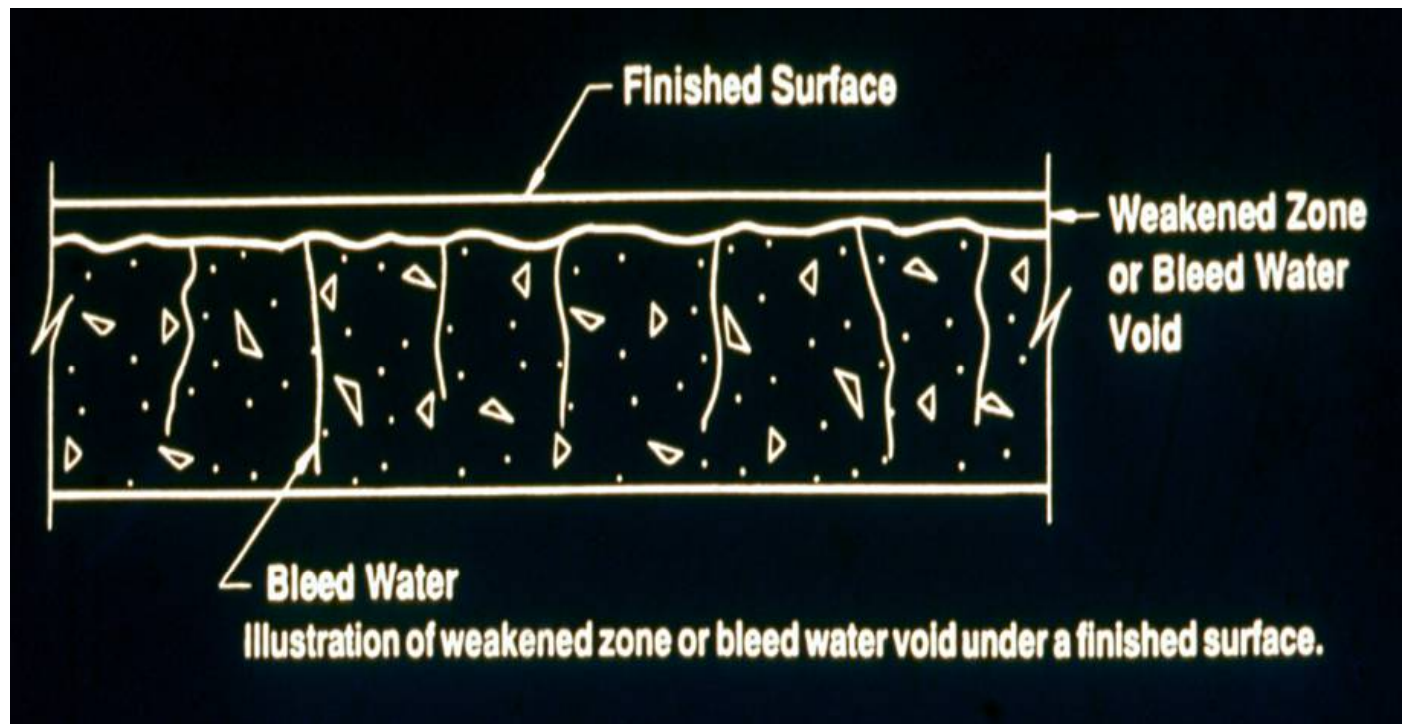
- Time Period When Various Finishing Procedures Should Be Executed Sequentially, Neither Too Early Nor Too Late in the Concrete-Hardening Process.
- *ACI 302.1 R*

Why The Time Lapse ?

Bleeding



Why do we allow the concrete to finish bleeding before finishing?





Consequences of Finishing Bleed Water Back Into the concrete Surface.

- Weakened Surface due to High W/C at concrete Surface (Dusting)
- Scaling
- Blisters
- Delamination

Another Common Cause of Weakened Surface Layers?



