Technical Advisory

U.S. DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Subject

Use and Inspection of Adhesive Anchors in Federal-Aid Projects

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T 5140.30	March 21, 2008	HIBT-10

Par.

1. What is the purpose of this Technical Advisory?
2. Does this Technical Advisory supersede another Technical Advisory?
3. What is the definition of "Fast Set epoxy"?
4. What is the background of this Technical Advisory?
5. What are the recommendations for new Federal-aid projects and existing projects?

1. **What is the purpose of this Technical Advisory?** The purpose of this Technical Advisory is to provide guidance and recommendations regarding the use and in-service inspection of adhesive anchors, including those utilizing "Fast Set epoxy" (see definition in paragraph 3), in sustained tension applications on all Federal-aid highway projects.

2. **Does this Technical Advisory supersede another Technical Advisory?** Yes. This Technical Advisory supersedes Technical Advisory T 5140.26, dated October 17, 2007, by updating the list of "Fast Set epoxies" identified in paragraph 3. Technical Advisory T 5140.26 is herein cancelled.

3. **What is the definition of "Fast Set epoxy"?** "Fast Set epoxy" refers to an epoxy produced by the Sika Corporation called Sikadur AnchorFix-3. This epoxy is also repackaged and distributed by the names/companies presented in a list of adhesives available from the Federal Highway Administration (FHWA) Web site at the following Web link: http://www.fhwa.dot.gov/Bridge/adhesives.cfm. FHWA will update this list as new information becomes available and encourages visitation to this Web site for the latest updates.

4. **What is the background of this Technical Advisory?**

   a. On July 10, 2006, a portion of the suspended ceiling system of the I-90 connector tunnel in Boston, Massachusetts, collapsed onto a passing car, killing the passenger and injuring the driver. The suspended ceiling in the

collapsed section was comprised of concrete panels connected to steel hangers suspended from the tunnel concrete ceiling by an adhesive anchor system consisting of stainless steel anchor rods embedded in epoxy. Immediately after the accident, the FHWA launched an independent study and testing plan to determine the probable cause of failure of the suspended ceiling system.

b. The testing plan consisted of short-term strength and long-term performance testing of the adhesive anchor system installed in the I-90 connector tunnel, as well as an experimental parametric study and a limited sustained load characterization study on the adhesive anchor system supplied for use in the I-90 connector tunnel conducted at the FHWA's Turner-Fairbank Highway Research Center (TFHRC). The testing program identified several installation factors that affect the short-term strength of adhesive anchors. However, while these factors may have contributed to the timing of the failure, the results clearly show that the primary cause of the collapse was the use of "Fast Set epoxy" which is incapable of resisting sustained tension loads without excessive creep.

c. In addition to the testing conducted on the adhesive used in the I-90 tunnel, data produced at TFHRC show that some anchor systems utilizing adhesives other than "Fast Set epoxy" that have passed the International Code Council (ICC) creep certification process are still vulnerable to creep under typical bridge and tunnel exposure conditions. The results indicate that the current American Society for Testing and Materials (ASTM) and the ICC creep prediction methodology do not appear to guarantee safe performance of adhesive anchors over the entire expected service life (75 to 100 years) of transportation structures. In addition, the ICC does not address issues related to overhead installation of anchors nor the effect that vibration could have on their long-term performance and integrity.

d. Therefore, as a result of the investigation of the collapsed suspended ceiling support system, and in concurrence with the National Transportation Safety Board's findings, the FHWA is now implementing these safety recommendations to ensure that similar incidents will not occur in the future.

e. At the time T 5140.26 was issued, the FHWA was aware of the four products originally listed in paragraph 3 as being inadequate. Since that time, the investigation has continued to identify adhesives that are repackaged Sika products that include the fast set hardener (part B of the epoxy). These repackaged adhesives have been added to the original list so that structure's owners are aware of the potential for creep issues associated with these products.

5. **What are the recommendations for new Federal-aid projects and existing projects?**

a. **New Federal-aid projects**

(1) This Technical Advisory strongly discourages the use of "Fast Set epoxy" for adhesive anchor applications.

(2) This Technical Advisory also strongly discourages the applications of anchor systems utilizing adhesives other than "Fast Set epoxy" for permanent sustained tension applications or overhead applications until the FHWA is satisfied with an improved certification process that is developed to ensure long-term creep performance and that recognizes the effect of overhead installation.

b. **Existing projects**

(1) Where applications are those specific to the use of "Fast Set epoxy" adhesive in sustained tension, it is strongly recommended the anchors be retrofitted and/or replaced with a reliable and appropriate mechanical anchor system and that rigorous and regular inspections are performed in the interim.

(2) Where applications of anchor systems in sustained tension using adhesives other than "Fast Set epoxy" or from an unknown source have been identified, instituting a rigorous and regular inspection program that considers importance and redundancy is strongly recommended to maintain an appropriate level of confidence in their long-term performance. This may require developing a testing protocol and program to determine the site specific ultimate capacities and creep characteristics of the adhesive over the expected life of the structure.

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