



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

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

March 4, 2026

In Reply Refer To:
HSST-1/B-388

Russell Hood
Safe Barriers PTE LTD
24 Kaki Bukit View, 415960
Singapore

Dear Mr. Hood:

We received your initial correspondence on August 11, 2023, requesting issuance of a Federal-aid reimbursement eligibility letter under the Federal-aid highway program for the roadside safety system, device, design, product, or hardware (collectively “device”) described below. On March 12, 2025, we received a complete set of files needed to complete our review. We write to inform you that the device Defender 100LDS is eligible for Federal-aid reimbursement. This letter is assigned Federal Highway Administration (FHWA) control number B-388.

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 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: Defender 100LDS
Type of system: Longitudinal Barrier
Test Level: Test Level 3
Testing conducted by: Calspan LLC
Date of request: August 11, 2023

The device and as-tested condition(s) is described as follows:

The Safe Barriers Defender 100LDS is a steel longitudinal barrier which measures 3900 mm long, 800 mm tall, with a 680 mm wide flange at the bottom and a 200 mm width at the top of the barrier. The barriers have four holes for an anchor pin to be inserted in, two holes measure 1,275 mm from the upstream edge of the barrier and the other two holes measure 1,275 mm from the downstream edge of the barrier. Each barrier is pinned to the ground in two locations using a removable RoadLoc RL45-M24-330 anchor rod, nut, and plate washer. Each barrier has 1 anchor on the traffic side and 1 anchor on the non-traffic side which are 13 in. deep and 1 in. diameter filled with HILTI HY-200 epoxy. The threaded rod is epoxied into the asphalt and granular subbase, at 0 degrees from plumb vertical into the 3.5 in thick asphalt pavement. The barrier weighs 318 kg individually and is able to connect to other barriers through male and female joints which are locked together with a locking pin placed between the two.

The barriers have two holes through the face of the barrier allowing for machinery to lift and transport each barrier as well as allow water to pass through to prevent flooding. These holes measure 150mm tall x 220mm wide. These holes are also where each of the anchor pin holes are located.

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-388 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 Build America Buy America Act, 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.

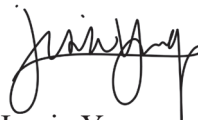
PUBLIC DISCLOSURE

To prevent any misunderstanding, and as discussed above, this Federal-aid eligibility letter is assigned FHWA control number B-388. It should only be reproduced in full with its attachment(s). This Federal-aid eligibility 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 Paul LaFleur at Paul.LaFleur@dot.gov.

Sincerely,



Jessie Yung
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	August 11, 2023	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Russell Hood	
	Company:	Safe Barriers PTE LTD	
	Address:	24 Kaki Bukit View, 415960	
	Country:	Singapore	
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	Defender 100LDS	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:	Russell Hood	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	Safe Barriers PTE LTD	Same as Submitter <input checked="" type="checkbox"/>
Address:	24 Kaki Bukit View, 415960	Same as Submitter <input checked="" type="checkbox"/>
Country:	Singapore	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.		
Safe Barriers PTE LTD and Calspan LLC, share no financial interests between the two organizations. This includes no shared financial interest but not limited to:		
i. Compensation including wages, salaries, commissions, professional fees, or fees for business referrals		
iii. Research funding or other forms of research support;		
iv. Patents, copyrights, licenses, and other intellectual property interests;		
vi. Business ownership and investment interest s;		

PRODUCT DESCRIPTION

- New Hardware or Significant Modification
 Modification to Existing Hardware

The Safe Barriers Defender 100LDS is a steel longitudinal barrier which measures 3900 mm long, 800 mm tall, with a 680 mm wide flange at the bottom and a 200 mm width at the top of the barrier. The barriers have four holes for an anchor pin to be inserted in, two holes measure 1,275 mm from the upstream edge of the barrier and the other two holes measure 1,275 mm from the downstream edge of the barrier. Each barrier is pinned to the ground in two locations using a removable RoadLoc RL45-M24-330 anchor rod, nut, and plate washer. Each barrier has 1 anchor on the traffic side and 1 anchor on the non-traffic side which are 13 in. deep and 1 in. diameter filled with HILTI HY-200 epoxy. The threaded rod is epoxied into the asphalt and granular subbase, at 0 degrees from plumb vertical into the 3.5 in thick asphalt pavement. The barrier weighs 318 kg individually and is able to connect to other barriers through male and female joints which are locked together with a locking pin placed between the two.

The barriers have two holes through the face of the barrier allowing for machinery to lift and transport each barrier as well as allow water to pass through to prevent flooding. These holes measure 150mm tall x 220mm wide. These holes are also where each of the anchor pin holes are located.