Blessing

Screeding (Strikeoff)



Vibratory Screeds



Laser Screeds



Bullfloating



Darbying



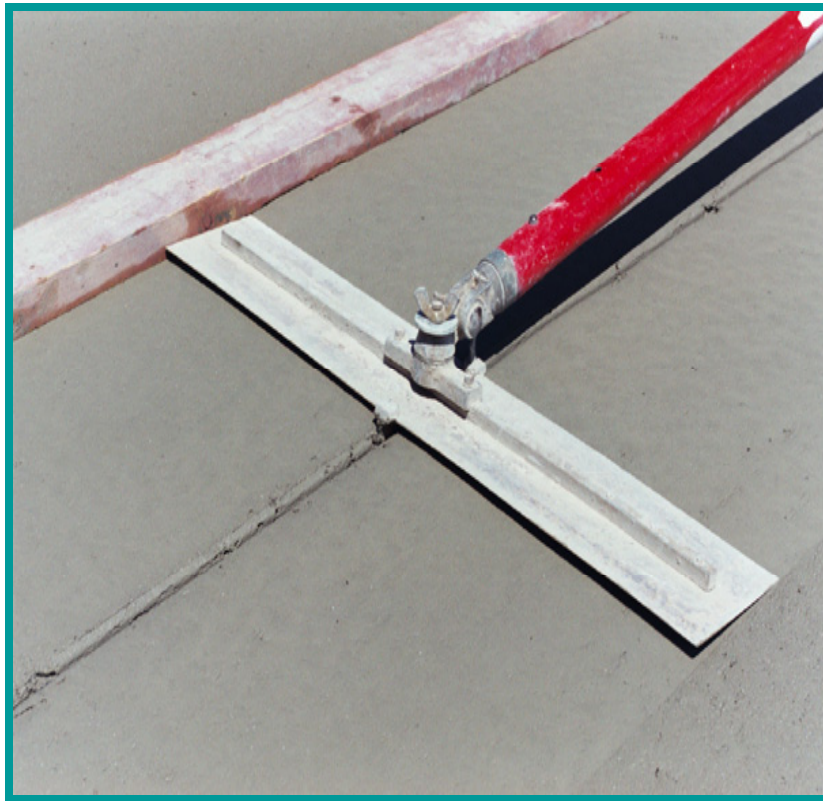
Edging

Edging densifies and compacts concrete next to forms where floating is less effective



Required along all edge forms,
isolation and construction joints
in floors and exterior slabs
Cut concrete away from forms
to a depth of 25 mm with a
pointed mason or margin trowel
Edging may be required after
each subsequent finishing operation
for interior slabs

Grooving



Early hand grooving forces the coarse aggregate particles away from the location of the groove and establishes the layer of mortar paste that must fill all defects in subsequent finishing passes.

Highway Straightedges



Floating (Power or Hand)



To embed aggregate particles just beneath the surface.

To remove slight imperfections, humps, and voids.

To compact the mortar at the surface in preparation for additional finishing operations.

