KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, 1990 EDITION

SECTION 701

CONCRETE STRUCTURE CONSTRUCTION

Page 376, subsection 701.03(b). Delete paragraphs six and seven and replace with the following:

The Contractor shall submit to the Engineer seven (7) copies of detailed falsework plans for review and approval by the railroad company (where applicable) and the Engineer on the following structures:

1. All structures over or under railroad tracks.
2. All structures built over highways or streets carrying traffic.
3. All structures carrying highway traffic during construction.
4. All structures which require falsework plans as noted on the construction Plans.

Three (3) copies of detailed plans for falsework shall be submitted to the Field Engineer for review and approval by the Field Engineer on the following structures:

1. All cast-in-place span structures supported on falsework.
2. Concrete Box Structures with spans greater than 16 feet (5.0 m) or heights greater than 14 feet (4.5 m).
3. Decks with girder spacing equal to or greater than 14 feet (4.5 m).
4. Deck overhangs greater than beam depth or greater than 54 inches (1.4 m).
5. Substructure forming with "non-typical" support.
6. Superstructure forming with "non-typical" support (i.e. needlebeams).

For normal structural steel, prestressed concrete girder, and reinforced concrete box bridge construction, falsework or formwork details for deck construction are not required.

On all structures where falsework is required, falsework plans (maximum size 22 X 36 inch (560 X 915 mm)) shall bear the seal of a licensed Professional Engineer. Falsework is defined to be any temporary structure which supports structural members or form work.

Falsework will be designed in accordance with KDOT Bridge Manual, Section V, Falsework Design, Analysis and Inspection.

All falsework details shall be adhered to by the Contractor. The Field Engineer shall review the falsework as constructed to assure substantial compliance with the falsework plan.

Page 377, subsection 701.03(b). Add the following at the end of this subsection:

Cast-in-place shear bolts, coil inserts or other devices used as falsework support shall not be placed in pier columns without the approval of the Engineer. Drilling and grouting of bolts or other devices into the pier columns shall not be permitted unless shown on the Plans.

Page 379, subsection 701.03(c). Delete the last paragraph on this page and replace it with the following:

Form bolts, rods, or ties may be steel or non-metallic. They shall be the type which permits the major part of the tie to remain permanently in the structure. They shall be held in place by devices attached to the wales capable of developing the strength of the ties. The Engineer may permit the use of wire ties on irregular sections and incidental construction if the concrete pressures are nominal and the form alignment is maintained by other means. The ties shall be removed on all exposed surfaces. Steel ties shall be removed to a depth of at least 1/2 inch (15 mm) below the concrete surface. Non-metallic ties may be removed flush with the concrete surface. Wire ties shall be cut back at least 1/4 inch (5 mm) below the concrete surface. The cavities on exposed surfaces shall be filled with cement mortar and the surface left sound, smooth, even and uniform in color. Cavities on unexposed surfaces may be filled with tar or roofing cement. Form ties will not be permitted through forms for handrail. Pipe spreaders shall not be used unless they can be removed as the concrete is placed. Wood or metal spreaders shall be removed as the concrete is placed. The use of cofferdam braces or struts that extend through the forms for any concrete section will not be permitted except in unusual situations and then only with approval of the Engineer.

Page 380, subsection 701.03(d). Delete the first paragraph of this subsection and replace with the following:

Forms on handrails, ornamental work, and other vertical surfaces that require a rubbed finish, shall be removed as soon as the concrete has hardened sufficiently that it will not be injured.

In the construction of cantilevered piers, where the formwork is supported on the column, the formwork used in supporting the pier beam may be removed after the pier beam has cured a minimum of seven days (4*) for cantilevers 10 feet (3 m) or smaller, or ten days (6*) for cantilevers greater than 10 feet (3 m).

In construction of column bent piers, falsework used in supporting the pier beam during construction may be removed in four days for pier beam spans less than 10 feet (3 m); seven days (4*) for spans of 10 to 20 feet (3 to 6 m), and ten days (6*) for spans greater than 20 feet (6 m).

*Note: Contractors may reduce the cure time required prior to form removal to the number of days shown in parenthesis, provided the concrete can be shown to have attained a minimum strength of 75% of the specified f'_c. To accomplish this, the Contractor prepares the necessary cylinders, and obtains the services of an approved laboratory to break them at the appropriate time and provide a report to the Engineer. Cylinders must be cured in the field, alongside and under the same curing conditions, as the concrete they are to represent.

