

ORIGINATION FORM

THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR

Modify Specification _____ 937 _____
Section/File number

New Section _____
Section number

Subject: Post-Installed Anchor Systems for Structural Applications in Concrete Elements

Origination date: 04-27-11

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Problem statement: The entire Section will be modified and reorganized to include two anchor systems:

- Adhesive Bonding Material Systems
- Undercut Anchor Systems

The current specification only addresses adhesive bonding material systems. The most significant changes coming to the Adhesive Bonding Material Systems Section will be renumbering (proposed Section 937-4). The proposed addition to the specification will be the Undercut Anchor Systems Section (Section 937-5). The first three parts of Section 937 will address general topics applicable to both anchor systems.

Information source: Charles Boyd, Sam Fallaha, Tom Andres, Steve Nolan, Andre Pavlov

Background data: Prior to the proposed addition of the undercut anchors to the Specifications, the only option for post-installation was the use of adhesive-bonded anchors. The use of adhesive bonded anchors presents some challenges for overhead applications and applications with sustained tension loads, presenting the need for an alternative post-installation anchor system.



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ANANTH PRASAD, P.E.
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M E M O R A N D U M

DATE: May 20, 2011

TO: Specification Review Distribution List

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

SUBJECT: Proposed Specification: **9370000 Post-Installed Anchor Systems for Structural Applications in Concrete Elements.**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by Gevin McDaniel of the State Structures Design Office to add undercut anchor systems.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at SP965RP or rudy.powell@dot.state.fl.us. Comments received after **June 17, 2011**, may not be considered. Your input is encouraged.

RP/dt
Attachment

**POST-INSTALLED ANCHOR SYSTEMS FOR STRUCTURAL APPLICATIONS IN
CONCRETE ELEMENTS.**

(REV ~~45-2029469178~~-11)

SECTION 937 (Pages 889 – 891) is deleted and the following substituted:

SECTION 937
~~ADHESIVE BONDING MATERIAL~~ *POST-INSTALLED ANCHOR* SYSTEMS
FOR
STRUCTURAL APPLICATIONS *IN CONCRETE ELEMENTS.*

937-1 General ~~Requirements.~~

Post-installed anchor systems intended for structural applications in concrete elements may be either adhesive-bonded anchor systems or undercut anchor systems. ~~Adhesive bonding material systems for structural applications shall consist of pre-packaged 2-part chemical components. The material systems shall be specifically intended for use in structural applications for bonding anchors and dowels to hardened concrete. Applications are limited to anchors and dowels installed in positions ranging from vertically downward to horizontal.~~

~~Do not use material from containers which are damaged or have been previously opened. Use only full packages of components. Combining of epoxy bonding components from bulk supplies is not permitted.~~

~~Material systems for Type HV and HSHV shall be pre-packaged to automatically proportion and mix the materials for use. Manual proportioning of the components will not be permitted.~~

~~**937-1.1 Type HV Adhesives:** Use Type HV adhesive bonding materials for all horizontal installations and vertical installations other than constructing doweled pile splices, except when Type HSHV is required. Type HV adhesives may not be substituted for Type HSHV adhesives.~~

~~**937-1.2 Type HSHV Adhesives:** Use higher strength Type HSHV adhesive bonding materials for installation of traffic railing barrier reinforcement and anchor bolts into existing concrete bridge decks and approach slabs. Type HSHV adhesives may be substituted for Type HV adhesives.~~

937-2 Qualified Products List (*QPL*).

Manufacturers of ~~adhesive bonding material~~ *post-installed anchor* systems may apply for inclusion of individual products on the Qualified Products List. The application shall be made in accordance with ~~6-1~~ *Section 6* and shall include certified test reports from an independent testing laboratory which shows the material system meets all the requirements ~~specified herein~~ *of this Section.*

937-3 Certification.

The Contractor shall provide the Engineer with certification from the manufacturer of the ~~adhesive bonding material~~ *anchor* system, confirming that the requirements of this Section are met. The certification shall conform to the requirements of Section 6. Each certification shall cover only one LOT of ~~adhesive~~ *anchoring* materials.

937-4 Adhesive Bonding Material Systems.

937-4.1 General: Adhesive bonding material systems for structural applications shall consist of pre-packaged 2-part chemical components. The material systems shall be specifically intended for use in structural applications for bonding anchors and dowels to hardened concrete. Applications are limited to anchors and dowels installed in positions ranging from vertically downward to horizontal.

Do not use material from containers which are damaged or have been previously opened. Use only full packages of components. Combining of epoxy adhesive bonding components from bulk supplies is not permitted.

Material systems for Type HV and HSHV shall be pre-packaged to automatically proportion and mix the materials for use. Manual proportioning of the components will not be permitted.

~~High Strength Horizontal to Vertical (HSHV) adhesive bonding systems permitted for horizontal to vertically downward installations, are intended for traffic railing installations where a shallower embedment is required.~~

~~Horizontal to Vertical (HV) adhesive bonding systems permitted for horizontal to vertically downward installations, are intended for all other structural uses.~~

937-4 Minimum Performance Requirements (FM 5-568).

