

Federal-Aid Reimbursement Eligibility Process

Roadside safety hardware or work zone traffic control devices that are certified by the petitioner as meeting the appropriate evaluation criteria may be submitted to the Federal Highway Administration (FHWA) Office of Safety for review to determine eligibility for reimbursement under the Federal-aid highway program. Requests may be submitted by the inventor, manufacturer, developer, test lab, State DOT, or other individual or organization that takes responsibility for the performance of the hardware. The purpose of this document is to outline the hardware eligibility review process when a request is submitted under the AASHTO MASH criteria, which is recommended for crash testing of new devices, and for consideration of modified devices under MASH or NCHRP Report 350. It describes the information that should be submitted when requesting a review for Federal-aid reimbursement eligibility, as well as providing links to the appropriate sites where further detailed information may be found.

Independently certified crash test reports, video/DVD documentation of the tests, and other documentation to support a request for eligibility for reimbursement should be sent via a traceable private courier service (e.g. Airborne, DHL, FedEx, UPS, etc.) or via US Postal Service [Express Mail](#) to this address:

Roadway Departure Team, Room E71-322
Office of Safety Technologies - HSST
Federal Highway Administration
1200 New Jersey Avenue, SE.
Washington, DC 20590

The FHWA's Office of Safety will determine the Federal-aid reimbursement eligibility of roadway safety hardware.

Please see information that follows on the supporting documentation that should be submitted with a request for eligibility under the MASH criteria. A flow chart of the process for a Federal-aid reimbursement eligibility determination is available online at:

http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware. A full description of the process is contained in Section II, below.

This document is guidance. It is not a regulation and does not impose legally binding requirements on the FHWA or the States. It does not create or confer any rights for or on any person or operate to bind the public. This guidance may be revoked at any time. You can use an alternative approach if the approach satisfies the requirements of the applicable statutes and regulations. This guidance supersedes the following documents:

- (1) FHWA Memorandum of July 25, 1997, “Identifying Acceptable Roadside Safety Features”,
- (2) FHWA Memorandum of November 18, 2005, “FHWA Hardware Acceptance Procedures – Category 2 Work Zone Devices”, and
- (3) FHWA Memorandum of November 20, 2009, “Manual for Assessing Safety Hardware (MASH)”.

GUIDANCE CONTENTS

- I. Background
 - A. Roadside design
 - B. FHWA hardware review
- II. Hardware Development
 - A. New hardware
 - B. Modifications to hardware.
- III. Crash Testing
- IV. Federal-aid Reimbursement Eligibility Process
 - A. Submittal process
 - B. Requesting Federal-aid Reimbursement Eligibility
 - C. Suggested attachments
- V. FHWA review and evaluation
- VI. Appeals
- VII. Federal-Aid Reimbursement Eligibility Letter

I. Background

A. Roadside design

Optimum highway design includes a roadside that is flat, traversable, and free of hazards. The American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide (RDG) has been adopted by the FHWA as our guidance for reviewing State roadside design policies for use on the National Highway System (NHS). The RDG includes guidance on roadside topography and safety hardware including breakaway sign and lighting supports, crash cushions, and longitudinal barriers including those for use on the roadside, medians, and as bridge railings. Each highway agency should have a written policy for designing clear roadsides that incorporates wide clear zones, traversable drainage structures, and breakaway sign and lighting supports. The roadside policy should also describe how the remaining hazards may be relocated, modified, shielded or delineated. The FHWA recommends that highway agencies adopt the RDG as their roadside policy document. If the agency chooses to develop its own roadside policy, it should fully explain the reasons for any significant deviations from the RDG and the basis for such deviations should be well documented. Where the State’s roadside policy calls for the installation of safety hardware and Federal-aid reimbursement for the hardware is expected, hardware that has been found “eligible for reimbursement” should be required.

B. FHWA hardware review

Eligibility of hardware for reimbursement under the Federal-aid program is based on a review of data submitted by the petitioner, who certifies the hardware meets the appropriate crash test criteria. The FHWA reimbursement eligibility process provides a consistent process that establishes whether the hardware is eligible for reimbursement under the Federal-aid highway program on a national level. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use as the FHWA, the Department of Transportation, and the United States Government do not endorse products or services.

