Chapter 12

Concrete Construction

Part 2

12-2 CONCRETE CONSTRUCTION PRACTICES

- Concrete construction involves:
  - concrete batching,
  - mixing,
  - transporting,
  - placing,
  - consolidating,
  - finishing, and
  - curing.

12-2 CONCRETE CONSTRUCTION PRACTICES

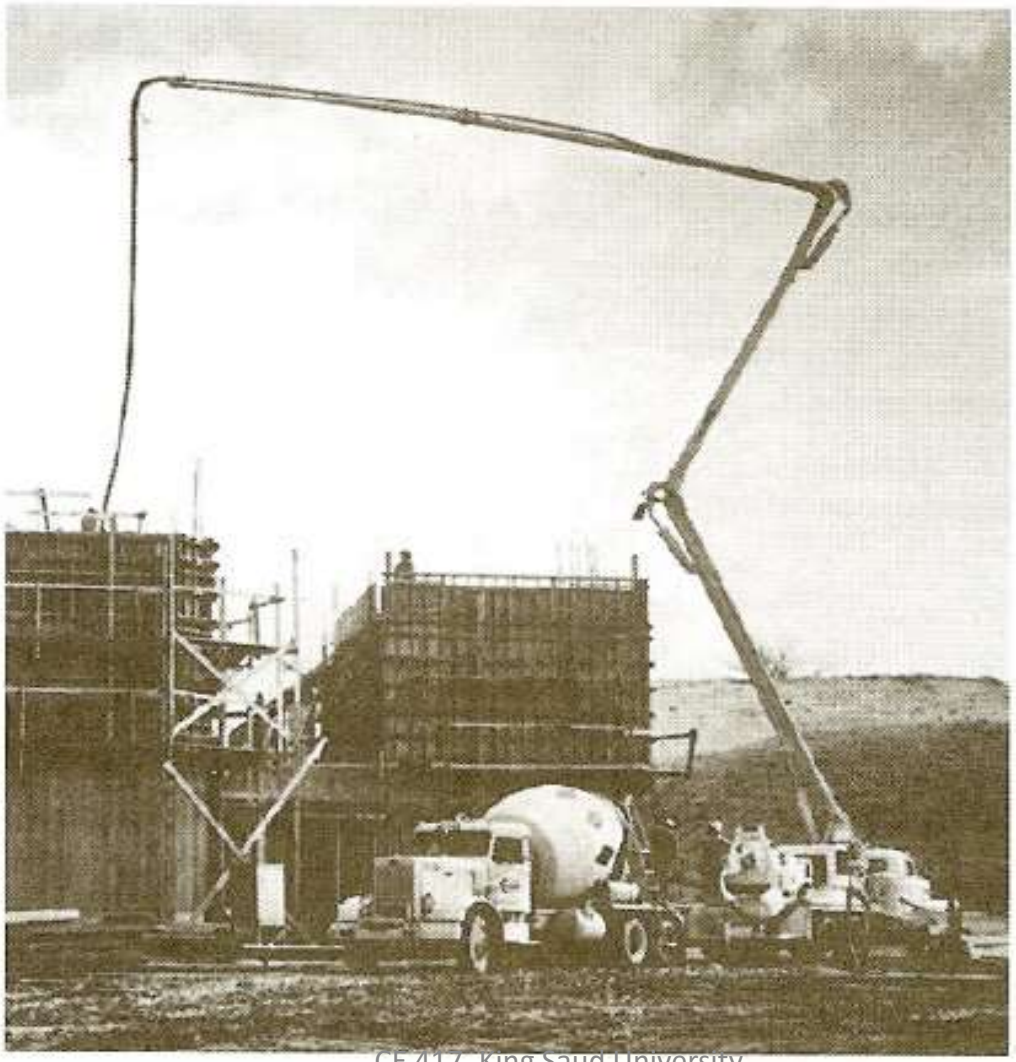
- Transporting and Handling
- Placing and Consolidating
- Finishing and Curing
- Hot-Weather Concreting
- Cold-Weather Concreting

Transporting and Handling

- A number of different items of equipment are available for moving concrete from the mixer to its final position.
  - wheelbarrows,
  - buggies,
  - chutes,
  - conveyors,
  - pumps,
  - buckets, and
  - trucks.
- care must be taken to avoid segregation when handling plastic concrete.

