PCA

Concrete Technology and Codes

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

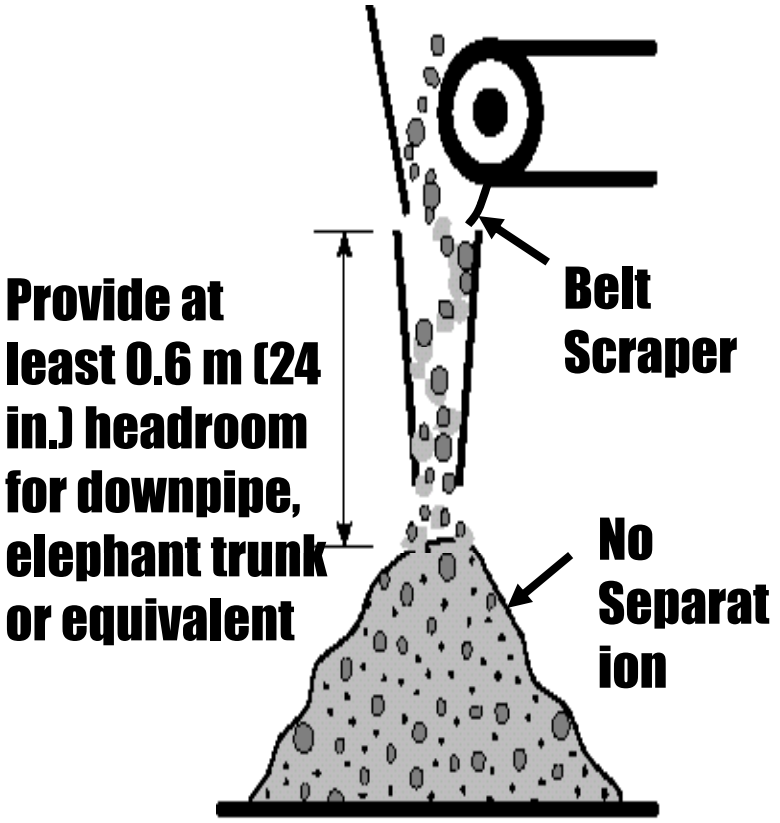
Concrete Placement Equipment

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

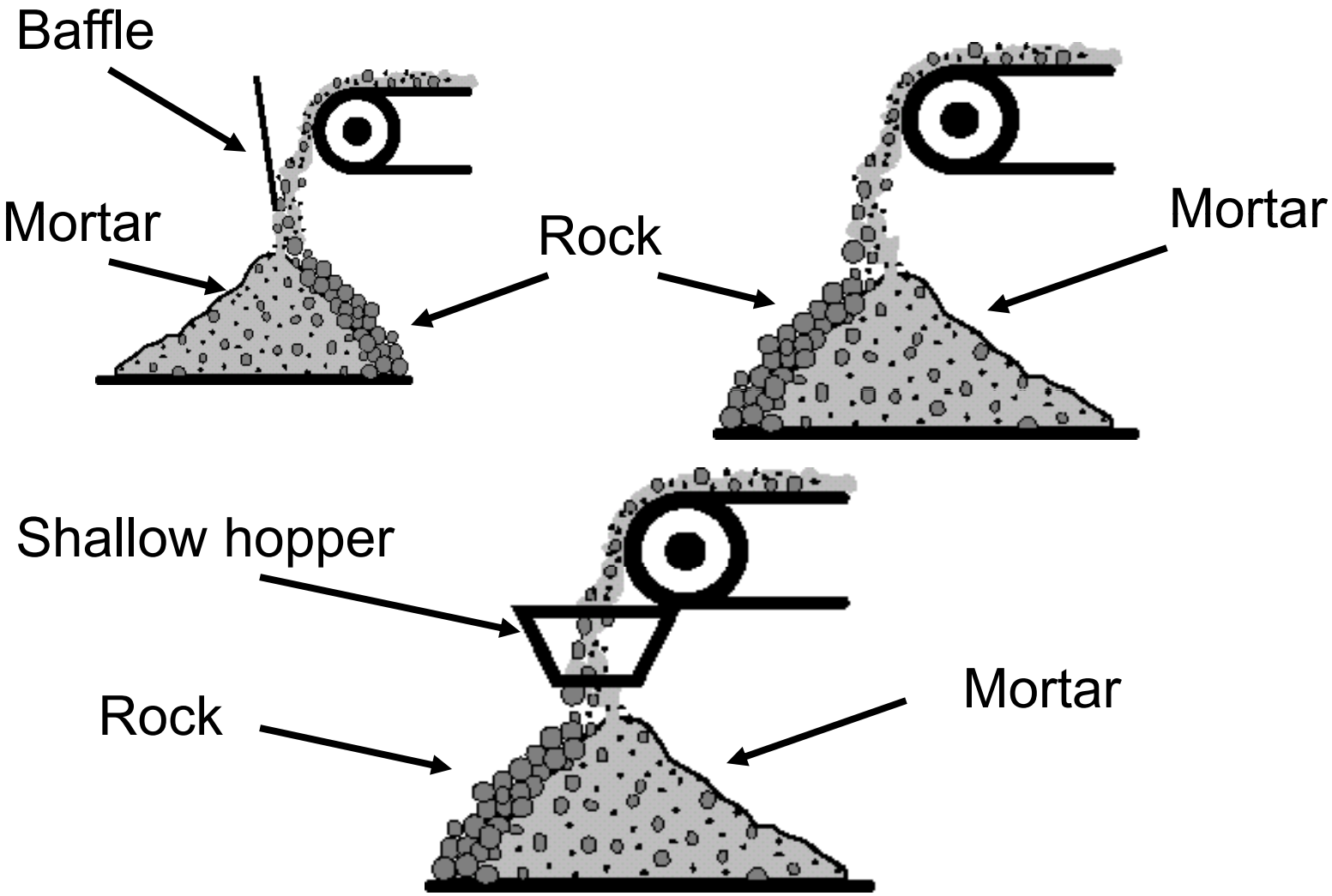
Chutes

Conveyors

Placement with Conveyor Belt



Incorrect Placement with Conveyor Belt



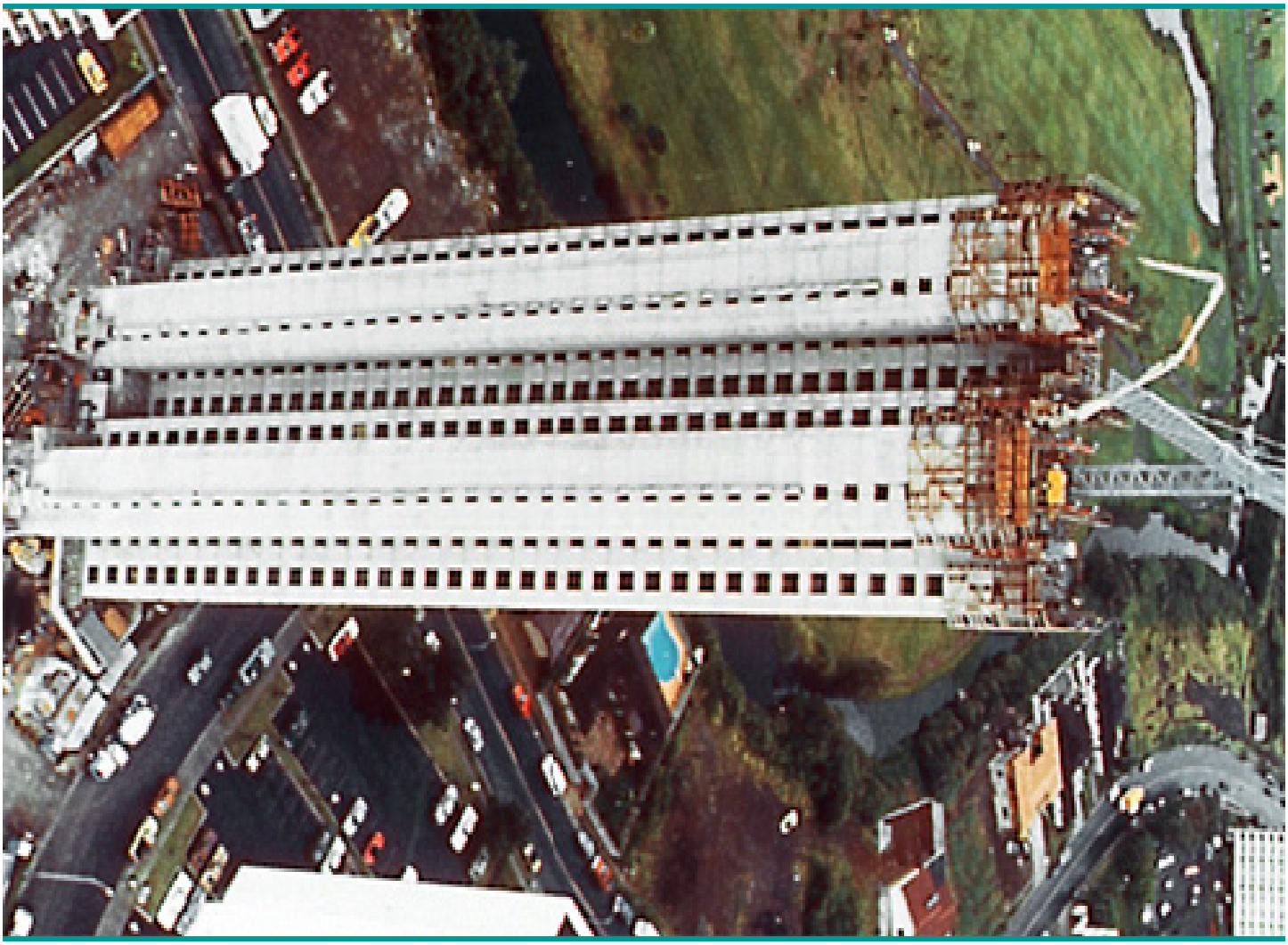
