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400 CONCRETE STRUCTURES. (REV 6-14-10) (FA 7-29-10) (1-11)

ARTICLE 400-14 (Page 394- 395) is deleted and the following substituted:

400-14 Removal of Forms.

Use the table below as the criterion for minimum time or compressive strength required before removal of forms or supports.

When using the time period criterion, include in the time period all days except days in which the temperature falls below 40°F.

Use the specified 28-day minimum compressive strength value as stated in 346-3.1 for each Class of Concrete utilized.

Location of Concrete Placement	Minimum Time for Form Removal for any Strength Concrete*	Minimum (%) of 28-day Compressive Strength for Form Removal
(1) Deck slabs, top slabs of culverts and bottom of caps, forms under sidewalks, and safety curb overhangs extending more than 2 feet		
(a) Class II (Bridge Deck)	7 days**	75**
(b) Class II (Other than Bridge Deck)	7 days	75
(c) Class III	7 days	70
(d) Class IV	7 days	60
(e) Class V	7 days	50
(2) Walls, piers, columns, sides of beams and other vertical surfaces	24 hours***	50***
(3) Front face form of curbs	6 hours	70
* For mass concrete, remove forms in accordance with 346-3.3		
** Reference 400-16.4		
***Do not place additional load on the section until 70% of the specified 28-day concrete strength is attained. Also, refer to 400-7.4.		

When using the percent of required strength, cast test cylinders for each mix for compressive strength determination or develop a curing concrete strength versus time curve (S/T Curve) which can be used in lieu of multiple test cylinders to determine when percent of required strength has been met.

Prior to curve use; obtain the Engineer's approval of the S/T Curve and its supporting data. An approved testing laboratory may be used to provide this information with approval of the Engineer. Plot S/T Curves using at least three different elapsed times that begin once test cylinders are cast; however, one of the elapsed times must be prior to the Contractor's intended form removal. Each elapsed time plotted must have a corresponding compressive strength computed by averaging the compressive strength of two test cylinders.

Cure such test cylinders as nearly as practical in the same manner as the concrete in the corresponding structural component, and test them in accordance with ASTM C 39 and ASTM C 31. Perform cylinder casting, curing, and testing at no expense to the Department and under the observation of the Engineer. When the S/T Curve indicates a

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compressive strength equal to or greater than the percentage of specified strength shown in the table above for form removal, the Contractor may remove the forms. When the ambient air temperature falls 15°F or more below the ambient air temperature that existed during development of a S/T Curve, use a S/T Curve that corresponds to the lower temperature and that is developed in accordance with this section.

Do not remove forms at any time without the consent of the Engineer. Even when the Engineer provides consent to remove the forms, the Contractor is responsible for the work.

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