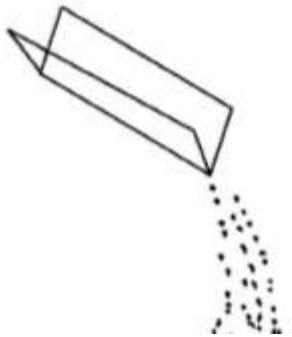
FIGURE 12-15: Concrete pump and truck mixer.

(Courtesy of Challenge-Cook Bros., Inc.)



Transporting and Handling

- Concrete conveyors: move concrete either horizontally or vertically.
- Chutes are widely used for:
  - moving concrete from the mixer to haul units, and
  - placing concrete into forms.



Transporting and Handling

- Truck mixers are equipped with integral retracting *chutes*
- It used for discharging concrete directly into forms within the radius of the chute.
- When chuting concrete,
  - the slope of the chute must be high enough to keep the chute clean
  - but not high enough to produce segregation of the concrete.

Placing and Consolidating

- *Placing:* the movement of plastic concrete into its final position (usually within forms).
  - Before placing concrete, the underlying surface and the interior of all concrete forms must be properly prepared.

Placing and Consolidating

- *Consolidation:* is the process of removing air voids in concrete as it is placed by using.
  - *Concrete vibrators*
    - hand rodding or spading may be employed.
  - Immersion-type electric,
  - pneumatic, or
  - hydraulic concrete vibrators are widely used.

Finishing and Curing

- *Finishing:* is the process of bringing the surface of concrete to its final position and imparting the desired surface texture.
- Finishing operations include:
  - Screeding: is the process of striking off the concrete in order to bring the concrete surface to the required grade

    https://www.youtube.com/watch?v=LSyTBM5nfMU
  - Floating: When the concrete has hardened enough, the concrete is floated with a wood or metal float,

    https://www.youtube.com/watch?v=aRFdoVcJAPc
  - Troweling: with a steel trowel follows floating when a smooth dense surface is desired, and

    https://www.youtube.com/watch?v=N1C-Zi-5qzE
  - brooming: the concrete may be *broomed* by drawing a stiff broom across the surface.

FIGURE 12-16: Roller finisher being used on large slab pour.
(Courtesy of CMI Corp.)

Hot-Weather Concreting

- The rate of hardening of concrete is greatly accelerated when concrete temperature is appreciably higher than the optimum temperature of 50 to 60°F (10 to 15.5°C).
- 90 degrees Fahrenheit (32°C) is considered a reasonable upper limit for concreting operations.

Cold-Weather Concreting

- The problems of cold-weather concreting are essentially opposite to those of hot-weather concreting.
- Concrete must not be allowed to freeze during the first 24 h after placing (to avoid permanent damage and loss of strength).
  - Keep Minimum 50°F (l0°C) for at least 3 days after placing.
  - Use Type III (high early strength) cement or
  - Use an accelerator to reduce concrete setting time during low temperatures

12-3 CONCRETE FORMWORK

- General Requirements for Formwork
- Typical Formwork
- Minimizing Cost of Formwork
- Construction Practices
- Formwork Safety

General Requirements for Formwork

- The principal requirements for concrete formwork are that it be:
  - safe,
  - produce the desired shape and surface texture, and
  - be economical.
- Procedures for designing formwork that will be safe under the loads imposed by:
  - plastic concrete,
  - workers and other live loads, and
  - external forces (such as wind loads)

FIGURE 12-18: Typical wall form.

