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

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

March 7, 2014

In Reply Refer To:
HSST/B-247

Mr. Luke Gallagher
Ingal Civil Products
57-65 Airds Road
Minto, NSW 2566
Australia

Dear Mr. Gallagher:

This letter is in response to your request for the Federal Highway Administration (FHWA) to review a roadside safety system for eligibility for reimbursement under the Federal-aid highway program.

Name of system: Ezy-Guard Smart, MASH
Type of system: Longitudinal Barrier
Test Level: AASHTO MASH TL3
Testing conducted by: Holmes Solutions
Task Force 13 Designator: SGR49
Date of request: October 28, 2013
Date of completed package: December 20, 2013

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

- Ezy-Guard Smart, MASH

Based on a review of crash test results you submitted certifying the device described herein meets the crash test and evaluation criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH), the device is eligible for reimbursement under the Federal-aid highway program. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use.

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.

Requirements
To be found eligible for Federal-aid funding, roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH).

Description
The device and supporting documentation are described in the attached form.

Summary and Standard Provisions
Therefore, the system described and detailed in the attached form is eligible for reimbursement and may be installed under the range of conditions tested. Please note the following standard provisions that apply to FHWA eligibility letters:

- This letter provides a AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO Roadside Design Guide.
- This finding of eligibility does not cover other structural features of the systems, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may influence system conformance with MASH will require a new reimbursement eligibility letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals safety problems, or that the system is significantly different from the version that was crash tested, we reserve the right to modify or revoke this letter.
- You are expected to supply potential users with sufficient information on design and installation 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 the MASH.
- To prevent misunderstanding by others, this letter of eligibility is designated as number B-247 and 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 at our office 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. The FHWA does not become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

- Because it is a steel product, the Retro-Rail™, MASH is subject to Section 635.410 (Buy America) of Title 23, U.S. Code of Federal Regulations, and cannot be permanently incorporated into any federally funded project unless it is made in the U.S. from U.S. steel.

Sincerely yours,

Michael S. Griffith

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:	October 28, 2013	◉ New ○ Resubmission
	Name:	Luke Gallagher	Signature: Luke Gallagher
	Company:	Ingal Civil Products	
	Address:	57-65 Airds Rd., Minto, NSW 2566	
	Country:	Australia	
	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.

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'B': Barriers (Roadside, Median, Bridge Railings)	◉ Physical Crash Testing ○ FEA & V&V Analysis	Ezy-Guard Smart	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.

Identification of the individual or organization responsible for the product:

Contact Name:	Luke Gallagher	Same as Submitter ☒
Company Name:	Ingal Civil Products	Same as Submitter ☒
Address:	57-65 Airds Rd., Minto, NSW 2566	Same as Submitter ☒
Country:	Australia	Same as Submitter ☒

PRODUCT DESCRIPTION

New Hardware

Request for Federal Aid Reimbursement Eligibility Of Highway Safety Hardware

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	Company:	Ingal Civil Products	
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Contact Name:	Luke Gallagher	Same as Submitter ☒
Company Name:	Ingal Civil Products	Same as Submitter ☒
Address:	57-65 Airds Rd., Minto, NSW 2566	Same as Submitter ☒
Country:	Australia	Same as Submitter ☒

PRODUCT DESCRIPTION

New Hardware

Ezy-Guard Smart is a narrow, guardrail barrier system comprising standard w-beam rail supported by steel posts and sliding carriages.
Ezy-Guard Smart posts are cold formed into a Z cross section of approximately 50mm (2 inch) wide x 90mm (3.54 inch) deep. The Z-posts are 1600mm long (62.99 inch). The Z-posts are hot dip galvanized and are installed to an above-ground height of 720mm (28.35 inch) at 2m (6.6 feet) centres.
The rail elements are standard 12 gauge, galvanized w-beam conforming to AASHTO M180 Class A rail. The height to top of rail is 730mm (28.74 inch). The rails are secured to a sliding carriage using a M16 (5/8") x 30mm (1.18 inch) long bolt with a hexagonal recess.

