



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

October 11, 2022

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

In Reply Refer To:
HSST-1/B-368

Jesper Sorensen
Blue Systems AB
FiskeBack Hamn 16
S-426 58 VastraFrolunda
Sweden

Dear Mr. Sorensen:

We received your correspondence of September 7, 2021 requesting issuance of a reimbursement eligibility letter under the Federal-aid highway program for the roadside safety system, device, design, product, or hardware (collectively “device”) described below. This letter is assigned Federal Highway Administration (FHWA) control number B-368.

ELIGIBILITY LETTERS

The FHWA issues Federal-aid reimbursement eligibility letters for new roadside safety devices that are crash tested in accordance with the industry standard of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH).

FHWA, the Department of Transportation, and the United States (government) do not regulate roadside safety devices, crash test facilities, or the manufacturing industry. Issuance of eligibility letters is discretionary and provided only as a service to the states. FHWA may, at its discretion, decline to issue, revise, or rescind an eligibility letter. Eligibility letters are only issued by the FHWA headquarters Office of Safety.

Eligibility letters are issued only as notice to the states that a device is eligible for reimbursement under the Federal-aid highway program. They do not establish approval or certification for any other purpose. Issuance of an eligibility letter is not a prerequisite or requirement for state transportation agencies seeking to use Federal-aid funds for roadside safety devices. State agencies may use a device for which an eligibility letter has not been issued and seek Federal-aid reimbursement.

FEDERAL-AID REIMBURSEMENT

The request for issuance of this letter certified the device was crash tested in accordance with the industry standard of AASHTO’s MASH. This eligibility letter is based on that certification and the material offered in support of its issuance. The device described below is eligible for reimbursement under the Federal-aid highway program.

Name of system: SAFENCE4RC-19CC3.0
Type of system: Longitudinal Barrier
Test Level: Test Level 4
Testing conducted by: Holmes Solutions and VTI
Date of request: September 7, 2021

Information about the device, including material such as the eligibility request, crash test reports, drawings, or images are included in one or more attachment(s) to this letter.

Eligibility letter B-368 is inapplicable to devices, optional equipment, alternate materials, or other features that were not crash tested in accordance with AASHTO's MASH.

This letter is issued only for the subject device as crash tested under AASHTO's MASH. Later modification(s) of the device are not eligible for Federal-aid reimbursement under this letter. Notice of later modification(s) should be given to transportation agencies, facility owners, and operators (collectively "agencies").

Agencies should be provided appropriate information about the device's design, installation, maintenance, materials, and mechanical properties.

Issuance of this letter is discretionary, and it may be revised or rescinded at FHWA's discretion. This letter is not a determination of compliance with the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or ownership of any intellectual property rights.

This eligibility letter is not a determination by the government that a crash involving the subject device will result in any particular outcome. It is limited to only the device's eligibility for Federal-aid reimbursement.

INTELLECTUAL PROPERTY

Issuance of this eligibility letter does not convey property rights of any sort nor any exclusive privilege. This letter is not authorization or consent by the government for the use, manufacture, or sale of any patented or proprietary system, device, design, product, or hardware for which the requester is not the patent owner. Eligibility letters are not an expression of any view, position, or determination by the government as to the validity, scope, or ownership of any intellectual property rights to a specific device. These letters do not grant, impute, suggest, or otherwise establish any ownership, distribution, or licensing rights to the requester. The government expresses no opinion about the intellectual property rights relating to any device for which this or any other eligibility letter is issued.

PUBLIC DISCLOSURE

To prevent any misunderstanding, and as discussed above, this eligibility letter is assigned FHWA control number B-368. It should only be reproduced in full with its attachment(s). This letter and the material offered by the requester supporting its issuance is public information. All eligibility letters and supporting material are subject to public disclosure under the Freedom of

Information Act (FOIA). Eligibility letters are available to the public at https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/.

If you have any questions please contact Aimee Zhang at Aimee.Zhang@dot.gov.