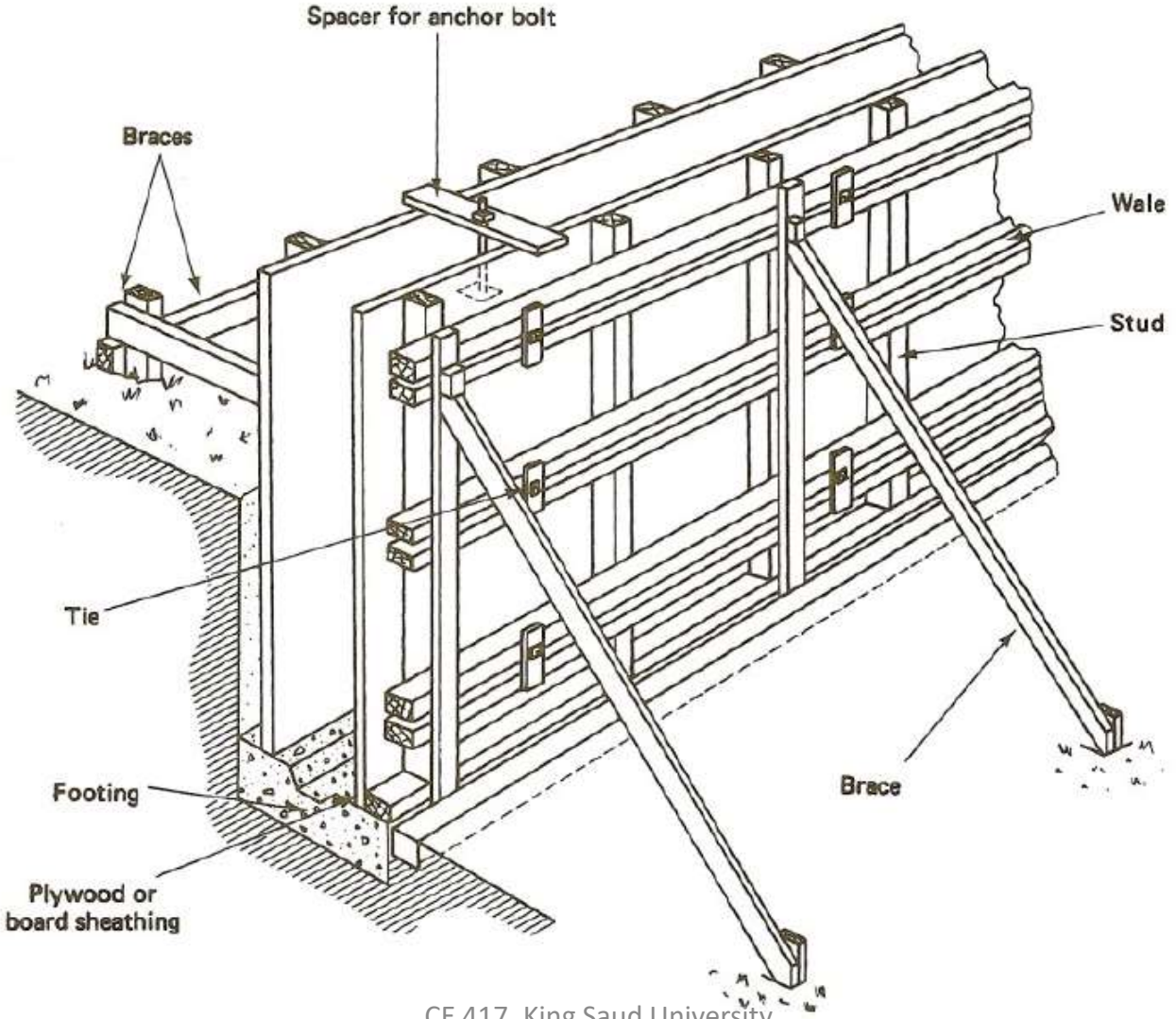


FIGURE 12-20: Typical column form.

(U.S. Department of the Army)

