CHAPTER 7

PLACING

7-1. General. Concrete may be placed between fixed forms, or it may be placed using approved slip-form paving equipment. Both methods produce satisfactory results, and when possible, the option should be left with the Contractor as to the method to be used. With slip-form equipment, the rate of placement can be significantly increased over the rate with fixed forms. In addition, the material for forms and the labor for setting forms are eliminated. As a result, the cost for large jobs will be less for slip-form placement than for placement with fixed forms. However, on small jobs or larger jobs with special requirements, the use of fixed forms may be necessary or more economical than the use of slip-form equipment. No guidelines can be given as to what size job will permit the economic use of slip-form pavers since the choice will depend on what equipment local contractors have available.

7-2. Placing time. Concrete will be placed before obtaining its initial set and within 45 minutes after water has been added to the batch. These provisions apply to all paving projects regardless of the type of mixing equipment used. The addition of water to the mixture in excess of that required by the mixture proportions to maintain slump during prolonged mixing will not be permitted.

7-3. Slip-form paving. Approval of the slip-form paving equipment for airfield pavement will be based on satisfactory performance in the field. Trial sections of sufficient length and located in low-volume aircraft traffic areas will be used to approve the paving equipment, considering both slip form and another for the fill-in operation when scheduled by the Contractor. Furthermore, approval will be based on the ability of the machine to consolidate the concrete and form the pavement to the desired cross sections. Plan grade and surface smoothness tolerances must be met. Particular attention should be paid to the ability of the machine to form the required edge without excessive slumping or tearing during slip-form operations and to form a suitable longitudinal construction joint during fill-in operations. The machine will not damage the surface or edge of the previously placed slab during fill-in operations. The suggested length of the trial section is 1,000 to 2,000 feet.

7-4. Spreading. Hand spreading of concrete will be permitted only when necessitated by odd widths or shapes of slabs, or in emergencies such as equipment breakdown.

7-5. Vibration. Vibration requirements are influenced by many factors, such as the type and size of aggregate, mixture proportions, air entrainment, slump, workability of mixture, and pavement thickness. The specified maximum spacing for vibrator units and the specified

vibrating procedures are based on field experience with the vibration of pavements 12 or more inches in thickness. There has been only limited use of internal vibration for thinner slabs. If necessary for proper consolidation of the concrete, a closer spacing of vibrator units will be required. General experience has been that it is more satisfactory to use vibrators at a closer spacing and for shorter periods of vibration than to attempt to consolidate the concrete by prolonged vibration at a wider spacing. The duration of the vibration will be limited by the time necessary to produce a satisfactory consolidation of the concrete, and overvibration will not be permitted. Vibrators must not be permitted to touch forms, dowels, tie bars, or other embedded items.

7-6. Surface vibrators. Surface vibrators will not be permitted as past experience with them generally has been unsatisfactory.

7-7. Steel reinforcement. Project drawings will show typical details of all slab reinforcement and will indicate the pavements requiring reinforcement and the location and amount of steel required in the slabs. This information will supplement the specification requirements for reinforcement, and all requirements will be carefully checked to insure there are no discrepancies between drawings and specification requirements.

7-8. Placing during cold weather. It is seldom desirable to place pavement concrete when the air temperature is below 40 degrees F., and special provisions for placement and protection of the concrete are necessary for such construction. For additional information on winter concreting, refer to ACI 306R. The necessary covers and other means of protecting the concrete during cold weather should be available on the job before starting concrete placement. Calcium chloride as an admixture may be either required or approved to accelerate the setting time of concrete placed during cold weather. No changes will be made in the requirements for temperature of the concrete when placing or for protection of the concrete against freezing when calcium chloride or any other accelerator is used.

7-9. Placing during hot weather. During hot weather, special precautions are necessary to prevent the formation of plastic-shrinkage cracks, which result from an excessive loss of moisture from the concrete before positive curing has begun. The concrete will be placed at the coolest temperature practicable, and in no case will the temperature of the concrete as placed exceed 90 degrees F. Mixing and placing of concrete will be so controlled as to keep moisture loss at a minimum. Aggregates will be moist when added to the mixer, and the subgrade dampened so it will not absorb water from the concrete. The concrete temperature may be reduced by using cement having a temperature below the maximum 150 degrees F. specified, by sprinkling the stockpiles of aggregate to produce cooling by evaporation, by precooling mixing water, or by avoiding delays in mixing and placing

