STATE OF ALASKA

TONY KNOWLES, GOVERNOR

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

3132 CHANNEL DRIVE
JUNEAU, ALASKA 99801-7898
PHONE: (907) 465-2960
TEXT TELEPHONE: (907) 465-3652
FAX: (907) 465-2460

STATEWIDE DESIGN AND ENGINEERING SERVICES DIVISION

September 20, 1999

Re: Upcoming NCHRP 350 Crash-worthiness Deadlines for Work Zone Traffic Control Devices

Henry Springer
Executive Director
Associated General Contractors
of Alaska
P.O. Box 240609
Anchorage, AK 99503

Dear Mr. Springer:

Your members should be made aware of upcoming implementation deadlines for work zone traffic control device crash-worthiness standards. As you know, National Highway Cooperative Research Program (NCHRP) Report 350 defines crash-worthiness standards for roadside appurtenances. The FHWA has set implementation deadlines.

Standards were implemented last year for category 1 work zone devices (cones, candles, etc.) and certain category 3 devices (crash cushions and truck-mounted attenuators). Standards will be implemented next year for category 2 devices (traffic signs, barricades, concrete barriers, etc.). All category 2 devices purchased or fabricated after October 1, 2000 must comply. Most existing devices on Alaska projects do not. Existing non-compliant devices may be used until the end of their useful life (about 3 years for signs and delineating devices substantially longer for concrete barrier).

While last year's implementation of standards for category 1 and 3 devices caused only a minor change in procedure, next year's implementation will have more of an impact.

NCHRP 350 implementation direction from the Director of the FHWA Office of Engineering is enclosed.

Please pass this information on to your members.

Thank you.

Sincerely,

Michael L. Downing, P.E.
Director

Enclosure

25A – T34LH

cc: (without enclosure)
Colleen Ackiss, P.E., Traffic Engineer, Northern Region
Chuck Correa, P.E., Construction Engineer, Southeast Region
Dave Eberle, P.E., Director of Operations, Central Region
Gary Eddy, P.E., State Construction Engineer, HQ
Gary Hogins, P.E., Chief, Design and Construction Standards, HQ
Pat Kemp, P.E., PreConstruction Engineer, Southeast Region
Michael Lukshin, P.E., Traffic Engineer, Southeast Region
David McCaleb, P.E., PreConstruction Engineer, Northern Region
Dennis Morford, P.E., Traffic Engineer, Central Region
Kurt Smith, P.E., State Traffic Engineer
Mike Tooley, P.E., Highway Construction Engineer, Central Region
Steve Van Horn, P.E., PreConstruction Engineer, Central Region
James Weed, P.E., Construction Engineer, Northern Region

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STATEWIDE DESIGN AND ENGINEERING SERVICES DIVISION

September 20, 1999

Re: Upcoming NCHRP 350 Crash-worthiness Deadlines for Work Zone Traffic Control Devices

Eden Larson, Director
Associated Builders and Contractors Inc.
3380 "C" Street, Suite 100
Anchorage, AK 99503

Dear Ms. Larson:

Your members should be made aware of upcoming implementation deadlines for work zone traffic control device crash-worthiness standards. As you know, National Highway Cooperative Research Program (NCHRP) Report 350 defines crash-worthiness standards for roadside appurtenances. The FHWA has set implementation deadlines.

Standards were implemented last year for category 1 work zone devices (cones, candles, etc.) and certain category 3 devices (crash cushions and truck-mounted attenuators). Standards will be implemented next year for category 2 devices (traffic signs, barricades, concrete barriers, etc.). All category 2 devices purchased or fabricated after October 1, 2000 must comply. Most existing devices on Alaska projects do not. Existing non-compliant devices may be used until the end of their useful life (about 3 years for signs and delineating devices substantially longer for concrete barrier).

While last year's implementation of standards for category 1 and 3 devices caused only a minor change in procedure, next year's implementation will have more of an impact.