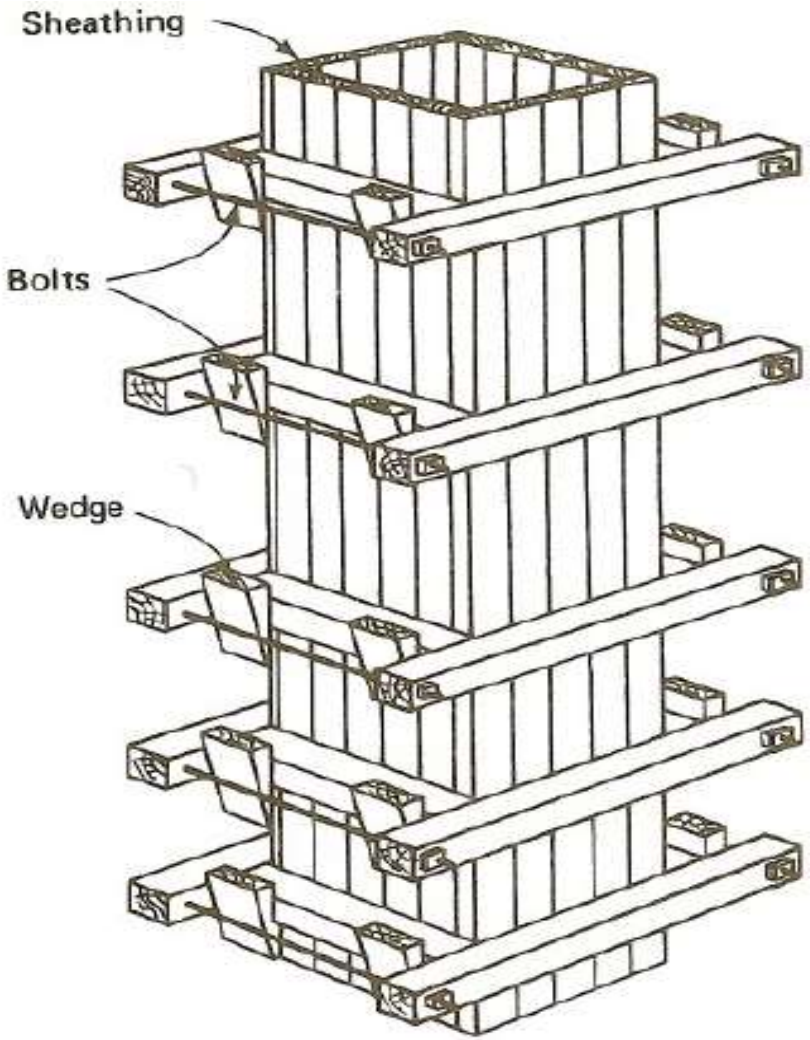


FIGURE 12-21: Form for elevated slab.

(Courtesy of American Concrete Institute)

