



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

September 8, 2021

1200 New Jersey Ave., SE  
Washington, D.C. 20590

In Reply Refer To:  
HSST-1/CC-168

Mr. Jesper Sorensen  
Blue System AB  
Fiskeback Hamn 16  
S-426 58 Vastra Frolunda  
Sweden

Dear Mr. Sorensen:

This letter is in response to your May 14, 2020 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number CC-168 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

### **Decision**

The following device is eligible within the length-of-need, with details provided in the form which is attached as an integral part of this letter:

- SAFENCE T10.0-19 Blue Systems End Terminal

### **Scope of this Letter**

To be found eligible for Federal-aid funding, new roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Assessing Safety Hardware (MASH). However, the FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. Eligibility for reimbursement under the Federal-aid highway program does not establish approval, certification or endorsement of the device for any particular purpose or use.

This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving the device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device. Proper manufacturing, installation, and maintenance are required in order for this device to function as tested.

This finding of eligibility is limited to the crashworthiness of the system and does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

### **Eligibility for Reimbursement**

Based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory, FHWA agrees that the device described herein meets the crash test and evaluation criteria of the AASHTO's MASH. Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

Name of system: SAFENCE T10.0-19 Blue Systems End Terminal  
Type of system: End Terminal  
Test Level: Test Level 3 (TL3)  
Testing conducted by: VTI Crash Safety & Holmes Solutions  
Date of request: May 14, 2020

FHWA concurs with the recommendation of the accredited crash testing laboratory on the attached form.

### **Full Description of the Eligible Device**

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

### **Notice**

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter. Any modifications to this device should be submitted to the user (i.e., state DOT) as per their requirements.

You are expected to supply potential users with sufficient information on design, installation and maintenance requirements to ensure proper performance.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of AASHTO's MASH.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

### Standard Provisions

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number CC-168 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- This FHWA eligibility letter is not an expression of any Agency view, position, or determination of validity, scope, or ownership of any intellectual property rights to a specific device or design. Further, this letter does not impute any distribution or licensing rights to the requester. This FHWA eligibility letter determination is made based solely on the crash-testing information submitted by the requester. The FHWA reserves the right to review and revoke an earlier eligibility determination after receipt of subsequent information related to crash testing.

Sincerely,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large, stylized "S" for the middle initial.

Michael S. Griffith  
Director, Office of Safety Technologies  
Office of Safety

Enclosures

## Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

<b>Submitter</b>	Date of Request:	May 14, 2020	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	JesperSorensen	
	Company:	BlueSystemAB	
	Address:	FiskebackHamn 16,S-42658VastraFrolunda	
	Country:	Sweden	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

**Device & Testing Criterion** -Enter from right to left starting with Test Level !-!-! !-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'CC':CrashCushions,Attenuators,&Terminals	<input checked="" type="radio"/> PhysicalCrashTesting <input type="radio"/> EngineeringAnalysis	SAFENCET10.0-19 BlueSystemsEnd Terminal	AASHTOMASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

**Individual or Organization responsible for the product:**

Contact Name:	JesperSorensen	SameasSubmitter <input checked="" type="checkbox"/>
Company Name:	BlueSystemAB	SameasSubmitter <input checked="" type="checkbox"/>
Address:	FiskebackHamn 16,S-42658VastraFrolunda	SameasSubmitter <input checked="" type="checkbox"/>
Country:	Sweden	SameasSubmitter <input checked="" type="checkbox"/>

Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

The test facility VTI or any of its employees does not have any financial interest in BlueSystem AB or Safence, Inc.

