Florida Department of Transportation

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STEPHANIE KOPELOUSOS
INTERIM SECRETARY

February 6, 2007

Mrs. 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 455
Proposed Specification: 4554200.D01

Dear Mrs. McCarthy:

We are submitting, for your approval, two copies of a proposed Supplemental Specification for Structures Foundations – Mixing, Pumping and Testing Cement Grout.

This change was proposed by Tom Malerk of the State Materials Office to remove requirements that are not necessary in less critical operations and allow more liberal use of available materials and innovation for appropriate situations.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via Email to SP965DB or duane.brautigam@dot.state.fl.us.

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

Sincerely,

Duane F. Brautigam, P.E.
State Specifications Engineer

DFB/dr
Attachment
cc: General Counsel
Florida Transportation Builders' Assoc.
State Construction Engineer

STRUCTURES FOUNDATIONS – MIXING, PUMPING AND TESTING CEMENT GROUT
(REV ~~11-20-06~~*2-05-07*)

ARTICLE 455-42 (Pages 558 and 559) is deleted and the following substituted:

455-42 Mixing and Pumping Cement Grout.

Meet the following requirements:

1. Only use pumping equipment approved by the Engineer in the preparation and handling of the *cement* grout. Before using the mixers, remove all oil or other rust inhibitors from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout.

2. Accurately measure all materials by volume or weight as they are fed to the mixer. Place the materials in the mixer in the following order: 1) water, 2) fluidifier, 3) other solids in order of increasing particle sizes. *The fluidifier may be added at the option of the Contractor.*

3. Use a quantity of water and mixing time that will produce a homogenous grout having a consistency of ~~18 to 24~~ *21* seconds *minimum*, ~~or higher if specified by the Engineer,~~ when tested with a flow cone in accordance with ASTM C 939 ~~(3/4 inch diameter outlet)~~, with a frequency at the discretion of the Engineer. Mix the grout at least one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding 2.5 hours at grout temperatures below 70ºF; two hours for temperatures from 70 to 100ºF. Do not place *cement* grout when its temperature exceeds 100ºF. If there is a lapse in the operation of grout injection, recirculate the grout through the pump, or through the mixer drum or agitator.

4. Use mixers capable of combining components of the cement grout into a thoroughly mixed and uniform mass, free from balls or lumps of cementitious material and capable of discharging the concrete with a satisfactory degree of uniformity. The Engineer's approval of grout mixers and all other equipment will be conditioned on proper performance during construction of the demonstration pile and subsequent production work.

5. Use a screen no larger than 3/4 inch mesh between the mixer and pump to remove large particles which might clog the injection system.

6. Use a positive displacement piston type grout pump capable of developing displacing pressures at the pump up to 350 psi.

7. Use a grout pump/system equipped with a pressure gauge to accurately monitor the pressure of the grout flow. Test and calibrate the equipment during construction of the demonstration pile to demonstrate flow rate measurement accuracy of ±3% over the range of grouting pressures anticipated during this work. Provide a pump stroke counter in good working condition on the grout pump. Also calibrate the equipment any time the Engineer suspects that the grout pump performance has changed.

ARTICLE 455-43 (Page 559) is deleted and the following substituted:

455-43 Testing Cement Grout.

~~Make four cubes, 2 by 2 inch each,~~ *The Engineer will cast four 4"x8" cylinders in accordance with ASTM C 31* for each *LOT, considered to be* 50 yd^3 of *cement* grout placed, ~~per~~ *or one* day of pile placement. The ~~Engineer~~ *Department* will test two ~~cubes~~ *cylinders* at seven days and two ~~cubes~~ *cylinders* at 28 days*, in accordance with ASTM C 39*. The minimum required strength *for the* ~~*QC sample*~~ *LOT* will be specified on the plans. When a cement grout acceptance strength test falls more than 10% or 500 psi below the specified minimum strength, whichever is less deviation from the specified minimum strength, perform one of the following:

(a) Remove and replace the ~~LOT of concrete~~ *cement grout represented by the* ~~*QC sample*~~ *LOT* in question at no additional cost to the Department, or

(b) Submit a structural analysis performed by the Contractor's Engineer of Record. If the results of the analysis, approved by the Department, indicate adequate strength to serve the intended purpose with adequate durability, the ~~concrete~~ *cement grout* may remain in place. Otherwise, remove and replace the ~~LOT~~ *grout represented by the* ~~*QC sample*~~ *LOT* ~~of concrete~~ in question*,* at no additional cost to the Department.