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Michael L. Downing, P.E.
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Steve Van Horn, P.E., PreConstruction Engineer, Central Region
James Weed, P.E., Construction Engineer, Northern Region

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject: ACTION: National Cooperative Highway Research Program (NCHRP) Report 350 Hardware Compliance Dates

Date: August 28, 1998

Reply to Attn. of: HNG-14

From: Director, Office of Engineering

To: Regional Administrators
Division Administrators
Federal Lands Highway Program Administrator

On August 28, the Federal Highway Administration's (FHWA) Executive Director, Anthony R. Kane concurred in the proposed AASHTO-FHWA Agreement on the NCHRP Report 350 Implementation that was prepared by the AASHTO 350 Task Force and submitted to him on July 1. In this document the task force recommends that the October 1, 1998, deadline for the use of NCHRP Report 350-tested roadside hardware on the National Highway System (NHS) be extended for selected hardware categories. A summary table showing extended implementation dates for several categories of roadside appurtenances, including some work zone hardware, is attached. The information in this memorandum, as it relates to implementation dates for complying with NCHRP 350 testing and evaluation criteria, supercedes such information in the July 25, 1997, memorandum on "Identifying Acceptable Highway Safety Features." Division offices should work with their States to update the State standard drawings, specifications and policies to ensure crash worthy barriers will be incorporated into NHS projects in accordance with the attached implementation schedule.

Although the table and accompanying footnotes are generally self-explanatory, there are several items that warrant special attention. The implementation date for the NCHRP Report 350-tested guardrail to bridge rail transitions has been extended to October 1, 2002. However, all new transitions must continue to satisfy NCHRP Report 230 evaluation criteria. Design details for several NCHRP Report 230 transitions have previously been distributed via FHWA Technical Advisories T 5040.26, dated January 28, 1988, and T 5040.34, dated June 8, 1993.

Although in most cases, the AASHTO-FHWA agreement states that upgrading of existing hardware that meets NCHRP Report 230 requirements is not required on 3R projects, an exception is made for w-beam guardrail terminals and cable guardrail terminals. Specifically, it should be noted that although the agreement provides considerable flexibility in retaining existing hardware meeting NCHRP Report 230 criteria on 3R projects, such flexibility does not exist for w-beam guardrail terminals. Also, please note that an extension or exception may be made in the future for the 3-strand cable anchor if planned NCHRP Report 350 tests of the current design are unsuccessful.

Also, a change from the guidance in the FHWA memorandum "Traffic Barrier Safety Policy and Guidance" dated September 29, 1994, is that existing Breakaway Cable Terminals (BCT's) should now be replaced with end treatments meeting NCHRP 350 criteria in conjunction with 3R work. A recent NCHRP Report 350 head-on test of the BCT with an 820-kg car at the test level 2 (TL-2) impact speed of 70 km/h resulted in unacceptable passenger compartment intrusion indicating clearly that the BCT is too stiff to accommodate end-on hits, even at reduced speeds.

Regarding work zone devices, the implementation date for Category II devices (portable sign stands with signs, Type I, II and III barricades, vertical panels, intrusion alarms and other devices not expected to cause significant velocity change) has been extended to October 1, 2000. Under Category III the implementation date for truck mounted attenuators and work zone crash cushions remains at October 1, 1998, but is extended until October 1, 2002, for other devices within this category. Other such devices include portable concrete barriers and devices similar to Category II but with masses that could cause significant velocity change. Portable concrete barriers with joints that fail to transfer tension and moment from one segment to another must be phased out by October 1, 2000, unless an engineering study or in-service performance study demonstrates the barrier will provide the performance requirements of the site where it is to be used. Also note that other Category III devices (other than portable concrete barriers, work zone crash cushions and truck mounted attenuators), such as portable signs with hard (plywood, aluminum) substrate, that have not been demonstrated to be crash worthy must be phased out on a system wide basis by October 1, 2002. Details on acceptable work zone hardware are contained in my August 28 memorandum, "Crash Tested Work Zone Traffic Devices."