Sincerely,

A handwritten signature in blue ink that reads "Louis M. Wood".

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

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	September 07, 2021	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Jesper Sorensen	
	Company:	BlueSystems AB	
	Address:	Fiske Bäck Hamn 16, S-426 58 Västra Frölunda	
	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
'B': Rigid/Semi-Rigid Barriers (Roadside, Median, Bridge Railings)	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	SAFENCE4RC-19CC3.0	AASHTOMASH	TL4

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:	BlueSystems AB	Same as Submitter <input checked="" type="checkbox"/>
Address:	Fiske Bäck Hamn 16, S-426 58 Västra Frölunda	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 LP or any of its employees do not have any financial interest in BlueSystems AB or Safence, Inc.

PRODUCT DESCRIPTION

Help

- New Hardware or Significant Modification
 Modification to Existing Hardware

The SAFENCE4RC-19 Blue Systems Cable Barrier System used in this test series consist of four 19 mm (0.75") 3x7 strand wire rope cables. Wires are attached to the post through the central slot detail and cap assembly in the post. The cable cross-section diameter is 20 mm and the wire ropes were attached at heights of 570 mm, 670 mm, 780 mm, and 800 mm above ground level. Cable height is measured from center of cable to ground. The overall barrier length was 188.4 m.

The system should be installed with post spacing of 3 meter. All posts should be installed in concrete foundation 600 mm deep x 300 mm diameter into AASHTO standard soil.

Test 4-10 and 4-11 were conducted at Holmes Solution. This Request for Eligibility Form is for those two tests. Test 4-12 were conducted at VTI, and a Request for Eligibility Form will be submitted for that test to complete the test series for TL4.

CRASH TESTING

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.

Engineer Name:	Emerson Ryder	
Engineer Signature:	Emerson Ryder	Digitally signed by Emerson Ryder Date: 2021.09.08 08:41:27 +12'00'
Address:	7 Canterbury Street 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: Help

Required Test Number	Narrative Description	Evaluation Results
4-10(1100C)	<p>The test was conducted with a 1100C vehicle impacting the test installation 1.39m upstream from steel post 20 at an angle of 24.8 degrees, and a velocity of 100.4 km/h. The maximum roll of the vehicle at 11.4 degrees during impact. The maximum working width of the system was recorded as 1.71 m. The maximum dynamic deflection of the system was also recorded at 1.71 m. The system successfully contained and redirected the test vehicle. No debris or detached elements penetrated or showed potential to penetrate the occupant compartment. No fragments were distributed outside of the vehicle trajectory. The trajectory of the vehicle was such that it did not present any undue hazard to other traffic, pedestrians, or work zone personnel. The vehicle remained upright during and after the impact and vehicle stability was considered satisfactory. The system successfully contained and redirected the test vehicle. The SAFENCE 4RC-19 cable barrier system was judged to have satisfied all the evaluation criteria for the MASH Test 4-10.</p>	PASS

Required Test Number	Narrative Description	Evaluation Results
4-11 (2270P)	The test was conducted with a 2270P vehicle impacting the test installation 405 mm upstream from steel line post 20 at an angle of 24.8 degrees, and a velocity of 99.0 km/h. The maximum roll of the vehicle was recorded as 18.9 degrees during the impact. The maximum working width of the system was recorded as 2.19 m. The maximum dynamic deflection of the system was also recorded as 2.19 m. The system successfully contained and redirected the test vehicle. No debris or detached elements penetrated or showed potential to penetrate the occupant compartment. No fragments were distributed outside of the vehicle trajectory. The trajectory of the vehicle was such that it did not present any undue hazard to other traffic, pedestrians, or work zone personnel. The vehicle remained upright during and after the impact and vehicle stability was considered satisfactory. Occupant risk factors satisfied the test criteria and the vehicle exit trajectory remained within acceptable limits. The SAFENCE 4RC-19 cable barrier system was judged to have satisfied all the evaluation criteria for the MASH Test 4-11.	PASS
4-12 (10000S)	This test was conducted at VTI, Sweden	PASS
4-20 (1100C)		
4-21 (2270P)		
4-22 (10000S)		