Cranes

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

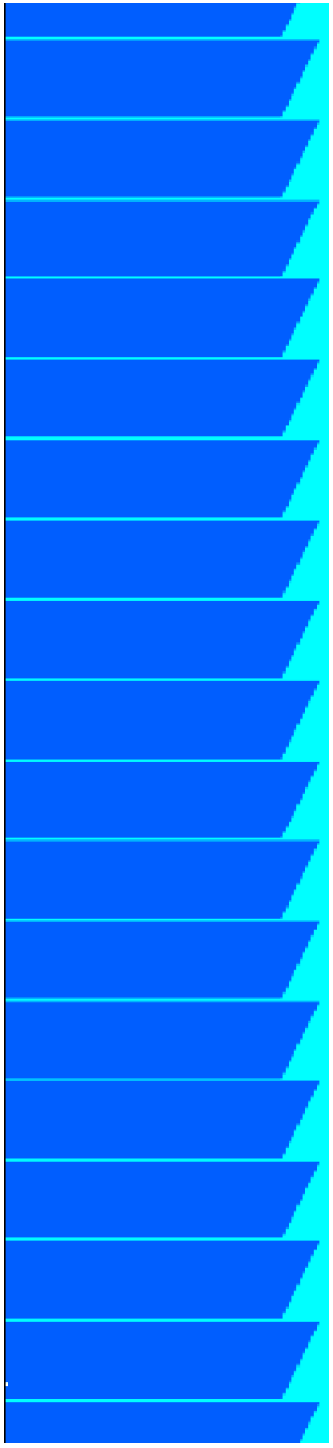
Dropchutes

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


HORNING
MORSOE

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

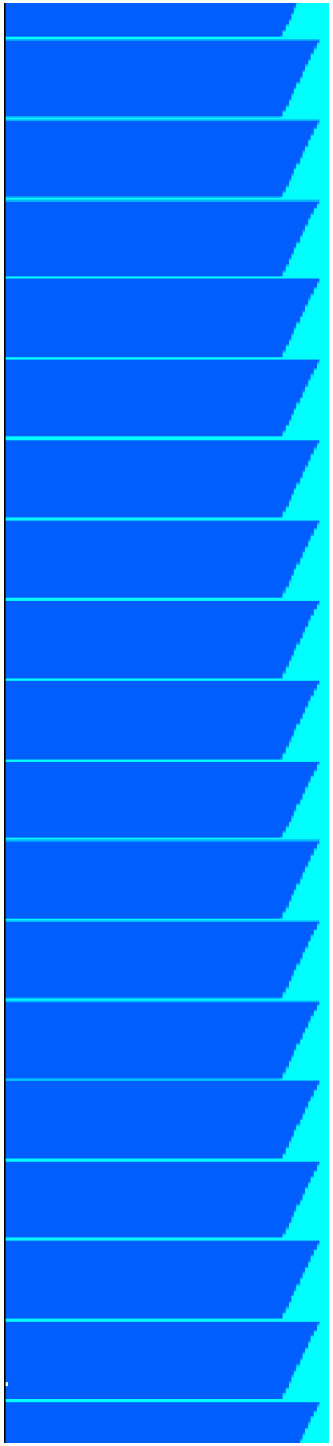
- DO NOT —
- (a) disturb saturated subgrades so bearing capacity is maintained
- (b deposit on frozen subgrade