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:	Mark Parisi	
Engineer Signature:	Mark Parisi	Digitally signed by Mark Parisi Date: 2023.08.10 08:02:05 -04'00'
Address:	4455 Genesee Street, Cheektowaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	<p>For this test, 20 barriers (78 m) were lined up so that they would be impacted at a 25° by the test vehicle. The vehicle was set to impact 3.6 ft upstream from the 8th and 9th barrier in the line. This test is intended to evaluate the longitudinal barrier's ability to successfully contain and redirect small passenger vehicles impacting within the length-of-need. For small cars, the primary concerns are the potential for vehicle under-ride, wheel snag, rollover, and head-slap. The primary evaluation is based on intrusion into the occupant compartment, vehicle stability, and occupant risk values. The test was conducted using a commercially available 2016 Nissan Versa with a test inertia mass of 2,421 lbs (1,098 kg). A 165 lbs standard test dummy was included in the vehicle as per the MASH 3-10 requirements which brought the Gross Static Mass up to 2,586 lbs (1173 kg).</p> <p>The test vehicle impacted 3.5 ft (1,056 mm) upstream of joint 8 and 9 of the system setup at a velocity of 62.0 mph (99.8 km/hr). Upon impact, the barrier began deflecting as it redirected the vehicle along the direction of its installation until reaching a maximum deflection of 11.5" (292.1 mm). The test vehicle was redirected from its 25° impact so that it eventually came to a rest due to the vehicles on board brakes 127' downstream from the point of impact and 54' separated from the impacted side of the barrier. The vehicle stayed within the required exit box conditions as it was redirected and disengaged from the barrier.</p> <p>The test vehicle's occupant compartment was not penetrated by the test articles and there was a maximum deformation of 4.71" (119.6 mm) in the occupant compartment. No major debris from the impact was noted on either the protected side of the barrier or along the impact area. The vehicle remained upright and did not exceed 75° roll and pitch throughout the test and its final trajectory was stable.</p> <p>TEST RESULT = PASS</p>	

Required Test Number	Narrative Description	Evaluation Results
3-11 (2270P)	<p>For this test, 20 barriers (78 m) were lined up so that they would be impacted at a 25° by the test vehicle. The vehicle was set to impact 4.3 ft upstream from the 8th and 9th barrier in the line. This test is intended to evaluate the longitudinal barrier's maximum strength and verify a barriers performance for impacts involving light trucks and SUVs due to the high rollover frequencies observed in crash data and during historical full-scale crash testing with light truck vehicles. The primary concerns are the potential for vehicle over-ride, rollover, and head-slap. The primary evaluation is based on barrier maximum strength and vehicle stability while still having to meet occupant risk values. The test was conducted using a commercially available 2016 Dodge Ram with a test inertia mass of 5,025 lbs (2,284 kg).</p> <p>The test vehicle impacted 4.2 ft (1,270 mm) upstream of joint 8 and 9 of the system setup at a velocity of 61.9 mph (99.6 km/hr). Upon impact, the barrier began deflecting as it redirected the vehicle along the direction of its installation until reaching a maximum deflection of 23.5" (596.9 mm). The test vehicle was redirected from its 25° impact so that it eventually came to a rest due to the vehicles on board brakes 141' downstream from the point of impact and the passenger door was resting along the impacted side of the barrier. The vehicle stayed within the required exit box conditions as it was redirected and disengaged from the barrier.</p> <p>The test vehicle's occupant compartment was not penetrated by the test articles and there was a maximum deformation of 6.12" (155.5 mm) in the occupant compartment. No major debris from the impact was noted on either the protected side of the barrier or along the impact area. The vehicle remained upright and did not exceed 75° roll and pitch throughout the test and its final trajectory was stable.</p> <p>TEST RESULT = PASS</p>	
3-20 (1100C)		
3-21 (2270P)		

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:	Calspan Corporation	
Laboratory Signature:	Mark Parisi	Digitally signed by Mark Parisi Date: 2023.08.10 08:02:22 -04'00'
Address:	4455 Genesee Street Cheektowaga, NY 14225	Same as Submitter <input type="checkbox"/>
Country:	USA	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	L20-602 December 31, 2022	

Submitter Signature*: **Russell Hood** Digitally signed by Russell Hood
Date: 2023.06.02 09:29:04 +08'00'