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:	HolmesSolutions	
Laboratory Signature:	Emerson Ryder	 Digitally signed by Emerson Ryder Date: 2021.09.08 08:44:30 +12'00'
Address:	7 Canterbury Street 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 :	1022 ISO/IEC 17025:2017 Client Number 7559 October 2020 to October 2021	

Submitter Signature*: Jesper Sorensen

Digitally signed by Jesper
Sorensen
Date: 2021.09.07 14:18:14 -0700

Submit Form

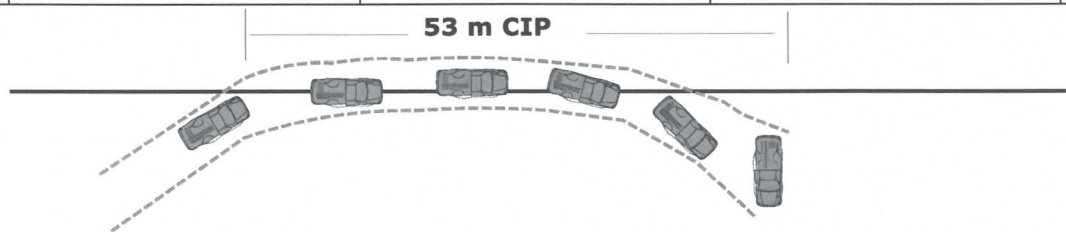
ATTACHMENTS

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



Test Article:	Blue Systems AB MashFlex Cable Barrier	Post Impact Vehicle Behaviour	
Total Length	188.4 m	Vehicle Stability	Good
Key Elements - Barrier	Mash Test 3-10	Stopping Distance	53.0 m
Description	4 Cable Barrier System	Vehicle Snagging	None
Length of Barrier Installation	175.0 m length of need	Vehicle Pocketing	None
Cable Heights	570 mm, 670 mm, 780 mm, 800 mm	Occupant Impact Velocity (m/s)	0.1631 seconds left side of interior
Post Spacing	2.5 m	Longitudinal	3.1
Test Vehicle		Lateral [optional]	-4.9
Designation	1100C	Occupant Ride-down Deceleration	
Make/Model	Nissan Tiida	X-direction (g)	-3.6 [0.4435 - 0.4535 seconds]
Dimensions (LxWxH)	4265 mm x 1680 mm x 1540 mm	Y-direction (g)	6.4 [0.2703 - 0.2803 seconds]
Curb Wt	1144.5 kg	THIV [optional] (m/s)	5.6 at 0.1446 seconds on left side of interior
Test Inertial Wt	1094.5 kg	PHD [optional] (g)	6.5 [0.2703 - 0.2803 seconds]
Gross Static	1169.5 kg	ASI [optional]	0.62 [0.2468 - 0.2968 seconds]
Impact Conditions		Test Article Damage	Moderate
Speed	100.4 km/h	Test Article Deflections	
Angle	24.8 degrees	Dynamic	1.71 m
Impact Point	1.39 m Upstream of Post 21	Permanent	0.16 m
Exit Conditions		Working Width	1.71 m
Exit Speed:	73.6 km/h	Vehicle Damage Exterior	
Exit Angle:	17.5° Est	VDS	11FL-2
Test Number	138879.3-10	CDC	11LFEE2
Test Date	13 November 2019	Maximum Deformation	130 mm