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

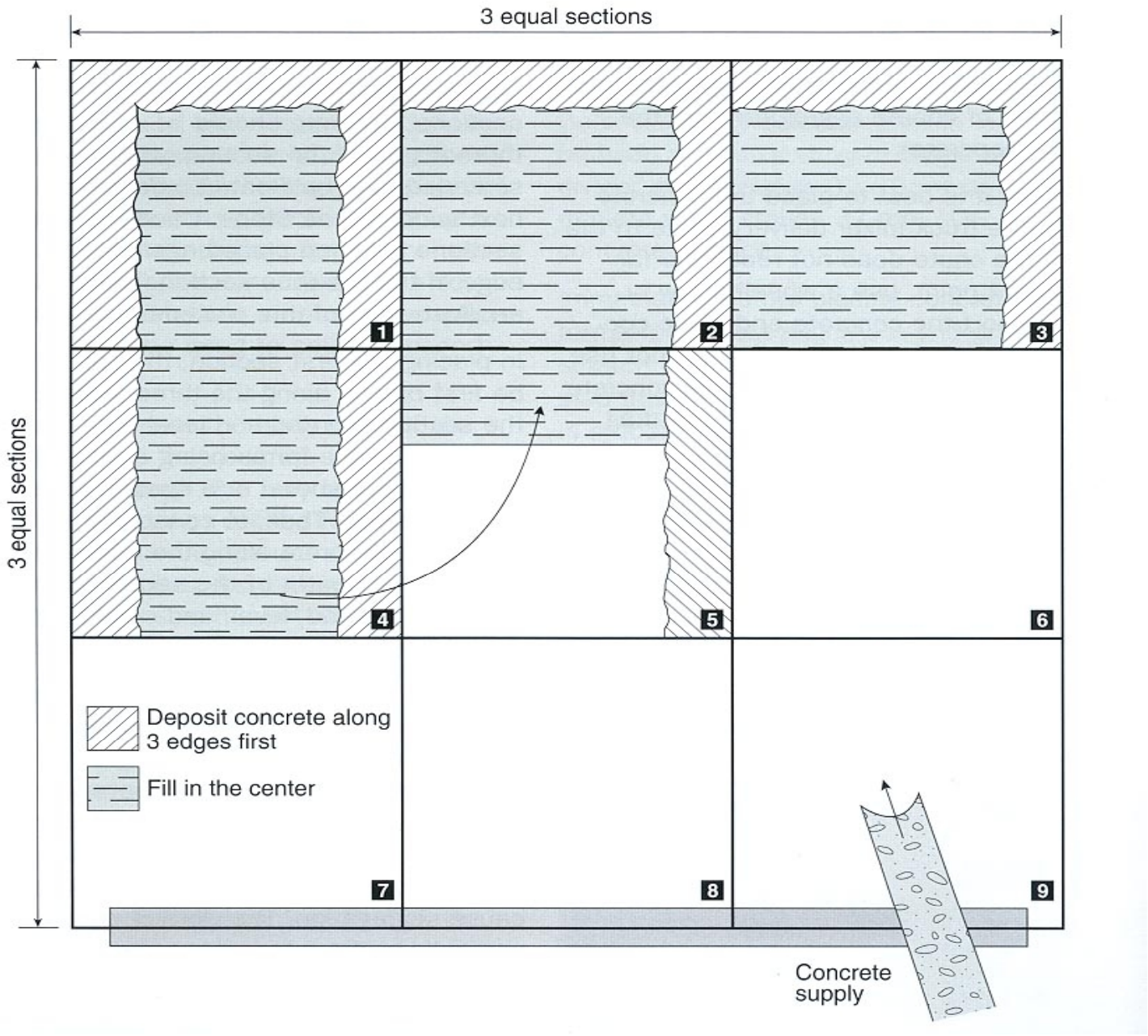


Placing Concrete

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)


3 equal sections
3 equal sections
1
2
3
4
5
6
7
8
9
Deposit concrete along 3 edges first
Fill in the center
Concrete supply

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

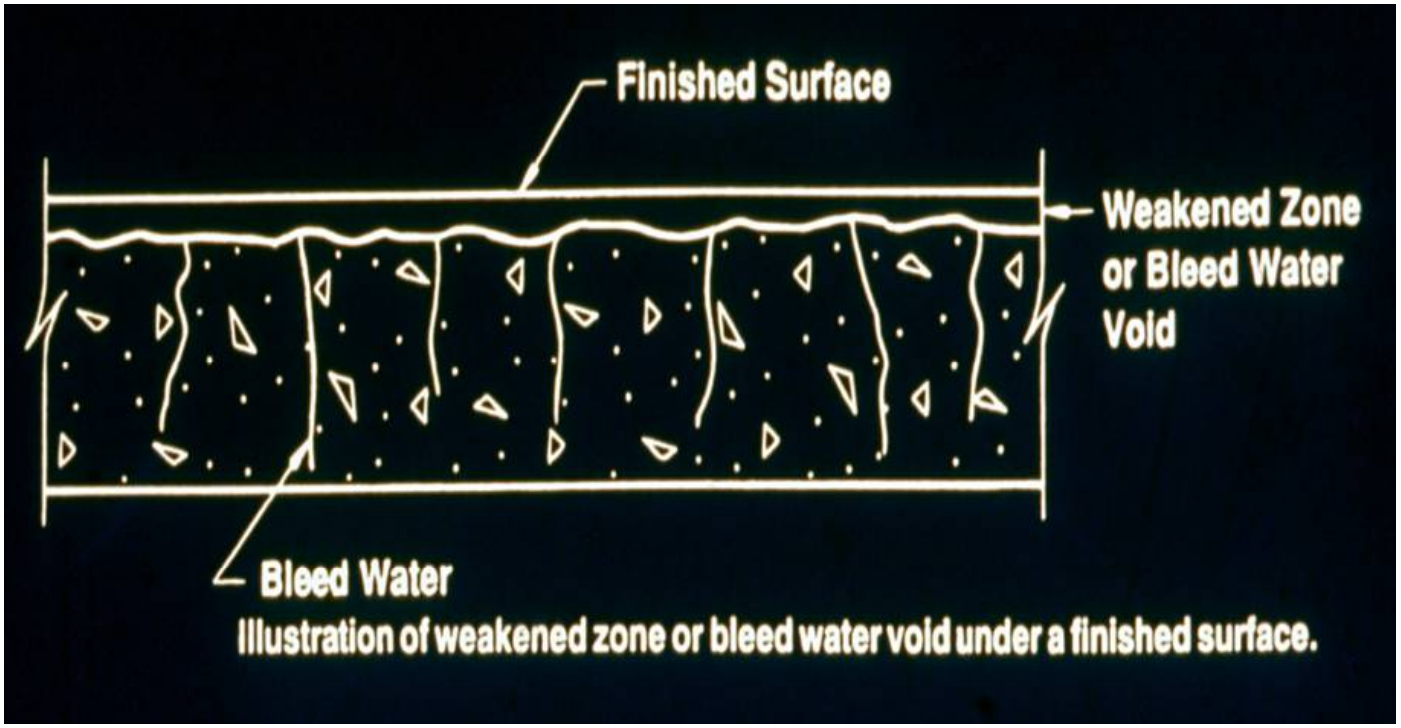
- Time Period When Various Finishing Procedures Should Be Executed Sequentially, Neither Too Early Nor Too Late in the Concrete-Hardening Process.