II. Hardware Development

A. New hardware

All hardware that has not received a Federal-aid reimbursement eligibility determination should be crash tested and those results certified by an accredited test facility that is independent from the developer of the safety hardware. Crash testing is the responsibility of the developer of the safety hardware – the FHWA does not pay for the crash testing of proprietary (patented) hardware. See Section III below for information on crash testing of new hardware and a link to the listing of accredited test facilities.

The recommended criteria for roadside safety hardware crash testing are described in the [AASHTO MASH](#).

As the full development of roadside safety hardware may require eight or more full-scale crash tests (at approximately \$50,000 each), a developer may use computer simulation during hardware development/refinement to optimize the design in order to minimize the expense of crash testing. The use of Finite Element Analysis (FEA) is a useful computer simulation tool for evaluating alternative designs and changes to roadside safety hardware as part of a crash-testing program. However, FEA should not be used as a substitute for full-scale crash testing of new hardware. As noted in Section III below, it may potentially be used in lieu of crash tests to support the modification of crash-tested hardware. FHWA's memo on the Roadside Safety Hardware – Federal-Aid Reimbursement Eligibility Process may be found at: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware.

B. Modifications to hardware that already has a Federal-aid reimbursement eligibility letter

At times, manufacturers of crash-tested hardware may wish to revise the design of their hardware. These modifications may or may not have an effect on the crash-test performance of the hardware. There are some modifications that, by their nature, are low risk and will have no effect on the hardware's ability to meet MASH criteria. Other requested modifications may only affect the

hardware's performance in certain crash-test scenarios. Significant modifications to hardware originally tested under the provisions of either the MASH or the National Cooperative Highway Research Program (NCHRP) [Report 350](#) should be crash tested under MASH.

FHWA has defined three categories for reviewing hardware modifications related to Federal aid reimbursement eligibility: 1) Significant; 2) Non-Significant - Effect is Uncertain; and 3) Non-Significant - Effect is Positive or Inconsequential. Using the guidance in this document, the petitioner should determine which category applies and submit the appropriate documentation with a registered professional engineer's certification that the proposed change meets the criteria for that category.

Significant:

Any structural change is considered significant if it could be expected to adversely affect the crash test performance of road safety hardware that was found eligible under either: (1) the provisions of National Cooperative Highway Research Program (NCHRP) Report 350; or, (2) the provisions of the AASHTO MASH. Each crash test that is required for the hardware in order to establish it meets MASH provisions should be listed, and the petitioner should provide a summary of each test actually conducted and its results. The petitioner should submit all documentation necessary to demonstrate that the hardware satisfies MASH.

Non-Significant - Effect is Uncertain:

A structural change to eligible hardware where the effect on the crash test performance of the hardware is uncertain should undergo, at a minimum, a finite element analysis.

If the structural change is non-significant, it should result in substantially the same performance as the original system. However, the difference in expected performance should be documented. The following steps should be followed in order to provide complete information for FHWA consideration of a structural non-significant submission:

1. Build a finite element model of the original crash-tested and eligible system.
2. Compare/validate the baseline crash test to the finite element model using the procedures contained in the recently published [NCHRP Web-Only Document 179](#) (NCHRP W 179) and prepare a validation report conforming to Appendix E of NCHRP W 179.
3. If the results of the validation report are satisfactory according to the acceptance criteria in NCHRP W 179, then modify the original numerical model to represent the proposed change.
4. Compare the finite element results of the modified model developed in step 3 to the original baseline test and prepare a validation report as shown in Appendix E of NCHRP W 179. A successful comparison is one that satisfies all three parts of the Appendix E forms including the solution verification, time history comparisons, and phenomena importance ranking tables.
5. Submit the original baseline validation report and the validation report for the modification to the FHWA. If the modified finite element analysis results in a validated comparison with the

original baseline crash test, then the proposed modification may be considered non-significant and FHWA may issue a Federal-aid reimbursement eligibility letter for the modified hardware.