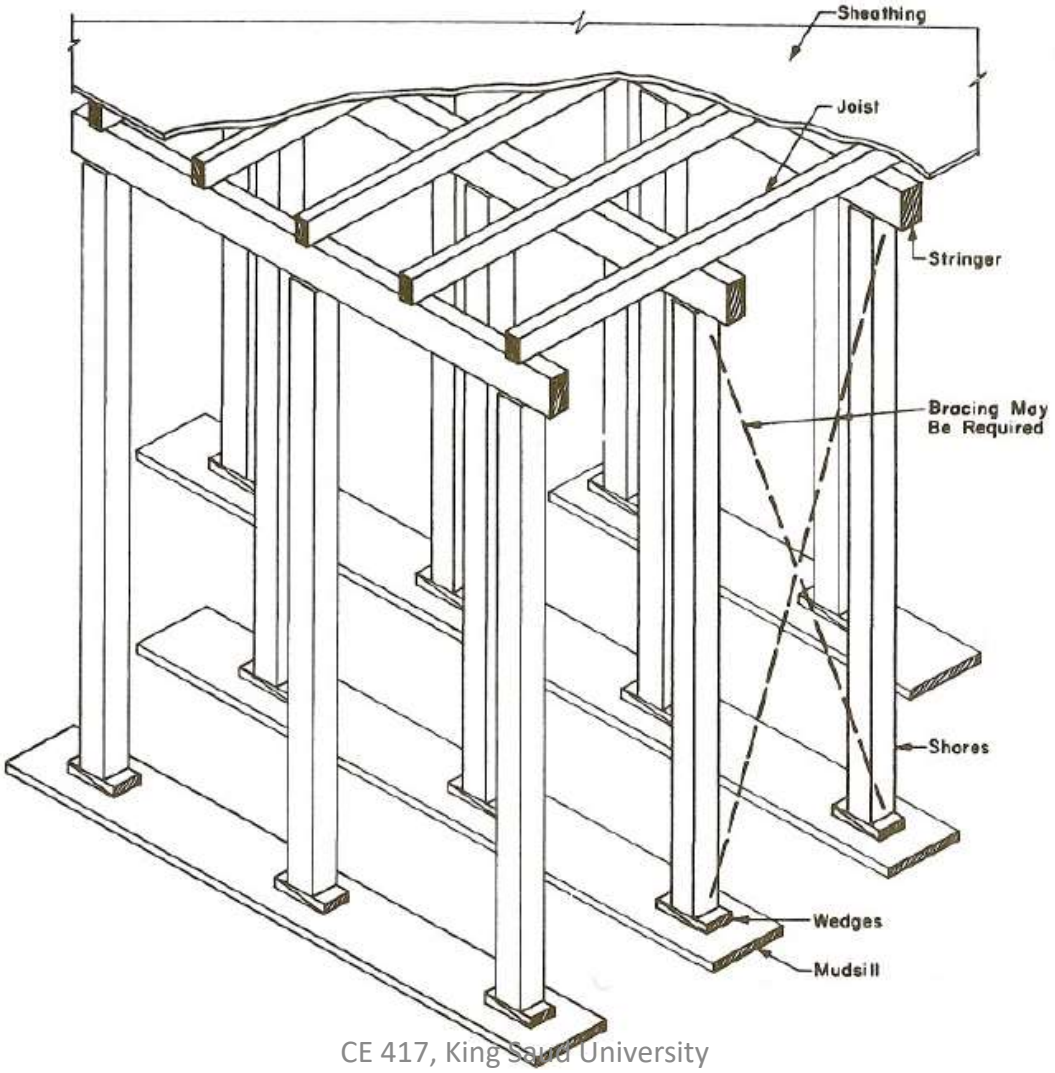


FIGURE 12-22: Beam and slab form.
(Courtesy of American Concrete Institute)

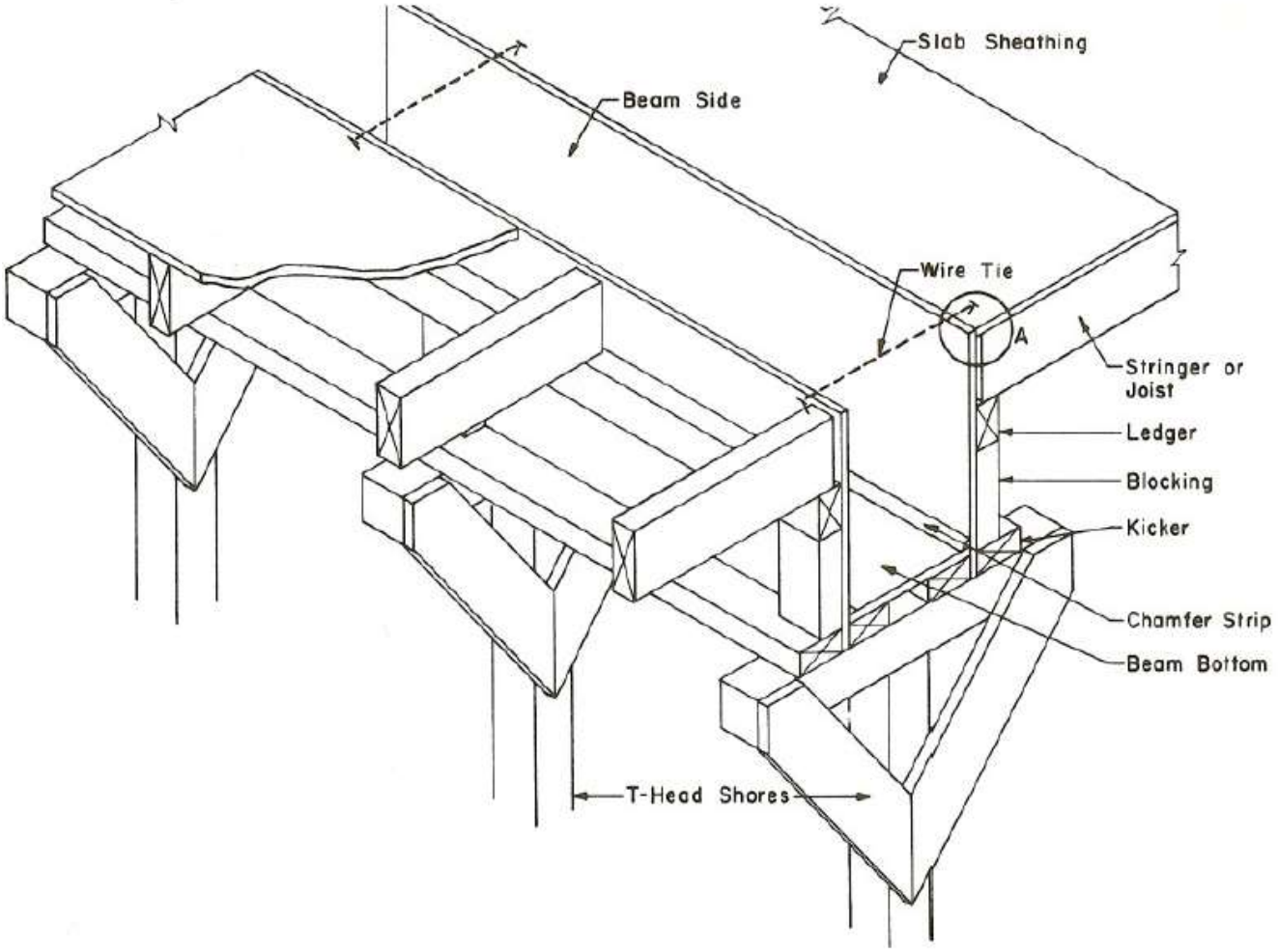


FIGURE 12-23: One-way slab form.