Implementation dates for Work Zone Category IV devices (arrow panels, variable message boards, and portable traffic signals/lighting equipment) and for Miscellaneous Hardware (see Footnote 18) have been extended indefinitely pending the results of additional research and analysis. Appropriate dates are expected to be announced within 2 years.

Henry H. Rentz

Attachment

AASHTO 350 Implementation Task Force
Summary of Implementation Issues by Hardware Type

Safety Hardware Type	NCHRP Report 350 Implementation Dates[1] & Caveats			Work to be Done
	Use in New Installations[2]	3R Projects[3]	System-wide Replacement	
Longitudinal Barriers: Guardrails, Bridge Railings, and Median Barriers	October 1, 1998[4] (Except weak-post w-beam system)	October 1, 1998[4] (Replacement of existing hardware meeting 230 is not required.)	Not Required.	- Test MB4 (SGM06b) - Test MB9 (SGM09c) - Test weak-post w-beam system, G2 (SGR02) - Test G9 wood post (SGR09c)
Guardrail to Bridge Rail Transitions	October 1, 2002[5] (Oct 1, 1998 meet 230)	October 1, 2002[5] (Replacement of existing hardware meeting 230 is not required.)	Not Required.	- Develop and test new transition designs to meet 350.
Guardrail Terminals	October 1, 1998 (Except cable guardrail terminals[6])	October 1, 1998 (Replacement of existing hardware not meeting 350 is required.)	Not required beyond FHWA memo of 29 Sep 94[7].	- Develop & test cable guardrail terminal - Test ELT - Test WyBET
Crash Cushions	October 1, 1998	October 1, 1998 (Replacement of existing hardware meeting 230 is not required.)	Not Required.	- Test steel drum system.

Safety Hardware Type	NCHRP Report 350 Implementation Dates[1] & Caveats			Work to be Done
	Use in New Installations[2]	3R Projects[3]	System-wide Replacement	
Work Zone Category I Devices[8]	October 1, 1998 New devices purchased after 1 Oct 98 must comply to 350[9]. (Agencies can phase out existing devices as they complete their normal service life.)	October 1, 1998 New devices purchased after 1 Oct 98 must comply to 350[9]. (Agencies can phase out existing devices as they complete their normal service life.)	Not Required.	None.
Work Zone Category II Devices[10]	October 1, 2000 New units purchased after 1 Oct 00 must comply to 350[11]. (Agencies can phase out existing devices as they complete their normal service life.)	October 1, 2000 New units purchased after 1 Oct 00 must comply to 350[11]. (Agencies can phase out existing devices as they complete their normal service life.)	Not Required.	- Crash test existing devices[11]

Safety Hardware Type	NCHRP Report 350 Implementation Dates[1] & Caveats			Work to be Done
	Use in New Installations[2]	3R Projects[3]	System-wide Replacement	
Work Zone Category III Devices[12]: Devices Listed in Category II but Having Masses > 45 kg "expected to cause significant occupant velocity change"	**October 1, 2002 Barriers with joints that fail to transfer tension and moment from one segment to another must be updated by Oct 1, 2000 New units purchased after Oct 1, 2002 shall comply with 350. (Agencies can phase out existing devices they complete their normal service life, except that barriers with joints that fail to transfer tension and moment from segment to another will not be acceptable after Oct 1, 2000, unless demonstrated to be crashworthy[13]**	**October 1, 2002 Barriers with joints that fail to transfer tension and moment from one segment to another must be updated by Oct 1, 2000 New units purchased after Oct 1, 2002 shall comply with 350. (Agencies can phase out existing devices they complete their normal service life, except that barriers with joints that fail to transfer tension and moment from segment to another will not be acceptable after Oct 1, 2000, unless demonstrated to be crashworthy[13]..**	**Required after 1 Oct 02 for devices that have not been demonstrated to be crashworthy[13] will not be acceptable**	- Crash test existing devices - Develop new or revised devices
Work Zone Category III Devices: Truck-Mounted Attenuators & WZ Crash Cushions	October 1, 1998 New units purchased after 1 Oct 98 must comply to 350. (Agencies can phase out existing TMAs and WZ crash cushions as they complete their normal service life.)	October 1, 1998 New units purchased after 1 Oct 98 must comply to 350. (Agencies can phase out existing TMAs and WZ crash cushions as they complete their normal service life.)	Not Required.	None.