Girders or beams shall not be set on the pier beam until after the falsework is removed.

Forms on other vertical surfaces such as walls and columns shall be removed upon approval by the Engineer. In determining the time for the removal of forms, consideration shall be given to the location and character of the structure, weather and other conditions influencing the setting of concrete. If forms are removed prior to the expiration of the cure period, the Contractor shall maintain the cure as provided in subsection 701.03(h).

Page 381, subsection 701.03(e). Delete the second paragraph of this subsection and replace with the following:

Fog all bridge deck placements. Begin the fogging immediately behind the tining float. Maintain the fogging to produce a "gloss to semi-gloss water sheen" on the surface until the curing is applied. Apply the fog over the entire placement width. Reduce fogging only if excess water accumulates on the surface.

Produce a fog spray from nozzles that atomize the droplets capable of keeping a large surface area damp without depositing excess water. Use high pressure equipment that generates at least 1200 psi at 2.2 gpm (8.3 MPa at 8.3 L/minute), or low pressure equipment having nozzles capable of supplying a maximum flow rate of 1.6 gpm (6.1 L/minute).

Maintain environmental conditions are such that the evaporation rate is less than 0.2 $lb/ft^2/hr$ (1.0 $kg/m^2/hr$). This may require placing the deck at night, in the early morning or on another day. The evaporation rate (as determined in the American Concrete Institute Manual of Concrete Practice 305R, Chapter 2) is a function of air temperature, concrete temperature, wind speed, and humidity.

Just prior to and at least once per hour during placement of the concrete, measure and record the air temperature, concrete temperature, wind speed, and humidity on the bridge deck. Take the air temperature, wind and humidity measurements approximately 12 inches (300 mm) above the surface of the deck. With this information, determine the evaporation rate by using the KDOT supplied software or by using Figure 2.1.5 from the above reference (copy attached). When the evaporation rate is equal to or above 0.2 $lb/ft^2/hr$ (1.0 $kg/m^2/hr$), take measures (such as installing wind breaks, cooling the concrete, sun screens etc.) to create and maintain an evaporation rate less than 0.2 $lb/ft^2/hr$ (1.0 $kg/m^2/hr$) on the entire bridge deck which are satisfactory for concrete placement.

During the preconstruction conference, submit an acceptable Quality Control Plan detailing the equipment (for both determining and controlling the evaporation rate) and procedures used to minimize the evaporation rate. Follow the same Contractor's Concrete Structures Quality Control Plan as outlined in KDOT's Construction Manual, Part V.

Page 384, subsection 701.03(f). Add the following to the first paragraph of this subsection:

When the Plans show a construction joint in the wall of a RCB, 3 inches (75 mm) above the floor, the Contractor has the option of constructing the joint as shown on the Plans, or constructing the joint level with the floor of the RCB. When the Plans show a construction joint in the wall of a RFB, 2 inches (50 mm) above the floor haunch, the Contractor has the option of constructing the joint as shown on the Plans, or even with the top of the floor haunch of the RFB.

Page 385, subsection 701.03(g). Add the following paragraph between the fourth and fifth paragraphs on this page:

Take every reasonable precaution to secure a smooth riding bridge deck. Correct surface variations exceeding 1/8 inch (3 mm) in 10 feet (3 m) by use of an approved profiling device, or other methods approved by the Engineer.

Page 387, subsection 701.03(h)(1). Delete the second paragraph on this page and replace with the following:

When curing membrane is used, no traffic of any kind, or concentrated loads such as stockpiles of forms or reinforcing steel will be permitted on the surface until the seven day curing period is complete. The Engineer may allow a minimum amount of "foot traffic" necessary to complete placement of concrete in adjacent areas, provided the curing membrane is covered with wet burlap or white polyethylene sheeting. If rain falls on the newly coated concrete before the film has dried sufficiently to resist damage, or if the film is damaged in any other manner, a new coat of the membrane shall be applied to the affected portion equal in curing value to the original application.

Page 387, subsection 701.03(h)(2). Delete this subsection and replace with the following:

(2) Bridge Decks. On bridge subdecks which will receive an overlay or wearing surface, the use of a liquid membrane will not be allowed. Curing will be with wet burlap.

If fogging of the bridge deck has been used during placement and finishing, continue until the wet burlap can be placed. If it has not been used to this point, it must begin during completion of the tining and finishing operation. Maintain a damp surface until the wet burlap cure begins.