Submit Form

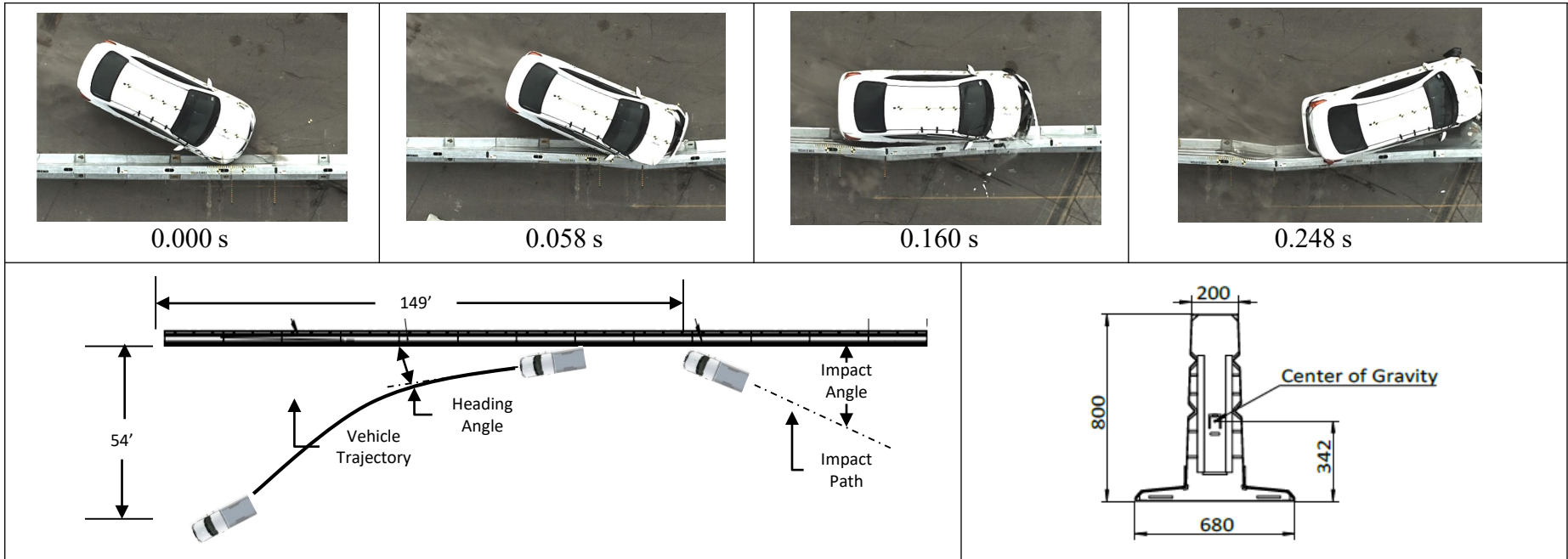
ATTACHMENTS

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		Key Words
Number	Date	



General Information

Test Agency Calspan Corporation
 Test Standard Test No. MASH Test 3-10
 Calspan Test No. BR0149
 Test Date..... 2023-03-08

Test Article

Type Metal Longitudinal Barrier – Pinned
 Name..... Defender 100 LDS Barrier
 Installation Length 256 ft (78.0 m)
 Material or Key Elements... Twenty 12.8 ft (3.9 m) long sections of metal barrier, 2.62 ft (0.80 m) above pavement x 2.23 ft (0.68 m) wide at the base x 0.66 ft (0.20 m) at top, with two 1in [24mm] diameter x 13 in [330 mm] bolts at the downstream anchor positions anchored into the asphalt and granular subbase, vertically into the asphalt pavement with HILTI HY200 Epoxy and a washer and nut on top to secure barrier to ground.

Soil Type and Condition AASHTO M147-65 material added above subgrade and below the asphalt was #2 (2inch) crushed stone compacted to above 90% of its dry density

Test Vehicle

Type/Designation 1100C
 Make and Model..... 2017 Nissan Versa
 Curb 2,346 lb (1,064 kg)
 Test Inertial 2,421 lb (1,098 kg)
 Dummy..... 165 lb (75 kg)
 Gross Static..... 2,586 lb (1,173 kg)

Impact Conditions

Speed 64.1 mi/h(103.1 km/h)
 Angle..... 25.7°

Location/Orientation

Targeted..... 3.6 ft [1,100 mm] Upstream of joint 8-9
 Actual..... 3.5 ft [1,056 mm] Upstream of joint 8-9

Impact Severity 58.8 kip-ft (79.7 kJ)

Exit Conditions

Speed 48.7 mi/h (78.4 km/h)
 Trajectory/Heading Angle ... 17.0 °

Occupant Risk Values

Longitudinal OIV 19.4 ft/s (5.9 m/s)
 Lateral OIV..... 27.9 ft/s (8.5 m/s)
 Longitudinal Ridedown 10.9 g
 Lateral Ridedown..... 17.0 g
 THIV..... 10.3 m/s
 ASI..... 1.79

Max. 0.050-s Average

Longitudinal -10.0 g
 Lateral..... -14.9 g
 Vertical..... -2.1 g

Post-Impact Trajectory

Stopping Distance..... 149 ft (38.7m) downstream
 54ft (16.5 m) Left of Barrier

Vehicle Stability

Maximum Yaw Angle..... 87.6°
 Maximum Pitch Angle..... 5.4°
 Maximum Roll Angle..... 14.9°
 Vehicle Snagging..... No
 Vehicle Pocketing No

Test Article Deflections

Dynamic..... 11.5 in (292.1 mm)
 Static..... 5.2 in (132.1 mm)
 Working Width..... 38.3 in (972.1 mm)

Vehicle Damage

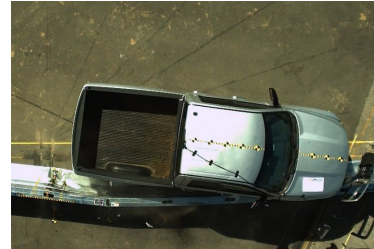
VDS 01RFQ5
 CDC..... 01RFEW5
 Max. Exterior Deformation 6.9 in (175.3 mm)
 Max. Occupant Comp. Deformation..... 4.71 in (119.6 mm)
 Wheel/Foot Well