- *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)

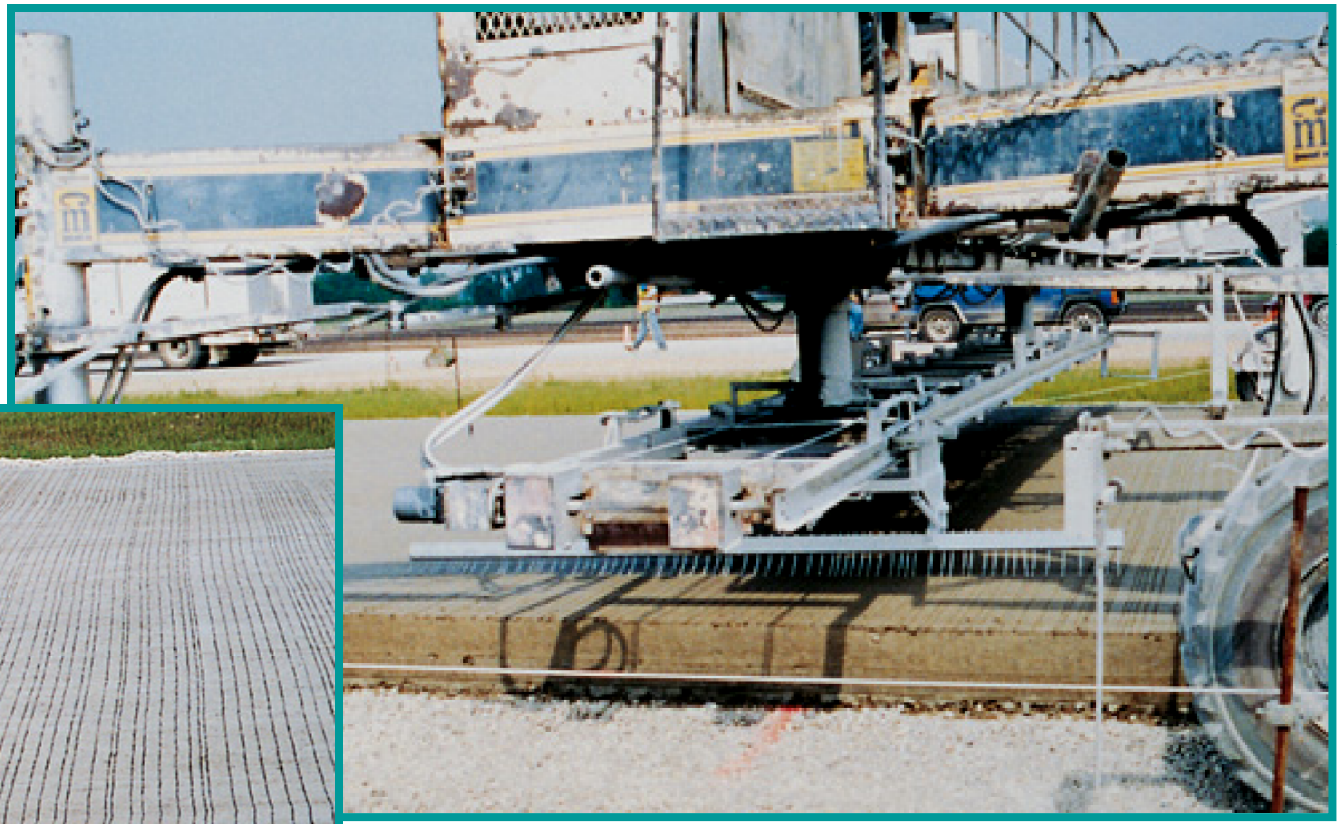
To embed aggregate particles just beneath the surface.
To remove slight imperfections, humps, and voids.
To compact the mortar at the surface in preparation for additional finishing operations.