In summary, the request for a determination of Federal-aid reimbursement eligibility for a non-significant change to hardware previously determined to be eligible should include:

- A. Finite Element Analysis using LS-Dyna that shows the modified hardware will perform in a similar manner to the NCHRP Report 350 or MASH crash testing that was first used to evaluate roadside hardware.
- B. Validation and Verification (V&V) analysis and report per the NCHRP W 179. A report conforming to Appendix E of NCHRP W 179 should be submitted for both the original model compared to the baseline test and the model of the non-significant change compared to the baseline test.

If the FEA results are unclear, crash testing of the modified hardware under MASH criteria should be undertaken before FHWA may make a determination regarding Federal-aid reimbursement eligibility.

Non-Significant- Effect is Positive or Inconsequential

The petitioner may submit a certification by a registered professional engineer that a modification does not affect the structure of the hardware and that certification may serve as a basis for continued eligibility. The engineering certification for such modifications should show the changes have no adverse effect on the crash test performance of the hardware. The petitioner should fully support the certification of crash performance through an engineering analysis of the crash testing conducted on the original hardware, and the expected effects of the modification(s).

If FHWA determines the engineer's certification and related documentation do not adequately demonstrate that the modification(s) fit into the non-significant effect category, then FHWA will request the petitioner to provide either an FEA or a full crash testing of the modified hardware before FHWA makes a determination regarding Federal-aid reimbursement eligibility.

III. Crash Testing

When hardware is ready to be crash tested, the developer/owner should contact one or more of the [accredited crash test laboratories](#) and discuss the hardware, the proposed test matrix, and the costs and scheduling of the crash tests. [Since September 24, 2009, 23CFR637.209\(a\)\(5\) has required crash test laboratories must be accredited according to the International Standard ISO/IEC 17025:2005.](#)

Laboratories that were initially accredited per NCHRP Report 350 procedures should be reviewed under MASH guidelines for future biennial accreditation updates.

The test reports should include a statement by the researcher that certifies the testing was conducted in conformity with MASH criteria and that the results of all necessary tests on the hardware meet the evaluation criteria.

All hardware that is to be used with auxiliary features should have those features in place during the MASH crash tests. For example, sign supports need signs; luminaire supports need mast arms; and work zone traffic control devices need signs, lights and/or flags if they will be marketed as being used with them.

If a “family” of hardware is proposed, the developer should carefully choose which version or versions of the hardware should be considered representative of the “family” of hardware to be used during a MASH compliant crash test program. The developer should provide reasoning and rationale used for choosing that representation of “family” within the submission for eligibility. Each member of a family of hardware should use a separate dedicated submission using the Adobe form. If a number of different sizes are proposed for use, then the “worst case” conditions should be used.

It is the responsibility of the hardware developer and the crash test labs to stay abreast of the crash testing criteria. For example, as of January 2012, the status of pendulum testing for breakaway supports under the MASH is undetermined. Surrogate testing must evaluate the roof crush and windshield damage as required in the MASH. Based on experience in reviewing both full scale testing and pendulum tests of breakaway supports, pendulum testing does not meet the MASH criteria. Guidance limiting luminaire supports to 1000 pounds cannot be relied upon to satisfy the MASH criteria because vehicle structures have changed and the MASH criteria now requires the pickup truck to be used. Crash testing of luminaire supports with pickups is very limited. As a result, it is not possible to reliably assess the potential for roof crush except through full-scale crash testing.

IV. Federal-aid Reimbursement Eligibility Process

A. Submittal process

A completed “Form to Request Eligibility for Federal Aid Reimbursement” under the Federal-aid highway program should be accompanied by certified crash test reports and videos (viewable on Microsoft Office Suite without the need for additional downloads) and photo documentation. The form should be used for both new and modified hardware. The test reports may be sent in hard copy or in electronic media with the videos and photos. A request for FHWA review without submitting complete documentation will delay the determination of reimbursement eligibility.

B. Requesting Federal-aid Reimbursement Eligibility

A transmittal requesting Federal-aid reimbursement eligibility should be submitted using the following template: FHWA Office of Safety Highway Safety Hardware - Form to Request Eligibility for Federal

Aid Reimbursement. This template can be located and downloaded from the FHWA Web site http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware. The transmittal uses Adobe software utilizing Adobe Form® and can be completed using either Adobe® full version or free version of Adobe Reader®. A tutorial on completing this form can be found in the file. The form serves as the official transmittal requesting hardware be determined eligible for reimbursement under the Federal-aid program.

