Florida Department of Transportation

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SECRETARY

July 7, 2008

Dr. Leslie McCarthy, PhD, P.E.
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 400
Proposed Specification: 4001400.D01 – Concrete Structures – Removal of Forms

Dear Dr. McCarthy:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

Please review and transmit your comments, if any, within four weeks. Comments should be sent via Email to ST986RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4110.

Sincerely,

Rudy Powell, Jr., P.E.
State Specifications Engineer

RP/sh
Attachment
cc: Gregory Jones, General Counsel
Florida Transportation Builders' Assoc.
State Construction Engineer
Marvin Williams, Federal Highway Administration

CONCRETE STRUCTURES-REMOVAL OF FORMS.
(REV ~~4-21-08~~*~~5-8-08~~6-26-08*)

ARTICLE 400-14 (Pages 378 and 379) 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 40ºF.

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

* 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 ~~from representative concrete concrete~~*for each mix* for compressive strength determination *or develop a curing ~~time~~ concrete strength versus time curve (~~T/S~~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 ~~T/S~~S/T Curve and its supporting data. An approved testing laboratory may be used to provide this information with approval of the Engineer. Plot ~~T/~~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 shorter than the elapsed time desired for form removal. Each elapsed time plotted must have a corresponding compressive strength computed by averaging the compressive strength of two test cylinders.

~~Provide the Engineer with a minimum of three cylinder breaks, established at different curing times and concrete strength, so he can develop a curve relating curing time to concrete strength.~~ 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 approved by the Engineer, the Contractor may use test results certified by a testing laboratory approved by the Department as a basis for form removal.~~ When ~~concrete strength tests~~*the* ~~*T/*~~*S/T* ~~*data*~~ *Curve* indicate*s* a 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. ~~Curing periods so established may be used so long as the ambient temperature is equal to or greater than the temperature existing during the curing of the test cylinders.~~ When the *ambient air* temperature falls 15ºF or more below the ambient *air* temperature *that* exist~~ing~~*ed* during *development of a* ~~*T/*~~*S/T Curve*~~*the test cylinder curing period*~~, ~~repeat the test procedure outlined above, and establish a different curing period for the different ambient temperature.~~*use a* ~~*T/*~~*S/T Curve that corresponds to the lower temperature and that is developed in accordance with this* ~~*provision*~~*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.

CONCRETE STRUCTURES-REMOVAL OF FORMS.
(REV 6-26-08)

ARTICLE 400-14 (Pages 378 and 379) 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 40ºF.

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

* 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 shorter than the elapsed time desired for 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

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 15ºF 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.