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

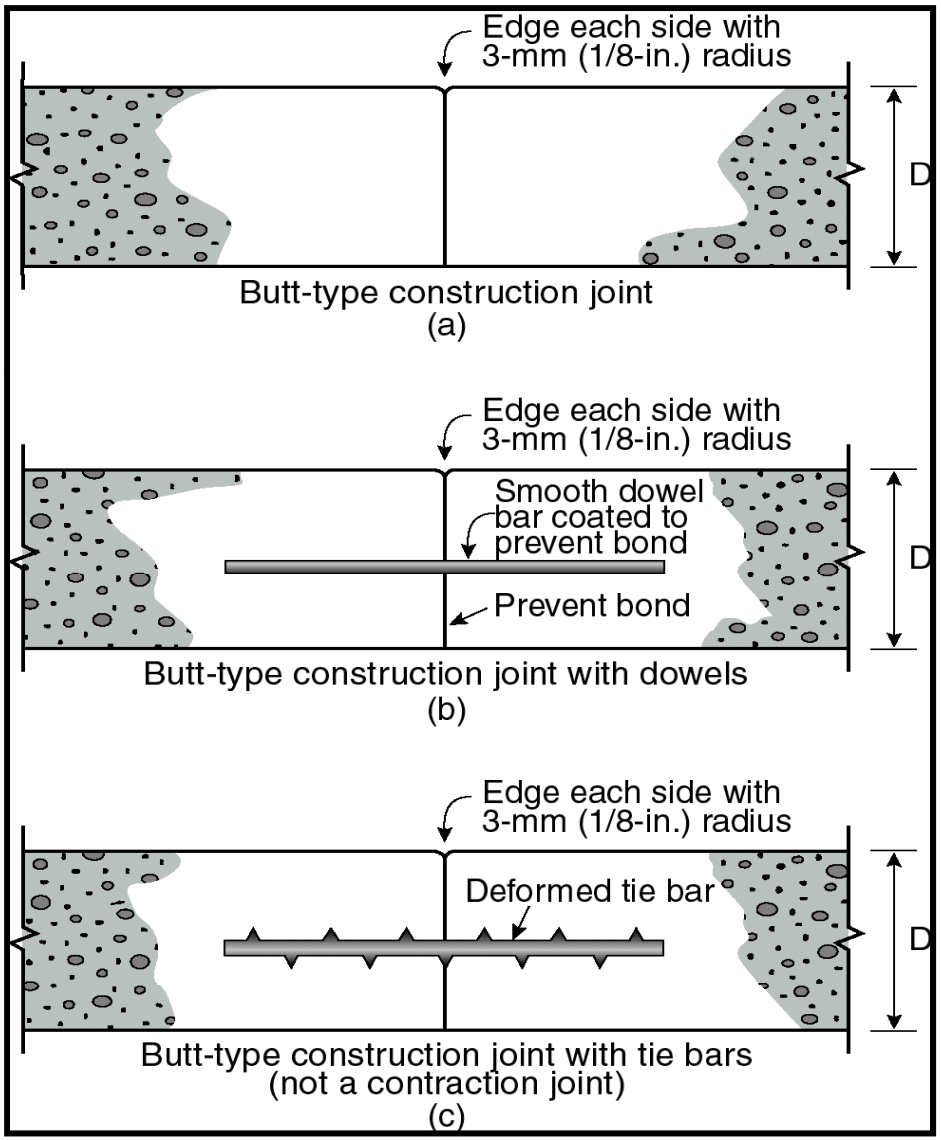
Tining



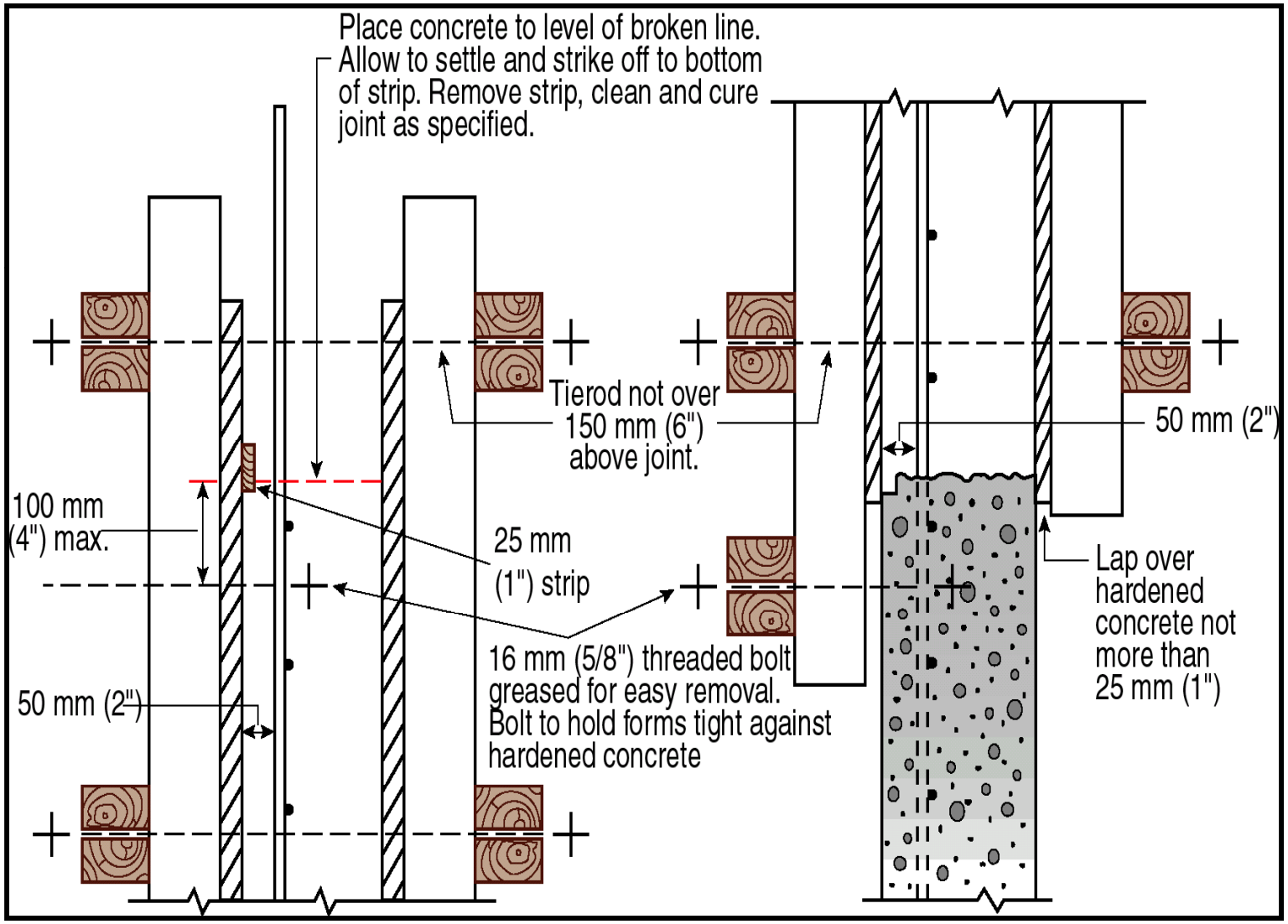
Joints in Concrete

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

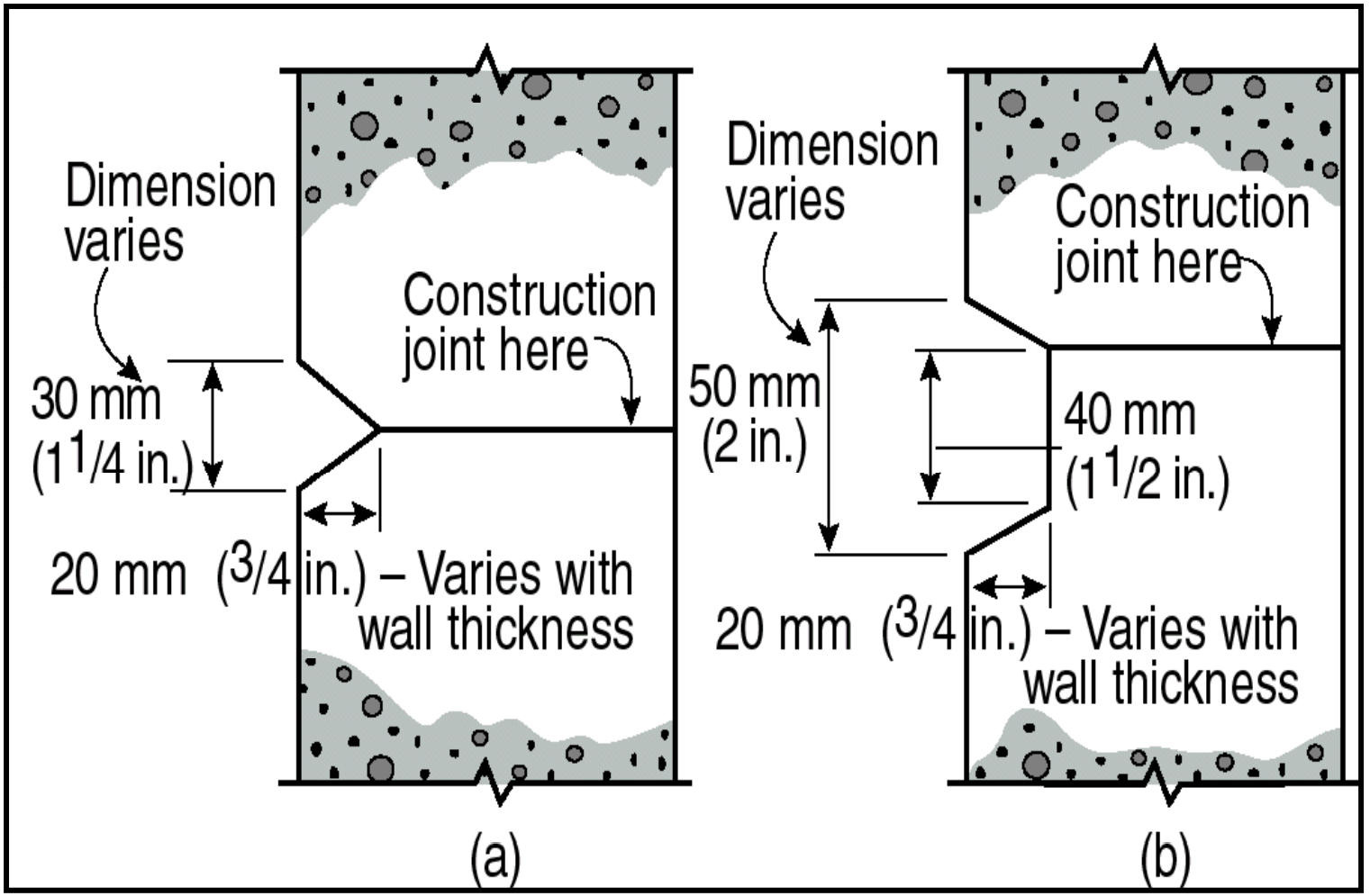