## PRODUCT DESCRIPTION

<a href="#">Help</a>	<p> <input checked="" type="radio"/> New Hardware or Significant Modification                  <input type="radio"/> Modification to Existing Hardware         </p> <p>             The barrier terminal BlueSystemsMASH16TL3end terminal - SAFENCET10.0-19- isa 10 meter long sloped down barrier leading and trailing end witha concrete ground anchor attachment block. The concrete block, with a weight close to 4000 kg, is dug down into controlled gravel, compacted per each 300 mm from bottom to top by a 500 kg vibrating ground compactor. The end terminal is tested with alternatively three and four cables, whichever is regarded as the most severe test for each test.         </p> <h3 style="text-align: center;">CRASH TESTING</h3> <p>             By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.         </p>	
Engineer Name:	Jan Wenall	
Engineer Signature:	Jan Wenäll	Elektroniskt undertecknad av Jan Wenäll SN: dc=se,dc=vti,ou=Domain Users,ou=Kontoret i Linköping,cn=Jan Wenäll,email=jan.wenall@vti.se Datum: 2020.04.28 15:58:54 +02'00'
Address:	VTI, S-581 95 Linköping	Same as Submitter <input type="checkbox"/>
Country:	Sweden	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result: [Help](#)

Required Test Number	Narrative Description	Evaluation Results
3-30(1100C)	Test report 56969, October 9, 2019. "Test 30 and 40 are designed to examine the risk of vehicle instability, especially for narrow terminal and crash cushion systems" are the directions given by MASH 2016. On such a sloped down terminal as tested, it is an expectation to see an impacting vehicle riding on top of the terminal and further down barrier. The sloped down terminal is an active choice between the blunt terminal, stopping the vehicle with high g-forces and the sloped down low g terminal not stopping the vehicle but the sometimes-risky top-of-the-barrier ride. The test 3-30 impact point is 1/4 vehicle width offset, to as well maximize the risk of both yawing and rolling of the impacting vehicle. The test details are described in the enclosed VTI test report number 56969, dated 2019-12-13. The vehicle came back on four wheels after the top wire ride, with vehicle occupant compartment intact.	PASS

Required Test Number	Narrative Description	Evaluation Results
3-31(2270P)	<p>Test report 56970, October 16, 2019. "For devices intended to decelerate vehicles to a stop, these tests are designed to evaluate the capacity of the feature to absorb sufficient energy to stop the 2270P vehicle in a safe and controlled manner. For gating systems, these tests are intended to evaluate occupant risk and vehicle trajectory criteria during high-energy, head-on impacts." are part of the description given by MASH 2016. This is both a gating and a non-gating system, but on a head-on high-energy impact it is of course likely the vehicle will overrun and override both the sloped down terminal and the adjoining barrier. Which was what happened. The test details are described in the enclosed VTI test report number 56970, dated 2019-12-13. The vehicle occupant compartment stayed intact.</p>	PASS
3-32(1100C)	<p>Test report 56971, October 22, 2019. "These tests are intended to examine the behavior of terminals and crash cushions during oblique impacts on the end or nose of the system." are part of the description for test 3-32 given by MASH 2016. Impact angles should be selected from a given range, to target the maximized risk of failure. Since the tests 3-32 and 3-33 are more or less similar, but with different vehicles, we did use the option to run on of the tests (3-32) at 5 degree impact angle and one test (3-33) at 15 degree impact angle, to effectively cover both possibilities. Once again, as this is both a gating and a non-gating system and with the impact positions of test 3-32 (and 3-33) it is of course likely the vehicle will overrun and override the sloped down terminal. The test details are described in the enclosed VTI test report number 56971. The vehicle occupant compartment stayed intact.</p>	PASS