All low strength cement grout accepted by the Engineer will be subject to reduced payment as follows: \$0.80/yd^3 for each 10 psi of strength test value below the specified minimum strength.

Reduction in pay will be applied to the entire length of all piles containing low strength cement grout, in any quantity. The quantity of cement grout affected by the price reduction may exceed the quantity of cement grout contained in the ~~LOT~~*QC sample**LOT*. The dollar reduction will be equated to an equivalent length of pile not to exceed the total pile length constructed utilizing the subject ~~LOT~~ ~~*QC sample*~~ *LOT* based on the following formula:

PLR = RC/UC

Where: PLR = Equivalent Pile Length Reduction in feet
RC = Total Reduction in payment, dollars
UC = Unit Cost of Pile, dollars/foot

STRUCTURES FOUNDATIONS – MIXING, PUMPING AND TESTING CEMENT GROUT
(REV 2-05-07)

ARTICLE 455-42 (Pages 558 and 559) is deleted and the following substituted:

455-42 Mixing and Pumping Cement Grout.

Meet the following requirements:

1. Only use pumping equipment approved by the Engineer in the preparation and handling of the cement grout. Before using the mixers, remove all oil or other rust inhibitors from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout.

2. Accurately measure all materials by volume or weight as they are fed to the mixer. Place the materials in the mixer in the following order: 1) water, 2) fluidifier, 3) other solids in order of increasing particle sizes. The fluidifier may be added at the option of the Contractor.

3. Use a quantity of water and mixing time that will produce a homogenous grout having a consistency of 21 seconds minimum, when tested with a flow cone in accordance with ASTM C 939, with a frequency at the discretion of the Engineer. Mix the grout at least one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding 2.5 hours at grout temperatures below 70ºF; two hours for temperatures from 70 to 100ºF. Do not place cement grout when its temperature exceeds 100ºF. If there is a lapse in the operation of grout injection, recirculate the grout through the pump, or through the mixer drum or agitator.

4. Use mixers capable of combining components of the cement grout into a thoroughly mixed and uniform mass, free from balls or lumps of cementitious material and capable of discharging the concrete with a satisfactory degree of uniformity. The Engineer's approval of grout mixers and all other equipment will be conditioned on proper performance during construction of the demonstration pile and subsequent production work.

5. Use a screen no larger than 3/4 inch mesh between the mixer and pump to remove large particles which might clog the injection system.

6. Use a positive displacement piston type grout pump capable of developing displacing pressures at the pump up to 350 psi.

7. Use a grout pump/system equipped with a pressure gauge to accurately monitor the pressure of the grout flow. Test and calibrate the equipment during construction of the demonstration pile to demonstrate flow rate measurement accuracy of ±3% over the range of grouting pressures anticipated during this work. Provide a pump stroke counter in good working condition on the grout pump. Also calibrate the equipment any time the Engineer suspects that the grout pump performance has changed.

ARTICLE 455-43 (Page 559) is deleted and the following substituted:

455-43 Testing Cement Grout.

The Engineer will cast four 4"x8" cylinders in accordance with ASTM C 31 for each LOT, considered to be 50 yd^3 of cement grout placed, or one day of pile placement.

The Department will test two cylinders at seven days and two cylinders at 28 days, in accordance with ASTM C 39. The minimum required strength for the LOT will be specified on the plans. When a cement grout acceptance strength test falls more than 10% or 500 psi below the specified minimum strength, whichever is less deviation from the specified minimum strength, perform one of the following:

(a) Remove and replace the cement grout represented by the LOT in question at no additional cost to the Department, or

(b) Submit a structural analysis performed by the Contractor's Engineer of Record. If the results of the analysis, approved by the Department, indicate adequate strength to serve the intended purpose with adequate durability, the cement grout may remain in place. Otherwise, remove and replace the grout represented by the LOT in question, at no additional cost to the Department.

All low strength cement grout accepted by the Engineer will be subject to reduced payment as follows: $\$0.80/yd^3$ for each 10 psi of strength test value below the specified minimum strength.

Reduction in pay will be applied to the entire length of all piles containing low strength cement grout, in any quantity. The quantity of cement grout affected by the price reduction may exceed the quantity of cement grout contained in the LOT. The dollar reduction will be equated to an equivalent length of pile not to exceed the total pile length constructed utilizing the subject LOT based on the following formula:

$$PLR = RC/UC$$

Where: PLR = Equivalent Pile Length Reduction in feet
RC = Total Reduction in payment, dollars
UC = Unit Cost of Pile, dollars/foot