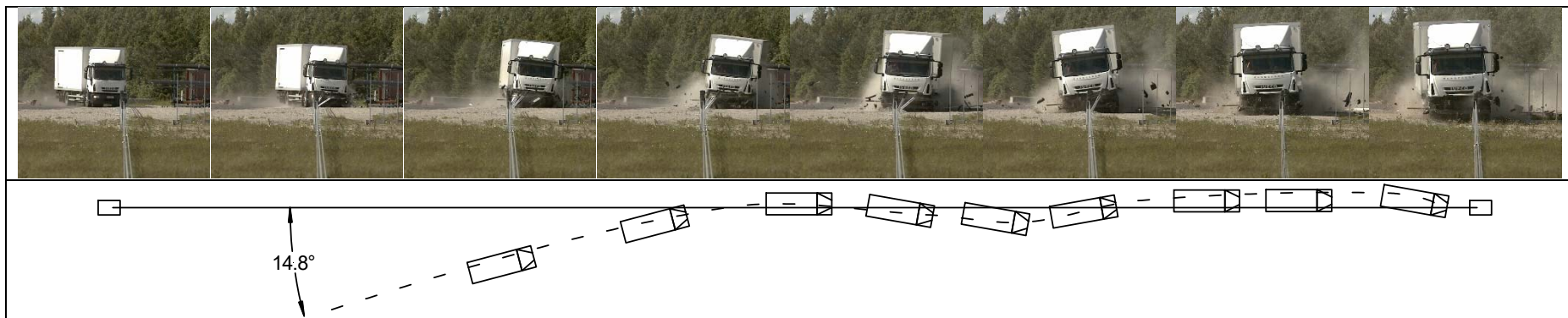




92.5 m From CIP



Test Article:	Blue Systems AB MashFlex Cable Barrier	Post Impact Vehicle Behaviour	
Total Length	188.4 m	Vehicle Stability	Good
Key Elements - Barrier	Mash Test 3-11	Stopping Distance	92.5 m
Description	4 Cable Barrier System	Vehicle Snagging	None
Length of Barrier Installation	175.0 m length of need	Vehicle Pocketing	None
Cable Heights	570 mm, 670 mm, 780 mm, 800 mm	Occupant Impact Velocity (m/s)	0.1973 seconds on left side of interior
Post Spacing	2.5 m	Longitudinal	2.6
Test Vehicle		Lateral (optional)	-3.5
Designation	2270P	Occupant Ride-down Deceleration	
Make/Model	Dodge Ram 1500 Quad Cab	X-direction (g)	-2.9 (0.2273 - 0.2373 seconds)
Dimensions (LxWxH)	5690 mm x 2000 mm x 1900 mm	Y-direction (g)	4.0 (0.5208 - 0.5308 seconds)
Curb Wt	2220.0 kg	THIV (optional) (m/s)	4.3
Test Inertial Wt	2244.5 kg	PHD (optional) (g)	4.5 (0.1849 - 0.1949 seconds)
Gross Static	2244.5 kg	ASI (optional)	0.37 (0.4263 - 0.4763 seconds)
Impact Conditions		Test Article Damage	Moderate
Speed	99 km /h	Test Article Deflections	
Angle	24.8 degrees	Dynamic	2.19 m
Impact Point	405 mm Upstream of post 20	Permanent	0.15 m
Exit Conditions		Working Width	2.19 m
Exit Speed:	68.8 km/h	Vehicle Damage Exterior	
Exit Angle:	1.2°	VDS	11FL-2
Test Number	138879.3-11	CDC	11LFEE2
Test Date	11 November 2019	Maximum Deformation	65 mm