Troweling

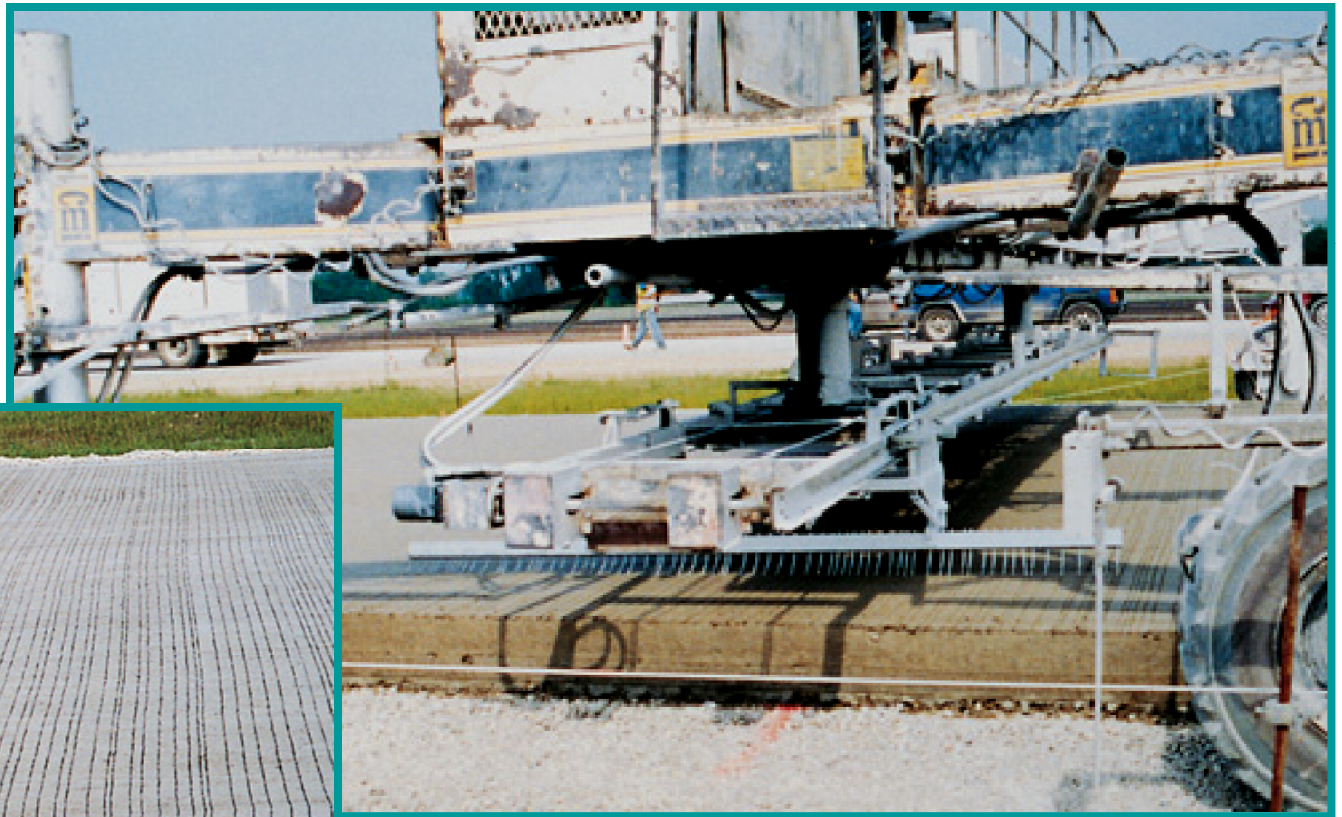


Creates smooth,
hard,dense surface
Exterior concrete
should not be troweled
because:
it can lead to a loss of
entrained air caused
by overworking the
surface
troweled surfaces can
be slippery when wet.