937-4.2 Minimum Performance Requirements (FM 5-568): When tested in accordance with FM 5-568, the adhesive bonding material system, for general use, shall meet the following requirements:

Uniform Bond Stress		
	Type HV	Type HSHV
Confined Tension	2,290 psi	3,060 psi
Damp-Hole Installation	1,680 psi	1,830 psi
Elevated Temperature	2,290 psi	3,060 psi
Horizontal Orientation	2,060 psi	2,060 psi
Short Term Cure	1,710 psi	1,710 psi
Specified Bond Strength	1,080 psi	1,830 psi
<i>Maximum Coefficient of Variation for Uniform Bond Stress – 20%.</i>		

~~Maximum Coefficient of Variation for Uniform Bond Stress 20%~~

Long Term Load (Creep):

- (1) The rate of displacement shall decrease during the 42 day application of load.
- (2) At 42 days the total displacement due to creep (with load still applied) shall be less than 0.03 inch and during the last 14 days of the 42 day load duration, the total displacement due to creep shall be less than 0.003 inch.
- (3) After removal of the 42 day load, the uniform bond Stress from a subsequent Confined Tension Test shall not be less than 1,826 psi.

937-5 Product Identification (Fingerprint) Properties (FM 5-569).

937-4.3 Product Identification (Fingerprint) Properties (FM 5-569): References for comparison including Infrared Absorption, Density or Average Weight, Gel Time or Setting Time, and Bond Strength shall be determined in accordance with FM 5-569.

937-6 Packaging and Marking.

937-4.4 Packaging and Marking: The adhesive bonding material system shall be delivered to the project site in original unopened containers with the manufacturer's label identifying the product. Each package shall be clearly marked with the following information:

- Manufacturer's name and address
- Product Name
- Date of Manufacture
- Expiration Date
- LOT Identification Number
- Storage and Handling Requirements

Each package shall include the manufacturer's instructions for anchor and dowel installation. The instructions shall include the following information:

- Diameters of drilled holes for applicable anchor and dowel sizes.

- Cleaning procedure for drilled holes, including a description of permitted and prohibited equipment and techniques.

- Allowable temperature ranges for storage, installation and curing.

- Identification of acceptable mixing/dispensing nozzles.

- Fabrication requirements for anchors and dowels.

- Description of tools permitted or required for installation.

- Method of identifying properly proportioned and mixed adhesive materials.

- Time and temperature schedule for initial set and full-strength cure.

- Special requirements for special installation conditions such as damp holes, or horizontal or near horizontal orientation of the anchor or dowel.

937-5 Undercut Anchor Systems.

937-5.1 General: *The undercut anchor system shall be ~~constructed of~~ Provide only 316 stainless steel ~~undercut anchor systems~~ qualified for use in cracked concrete.*

The ~~U~~ndercut anchor sleeve ~~must~~ shall form a cone shaped undercut or expand into a preformed cone (or reverse cone) shaped undercut. Anchors using only self-cutting teeth that are expanded to form the undercut are not permitted.

Undercut anchors with a marked setting indicator not requiring a specified setting torque are permitted. The ~~M~~arked setting indicator ~~must~~ shall indicate the displacement of the anchor bolt relative to the anchorage sleeve and must be visible above the concrete surface after the setting operation is complete.

937-5.2 Minimum, Performance Requirements: *Use Category I undercut anchor systems as defined in ~~designed in accordance with~~ ACI 318, Appendix D. ~~and the Department's Structures Manual.~~*

Use only undercut anchor systems tested in accordance with the International Code Council Evaluation Service (ICC-ES) Acceptance Criteria for Mechanical Anchors in Concrete Elements ACI 193, meeting the assessment requirements of Qualification of Post-Installed Mechanical Anchors in Concrete (ACI 355.2-07) as specified in ACI 318, Appendix D.

937-5.3 Packaging and Marking: The ~~Deliver~~-undercut anchor systems shall be delivered to the project site in packaging with the manufacturer's label identifying the product.

~~Clearly mark e~~Each package or anchor shall be clearly marked with the following information:

Manufacturer's name and address

Product Name

Anchor material grade

LOT Identification Number

Include the manufacturer's instructions for installation of the anchor with each package or anchor with the following information, as a minimum:

Diameter and depth of drilled holes for applicable anchor sizes,

Cleaning and preparation procedures for drilled holes,

Description of tools permitted or required for installation.

In lieu of creating a new section in the Specifications to address undercut anchors, this section was revised to incorporate all proposed post-installed anchor systems addressed in the Specification. To make this change, revisions, deletions and references have been proposed for Section 937 to address acceptable material systems, minimum performance requirements as well as the design of the proposed Undercut Anchor Systems.

Recommended

Usage Note:

Undercut anchors are intended for overhead applications and applications with sustained tension loads.

Estimated fiscal

impact, if

implemented:

None

Implementation of this Specification will begin as requested after January 1, 2012.