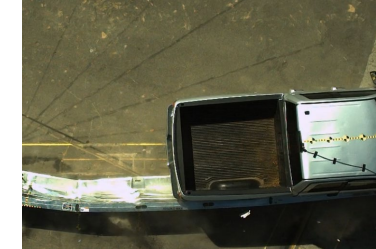
0.000 s



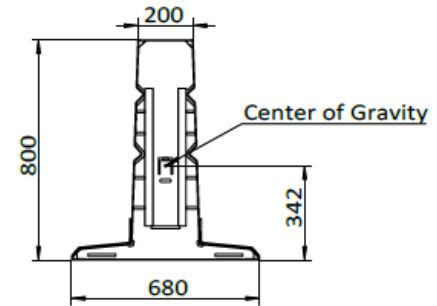
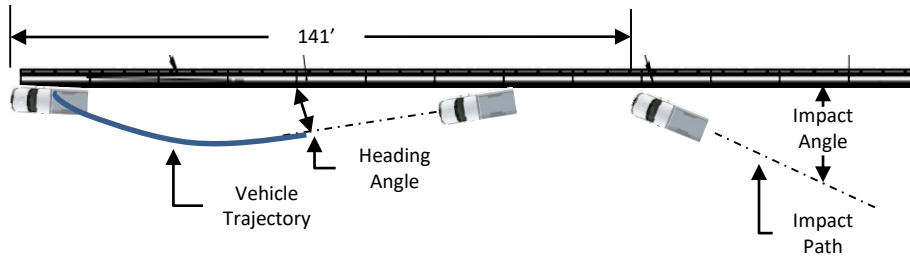
0.074 s



0.238 s



0.374 s



General Information

Test Agency Calspan Corporation
 Test Standard Test No. MASH Test 3-11
 Calspan Test No. BR0140
 Test Date..... 2022-09-23

Test Article

Type Metal Longitudinal Barrier – Pinned
 Name..... Defender 100 LDS Barrier
 Installation Length 256 ft (78.0 m)
 Material or Key Elements... Twenty 12.8 ft (3.9 m) long sections of metal barrier, 2.62 ft (0.80 m) above pavement x 2.23 ft (0.68 m) wide at the base x 0.66 ft (0.20 m) at top, with two 1in [24mm] diameter x 13 in [330 mm] bolts at the downstream anchor positions anchored into the asphalt and granular subbase, vertically into the asphalt pavement with HILTI HY200 Epoxy and a washer and nut on top to secure barrier to ground.

Soil Type and Condition AASHTO M147-65 material added above subgrade and below the asphalt was #2 (2inch) crushed stone compacted to above 90% of its dry density

Test Vehicle

Type/Designation 2270P
 Make and Model..... 2016 Dodge Ram
 Curb 5,144 lb (2,333.7 kg)
 Test Inertial 5,035 lb (2,284 kg)
 Dummy..... N A
 Gross Static..... 5,035 lb (2,284 kg)

Impact Conditions

Speed 64.2 mi/h(103.2 km/h)
 Angle..... 24.7°

Location/Orientation

Targeted..... 4.3 ft [1,300 mm] Upstream of joint 8-9
 Actual..... 4.2 ft [1,270 mm] Upstream of joint 8-9

Impact Severity 122.2 kip-ft (165.7 kJ)

Exit Conditions

Speed 42.6 mi/h (68.6 km/h)
 Trajectory/Heading Angle ... 9.2°

Occupant Risk Values

Longitudinal OIV 10.7 ft/s (3.3 m/s)
 Lateral OIV 12.4 ft/s (3.8 m/s)
 Longitudinal Ridedown 13.6 g
 Lateral Ridedown..... 6.5 g
 THIV..... 4.6 m/s
 ASI 0.75

Max. 0.050-s Average

Longitudinal-7.2 g
 Lateral.....-4.6 g
 Vertical.....-4.8 g

Post-Impact Trajectory

Stopping Distance..... 141ft (43.0m) downstream

Vehicle Stability

Maximum Yaw Angle 30.6°
 Maximum Pitch Angle 13.6°
 Maximum Roll Angle..... 27.4°
 Vehicle Snagging..... No
 Vehicle Pocketing No