Construction Joints



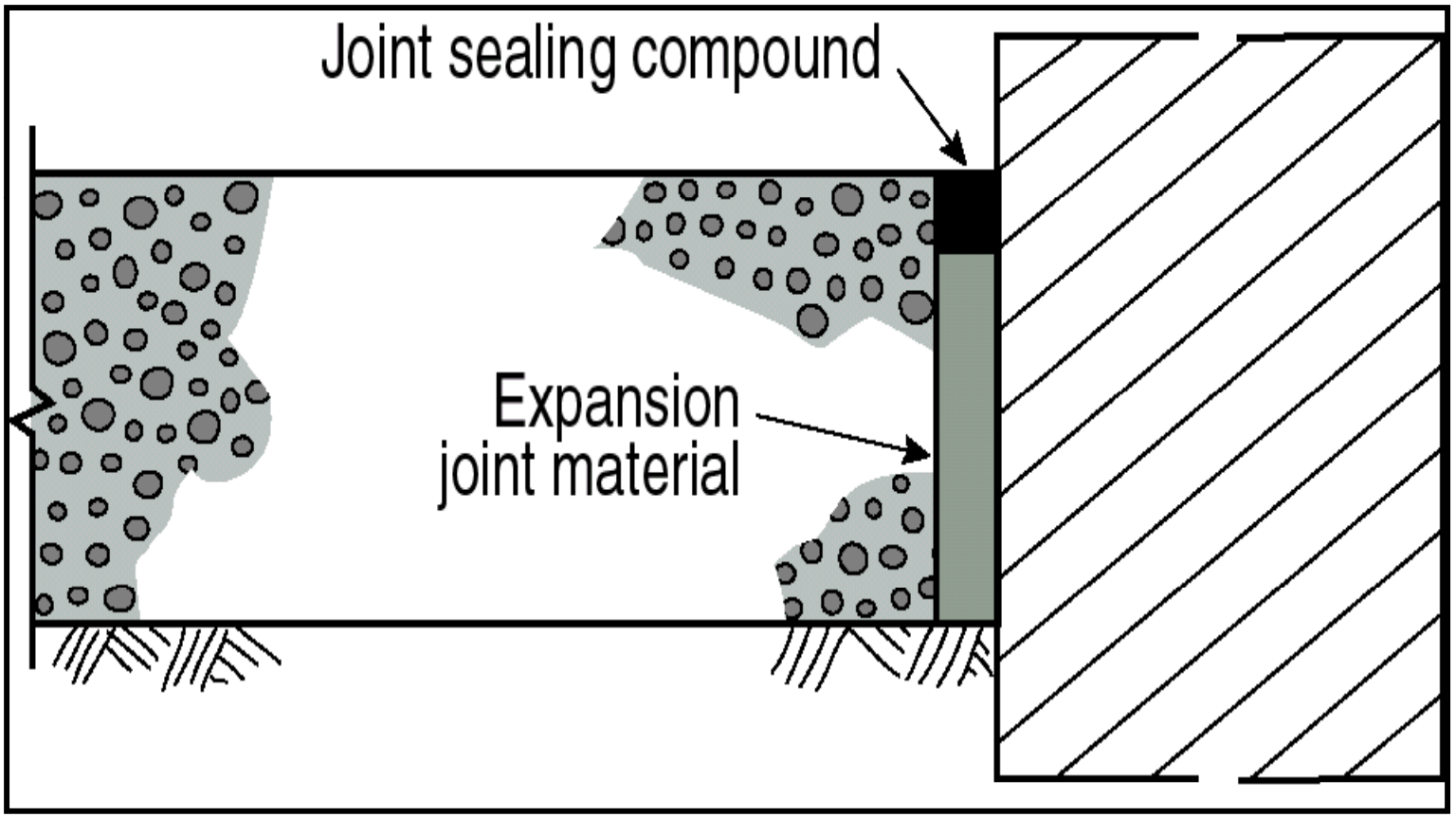
Horizontal Construction Joint



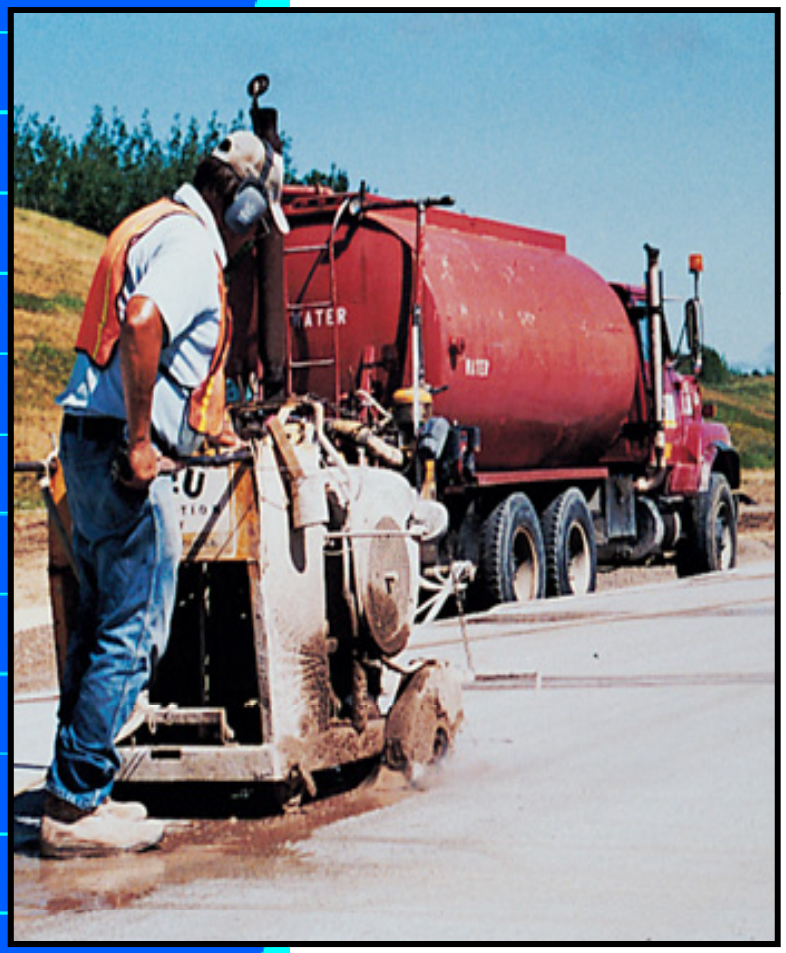
Horizontal Construction Joints

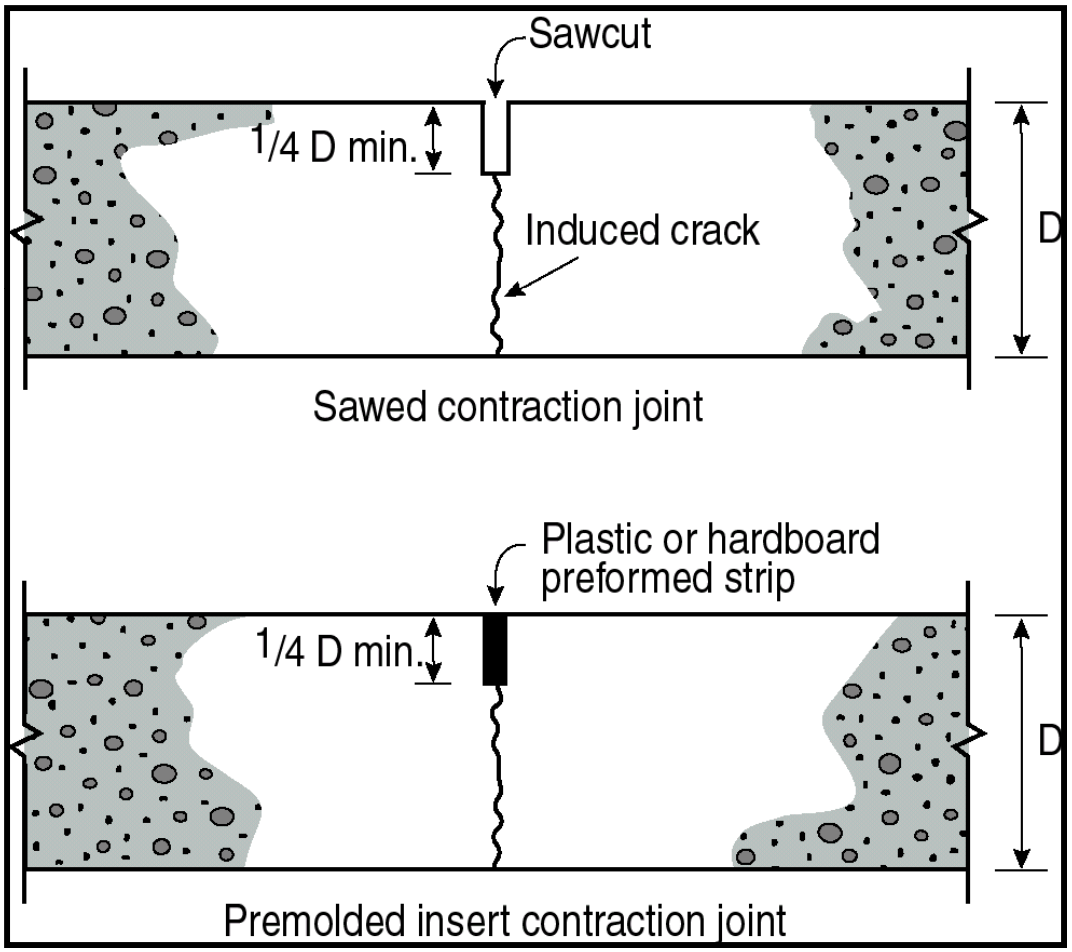


Isolation Joints