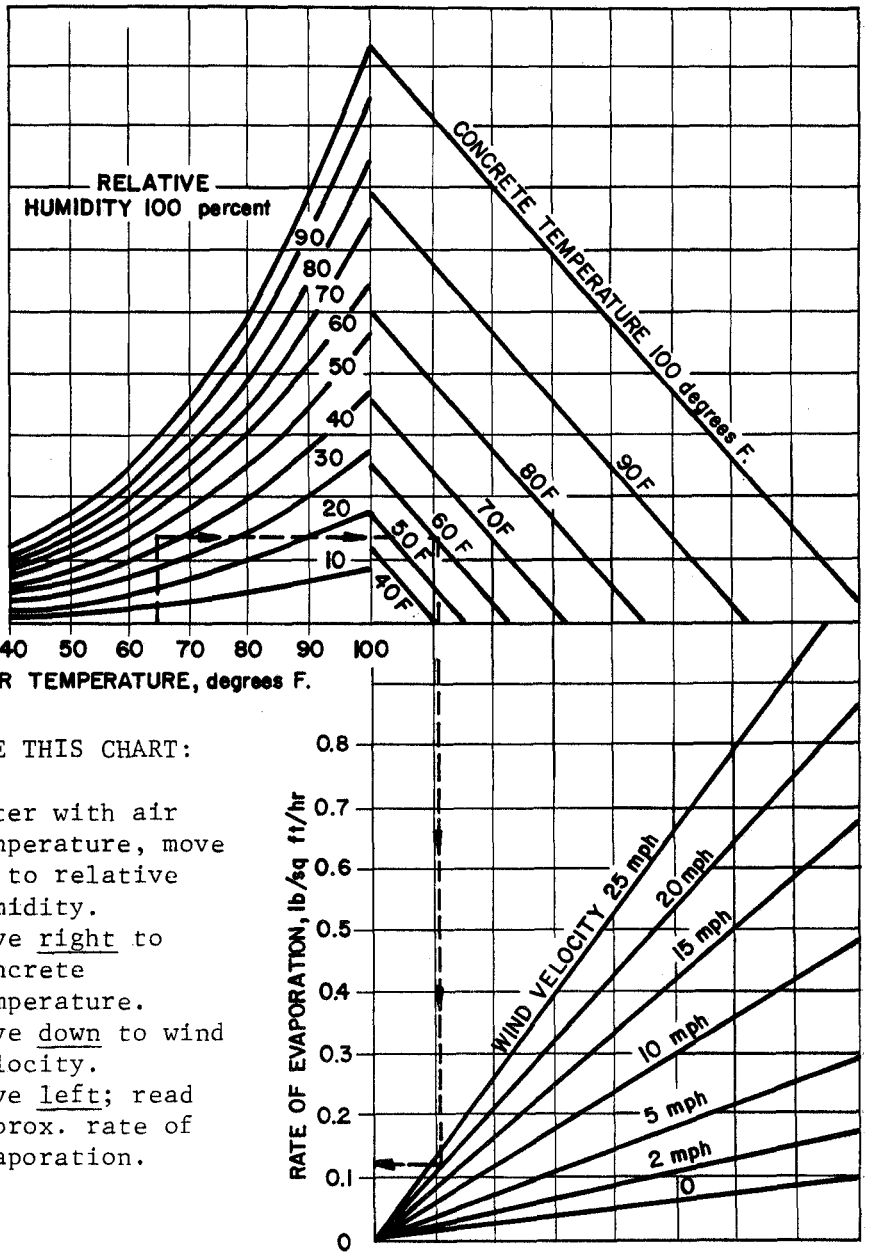
concrete. The concrete will be placed and finished as rapidly as practicable, and the curing started without delay. If the application of the curing medium should, for any reason, lag placement for a time sufficient to permit surface drying, the surface should be kept damp with a fog spray and placement should be discontinued until corrective action can be taken. The fog spray equipment will be capable of applying a very fine mist to the concrete to replace moisture lost by evaporation. In windy areas, screens may be needed to protect the concrete from rapid evaporation caused by wind. Curing methods will assure that an evaporation rate of 0.2 psf per hour as shown in figure 7-1 is not exceeded.

7-10. Placing of small areas. For vehicular parking and paving projects of 1,200 cubic yards or less, machine spreading, finishing, and floating will not be required if the benefits derived from the use of the equipment are not commensurate with the cost of using the machines. In this case, hand spreading, finishing, and floating will be specified.

7-11. Overlay-pavement construction. Where overlay-pavement construction is required, contract specifications will contain provisions for preparation and treatment of the existing surface before placing concrete in the overlay pavement. Criteria herein pertain to construction of rigid overlays on existing rigid pavement. Construction of rigid overlays on existing flexible pavement or an existing rigid pavement with a bond breaking course is treated as new construction.

a. Bond between layers of pavement. Overlay pavements generally are designed on the assumption that a partial bond will develop between the two concrete layers. Concrete surfaces to receive partially bonded overlays will be thoroughly cleaned of dirt and other foreign material, loose or spalled concrete, extruding joint seal, bituminous patches, and material that would break the bond between the concrete layers. Different areas of pavement will require different treatment. The condition of the existing pavement will determine the cleanup measures necessary. Normally, sandblasting or surface-abrading equipment will be required to remove material adhering to the surface, and hand scaling of loose or spalled material will be required. No special treatment, such as acid wash of the prepared surface or the use of a grout bonding course, will be required for partially bonded overlays. In areas where oil or grease is present on the surface, scrubbing with a detergent and a wire brush may be required. Cleaning of surfaces to receive the overlay with rotary grinding equipment will be permitted, but the surface must be swept clean prior to placing the concrete overlay.

b. Control of cracking in overlay pavement. Considerable difficulty has been experienced with uncontrolled cracking of overlay pavements at contraction joints. This cracking is likely to occur



TO USE THIS CHART:

1. Enter with air temperature, move up to relative humidity.
2. Move right to concrete temperature.
3. Move down to wind velocity.
4. Move left; read approx. rate of evaporation.

CURING OF CONCRETE (IS 155.02T), WITH PERMISSION OF THE PORTLAND CEMENT ASSOCIATION, SKOKIE, ILLINOIS

FIGURE 7-1. MOISTURE LOSS FROM CONCRETE SURFACE EVAPORATION

during hot weather when the temperature of existing pavement is appreciably higher than that of the concrete being placed in the overlay. Contraction due to cooling of base pavement results in movement at the existing joint, which may start a crack in the bottom of the overlay as the concrete hardens. This cracking may occur when the concrete is too green to saw. Often the crack is not visible at the surface of the pavement when the sawing is done. To prevent such cracking, it may be necessary to use filler-type joints.