Safety Hardware Type	NCHRP Report 350 Implementation Dates[1] & Caveats			Work to be Done
	Use in New Installations[2]	3R Projects[3]	System-wide Replacement	
Work Zone Category IV Devices[15]	Delayed[16] Announcement of an implementation date will be made by 1 Oct 00.	Delayed[16] Announcement of an implementation date will be made by 1 Oct 00.	Decision delayed	- Develop new designs that meet 350.
Breakaway Devices[17]	October 1, 1998[17]	October 1, 1998[17]	Not Required.	None.
Miscellaneous Hardware[18] ~~Steel~~ CRT, ballast, culvert spin	Delayed[19] Announcement of an implementation date will be made by 1 Oct 00.	Delayed[19] Announcement of an implementation date will be made by 1 Oct 00.	Not Required.	- Develop and test new designs to meet 350.

Notes:

1. Date given is the date a construction project under which a feature is to be installed is advertised for bids or the date a feature is to be installed by transportation agency or utility company maintenance or force account workers.
2. A new installation of a feature occurs when one is installed where none exists. (A transportation agency shall define when extensions, relocations, adjustments, or major repairs to a feature constitute a new installation.)
3. The general rule is that all permanent safety features on new construction and 3R projects should meet current criteria unless a design exception is obtained. The intention here, and in Note 2, is to continue this rule. However, features that meet the acceptance requirements recommended in NCHRP Report 230, at the discretion of the responsible transportation agency, may remain in place. The preferred treatment of features that must be moved, reconstructed, or extended because of a changed roadway grade, width, or other condition or must be rebuilt because of crash damage is to bring them to current criteria. Nevertheless, a transportation agency, at its discretion, may retain or extend "in-kind" an existing feature meeting the acceptance requirements in NCHRP Report 230. (The FHWA's guidance on guardrail terminal replacement is given in its memorandum cited in Note 7 below.)
4. Full acceptance of this date is contingent upon successful completion and FHWA acceptance of certification tests for the weak-post w-

beam guardrail system at Test Level 3. (The weak-post w-beam guardrail length-of-need has met Test Level 2.)These tests are being conducted by Penn State and should be completed by July 1998. If difficulties are encountered, consideration may be given to an exception for weak-post w-beam systems. It should also be pointed out that the turned-down terminal usually used with this system has not met Report 230 requirements. The crash testing histories for bridge railings differ from those of other longitudinal barriers. For information on acceptable bridge railings, see FHWA memorandum from Chief, Federal-aid Division, dated May 30, 1997, Subject: Action: Crash Testing of Bridge Railings.

5. As of May 1998, steel- and wood-post versions of one style w-beam-to-shaped concrete parapet transition have each qualified under Report 350 acceptance criteria. Efforts are underway to qualify other transitions.

6. Full acceptance of this date is contingent upon successful completion and FHWA acceptance of certification tests for the cable guardrail end treatment. Funding is available for two tests of the New York State DOT cable guardrail terminal. It is uncertain if this level of testing will be sufficient or that the testing can be complete to meet the October 1998 implementation date. If difficulties are encountered, it may be necessary to provide some type of exception for this type of system. There are no proven Report 230 qualified cable guardrail terminals. Continued use of existing designs until a Report 350 qualified terminal is available should be supported by a record of acceptable field performance.

