PLACING CONCRETE

CONCRETE
STANDARD ENGINEERING SPECIFICATION

ISSUED	NOV 1966
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SB 9 U

1. SCOPE

1.1 This specification describes the methods and general requirements for the preparation and placement of concrete.

1.2 See SB18.1U and SB18.3U for placing concrete in piles.

2. GENERAL

2.1 References to specifications and standards published by national societies and associations including Du Pont standards or specifications, to which compliance is required by Du Pont, shall be the latest issue published at time of order.

2.2 For limitations on placing aluminum conduit in concrete, see E7V.

3. PREPARATION

3.1 Formwork shall be completed and reinforcement secured in place, including expansion-joint materials, anchors, inserts, and other embedded items required by the trades involved. Ice, excess water, and debris shall be removed and the entire preparation shall be approved by Du Pont.

3.2 Forms shall be oiled or thoroughly wetted as set forth in SB7U.

3.3 The inner faces of equipment used for mixing and conveying concrete shall be clean and free of hardened concrete, oils, greases, and other foreign substances.

3.4 Subgrades shall be moistened uniformly and sufficiently to eliminate absorption of concrete moisture. Care shall be taken not to cause pools of water or a muddy subgrade. Coarse porous subgrades shall be covered with reinforced paper or polyethylene film to prevent escape of concrete ingredients. A covering is not required for sand, sand-clay, or clay subgrades, except when a membrane moisture barrier is required. Installation, when required, shall be per SB15U, 4.2.1. **Note:** Concrete shall not be placed on frozen subgrade.

4. HANDLING

4.1 Concrete shall be handled from the mixer to the place of final deposit as rapidly as possible, by methods which will prevent segregation or loss of ingredients, and in a manner which will assure that the required quality of concrete is obtained. Concrete shall be deposited continuously to prevent cold joints, and as nearly as practicable in its final position. It shall not be placed in large quantities at a given point and be allowed to flow or be worked more than a distance of 5 feet because this will cause segregation of the aggregates.

4.2 If a vertical section cannot be placed continuously, it shall be placed in horizontal layers of uniform thickness, each layer thoroughly compacted before the next is placed. Layers should be 6 inches to 12 inches thick for reinforced members, and up to 18 inches thick for mass work; the thickness depending upon form width, amount of reinforcing, and the requirement that each layer be placed before the previous one stiffens. When conditions are such that the next layer cannot be placed before the previous one stiffens, construction joints with keys shall be used. Design shall be consulted for location of construction joints.

4.3 Segregation or accumulation of hardened concrete on form surfaces and reinforcing steel between lifts is not acceptable. Concrete shall be deposited through openings in the forms located at the top of each lift, or at points which will prevent segregation, or through tremies whose lower ends are close to the point of deposit.

4.3.1 Precautions

a. Concrete shall not be allowed to drop freely more than 4 feet, and the drop always shall be vertical. For greater drops, rubber or metal drop chutes shall be used.

b. Constant attention is required to detect and correct any displacement of reinforcing or formwork while placing concrete.

4.4 Underreamed shafts shall be plumb and footing base shall be clean and level prior to placing concrete.

4.5 When pouring underreamed footings, an elephant trunk or tremie tube shall be used to protect sides of shaft and prevent segregation of concrete.

5. CHUTING

When concrete is conveyed by chutes or mechanical conveyors, the equipment shall be of such size and design as to ensure continuous flow. The chutes shall be metal or metal lined, and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements, may be used provided they discharge into a hopper before distribution. Chutes shall be oval shaped to prevent segregation of concrete ingredients.

6. PNEUMATIC PLACING

The concrete shall be of medium consistency and of uniform composition, otherwise clogging of pneumatic conveying equipment will occur. The nozzle shall be close to the point of deposit, never more than 5 feet, and the supply of concrete shall be continuous. The design mix of concrete shall not be changed to suit the equipment and placing shall conform to 4.3.1.

7. CONSOLIDATION

7.1 All concrete shall be consolidated by means of hand tools, vibrators (preferably), and finishing machines to secure a dense structure and smooth surfaces. The concrete shall be worked well around reinforcement, embedded fixtures, and into corners. Concrete should be placed directly in corners and ends of walls, and the flow of concrete shall be from the corners and ends rather than toward them.

7.2 Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute and shall be operated by competent workmen. Overvibrating and the use of vibrators to move concrete shall not be allowed. For 5 to 15 seconds duration, vibrators shall be inserted vertically to full depth of the layer being placed and then withdrawn. The vibration shall be spaced 18 to 30 inches apart depending upon the mass being placed.

7.3 Concrete floors shall be finished as set forth in SB10U.

8. WEATHER CONDITIONS

8.1 Protection. Unless adequate protection is provided, concrete shall not be placed during rain, sleet, or snow.

8.2 Placing Temperature

8.2.1 Cold Weather. When the mean daily temperature falls below 40°F (4.4°C) for more than one day, concrete shall not be placed without approval of Du Pont. When so permitted, the temperature of the concrete as placed shall be between 65 and 75°F (18.3 and 24°C). For concrete curing, see SB12U.