3-33(2270P)	<p>Test report 56972, October 31, 2019. "These tests are intended to examine the behavior of terminals and crash cushions during oblique impacts on the end or nose of the system." are part of the description for test 3-33 given by MASH 2016. Impact angles should be selected from a given range, to target the maximized risk of failure. Since the tests 3-32 and 3-33 are more or less similar, but with different vehicles, we did use the option to run on of the tests (3-32) at 5 degree impact angle and one test (3-33) at 15 degree impact angle, to effectively cover both possibilities. Once again, as this is both a gating and a non-gating system and with the impact positions of test 3-33 (and 3-32) it is of course likely the vehicle will overrun and override the sloped down terminal. The test details are described in the enclosed VTI test report number 56972. The vehicle occupant compartment stayed intact.</p>	PASS
3-34(1100C)	<p>Test report 56973, November 7, 2019. "Test 34 is intended to evaluate impact performance of terminals and crash cushions at the critical impact point (CIP) where the behavior of these devices changes from gating or capturing to redirection. Vehicle trajectory and occupant risk are the primary concerns for this test" are the directions given by MASH 2016. In this case, CIP is the break point where it is assumed that the uppermost wire rope will start containing and possibly redirecting the impacting vehicle. The test details are described in the enclosed VTI test report number 56973. The vehicle occupant compartment stayed intact.</p>	PASS
3-35(2270P)	<p>Due to winter weather in Sweden, it was not possible to perform this last test for the terminal at VTI. We were in process of doing other testing at Holmes Solutions, and decided to do the test 3-35 at Holmes Solution to finish the testing for our end terminal. This report will be submitted in a separate electronic file to complement this application.</p>	PASS
3-36(2270P)		Non-Relevant Test, not conducted

3-37(2270P)	Test report 56975, October 4, 2019. "Test 37 examines the behavior of crash cushions and terminals during reverse-direction impacts." are the instructions given by MASH 2016. The aim is CIP for reverse-direction impacts, in this case judged to be an impact where the vehicle most likely was under full barrier deflection while reaching the firm and final connection of the terminal to ground, with the risk of both pocketing and snagging by the trailing terminal end. The test 3-37B was chosen and motivated by the description in MASH 2016 "For post-and-beam terminals utilizing a breakaway cable system, the 1100C will generally be the critical vehicle for this test, and the impact point should be selected to maximize the risk of the vehicle snagging on the anchor cable."	PASS
3-38(1500A)		Non-Critical, not conducted
3-40(1100C)		Non-Relevant Test, not conducted
3-41(2270P)		Non-Relevant Test, not conducted
3-42(1100C)		Non-Relevant Test, not conducted
3-43(2270P)		Non-Relevant Test, not conducted
3-44(2270P)		Non-Relevant Test, not conducted
3-45(1500A)		Non-Relevant Test, not conducted

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Swedish National Road and Transport Research Institute, VTI	
Laboratory Signature:	<b>Anita Ihs</b>	Elektroniskt undertecknad av Anita Ihs Datum: 2020.05.08 13:24:01 +02'00'
Address:	SE-581 95 Linköping	SameasSubmitter <input type="checkbox"/>
Country:	Sweden	SameasSubmitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	SWEDAC1132, recent and valid annual inspection 2019-03-15, valid at time of test.	

Submitter Signature\*: Jesper Sorensen  Digitally signed by Jesper Sorensen  
Date: 2020.05.14 12:10:46 -07'00'

Submit Form

ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words

## Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

<b>Submitter</b>	Date of Request:	May 14, 2020	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Jesper Sorensen	
	Company:	Blue Systems AB	
	Address:	Fiskeback Hamn 16, S-426 58 Vastra Frolunda	
	Country:	Sweden	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

**Device & Testing Criterion** – Enter from right to left starting with Test Level

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'CC': Crash Cushions, Attenuators, & Terminals	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	SAFENCE T10.0-19 Blue Systems End Terminal	AASHTO MASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

**Individual or Organization responsible for the product:**

Contact Name:	Jesper Sorensen	Same as Submitter <input checked="" type="checkbox"/>
Company Name	Blue Systems AB	Same As Submitter <input checked="" type="checkbox"/>
Address:	Fiskeback Hamn 16, S-426 58 Vastra Frolunda	Same as Submitter <input checked="" type="checkbox"/>
Country:	Sweden	Same as Submitter <input checked="" type="checkbox"/>
Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.		
The test facility Holmes Solutions or any of its employees does not have any financial interests in Blue Systems AB.		