In the safety performance evaluation of Ezy-Guard Smart, two full-scale crash tests were conducted.
MASH Test Designation 3-10:
Ezy-Guard Smart successfully contained and redirected the 1100C vehicle. The vehicle did not penetrate or underride the barrier. Maximum dynamic deflection of the barrier was 994mm (39.13 inch).
MASH Test Designation 3-11:
Ezy-Guard Smart contained and redirected the 2270P vehicle. The vehicle did not penetrate or underride the barrier. Maximum dynamic deflection of the barrier was 1650mm (64.96 inch).

CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-10 (1100C)	Additional transition test to NCHRP-350 test 3-21. 29 Mar 2011. Test No. 102350.97.05.2.6.2. Ezy-Guard Smart W-Beam barrier system when installed at a nominal height of 730mm (29"), and transitioning into an ET-Plus End Terminal , successfully passed the NCHRP-350 3-21 test.	PASS
3-11 (2270P)		
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:	Holmes Solutions	
Laboratory Contact:	Chris Allington	Same as Submitter ☐
Address:	Level 2, 123 Victoria Street, Christchurch 8013	Same as Submitter ☐
Country:	New Zealand	Same as Submitter ☐
Accreditation Certificate Number and Date:	Cert No. 1022 - 23 July 2009	

ATTACHMENTS

Attach to this form:

1) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
2) 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 key to understanding the performance of the device should also be submitted to facilitate our

review.

FHWA Official Business Only:

Eligibility Letter		AASHTO TF13	
Number	Date	Designator	Key Words
B247	February 17, 2014	SGR49	w-beam, Z Post, MASH, TL3

Test Summary

Holmes Solutions Limited, New Zealand

Test No. 102350.97.05.2.5.2 — **03 March 2011**

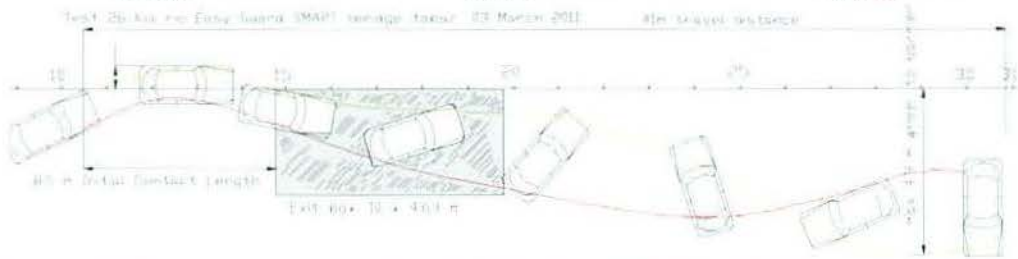

0.0 sec

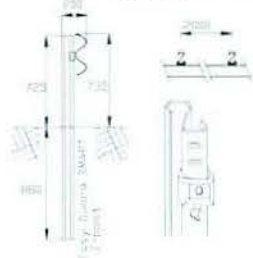

0.17 sec


0.34 sec


0.50 sec


0.67 sec





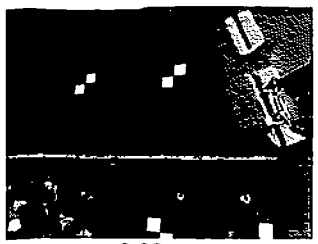
- **Test Article** — Longitudinal Guard Rail: EZY Guard SMART
- **Total Length** — 90.0 m
- **Key Elements – Barrier**
  - Description..... W-Beam/steel post/carriage/dams
  - Length ..... 60.0 m LON
  - Rail Height..... 730 mm (29")
  - Post Spacing ..... 2.0 m nominal
- **Test Vehicle**
  - Designation..... 1100C
  - Make/Model..... Kia Rio Liftback LS
  - Dimensions (lwh)..... 4200 L x 1675 W x 1435 mm
  - Curb Wt..... 1100 kg
  - Test Inertial Wt..... 75 kg
  - Gross Static Wt..... 1175 kg
- **Impact Conditions**
  - Speed ..... 101.0 kph
  - Angle ..... 25°
  - Impact Point ..... 1.0 meter upstream of line post 11
- **Exit Conditions**
  - Exit Speed ..... 71 kph
  - Exit Angle ..... 3°
- **Vehicle Damage - Exterior**
  - VDS 11FL-3
  - CDC 11LFEE3
  - Max. Deformation ..... 275 mm