Brooming



Tining

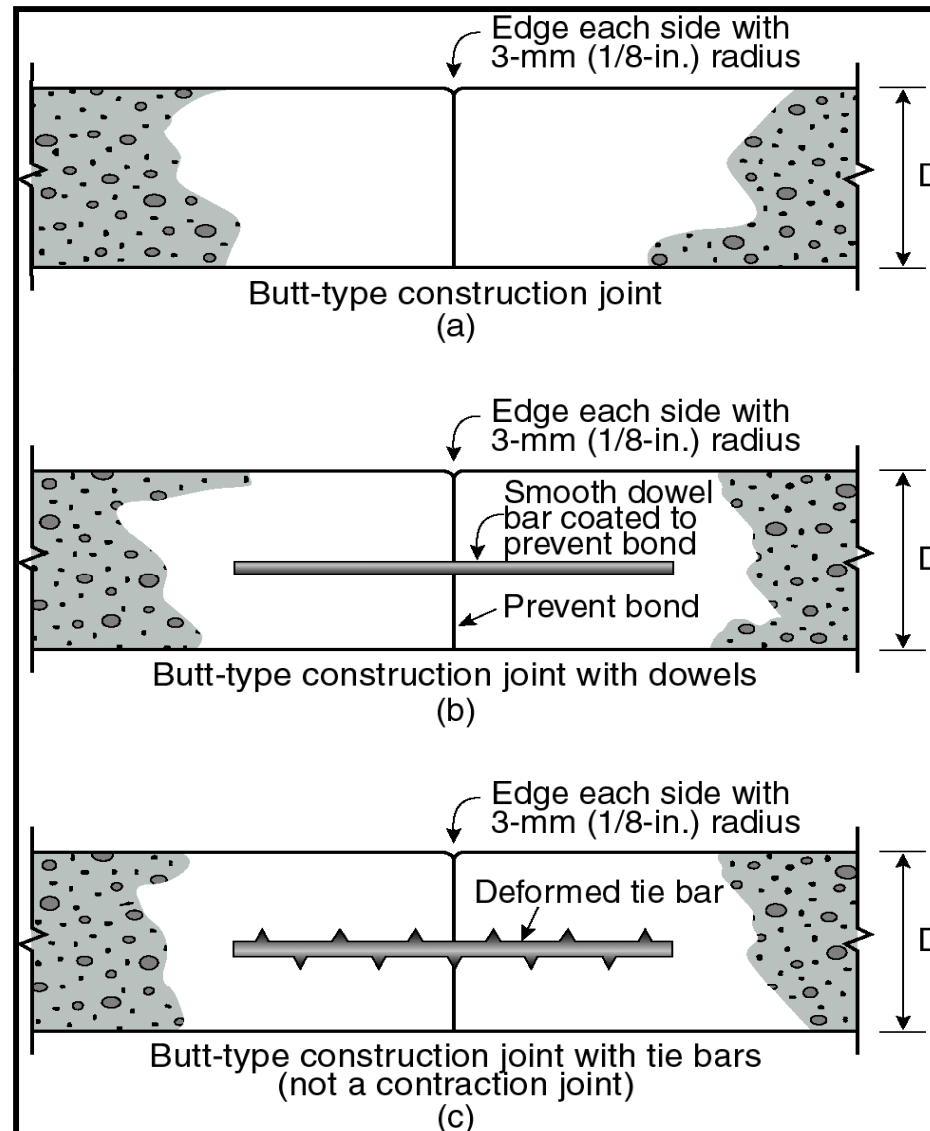




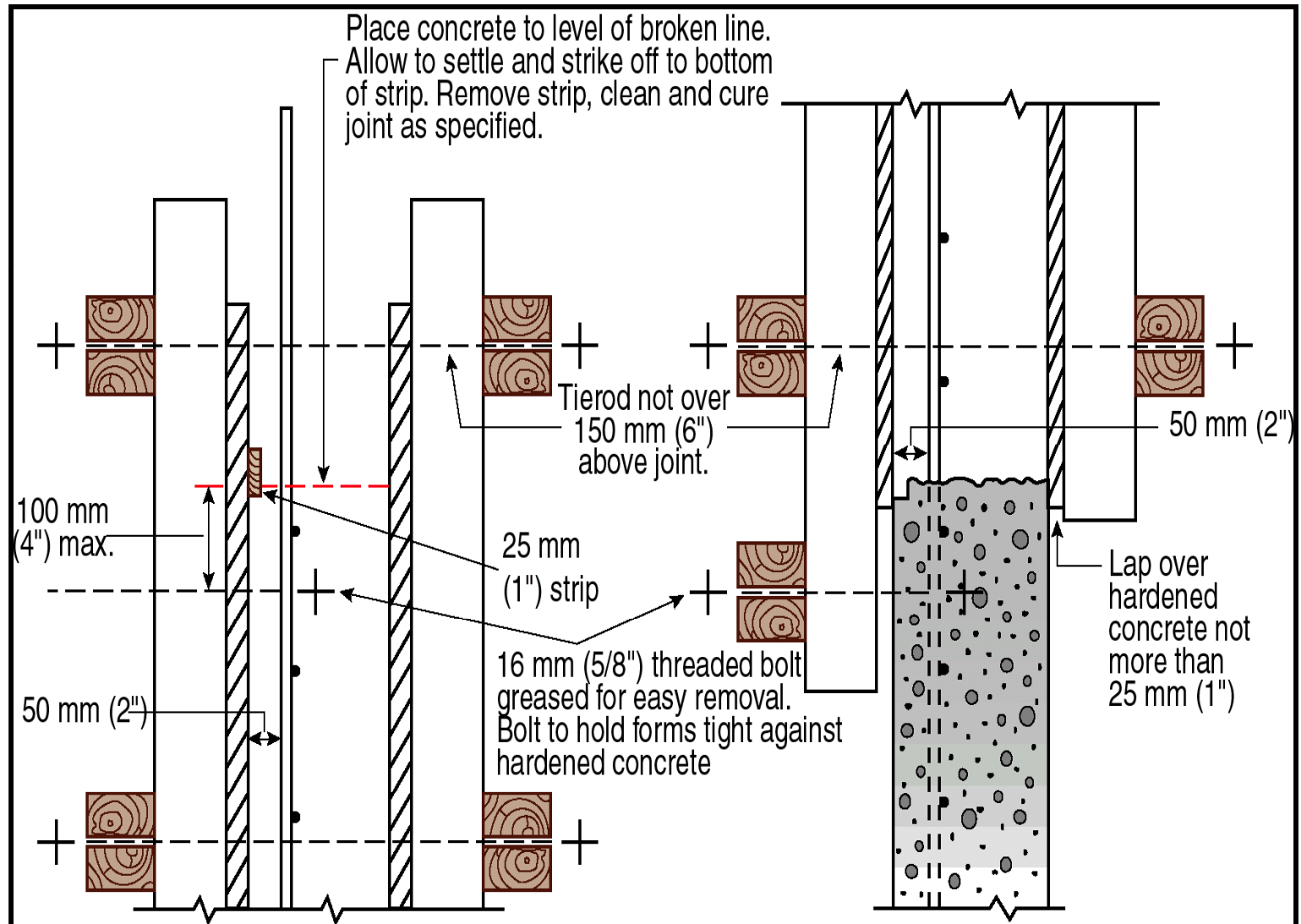
Joints in Concrete

- Construction Joints
- Isolation Joints (Expansion)
- Contraction Joints

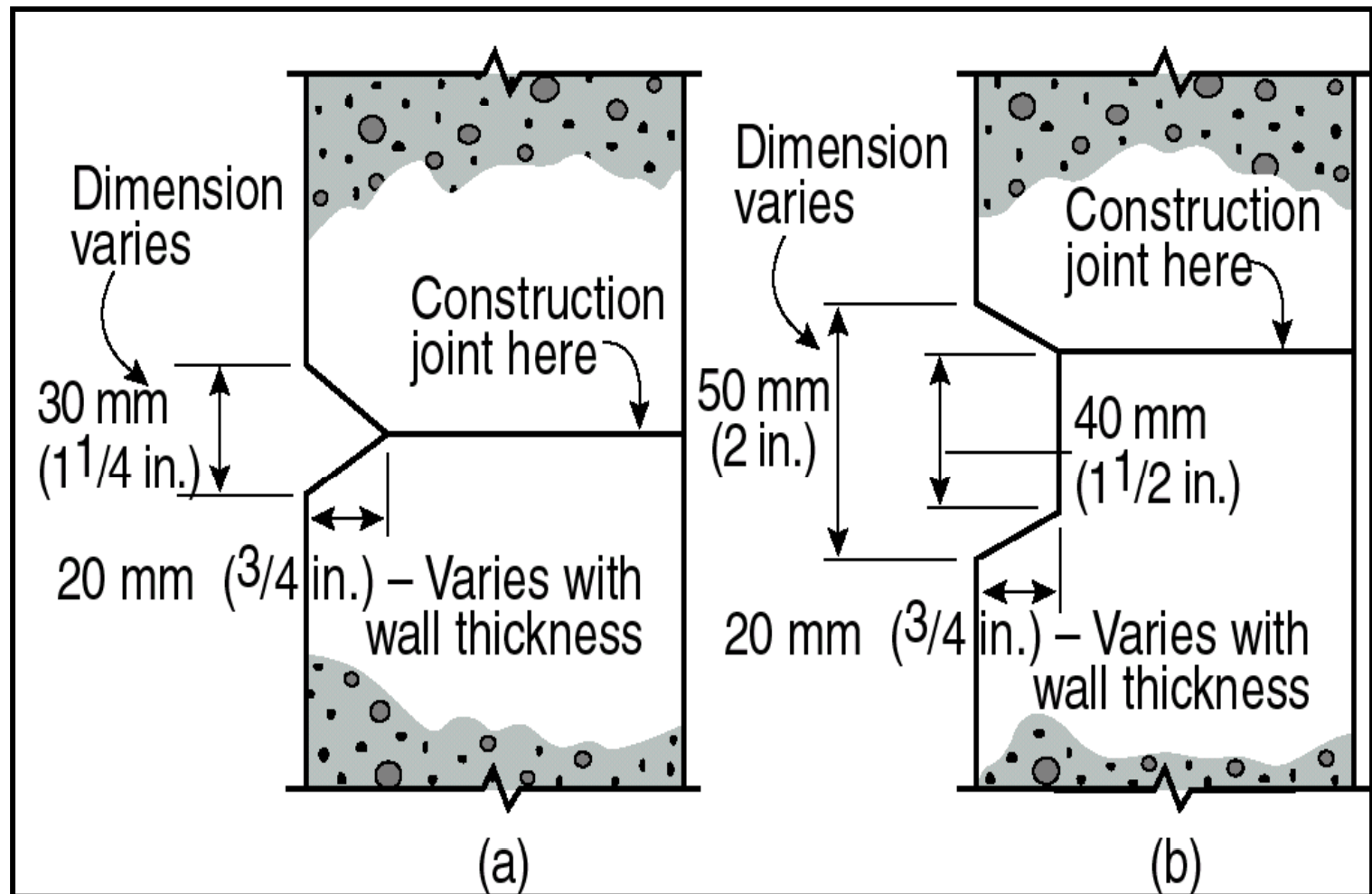