Apply the wet burlap when the concrete has hardened sufficiently to preclude marring of the surface. The burlap must be kept wet 100 percent of the time during the cure period. The use of soaker hoses or spraying is required. Continue the wet burlap cure for a period of seven days

For the first twenty-four hours of the seven day curing period, white polyethylene sheeting may not be used in direct sunshine during the day when the concrete surface temperature is above 90°F (32°C). However, it may be used at night in lieu of keeping personnel and equipment on the job site to keep the burlap wet. If polyethylene sheeting is used over the burlap during the first twenty-four hours when the concrete surface temperature is above 90°F (32°C), it must not be placed prior to one hour before sunset, and must be removed within one hour after sunrise. After the first twenty-four hours, the polyethylene sheeting may be left in place continuously, day and night, for the remainder of the curing period.

For full depth bridge decks which include the wearing surface, the initial cure will be a clear or translucent, with fugitive dye, liquid membrane meeting the requirements for Type 1-D in Section 1400, and applied **immediately** behind the tining float. The final cure will be with wet burlap covered with white polyethylene sheeting, applied as described above. If fogging has been required up to this point because of the evaporation rate, continue fogging until the wet burlap can be placed.

Perform cold weather curing as outlined in the Standard Specifications.

Construction loads on the new bridge sub-deck, new one-course deck, or any concrete overlay are subject to these limitations:

- Only foot traffic is allowed on the sub-deck, one-course deck, or any concrete overlay during the 7-day curing period. Work to place reinforcing steel or forms for the bridge rail or barrier on the bridge deck is allowed 3 days after the concrete is placed, provided the curing is maintained on any exposed deck by keeping it wet during the 7-day curing period.

- Light truck traffic (gross vehicle weight less than 5 ton (5 Mg)) is allowed on the bridge sub-deck or one-course deck 10 days after the concrete is placed (15 days for haunched slab bridges).
- Legal loads are allowed on the bridge sub-deck or one-course deck 14 days after the concrete is placed (21 days for haunched slab bridges). Legal loads are allowed on any concrete overlay 7 days after the concrete overlay is placed.
- If the Engineer approves, heavy stationary loads (such as material stockpiles) may be allowed on the bridge sub-deck or one-course deck 14 days after the concrete is placed (21 days for haunched slab bridges). Heavy stationary loads may be placed on any concrete overlay 7 days after the concrete overlay is placed. The Contractor must submit, to the Engineer for consideration, the weight of the material and the footprint pressure of the load.
- If the Engineer approves, vehicle loads greater than legal loads may be allowed on the bridge deck 28 days after the deck pour is completed. The Contractor must submit, to the Engineer for consideration, the axle (or track) spacing and width, the size of each tire (or track length and width) and their weight.

Page 388, subsection 701.03(h)(4). Add the following at the beginning of this subsection:

Drilled shafts shall cure a minimum of two days before placement of column reinforcement or forms are permitted.

For columns constructed on spread footings founded in rock, construction of the column shall not proceed until the footing has cured a minimum of two days. For columns constructed on footing supported on piles, column construction shall not proceed until the footing has cured a minimum of four days (2*).