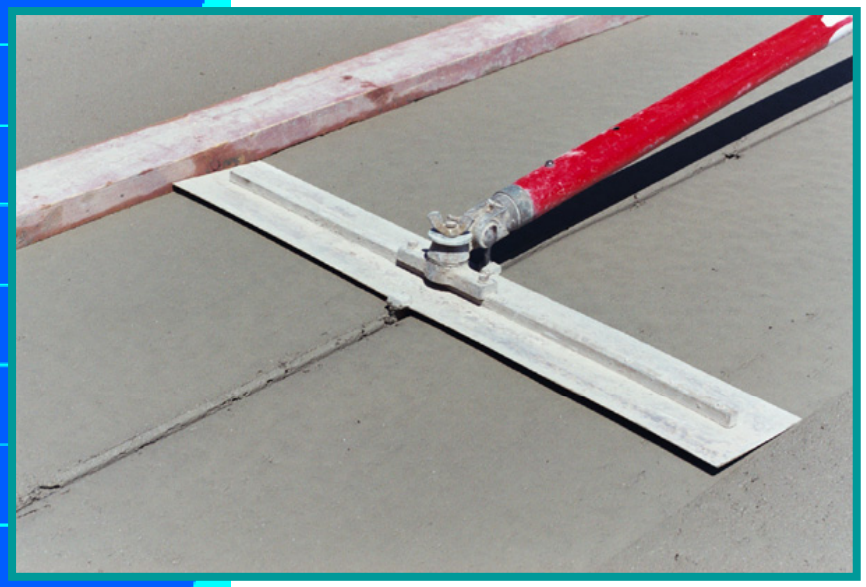
Contraction Joints





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 ¾ in.	Maximum-size aggregate ¾ in. and larger
4	8	10
5	10	13
6	12	15
7	14	18
8	16	20
9	18	23
10	20	25