## PRODUCT DESCRIPTION

<input checked="" type="radio"/> New Hardware or Significant Modification	<input type="radio"/> Modification to Existing Hardware	
<p>The end terminal consist of the Safence cable barrier system (marketed as MashFlex in Australia and new Zealand) with concrete anchor blocks, with the first post in the system located 1.0 m from the cable connection bracket, which is cast into the concrete anchor block. The terminal end system has a space of 9.0 m from the first post to the second, before transiting to the first Length of Need (LoN) post.</p> <p>This is test 3-35 of the "SAFENCE T10.0-19 Blue Systems End Terminal" all other required tests were performed at VTI in Sweden, and this submittal is to complement that request for Federal Aid Reimbursement Eligibility for Highway Safety Hardware.</p>		
<h3>CRASH TESTING</h3>		
<p>By signature below, the Engineer affiliated with the testing laboratory agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.</p>		
Engineer Name:	Emerson Ryder	
Engineer Signature:	Emerson Ryder	Digitally signed by Emerson Ryder Date: 2020.05.14 09:22:12 +12'00'
Address:	L2, 254 Montreal St., Christchurch	Same as Submitter <input type="checkbox"/>
Country:	New Zealand	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-30 (1100C)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS
3-31 (2270P)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS
3-32 (1100C)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS
3-33 (2270P)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS
3-34 (1100C)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS

Required Test Number	Narrative Description	Evaluation Results
3-35 (2270P)	<p>The objective of this study was to evaluate the performance of the Blue Systems AB Safence Cable Barrier System (MashFlex) to the requirements of Test Level 3 (Test 3-35 only) as detailed in the Manual for Assessing Safety Hardware, MASH [2016].</p> <p>MASH specifically addresses the performance requirements of terminal end barrier systems. Recommended tests to evaluate performance are defined for three different test levels. Test Level 3 (TL-3) is conducted at up to 100 km/h and considered representative of the typical maximum allowable speed on high-speed arterial highways.</p> <p>There are up to ten tests recommended within the MASH Test level 3 matrix for validating the crashworthiness of a non-releasing, gating and redirective terminal end. Testing undertaken with the 2270 kg pic-up (2270P) are primarily focused on evaluating the strength of the system. MASH notes that the safety performance of a highway appurtenance cannot be measured directly but can be judged on the basis of three factors; structural adequacy, occupant risk, and post-impact vehicular response. As per client request only Test 3-35 was required for this report. Holmes Solutions were independently contracted by the client to conduct the impact testing in accordance with MASH (2016). All testing was undertaken in accordance with the requirements of the ISO 17025 accreditation under the ILAC scheme. The test vehicle had a contact length of 43.0 m with the barrier system, a maximum working width and dynamic deflection of 3.10 m. Permanent deflection was measured as 0.57 m. Max roll was 6.7 degrees. Test date was 26<sup>th</sup> November 2019</p>	PASS
3-36 (2270P)		Non-Relevant Test, not conducted
3-37 (2270P)	See other Blue Systems request file BlueSystemAB_SAFENCE_10.0_T_19_date	PASS
3-38 (1500A)		Non-Critical, not conducted
3-40 (1100C)		Non-Critical, not conducted
3-41 (2270P)		Non-Critical, not conducted
3-42 (1100C)		Non-Critical, not conducted
3-43 (2270P)		Non-Critical, not conducted
3-44 (2270P)		Non-Critical, not conducted
3-45 (1500A)		Non-Critical, not conducted

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Holmes Solutions	
Laboratory Signature:	<b>Emerson Ryder</b>	Digitally signed by Emerson Ryder Date: 2020.05.14 09:22:12 +12'00'
Address:	7 Canterbury Street Hornby Christchurch	Same as Submitter <input type="checkbox"/>
Country:	New Zealand	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	accreditation certificate number 1022 accreditation dates 12th July 2019 to 12th July 2020	

Submitter Signature\*: **Jesper Sorensen** Digitally signed by Jesper Sorensen  
Date: 2020.05.14 12:13:52 -07'00'

Submit Form

## ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words