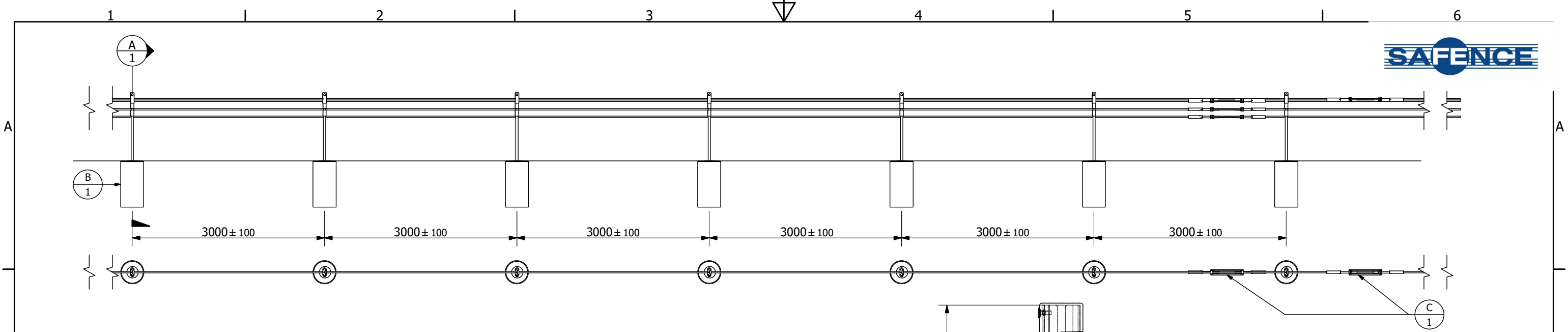


Test Agency