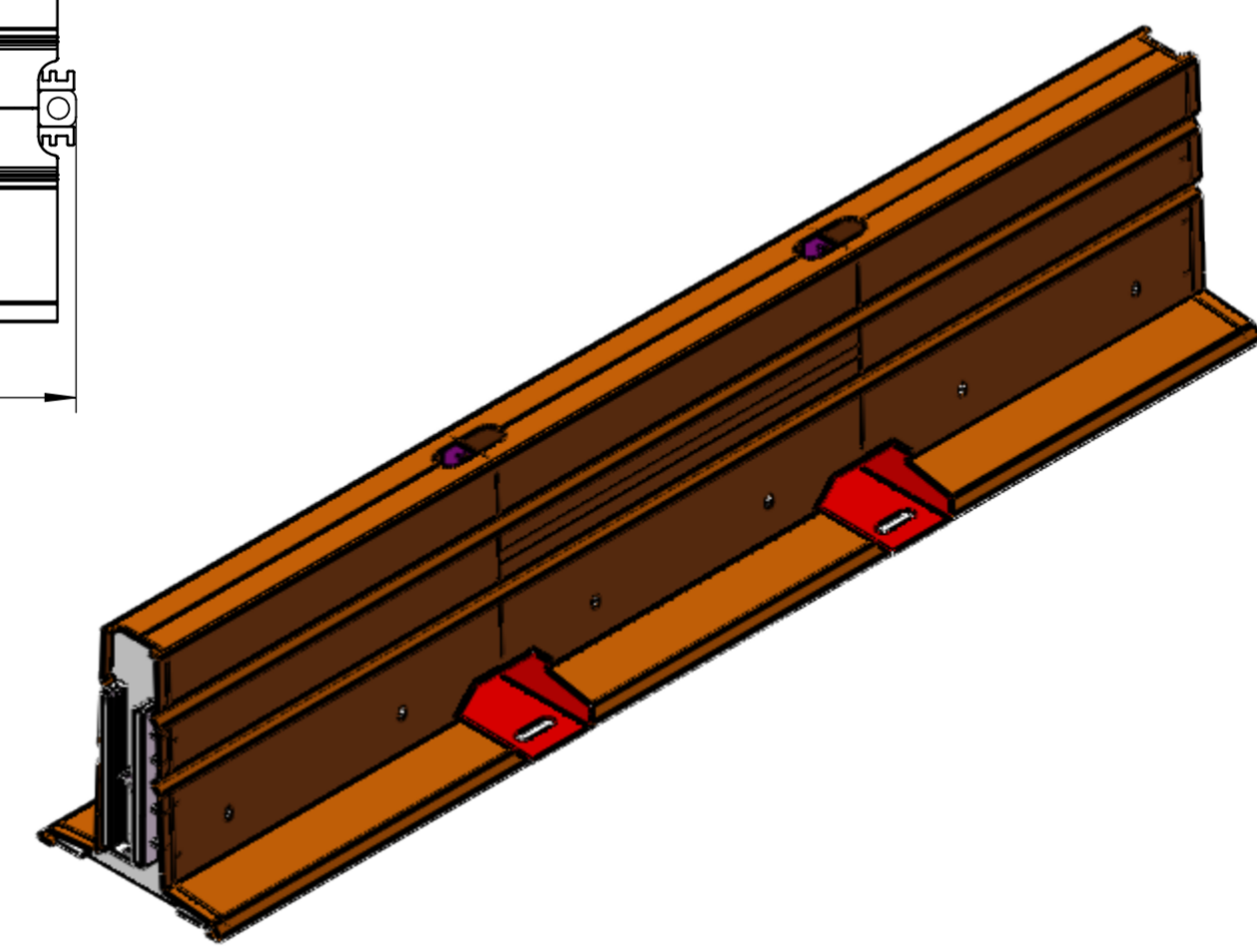
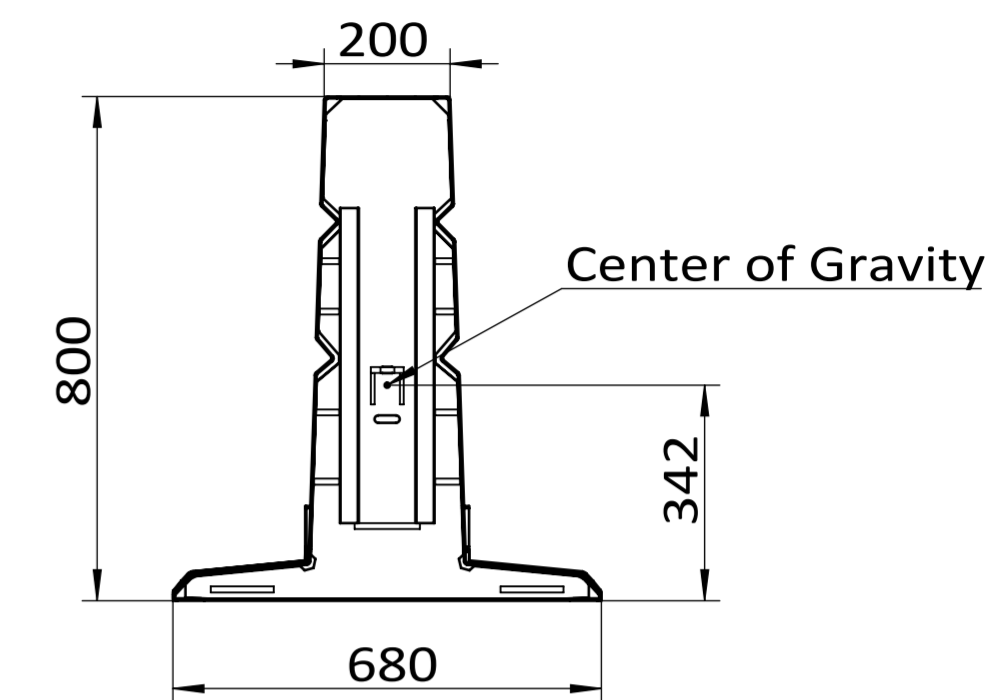
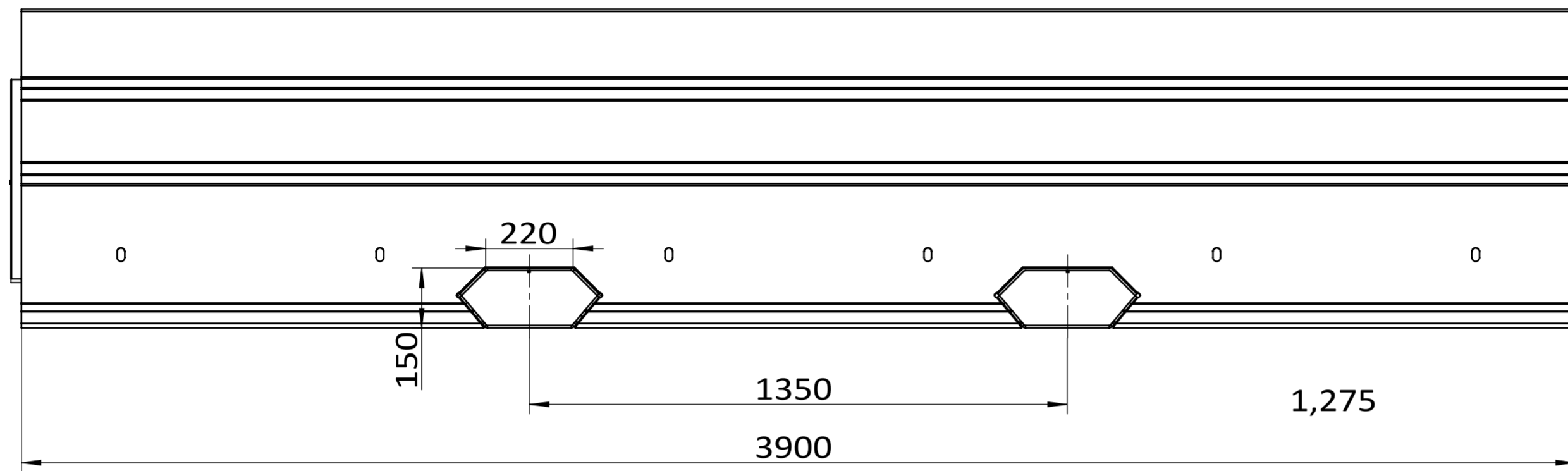
Test Article Deflections