C. Suggested attachments

These suggested attachments will assist FHWA in processing requests for federal-aid reimbursement eligibility determinations. Attachments to the completed form should include:

1. A PDF file with the crash test report's Test Data Summary Sheet(s) for all physical crash testing.
2. A PDF file with the crash test report's Test Data Summary Sheet(s) for all original crash testing of which FEA is analyzed in comparison.
3. A drawing or drawings of the hardware that conform to the AASHTO/AGC/ARTBA Joint Committee, Subcommittee on New Products Task Force-13 (TF-13) [Drawing Specifications](#). For proprietary hardware, a single isometric line drawing should be submitted to illustrate the hardware, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are key to understanding the performance of the hardware should also be submitted to facilitate review.
4. All crash test videos. If submission contains video files too large for regular email, submitter should convey properly identified video files via mail service to Office of Safety address as listed on page 1, or conveyance via other method.

V. FHWA Review and Evaluation

Receipt of the request for reimbursement eligibility determination will be acknowledged within two weeks. FHWA will endeavor to promptly review the submission to confirm conformity with the MASH, but the petitioner should understand that requests for assistance on numerous roadside design topics are received frequently by the FHWA Office of Safety. Requests for eligibility are generally reviewed in the order received. When FHWA has reviewed the certified crash tests and/or other documentation and concurred in the request, a draft eligibility letter will be prepared and sent to the petitioner for review and comment to ensure the request has been adequately addressed. If the petitioner provides adequate detail in their request form, FHWA may be able to respond more promptly with an eligibility letter that is briefer in that it can incorporate information in the incoming form by reference. Therefore, the petitioner should ensure the form provides sufficient details, but refrain from making subjective claims about the hardware's attributes.

As part of the reimbursement eligibility process, FHWA may also include the TF-13 designator, working through the Task Force 13 webmaster to assign the designator. It is the owner's responsibility to use this assigned designator on an approved TF-13 system drawing [[TF13 Publication 1 - A Guide to](#)

[Standardized Highway Barrier Hardware](#)] to be submitted by the owner to TF13 for peer review and inclusion into the on-line [TF13 Barrier Hardware Guide](#).

MASH has improved consistency in the testing and evaluation of safety hardware, however some subjectivity remains. FHWA has determined that the following test anomalies may result in a decision to find the hardware ineligible for reimbursement even if all other MASH evaluation criteria are met:

- Test vehicle vaults during initial impact and ends up resting on top of the barrier (fully or partially).
- The impact causes the complete separation of the barrier even though the vehicle is redirected.
- Test article causes excessive tearing/shredding to the vehicle exterior increasing the potential harm to vehicle occupants.
- Substantial debris travels over a barrier intended for use in a narrow median.

If FHWA identifies other such test anomalies, it may decline to determine MASH-compliant hardware eligible.

VI. Appeals

If the petitioner differs with the FHWA's determination of eligibility for reimbursement under the Federal-aid Highway program, the decision may be appealed in writing. The appeal should be directed to the Associate Administrator for Safety at the FHWA address given above. The appeal should specify the part(s) of the FHWA decision to which the petitioner objects and the action desired. The appeal also should include documentation supporting the claims being made in the appeal.