- **Post Impact Vehicle Behaviour**
  - Vehicle Stability..... Good
  - Stopping Distance..... 41 m
  - Initial Contact Length 8.5 m
  - Roll Angle Max. 12.0°
  - Pitch Angle Max. -12.1°
  - Yaw Angle Max 254.5°
- **Vehicle Snagging** ..... None
- **Vehicle Pocketing** ..... None
- **Occupant Impact Velocity**
  - Longitudinal ..... 5.6 m/s
  - Lateral (optional)..... 4.9 m/s
  - ASI (Acceleration Severity Index) 0.70
- **Occupant Ride down Deceleration**
  - x-direction..... -10.2 g
  - y-direction..... -8.6 g
  - THIV (optional)..... 24.7 kph at 0.1431 s on RHS (6.9 m/s)
  - PHD (optional)..... 10.3 g (0.4182 – 0.4282 s)
- **Test Article Deflections**
  - Dynamic..... 0.99 m
  - Permanent..... 0.77 m
  - Working Width..... 0.99 m
- **Test Article Damage** ..... Moderate

Test Summary

Holmes Solutions Limited, New Zealand

Test No. 102350.97.05.2.5.1 — **1 March 2011**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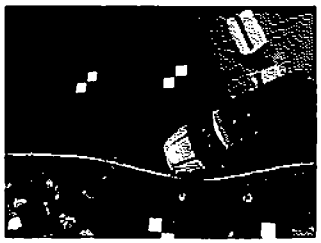
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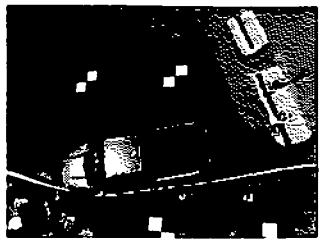
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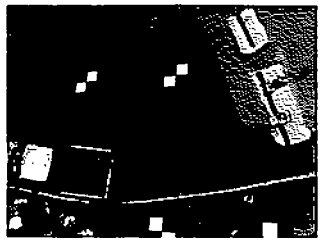
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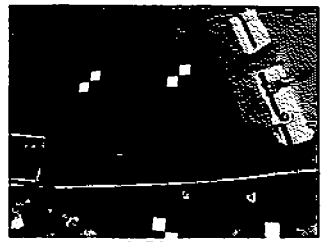
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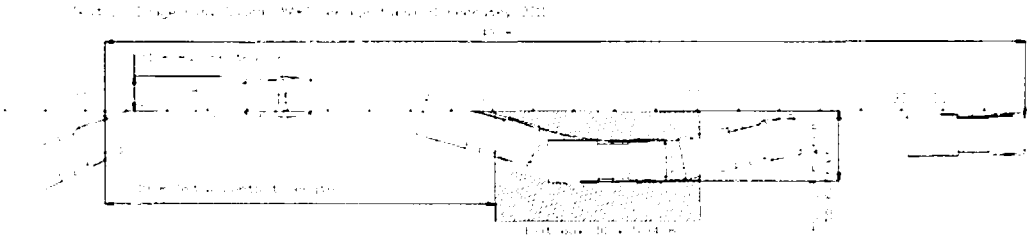
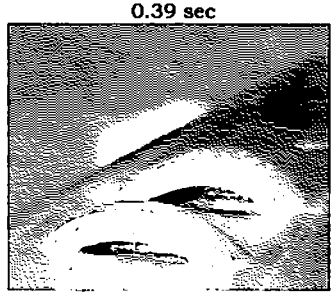
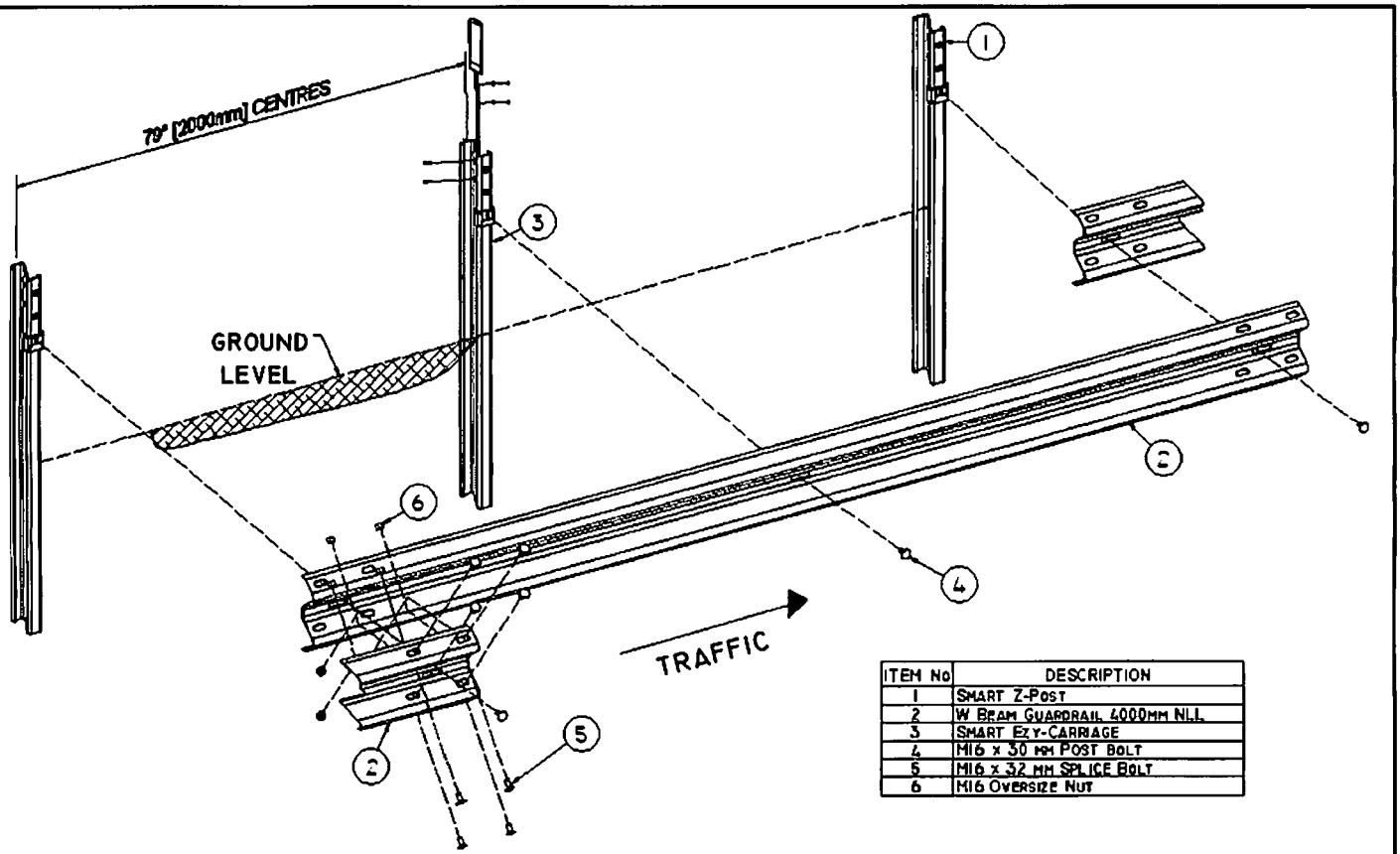