Dynamic..... 23.5 in (596.9 mm)
 Static..... 16.3 in (414.0 mm)
 Working Width..... 50.3 in (1277.6 mm)

Vehicle Damage

VDS 01RFQ5
 CDC..... 01RFEW5
 Max. Exterior Deformation 8.3 in (210.8 mm)
 Max. Occupant Comp.
 Deformation..... 6.12 in (155.5 mm)
 Wheel/Foot Wells

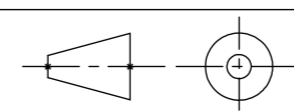
ITEM	DRAWING NO.	DESCRIPTION	QTY.
1	D1	DEFENDER MAIN BODY	1



Tolerances unless otherwise stated
Machining: up to 300mm ±0.50
 300 to ~ ±0.80
Fabrication: up to 300mm ±2.00
 300 to 1000mm ±3.00
 1000 to ~ ±6.00
Angular: all ±2.0°

MATERIAL	SEE PARTS TABLE
FINISH	HOT DIP GALVANISED
WEIGHT	318 KG
DIMENSIONS	MM
DATE	15 Dec. 2016

SAFE BARRIERS



SHEET 1 of 1

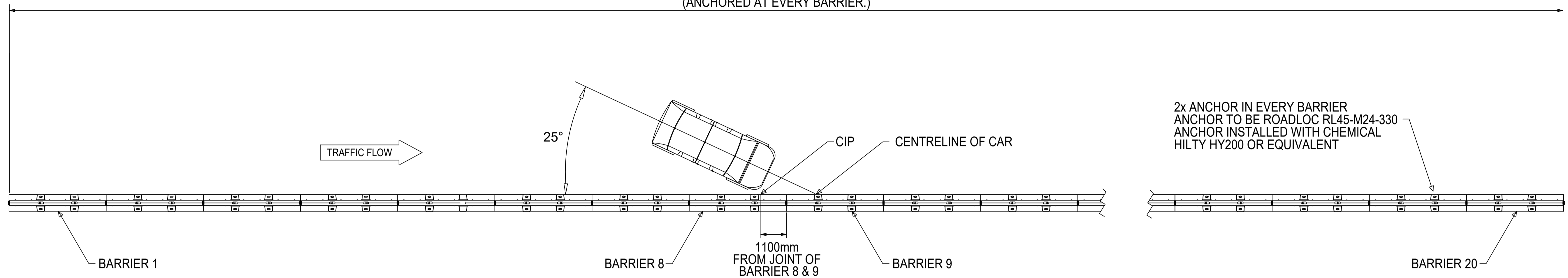
DRAWING DESCRIPTION	DEFENDER 100				
DRAWING REF.	D100				
DRAWN BY	DC	CHECKED	RM	APPROVED	RH

REV	DATE	DESCRIPTION	DRAWN	APPRD.