VII. Federal-Aid Reimbursement Eligibility Letter

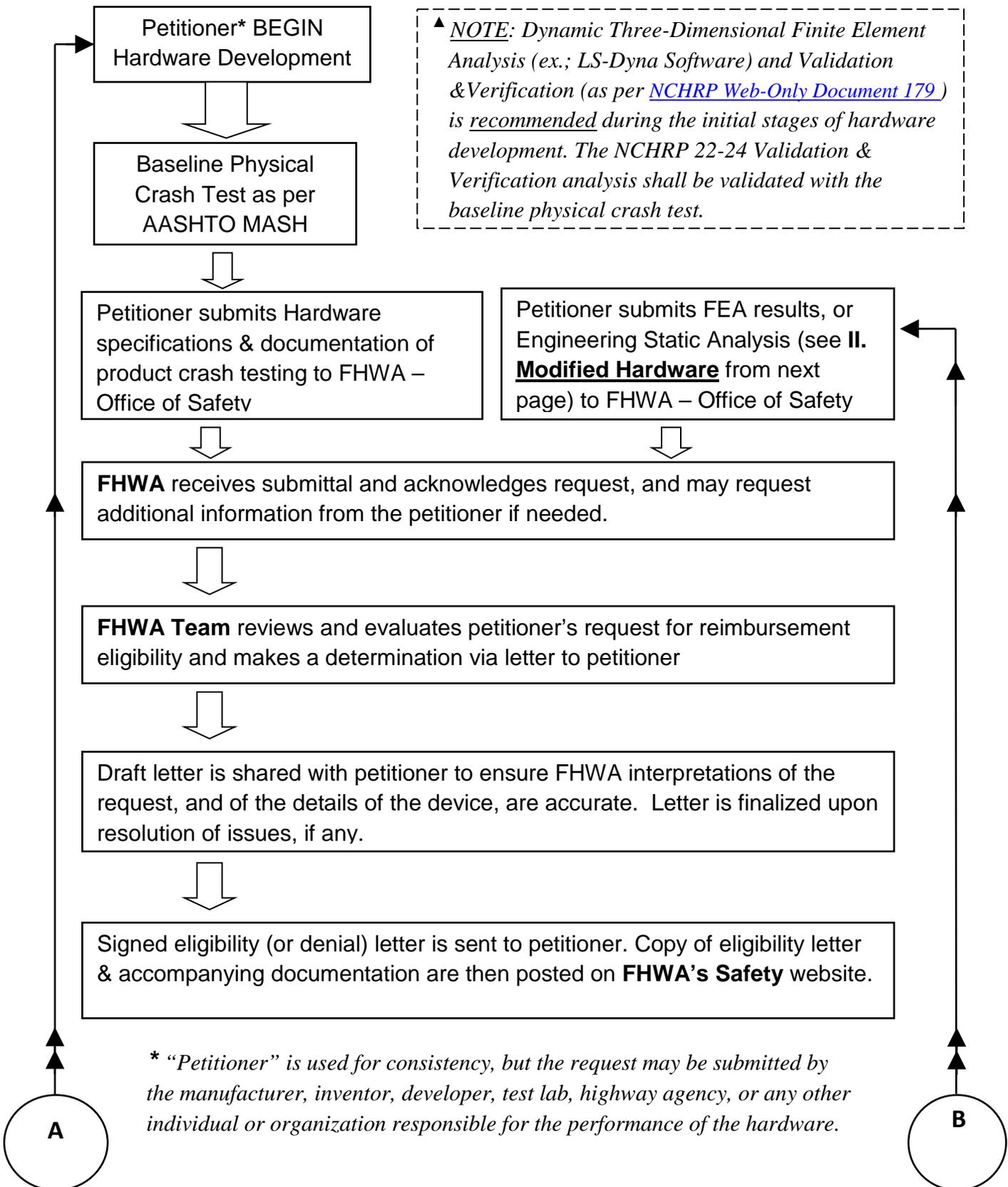
The FHWA reimbursement eligibility letter will be sent in hard copy and, upon request, sent electronically in PDF format. FHWA reimbursement eligibility letters are posted on the FHWA [Roadway Departure Safety Web site](#).

Please note that a finding of Federal-aid reimbursement eligibility by the FHWA does not ensure acceptance or use by the various highway agencies. Those highway agencies may reject a design or place limits upon its use for a variety of reasons – such as placing their own interpretation of the test results, requiring additional testing, or requiring in-service evaluation. The FHWA may also modify or revoke eligibility if hardware is promoted for use under conditions that are significantly divergent from the test conditions. Any deliberate misrepresentation or withholding of the conditions of the Federal-aid reimbursement eligibility determination of hardware by the developer or supplier can be cause for withdrawal of eligibility.

The FHWA, the Department of Transportation, and the United States Government do not endorse products or services and the issuance of a reimbursement eligibility letter is not an endorsement of any product or service.

Federal Aid Reimbursement Eligibility Process Flowchart Using Recommended Criteria

I. New Hardware



II. Modified Hardware