Construction Joints



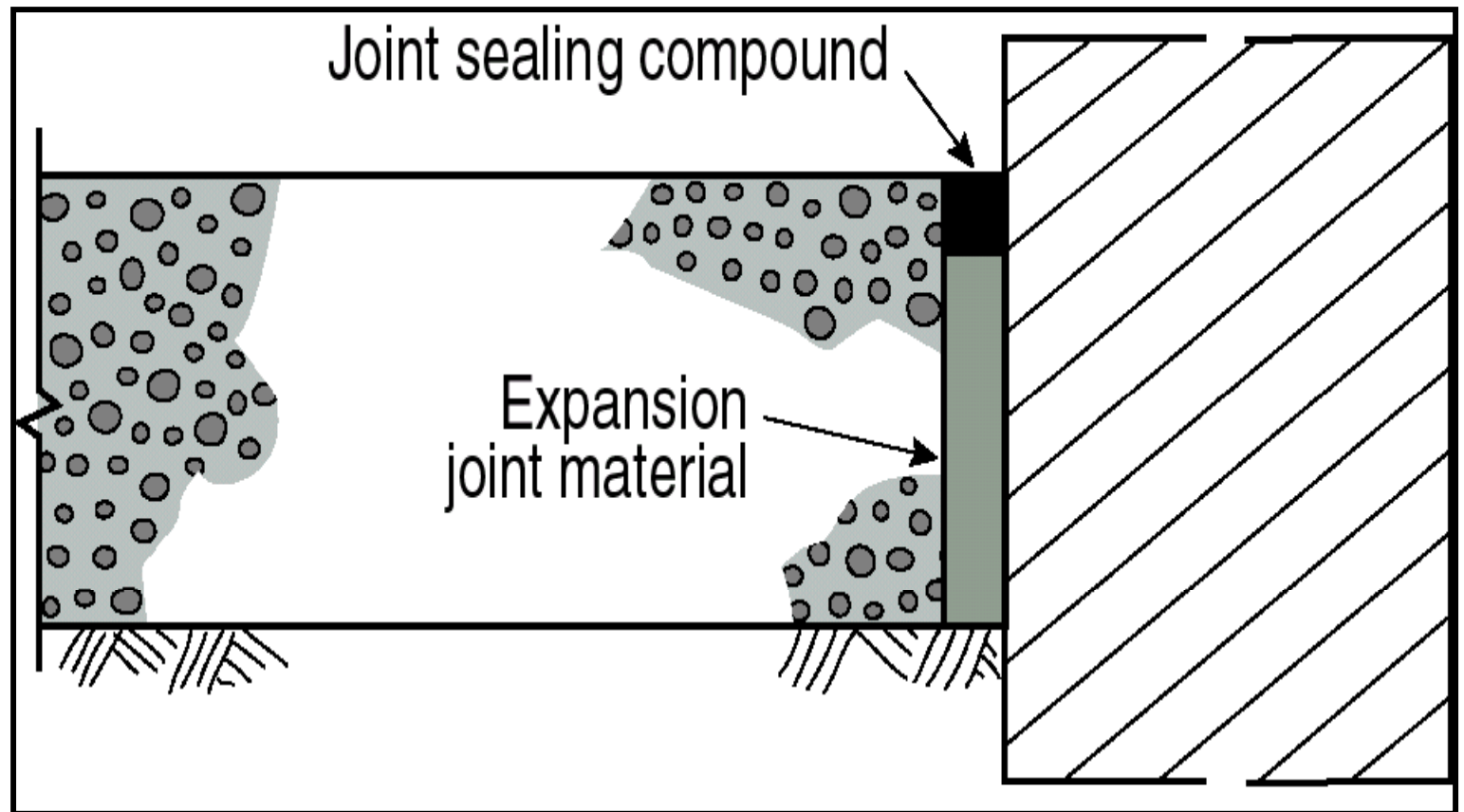
Horizontal Construction Joint



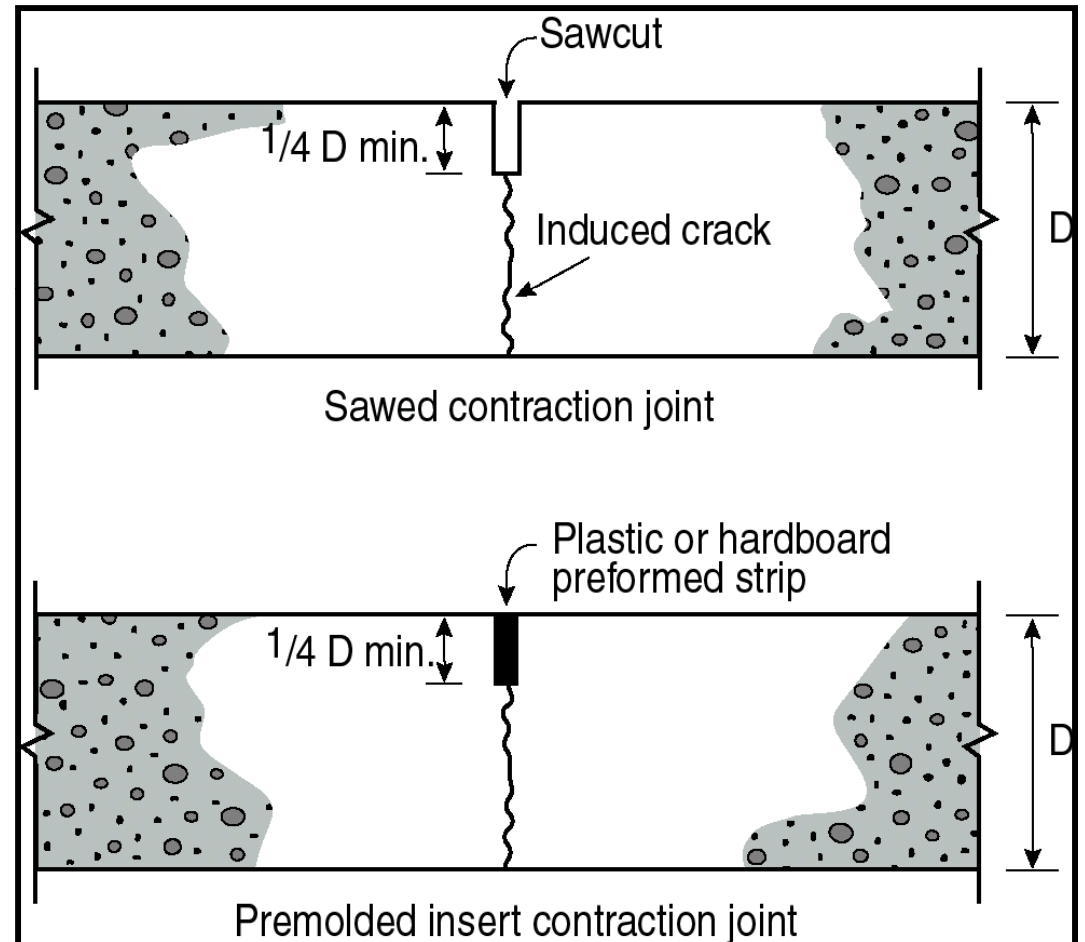
Horizontal Construction Joints



Isolation Joints



Contraction Joints



Making Contraction Joints

Grooving tool
on bull-float



Dry-cut sawing concrete



Spacing of Contraction Joints in Meters

Slab thickness, mm	Maximum-size aggregate less than 19 mm	Maximum-size aggregate 19 mm and larger
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

Metric



Spacing of Contraction Joints in Feet

Slab thickness, in.	Maximum-size aggregate less than $\frac{3}{4}$ in.	Maximum-size aggregate $\frac{3}{4}$ in. and larger
4	8	10
5	10	13
6	12	15
7	14	18
8	16	20
9	18	23
10	20	25