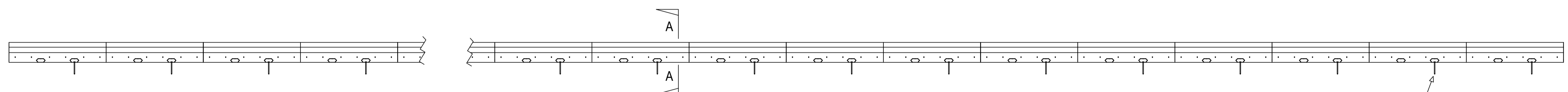
SAFE BARRIERS - DEFENDER 100 LDS 3-10 TEST

PLAN VIEW

DEFENDER 100 LDS SYSTEM
(ANCHORED AT EVERY BARRIER.)

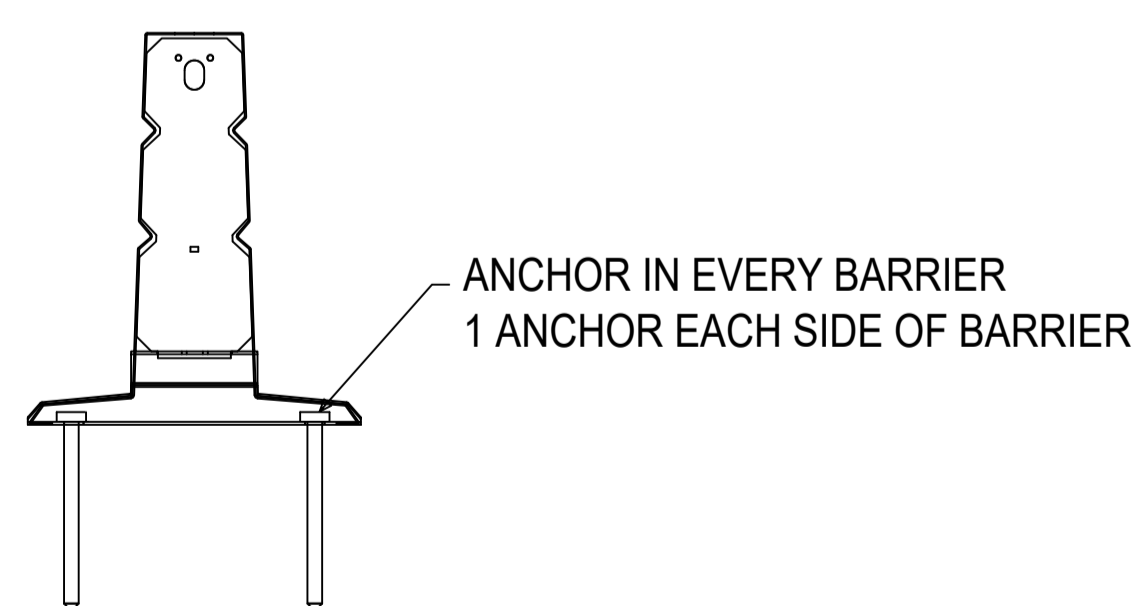


ELEVATION VIEW



2x ANCHOR IN EVERY BARRIER
ANCHOR TO BE ROADLOC RL45-M24-330
ANCHOR INSTALLED WITH CHEMICAL
HILTY HY200 OR EQUIVALENT

A - A
TYPICAL BARRIER SECTION

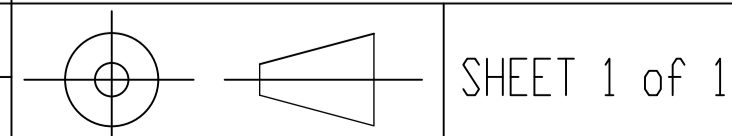


TEST 3-10
VEHICLE: 1100kg Sedan
IMPACT SPEED: 100km/h
IMPACT ANGLE: 25 DEGREES
CIP: 1100 mm UPSTREAM OF BARRIER 8&9 JOINT