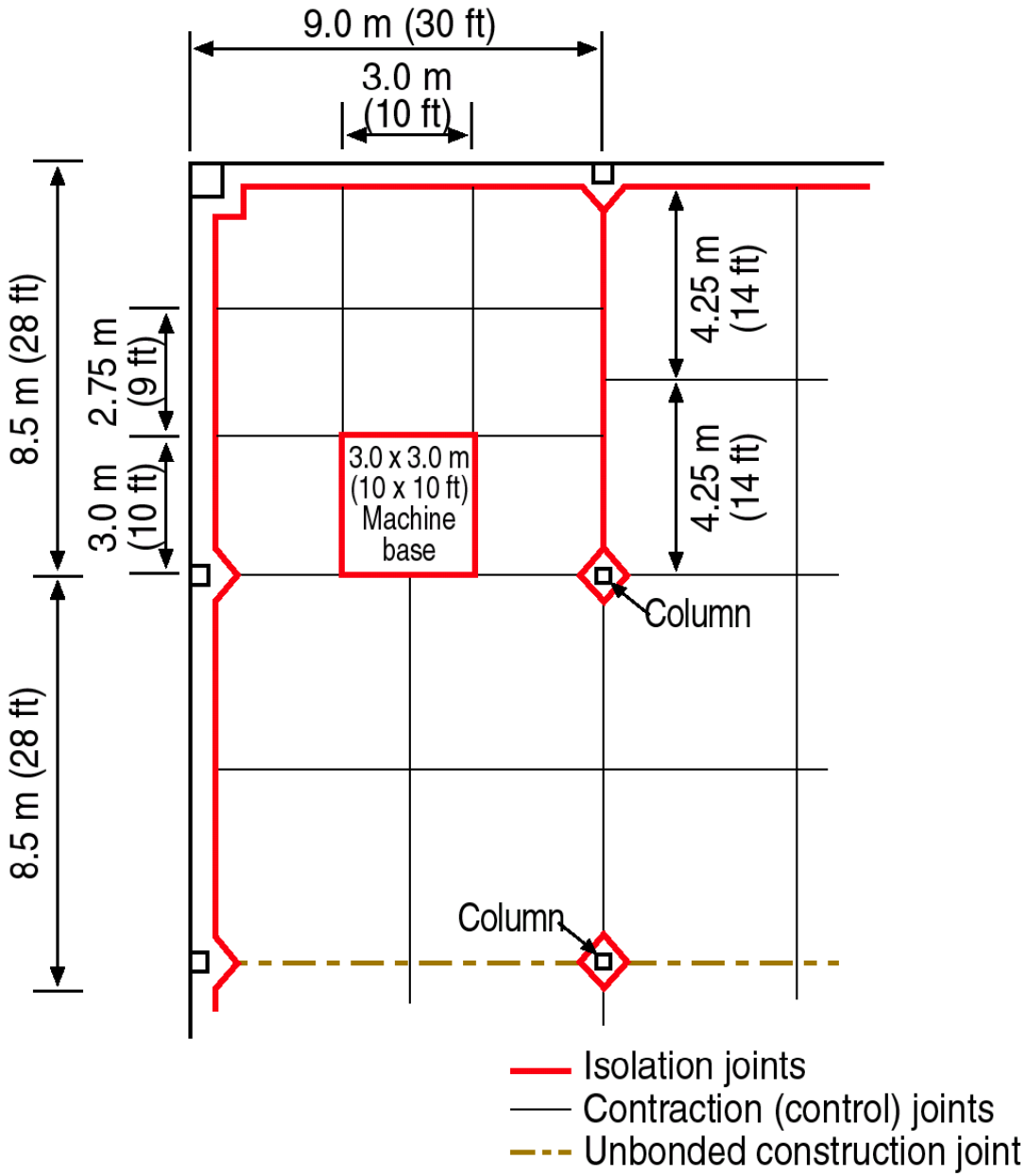
Inch-Pound

Joint Layout for Slabs

Basic Factors to Remember

- Panels created by contraction joints should be approximately square
- Panel aspect ratio max. 1½ 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?