

**FY 2020/2021 QC Category No. 10A
STATEWIDE INSPECTION GUIDELIST
Bridge Structures - General Concrete**

FORMING

1. The ground on which concrete or formwork will be supported for pile and drilled shaft footings must be prepared and compacted properly, prior to form setting. [Spec. 455-1]
2. Form material must be approved and must have the proper dimensions, chamfers, positioning, bracing, friction collars, release agent, and be free of dirt or any other debris. Engineer must approve forms, including Stay-In-Place (SIP), prior to concrete placement. Check for coating defects on all surfaces of polymer coated SIP form elements prior to their installation. [Spec. 400-5]
3. Traffic railing removable forms must be erected and aligned such that all plane surfaces of the finished barrier do not have deviations exceeding 3/8 inch measured as an ordinate between the concrete and a 10-foot straightedge. [Spec. 521-4]
4. Slip formed traffic railing concerns: guide string alignment, adequate slip forming machine operation and vibrators, clean deck surface, and rebar cover adjustments made just before the slip former passes. [Spec. 521-4 and Good Practice]
5. Falsework must be approved by the Engineer prior to any concrete placement. Falsework and shoring requiring shop drawings must be inspected and certified by the Specialty Engineer prior to concrete placement. [Spec. 5-1, 400-4, and Good Practice]

PLACING AND TYING REBARS

6. Protect and store rebar, keeping above the ground surface. Minor field bending may be done with the approval of the Engineer. Hot bending or thermal cutting of rebar is not allowed. [Spec. 415-3 thru 4]
7. Rebar placing, tying and support concerns: placement tolerances, securing and lapping of splices, mortar block composition and fastening. In extremely aggressive environments, use of metal chairs or bolsters in contact with removable forms or floor surfaces is not permitted. [Spec. 415-5]
8. Footing rebars: use double strand single tie at all perimeter intersections and at every other interior intersection. [Spec. 415-5]
9. Column hoops shall be tied to the vertical bars at every intersection by a cross or figure 8 tie. [Spec. 415-5]
10. Wall rebars shall be tied with a cross or figure 8 tie at all perimeter intersections and at a minimum, every third interior intersection. [Spec. 415-5]
11. Beam and cap rebars: Heavy beam bolsters must be used for bottom and top mats of rebars and concrete blocks for spacing longitudinal bars below the top mat; spacing

and positioning is critical. Tying shall be double strand single ties at all intersections. [Spec. 415-5]

12. Traffic railing rebars must be free of hardened concrete, curing compound and other foreign matter; utility conduits and embedments must be separated from rebar, and utility conduit slip joints and junction boxes properly installed. [Spec. 415, 521 and Good Practice]

PLACING CONCRETE

13. Monitor surface moisture evaporation rate during placement and prevent the rate from exceeding 0.1 lb/ft²/hr unless countermeasures such as application of evaporation retarder or fogging are employed. [Spec. 400-16]
14. Follow temperature restrictions for mixing and placing concrete when very hot or very cold, requirements for keeping concrete warm when cold and for retarding when hot, and mass concrete temperature requirements for differential and core temperature. Do not remove the temperature control mechanisms until the core temperature is within 50°F of the ambient temperature for mass concrete. [Spec. 346-3, 346-7, 400-7]
15. Concrete shall not be placed until foundations, forms, falsework and rebars have been inspected and approved and metal forms and rebars are sprayed with cool water in hot weather. [Spec. 400-7]
16. Concrete placement concerns: place in its final position and in level layers, do not move concrete with a vibrator, prevent displacement of rebar, prevent aggregate segregation or separation, do not drop concrete freely over 5 feet and vibrations from adjacent equipment or operations must be controlled. [Spec. 346-6, 400-7]
17. Belt conveyors for concrete placement must be approved. [Spec. 400-7]
18. If concrete is pumped, minimum hose diameter is 4 inches and all other Spec. requirements must be met. [Spec. 400-7]
19. Special requirements for placement in successive layers. Ensure vibrator penetration into underlying layer and lifts that do not exceed 20 inches where possible. [Spec. 400-7]
20. Number, type and size of vibrators must be approved and inserted and withdrawn as near to plumb as possible in a slow and steady manner. Circles of vibrator influence shall overlap to ensure that the entire placement is adequately vibrated. Proper vibration is critical in areas where concrete flow is restricted by dense reinforcement or where concrete will not readily flow since these areas have a high probability of forming voids or honeycomb. [Spec. 400-7]
21. Place columns in one continuous operation for each lift as shown in the plans. [Spec. 400-7]

22. Deck slabs: screeding system must be demonstrated and approved prior to placement and concrete must be placed in continuous strips (transverse or longitudinal) with no time for initial set between strips except at planned joints. [Spec. 400-7 and Good Practice]
23. Unhardened concrete must be completely protected from rain and runoff by a system that does not come in contact with the concrete. Do not place concrete during rain. [Spec. 400-7]

CURING

24. No further curing is required if forms are kept in place, without loosening, for a least 72 hours; if forms are removed before 72 hours, cure these surfaces by applying curing compound or extending the moist cure area. [Spec. 400-16]
25. Properly apply an approved membrane curing compound at a minimum rate of 0.06 gallon/square yard of surface area. [Spec. 400-16]
26. Covers for continuous moisture curing shall be kept continuously wet for at least 72 hours for elements other than decks; 7 days for decks. Burlap-polyethylene sheeting is required to have a minimum weight of 1-1.8 ounces/square feet for two layers or 0.6-0.7 ounces/square feet for four layers. Provide a tight seal when using curing blankets for tops of components with side forms. [Spec. 925-3, 400-16]
27. Curing compound for slip formed traffic railings must be applied at the proper spread rate within 30 minutes of extrusion or before loss of water sheen and must remain in place for at least 7 days. Contractor must submit spread rate calculations to the Engineer. Remove compound completely if applying a Class 5 coating. [Spec. 400-16]
28. Construction joints must be cured using either the continuous moisture or curing blanket method. [Spec. 400-16]

FORM REMOVAL

29. Time of removal of forms shall be per plans, when minimum time or compressive strength is reached per the Specs or by using an approved strength versus time (S/T) curve. [Spec. 400-14]
30. Concrete in cofferdams must not be exposed to the action of water prior to final set and must not be exposed to salt or brackish water for 7 days after placement. [Spec. 400-7]

FINAL FINSHING

31. Remove metal ties and other metal appurtenances to at least one inch below the finished concrete surface. Remove irregular projections and patch void, honeycomb and form tie cavities with mortar material using methods that comply with the specs. [Spec. 400-15]

PROTECTION OF CONCRETE

32. Caps of piers and bents: do not place the weight of the superstructure or of beams on the caps until they have reached the age of 10 days unless proof of cap concrete strength is provided by testing per specification. [400-17]

CRACK INSPECTION

33. The Engineer will inspect concrete surfaces as soon as surfaces are fully visible after casting, between 7 and 31 days after the component has been burdened with full dead load, and a minimum of 7 days after the bridge has been opened to full unrestricted traffic. The Engineer will measure the width, length, depth (coring may be needed), termination points and precise location of all cracks and display, to scale, the results on a drawing referred to as a crack map. [Spec. 400-21]
34. Provide access, equipment and personnel necessary for the Engineer to perform crack inspection. Core cracks in accordance with the Engineer's recommendations. [Spec. 400-21]