

**FY 2013/2014 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 form alignment is particularly critical since public visibility of railings is very high. [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 should be reviewed by the Project Administrator 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. Storing, bending, splicing, and cutting rebar must be done properly. [Spec. 415-3 thru 4]
7. Rebar placing, tying and support concerns: placement tolerances, securing and lapping of splices, mortar block composition and fastening. If form bottom is 12 feet or less above mean high water and environment is extremely aggressive, use of metal chairs or bolsters in contact with forms 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 ties. [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 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 separated from rebar, and utility conduit slip joints and junction boxes properly installed. [Spec. 415-3 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. 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 specifications for monitoring mass concrete temperature gradient and core temperature. Do not remove the temperature control mechanisms until the core temperature is within 50 degrees 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 forms and rebars are sprayed with cool water. [Spec. 400-7]
16. Placement concerns: placement in the final position and in level layers, no movement with a vibrator, no displacement of rebars, no aggregate segregation or separation, not dropped freely over 5' 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" 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 12" where possible. [Spec. 400-7]
20. Number, type and size of vibrators must be approved and they shall be 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 particularly 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 unless construction joints are 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 but if before 72 hours, an approved curing method must be used. [Spec. 400-16]
25. Properly apply an approved membrane curing compound at a rate of 1 gallon/150 square feet of surface area. [Spec. 400-16]
26. Covers for continuous moisture curing shall be kept continuously wet for at least 72 hours for other than decks; 7 days for decks. Burlap-polyethylene sheeting is required to have a minimum weight of 9 ounces/square yard. 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 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 before application of Class 5. [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 table in 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 FINISHING

31. Remove form tie ends and irregular projections and patch void, honeycomb and form tie voids with mortar material and use methods that comply with specs. [Spec. 400-15]
32. Class 5 Coating (textured paint) must be on the QPL and meet material specs. and must have surfaces prepared and coatings applied in accordance with manufacturer's specs. at a spread rate of $50 \pm 10 \text{ ft}^2/\text{gal.}$ Coating thickness shall be checked if the spread rate is uncertain. [Spec. 400-15, Good Practice]

PROTECTION OF CONCRETE

33. 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

34. 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. [Spec. 400-21]
35. 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. After initial inspection determine the cause of the cracks, monitor the cracks and document the growth of individual cracks. Use a pocket microscope to measure crack widths of 25 mils or less. Determine if cracks are structural or nonstructural and evaluate nonstructural cracks in accordance with CPAM 10.3.5. [Spec. 400-21]
36. Inspect underwater components in accordance with CPAM 10.6. [CPAM 10.6]