(Courtesy of American Concrete Institute)

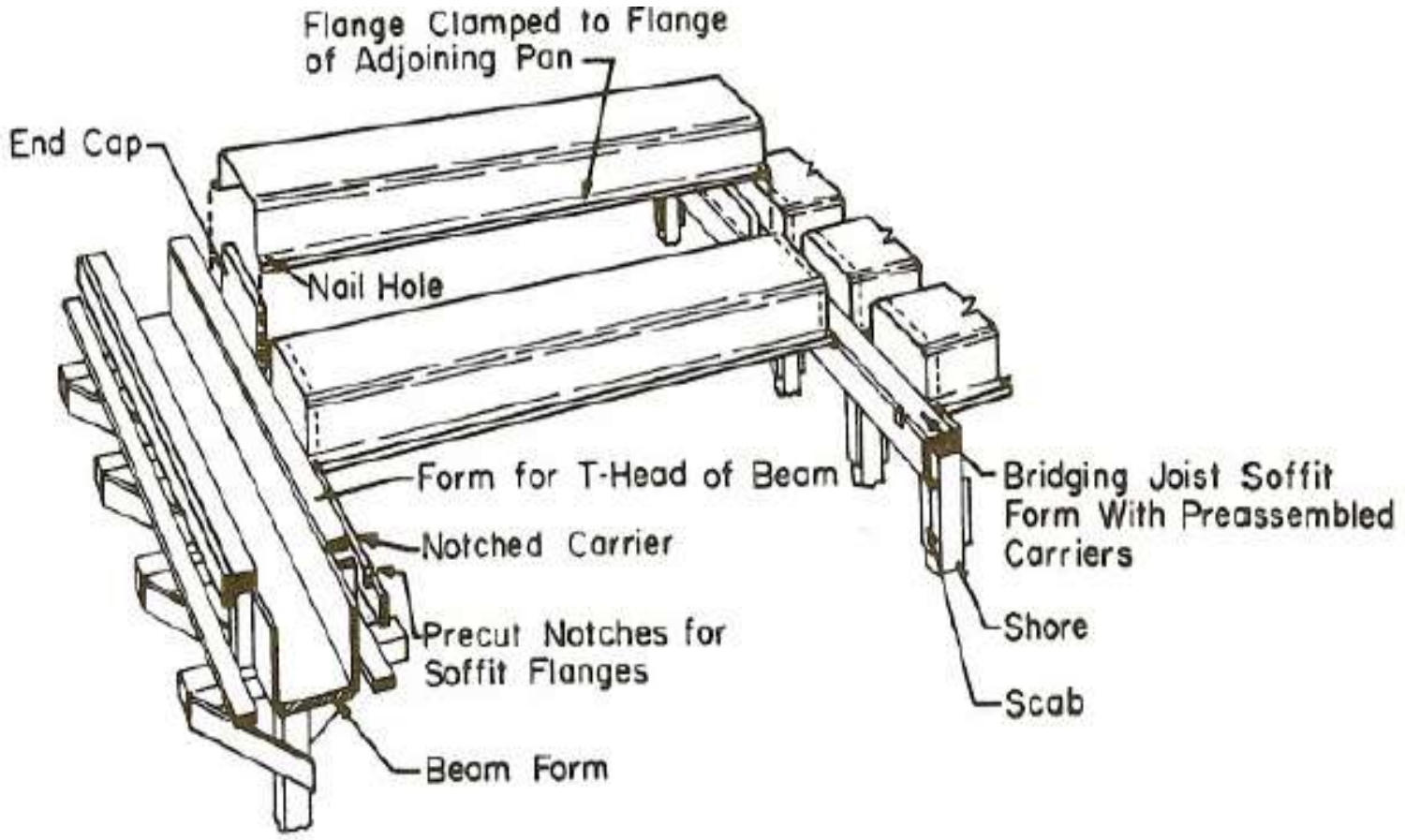


FIGURE 12-24: Two-way slab form.
(Courtesy of American Concrete Institute)