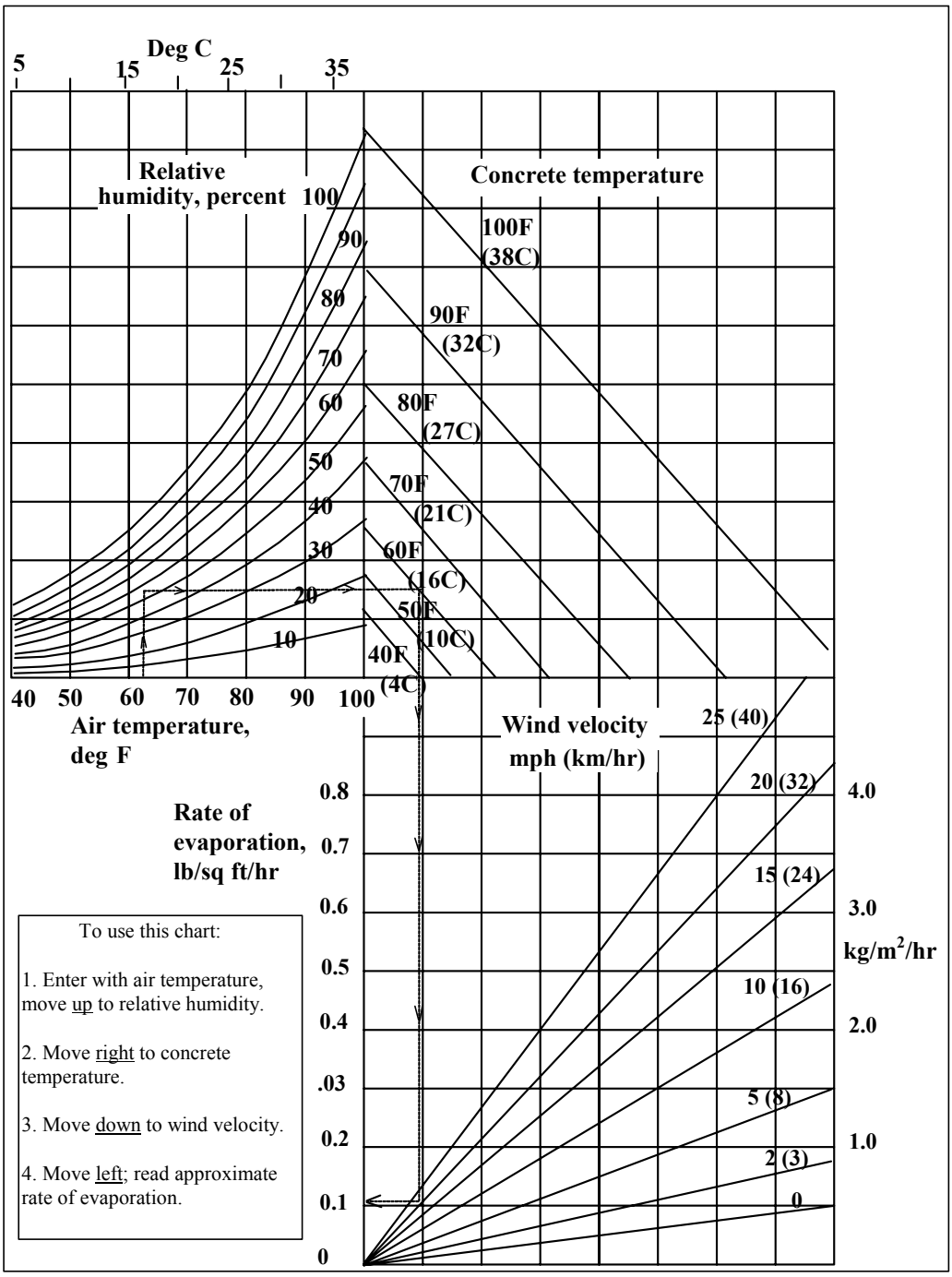
In the construction of cantilevered piers, where the formwork is supported on the column, erection of the pier beam formwork and placing pier beam resteel shall not proceed until the column has cured a minimum of four days (2*). Pier beam concrete shall not be placed until the column has cured a minimum of seven days (4*).

In construction of column bent piers, erection of the pier beam formwork and placing pier beam resteel may not proceed until the column has cured a minimum of two days. Pier beam concrete shall not be placed until the columns have cured a minimum of four days (2*).

*Note: Contractors may reduce the cure time required prior to placement to the days shown in parenthesis, provided the concrete can be shown to have attained a minimum strength of 75% of the specified f'_c. To accomplish this, the Contractor prepares the necessary cylinders, and obtains the services of an approved laboratory to break them at the appropriate time and provide a report to the Engineer. Cylinders must be cured in the field, alongside and under the same curing conditions, as the concrete they are to represent.

01-12-04 M&R (REK)

STANDARD PRACTICE FOR CURING CONCRETE



Effect of concrete and air temperatures, relative humidity, and wind velocity on the rate of evaporation of surface moisture from concrete. This chart provides a graphic method of estimating the loss of surface moisture for various weather conditions. To use the chart, follow the four steps outlined above. When the evaporation rate exceeds 0.2 lb/ft^2/hr (1.0 kg/ m^2/hr), measures shall be taken to prevent excessive moisture loss from the surface of unhardened concrete; when the rate is less than 0.2 lb/ft^2/hr (1.0 kg/ m^2/hr) such measures may be needed. When excessive moisture loss is not prevented, plastic cracking is likely to occur.