Inch-Pound

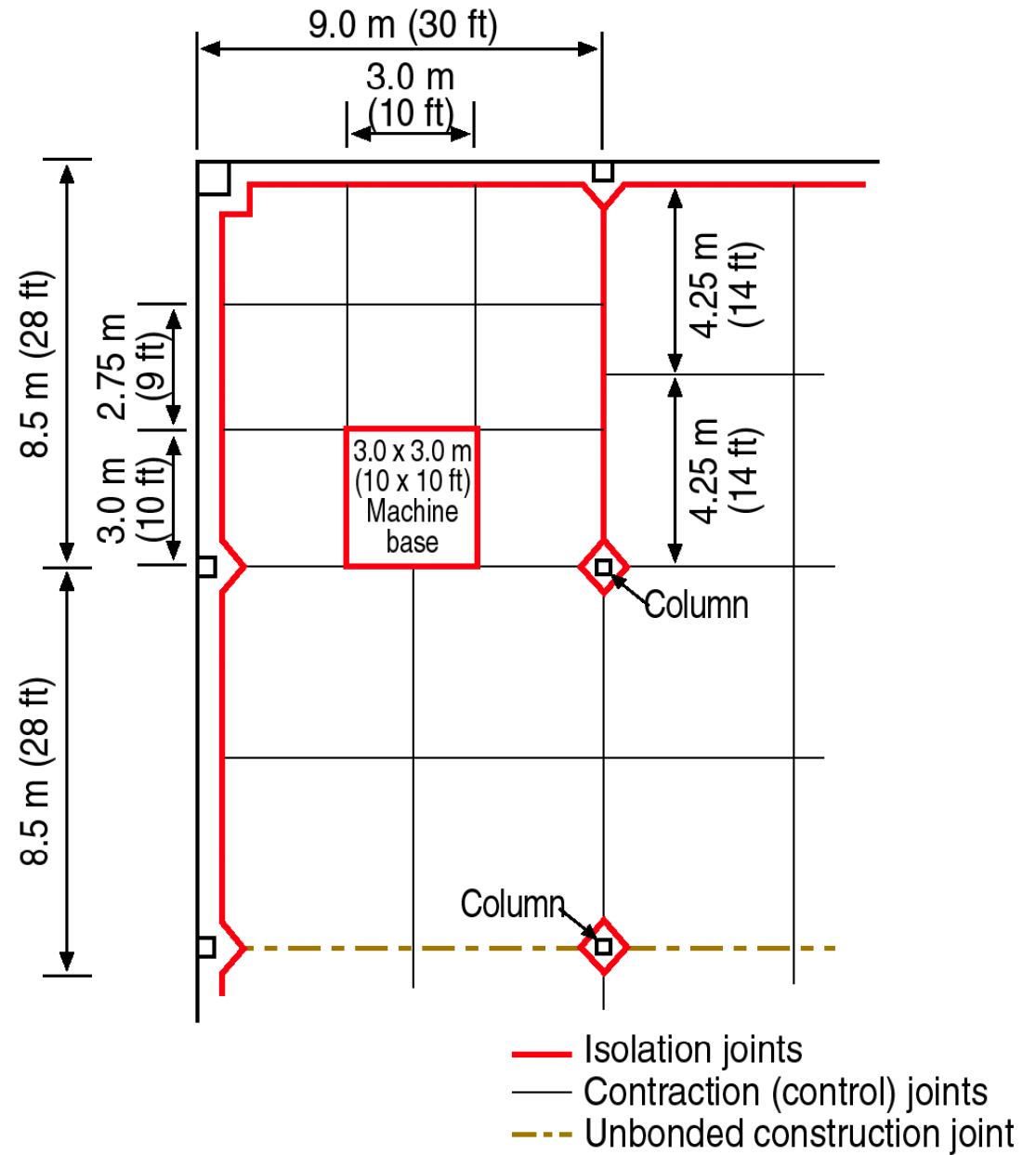


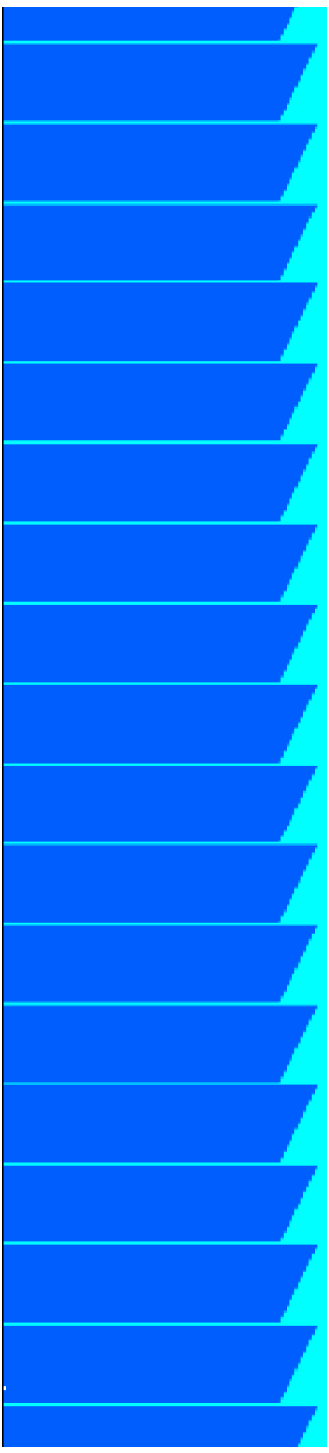
Joint Layout for Slabs

Basic Factors to Remember

- Panels created by contraction joints should be approximately square
- Panel aspect ratio max. $1\frac{1}{2}$ to 1
- Contraction (control) joints should only terminate at a free edge or at an isolation joint
- When joint spacing exceeds 4.5 m (15 ft), load transfer by aggregate interlock decreases significantly

Typical Joint Layout





What is the last and maybe most important step in the concrete finishing process?

- Cure the concrete!



Summary

- Preconstruction preparation
- Placing
- Finishing
- Jointing



● Questions?