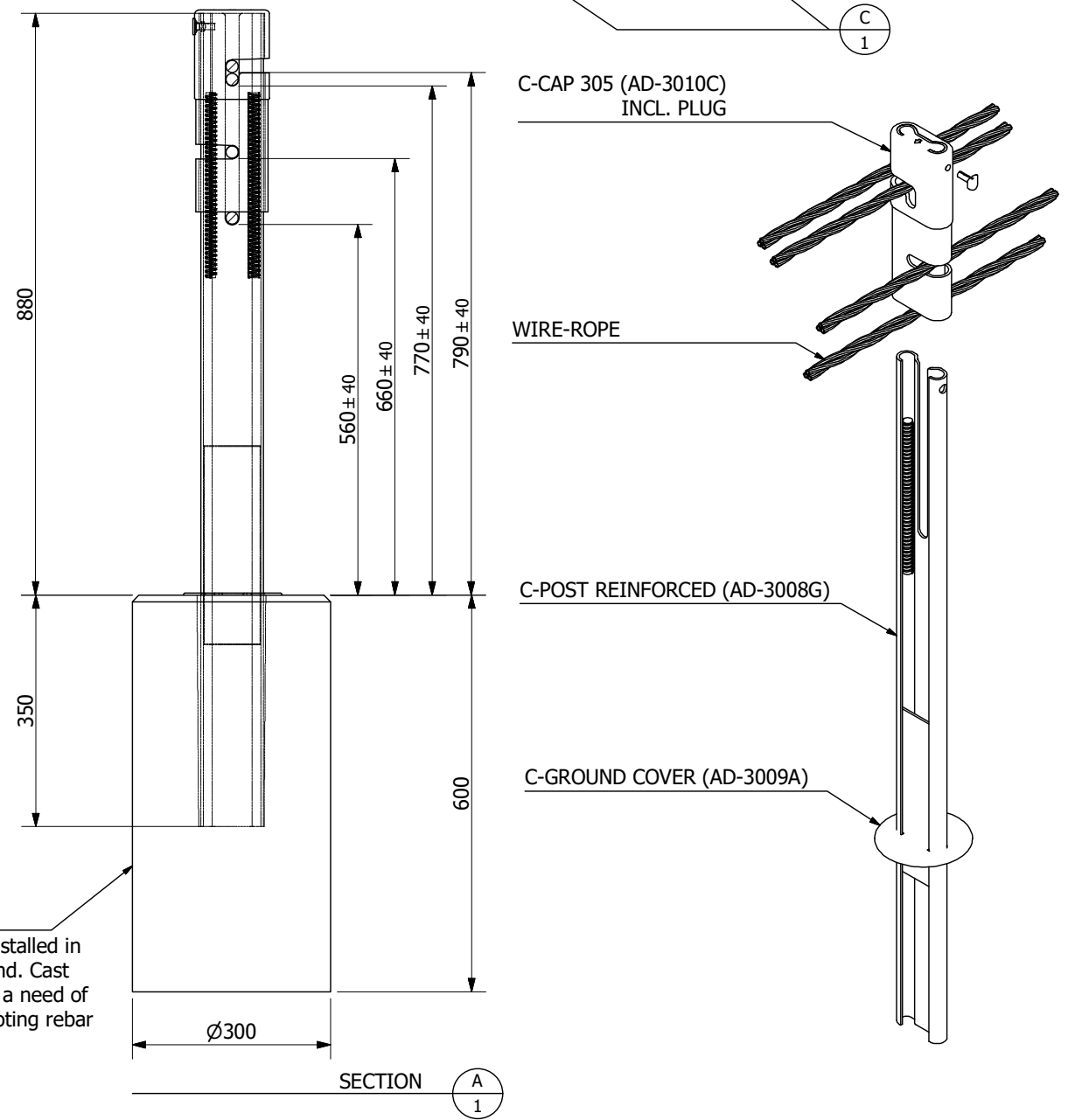
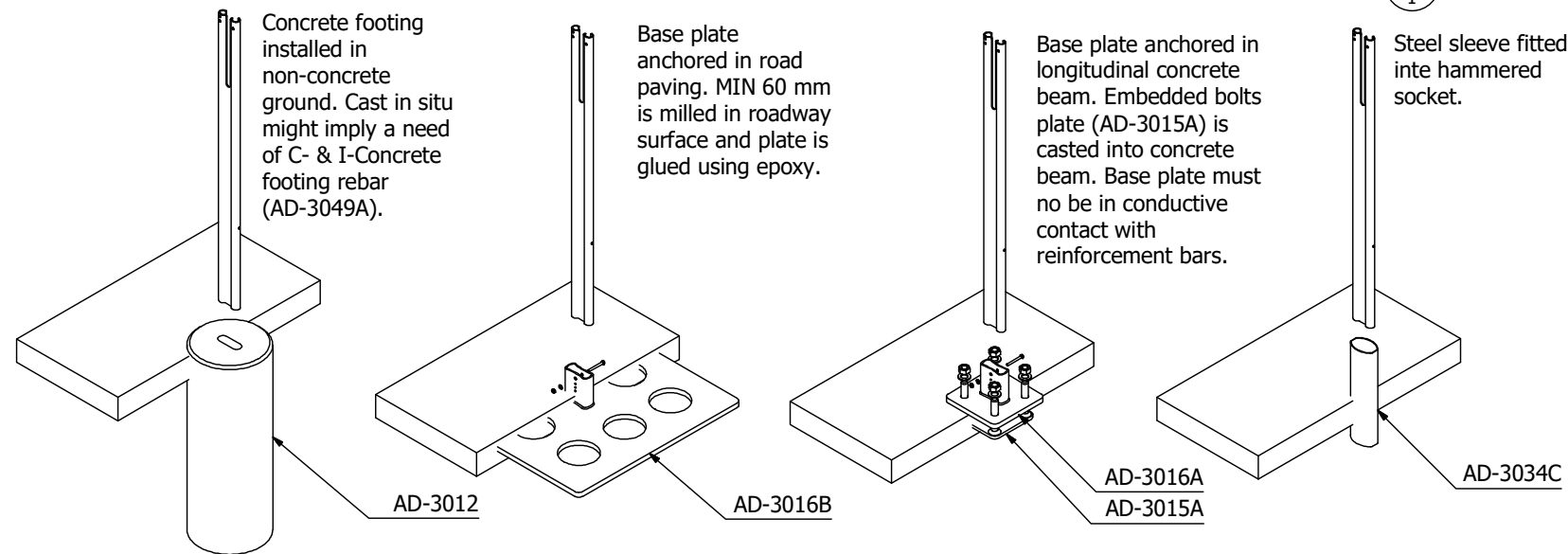
VTI

