

- 4 A clear, non-wax, water-based, dissipating membrane-curing compound may be used as soon as practical instead of curing blankets. Ensure that it meets the requirements of **Subsection 702.2.2.11**.
- 5 Apply the curing compound as soon as the finishing of the concrete surface is complete. Apply the compound uniformly at a rate of at least 1 gallon per 150 square feet until the entire surface has a solid and vapor-tight coating of the curing compound. Apply the compound by means of a spray nozzle that is held 2 feet or less from the concrete surface. If necessary, protect the spray from the wind by suitable means. Keep the spray nozzle and other spraying equipment clean at all times.
- 6 If rain falls on the newly sprayed surface before the film has sufficiently dried, immediately as conditions permit, re-spray the surface to the specified thickness. Where the curing compound is inadvertently applied to surfaces against which new concrete is to be cast, including projecting reinforcing steel, completely remove the compound by the use of steel wire brushes or by other means accepted by the RCE.
- 7 Protect the sprayed surface film from abrasion or damage for at least 3 days. Do not allow the placing of forms, lumber, reinforcing steel, equipment, or unnecessary walking on the surface until the film is at least 3 days old.

#### **702.4.5 Removal of Falsework and Forms**

- 1 In order to obtain a satisfactory surface finish, remove the forms for ornamental work, railings, parapets, and other vertical surfaces that will be exposed in the finished work as soon as the concrete has hardened sufficiently to allow the removal of the forms without damaging the edges, corners, and faces of the concrete. Do not remove the forms in less than 5 hours, nor more than 48 hours, unless the concrete is poured on Friday, in which case the forms may be removed the following Monday. Column and pier forms may be removed after 24 hours.
- 2 Keep forms and falsework under slabs, beams, girders, caps, arches, and structures or parts of structures carrying static dead loads in place until the concrete compressive strength reaches at least 75% of the design strength. Make additional test cylinders and cure under similar conditions for use in form removal strength determinations.
- 3 Do not use methods of form and falsework removal that are likely to cause overstressing of the concrete. In general, remove the forms from the bottom upward. Do not remove forms without the consent of the RCE.
- 4 Strike falsework supporting concrete beams, slabs, and brackets that will support sidewalks, concrete railing, or other applicable items before the sidewalk, concrete railing, or the other items are cast.
- 5 Make additional strength control cylinders if early removal of falsework is desired. The falsework may be struck when these cylinders, cured under the same conditions as the concrete in the structure, have developed a unit strength of 75% of the required 28-day compressive design strength. How-

ever, do not subject such concrete to a superimposed load until the compressive strength develops 90% of the required compressive design strength. Assist in transporting the additional strength control cylinders to the OMR for testing.

- 6 Extra test cylinders for early form or falsework removal will be at no additional expense to the Department.

#### **702.4.6 Protecting and Loading Recently Placed Concrete**

- 1 Do not place beams, girders, or other precast elements on concrete substructures until the concrete in the substructure develops a minimum of 75% of the design compressive strength. Do not place deck concrete until the concrete in the substructure develops a minimum of 90% of the design compressive strength.
- 2 Do not place backfill or fill for retaining walls, abutments, piers, wingwalls, or other structures that will retain material to an elevation higher on one side than on the other until the concrete develops a minimum of 90% of the specified design strength.
- 3 Do not place backfill for arch culverts and box culverts to an elevation higher than 1 foot above the top of footing or bottom slab until the concrete develops a minimum of 90% of specified design strength.
- 4 Adhere to the following time and strength requirements when performing construction activities on or near recently placed concrete:
- Wait a minimum of 12 hours between placing footing or drilled pier concrete and erecting column forms.
  - Wait a minimum of 24 hours between placing footing and drilled pier concrete and placing column concrete.
  - Wait a minimum of 72 hours between placing column concrete and beginning erection of cap forms or until column concrete attains a minimum of 75% of the design compressive strength as verified by testing extra test cylinders.
  - Wait a minimum of 96 hours between placing column concrete and placing cap concrete or until column concrete attains a minimum of 75% of the design compressive strength as verified by testing extra test cylinders.
  - Wait a minimum of 12 hours after a drilled shaft or drilled pile concrete has achieved the initial set, determined by the RCE or BCE, before installing adjacent piling or drilling adjacent shaft/drilled pile within a 20-foot radius of the cast concrete item. Multiple shafts or piles may be drilled before placing concrete if the drilled holes remain in a stable condition. For non-cased drilled shafts or drilled piles, wait until the cast concrete attains a minimum of 75% of the design compressive strength, verified by testing test cylinders, before placement of a construction vehicles or equipment are allowed within the 20-foot radius of the cast concrete item.

#### 702.4.6

#### 702.4.7

- 5 Do not blast within a 50-foot radius of any cast structural concrete item until the cast item attains 90% of the design compressive strength verified by testing concrete test cylinders.
- 6 The requirements of this subsection are minimum requirements. Additional restrictions or increased wait times may be required to protect the concrete if deemed necessary by the RCE or BCE. Suspend any activity determined by the RCE or BCE to be detrimental to the concrete item cast regardless of the distance from the cast concrete until such time as the RCE or BCE allows the activity to proceed or until the cast concrete attains a minimum of 90% of the design compressive strength verified by testing concrete test cylinders.
- 7 Do not place highway traffic, construction vehicles, and/or construction loads/equipment on a bridge deck or approach slab until the concrete develops a minimum of 90% of the specified design compressive strength verified by testing concrete test cylinders.
- 8 Do not abruptly start or stop construction vehicles, construction equipment, concrete trucks, etc. on bridge deck(s) and/or approach slabs. Do not mix concrete in a truck mixer while the truck is on the deck without permission from the RCE. To avoid excessive vibrations while placing concrete barrier rail or parapet, do not place any equipment on the deck except for one concrete truck mixer if required. Do not place other equipment or traffic on the deck until concrete barrier rails and parapet walls obtain a minimum of 75% of the compressive design strength verified by testing test cylinders.
- 9 Make test cylinders for early testing to determine the concrete compressive strength for all items of the structure that are required to meet 75% of the design compressive strength.
- 10 Make early break test cylinders to determine concrete strength if early live loading, including highway traffic and/or construction equipment loading is desired. Assist the RCE in the making and transporting of early break test cylinders to the OMR.
- 11 If loads or equipment exceeding 80,000 pounds gross weight are intended to be placed on the structure, submit 7 copies of the proposed plan with calculations for placing the load(s) on the structure for review, comments, and written acceptance by the BCE. Have the plan and design calculations prepared by a South Carolina registered Professional Engineer.

#### 702.4.7 Initial Surface Finish

- 1 Thoroughly vibrate and work the concrete in all structures during the placement operation by means of suitable tools. Ensure that the vibrating and working forces the coarse aggregate from the surface and thoroughly works the mortar against the forms to produce a smooth finish free from water-pockets, air pockets, sand streaks, and honeycombing.
- 2 As soon as the concrete has met the strength requirements specified in **Subsection 702.4.5**, carefully remove the forms. Immediately following form removal, perform the initial surface finishing as described herein.