7. FHWA Executive Director to FHWA Regional Administrators and Federal Lands Program Administrator, Subject: Action: Traffic Barrier Safety Policy Guidance, dated September 29, 1994

8. Category I currently includes plastic cones, drums, and tubes without attachments such as signs or warning lights (see FHWA July 25, 1997 memo 1997, FHWA Director, Office of Engineering, to FHWA field offices, Subject: Action: Identifying Acceptable Highway Safety Features.).

9. Vendors can self-certify Category I devices by meeting the criteria in Attachment A, Page 8, of the FHWA memo of July 25, 1997

10. Category II includes portable sign stands (with signs), type-1,-2,&-3 barricades, vertical panels, intrusion alarms, and other work zone devices under 45 kg. (See FHWA memo of July 25, 1997 cited in note 8)

11. Efforts should be made to allow certain classes of devices in Category II to be reclassified as Category I to allow self-certification. Vendors can self-certify Category I devices by meeting the criteria in the FHWA memo cited in Note 8.

12. Category III covers traffic control devices with masses greater than 45 kg. Some portable sign support and sign combinations failed to met Report 350 acceptance requirements and others, such as those incorporating motor vehicle axles as supports, can be expected to fail. These should be phased out of service soon unless they are modified to make them crashworthy. This category also includes the portable temporary barriers, work zone crash cushions, and truck-mounted attenuators covered separately in this table. (See FHWA memo of July 25, 1997 cited in note 8). The cited FHWA memorandum discusses reduce test instrumentation. The Report 350 suggests this reduced instrumentation applies to the testing of freestanding devices with masses <45kg. Testing has indicated that this criterion is overly conservative. Efforts are underway to develop more appropriate testing and instrumentation guidelines for these devices. Further

instructions on this will be forth coming from FHWA Office of Engineering.

13. A barrier will be considered crashworthy if (a) it has been crash tested and met the acceptance requirements proposed in either NCHRP Reports 230 or 350 or (b) it is a barrier with one of the five joints listed as "Tested and Operational Connections" starting on page 9-3 of the 1996 AASHTO Roadside Design Guide or (c) if and Engineering Study of in-service performance study demostrates the barrier will provide the preformance requirements of the site where it is to be used.

14. Two "F-shape" portable concrete barriers have qualified under the acceptance criteria in Report 350.

15. Category IV includes work zone traffic control equipment such as arrow panels, variable message boards, portable traffic signals, and portable lighting equipment. (See FHWA memo of July 25, 1997 cited in note 8)

16. This delay is to allow time to conceive and evaluate alternative measures for making these devices crashworthy, to examine the use and crash histories of existing devices, and to review and, if needed, develop safer, cost-effective strategies for the placement or replacement of these devices that will accomplish providing motorists with needed information for driving in work zones.

17. Breakaway support hardware previously found acceptable under the breakaway requirements of either the 1985 or 1994 editions of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* are acceptable under the NCHRP Report 230 or 350 guidelines. The July 25, 1997, FHWA memorandum cited in Note 8 exempts utility poles and signal supports from the Report 350 requirements. However, where breakaway utility poles or traffic signal supports are practical they should be used.

18. Miscellaneous hardware items identified as warranting special consideration for implementation timing are short-radius guardrail returns, the "bullnose" guardrail terminal, guardrails over low-fill culverts, guardrail curb combinations, the w-beam-to-thrie-beam guardrail transition, and culvert end grates.

19. The indicated delay is to provide time to assess efforts underway and, if needed, to adjust those efforts or initiate new efforts to provide crashworthy versions of the identified miscellaneous hardware items. It is believed that it is possible, in the near future, to complete the development and testing of several miscellaneous devices needed by the states. The short-radius guardrail and bull-nose treatment can meet 350 through similar modifications. A long span guardrail for low-fill culverts is believed to be close to being passed. The guardrail connected to the culvert, short-radius guardrail, and culvert grates can be solved, but there is no known funding for these efforts. Testing of guardrail adjacent to curbs is underway and it is expected that designs meeting 350 will result.