- Test Number R20210615-1
- Date 15th of June 2021
- Test Article Safence 4RC-19 CC3.0
- Total Length 187.4 meters
- Key Elements – Terminal and barrier
 - Description – Four wire rope barrier, post distance 3.0 meters.
 - Tension 25 kN per each wire
 - Length – 187.4 meters
 - Base Width – post concrete foundation (below ground) is 0.3 meters wide, and post is 0.1 meters wide.
 - Height – barrier full height 0.88 meters
- Test Vehicle
 - Type/Designation 10000S
 - Make and Model Iveco Eurocargo
 - Curb 6940 kg
 - Test Inertial/gross static 9976 kg
- Impact Conditions MASH 2016 test 4-12
 - Speed 96.26 km/h
 - Angle 14.8°
 - Location/Orientation - Vehicle left longitudinal line pointing towards 7th post along the barrier installation.

- Post-Impact trajectory
 - Vehicle was stable and did stop 122 meter after impact point
- Test article damage
 - Most of barrier run down, end anchors moved
- Exit Conditions
 - Speed N/A, vehicle never leaves barrier until full stop.
 - Angle N/A, vehicle never leaves barrier until full stop.
- Barrier deformation
 - Barrier dynamic deflection 2.8 meters.
 - Vehicle dynamic deflection 3.8 meters.
 - Working width at 3,58 meters height is 3.8 meters.



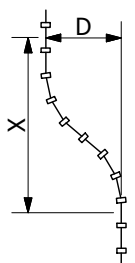
DEPLOYMENT METHODS FOR ALTERNATIVE GROUND CONDITIONS



Mounting is generally not recommended in horizontal curves with a radius <400m.

Mounting in vertical curves should not be executed in depressions with a radius <1 200m.

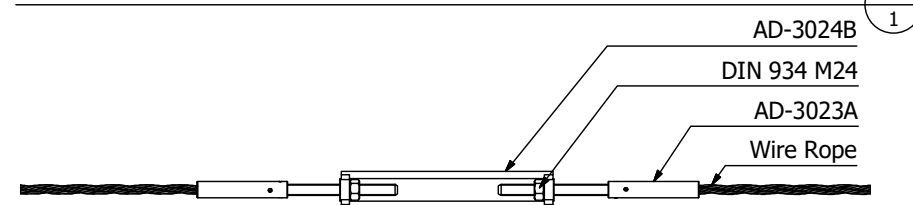
For further enquiries or specific advisement regarding installment or working features of SAFENCE, please contact Blue Systems.



Lateral movement to bypass obstacles (bridge piers etc.) are to be conducted gradually to prevent posts from being exposed to very high transverse forces.

Lateral movement, D [m]:	0,5	1,0	1,5	2,0
Transition distance, X [m]:	40	50	60	70

RIGGING SCREW ASSEMBLY



Rigging screws are to be mounted at every linear 300^{+50}_{-0} m and at 150^{+25}_{-0} linear metres from anchoring point.

Wire fittings are swaged into the cables with A-400RS-AV297 and pulled with 070827-03. After tension force according to Tensioning Table T2 is reached, AD-3023A is locked with DIN 934 M24 or equivalent.

Tensioning Table T3		
T (°C) $^{+5}_{-4}$	F (kN) ±1,5	P (Bar) ±15
-20	37,3	420
-10	34,3	390
0	31,4	350
10	28,4	320
20	25,5	290
30	22,6	250
40	19,6	220
50	16,7	190
60	13,7	150

AD-3012
Concrete footing installed in non-concrete ground. Cast in-situ might imply a need of C- & I-Concrete footing rebar (AD-3049A).

Drawn DM	Date 2020-07-01	Acceptance Standard MASH16 TL4	Units mm	Sheet size A3
BLUE SYSTEMS		Name SAFENCE 4RC-19 CC3.0		
Fiskebäcks Hamn 16 SE-426 58 Västra Frölunda Sweden Tel: +46 31-29 72 16 Fax: +46 31-29 30 65 E-mail: info@bluesystems.se		Drawing no. SRB-3012-3.0	Standard Drawing Sheet 1 / 1	
This drawing is the property of BLUE SYSTEMS AB. The content must not be copied or made available to any third party without our written permission.				