8.2.2 Hot Weather Above 90°F (32.2°C). Concrete shall have a placing temperature of less than 85°F (29.4°C), preferably around 65°F (18.3°C), and shall be handled so as to avoid flash set, or cold joints. Mixing water should be cooled or ice may be used as part of the mixing water. Fresh concrete shall be shaded and protected from drying winds while finishing. Use Master Builders Confilm, a spray-on evaporation retardant, or approved substitute. It is not a curing compound. In extreme cases, placing of concrete should be discontinued during the hottest part of the day. High concrete and air temperatures, low humidity, and winds are factors which affect the rate of evaporation. When the rate exceeds 0.2 lb/ft^2/h (0.98 Kg/m^2/h), precautionary measures are mandatory. See Figure 1 to determine the rate of evaporation.

9. RECORDS

Records shall be kept of each day's concrete placement indicating time of start and finish, volume of concrete placed, location in the structure, composition of the mix, and weather conditions (including temperature). Originals and one copy of such records shall be furnished Du Pont after each day's work.

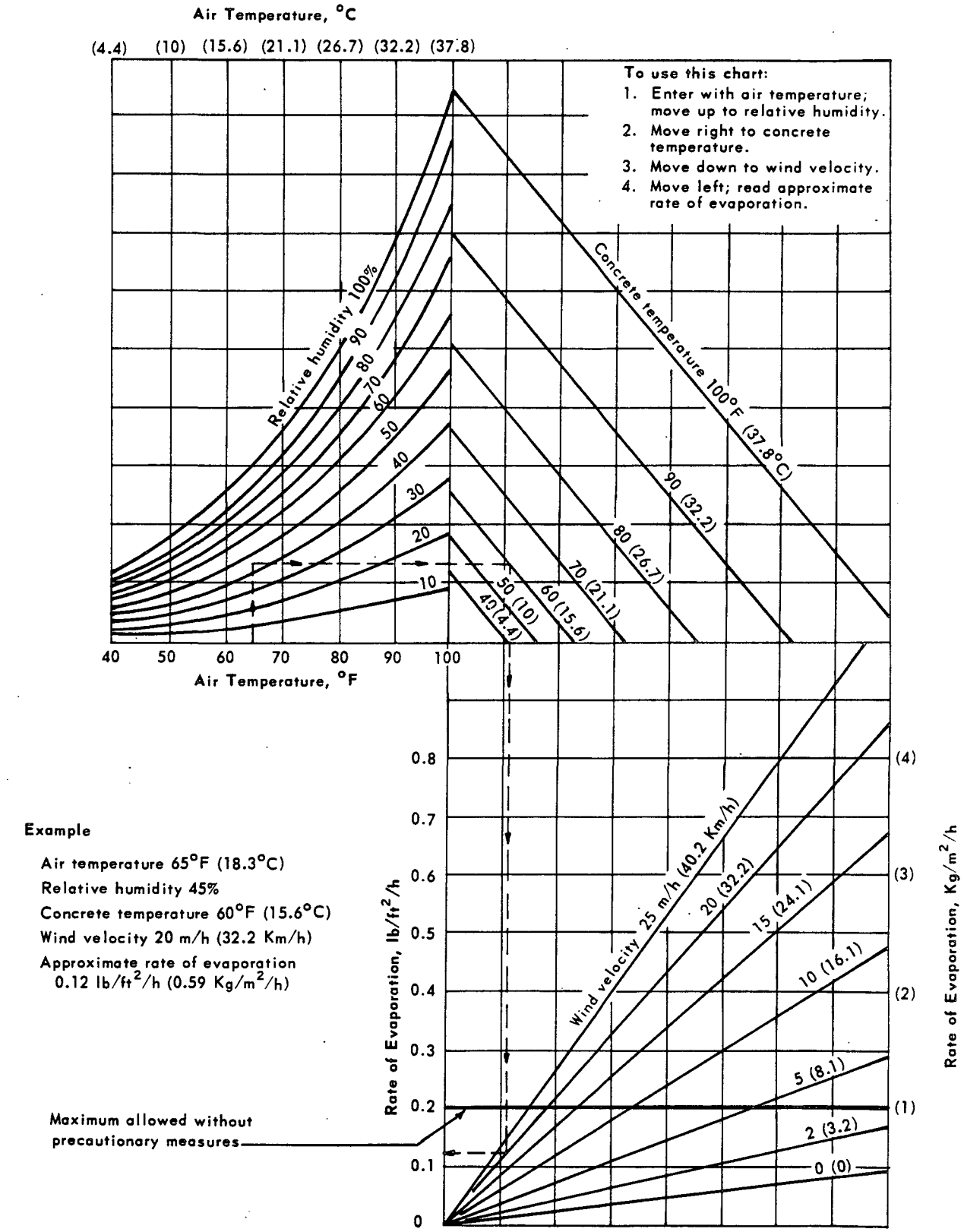

FIGURE 1 – EFFECT OF CONCRETE AND AIR TEMPERATURES, RELATIVE HUMIDITY, AND WIND VELOCITY ON THE RATE OF EVAPORATION OF SURFACE MOISTURE FROM CONCRETE*

*Reproduced from Portland Cement Association, "Design and Control of Concrete Mixtures," 12 Ed, p 99, Figure 11–6