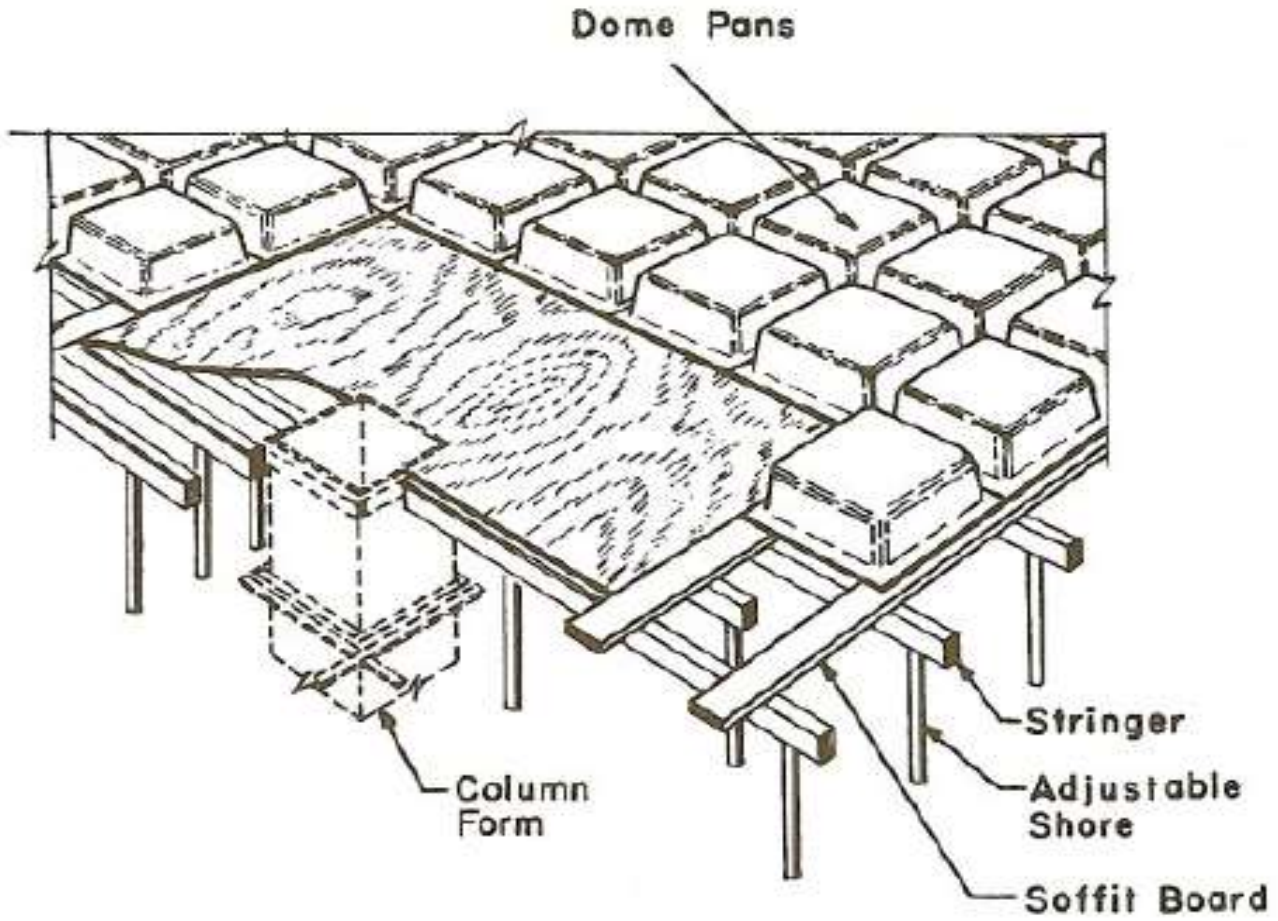
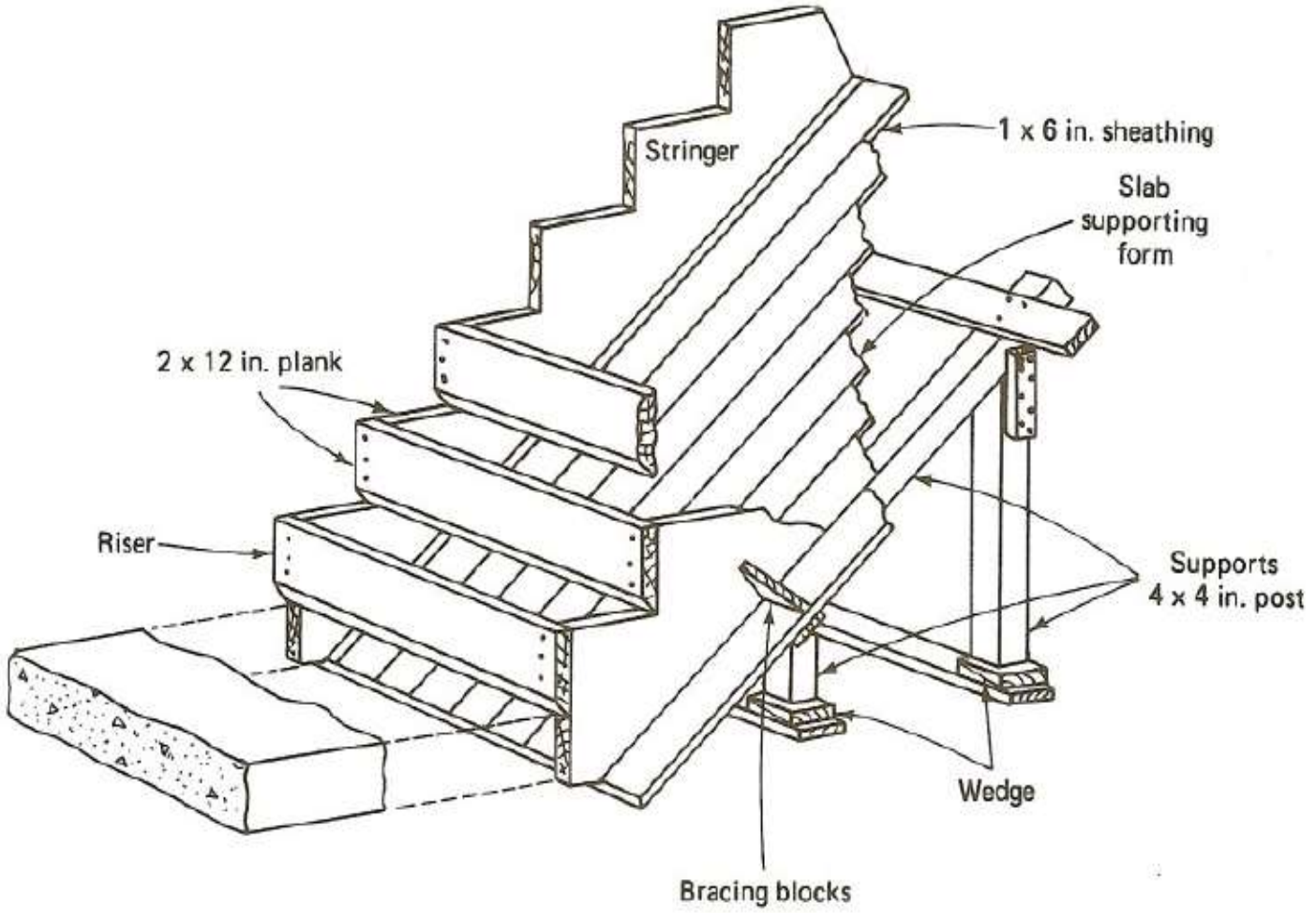


FIGURE 12-25: Wood form for stairway.

(U.s. Department of the Army)



Minimizing Cost of Formwork

- repetitive use of forms can lower formwork cost.
- Multiple-use forms may be either:
  - standard commercial types or
  - custom-made by the contractor.
    - use assembly-line techniques whenever possible.
- *Flying forms* (Figure 12-26)*:* are often economical in repetitive types of concrete construction.
- use of *slip forms* and *tilt-up construction* techniques (*Where appropriate*)

FIGURE 12-26: Repositioning flying form.
(Courtesy of Lorain Division, Koehring Co.)

Formwork Safety

1) Provide adequate foundations for all formwork.
2) Provide adequate bracing of forms.
3) Control the rate and location of concrete placement so that design loads are not exceeded.
4) Ensure that forms and supports are not removed before the concrete has developed the required strength.
5) When placing prefabricated form sections in windy weather, care must be taken to avoid injury due to swinging of the form caused by wind forces.
6) Clean the site from the nails.