REV	DATE	DESCRIPTION	DRAWN	APPRD.
1	19/04/23	ISSUED FOR CONSTRUCTION	JM	RH
0	5/10/22	ISSUED FOR CONSTRUCTION	JM	RH

SAFE BARRIERS

DIMENSIONS	MM
DATE	17 AUGUST, 2021

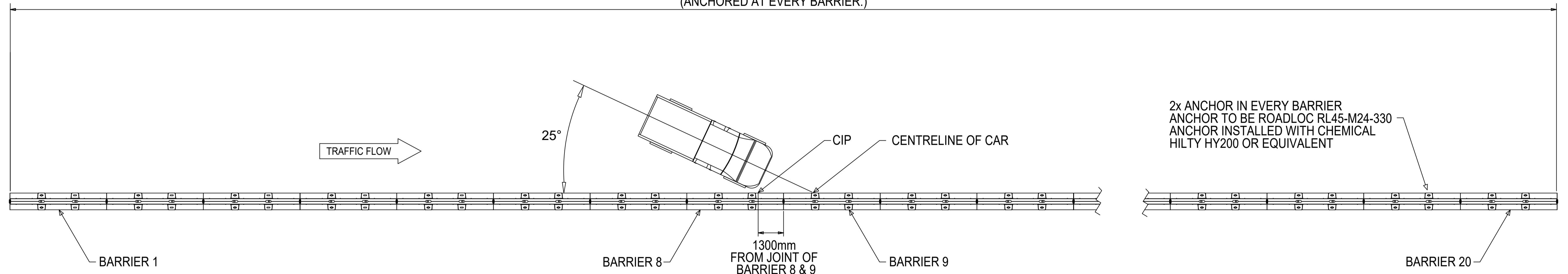


DRAWING DESCRIPTION	DEFENDER BARRIER SYSTEM				
DRAWING REF.	SB-LDS-TEST SETOUT-3-10				
DRAWN BY	JM	CHECKED	CJR	APPROVED	RH

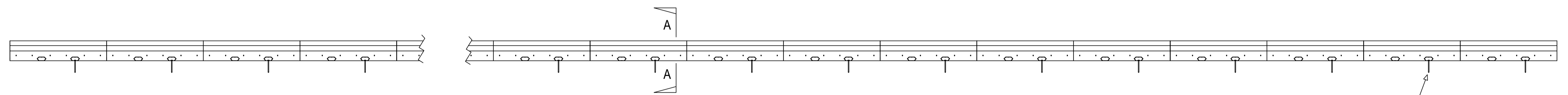
SAFE BARRIERS - DEFENDER 100 LDS 3-11 TEST

PLAN VIEW

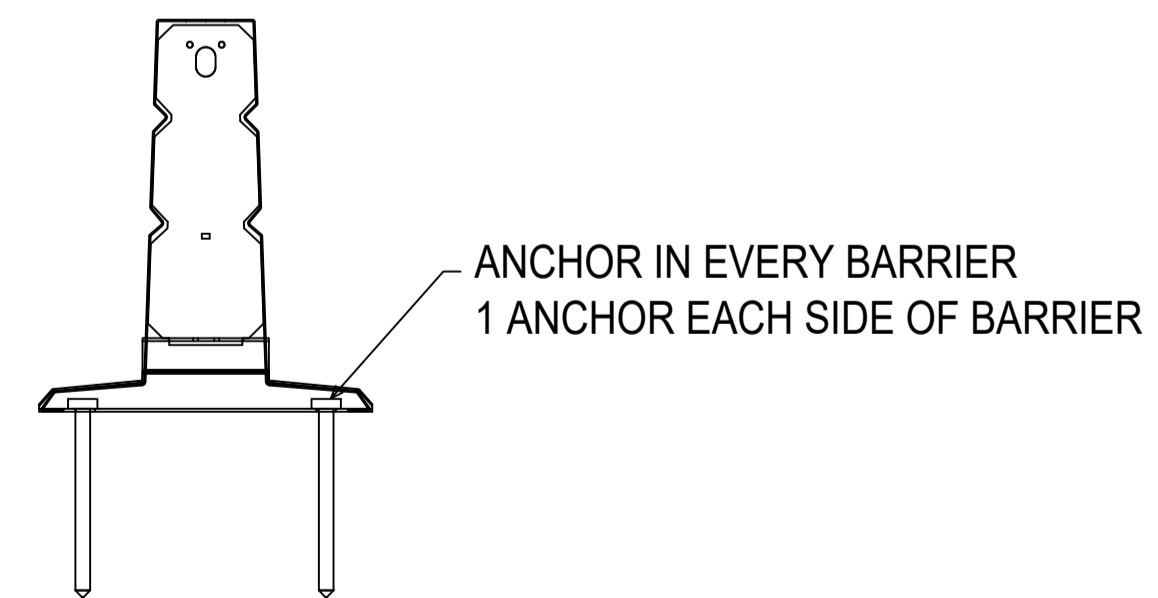
DEFENDER 100 LDS SYSTEM
(ANCHORED AT EVERY BARRIER.)



ELEVATION VIEW



A - A
TYPICAL BARRIER SECTION

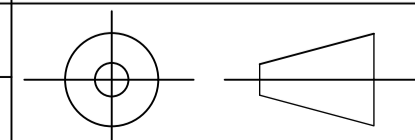


TEST 3-11
VEHICLE: 2270P
IMPACT SPEED: 100km/h
IMPACT ANGLE: 25 DEGREES
CIP: 1300 mm UPSTREAM OF BARRIER 8&9 JOINT

REV	DATE	DESCRIPTION	DRAWN	APPRD.
3	17/04/23	ISSUED FOR CONSTRUCTION	JM	RH
2	3/02/23	ISSUED FOR CONSTRUCTION	JM	RH
1	5/10/22	ISSUED FOR CONSTRUCTION	JM	RH
0	30/05/22	ISSUED FOR CONSTRUCTION	JM	RH

SAFE BARRIERS

DIMENSIONS	MM
DATE	17 AUGUST, 2021



SHEET 1 of 1

DRAWING DESCRIPTION	DEFENDER BARRIER SYSTEM				
DRAWING REF.	SB-LDS-TEST SETOUT-3-11				
DRAWN BY	JM	CHECKED	CJR	APPROVED	RH