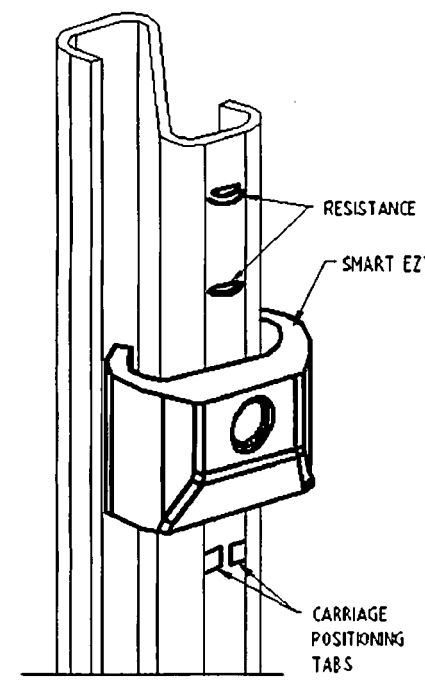


- Test Article: Longitudinal Guard Rail: Ezy-Guard Smart
- Total Length: 90.0 m
- Key Elements – Barrier
  - Description: W-Beam/steel post/carriage/dams
  - Length: 60.0 m LON
  - Rail Height: 730 mm (29")
  - Post Spacing: 2.0 m nominal
- Test Vehicle
  - Designation: 2270P
  - Make/Model: Dodge Ram 1500 Quad Cab
  - Dimensions (lwh): 5660 x 2000 x 1900 mm
  - Curb Weight: 2260 kg
  - Test Inertial weight: 2264 kg
  - Gross Static weight: 2264 kg
- Impact Conditions
  - Speed: 99.2 kph
  - Angle: 25°
  - Impact Point: 1.0 m upstream of line post 11
- Exit Conditions
  - Exit Speed: 69.4 kph
  - Exit Angle: 3°
- Vehicle Damage - Exterior
  - VDS: 11-LFQ-3
  - CDC: 11FLEE2
  - Max. Deformation: 120 mm
- Post Impact Vehicle Behaviour
  - Vehicle Stability: Good
  - Stopping Distance: 43.0 m
  - Initial Contact Length: 19 m
  - Roll Angle Max.: -9.9°
  - Pitch Angle Max.: 4.5°
  - Yaw Angle Max.: -30.6°
- Vehicle Snagging: None
- Vehicle Pocketing: None
- Occupant Impact Velocity: Right side of interior
  - Longitudinal: 4.4 m/s at 0.1842 s
  - Lateral (optional): 3.8 m/s at 0.1842 s
  - ASI (Acceleration Severity Index): 0.48
- Occupant Ridedown Deceleration
  - x-direction: -5.5 g (0.1999 – 0.2099 s)
  - y-direction: -4.8 g (0.3130 – 0.3239 s)
  - THIV (optional): 19.8 kph at 0.1765 s (5.5 m/s)
  - PHD (optional): 5.8 g (0.2056 – 0.2156 s)
- Test Article Deflections
  - Dynamic: 1.65 m
  - Permanent: 1.30 m
  - Working Width: 1.65 m
- Test Article Damage: Mild

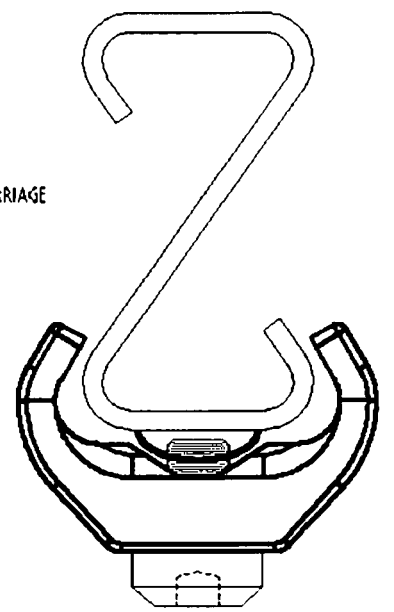
Issue: 12042011



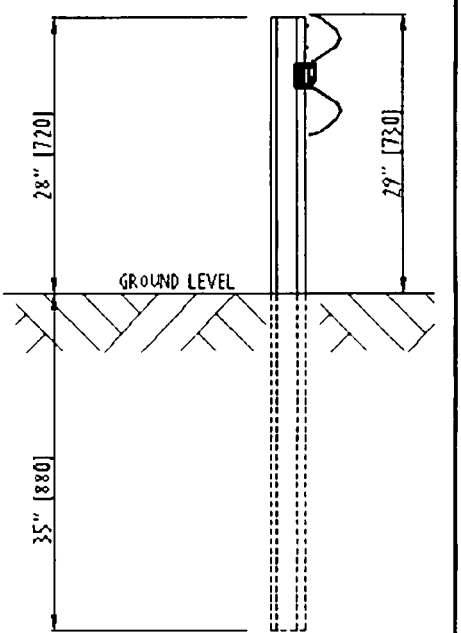
ITEM No	DESCRIPTION
1	SMART Z-POST
2	W BEAM GUARDRAIL 4000MM NLL
3	SMART EZY-CARRIAGE
4	M16 x 30 MM POST BOLT
5	M16 x 32 MM SPLICE BOLT
6	M16 OVERSIZE NUT



SMART Z-POST & CARRIAGE
ISO VIEW



SMART Z-POST & CARRIAGE ASSEMBLY
PLAN VIEW



SMART Z-POST & CARRIAGE
ASSEMBLY

EZY-GUARD SMART

EZY-SM-100

SHEET NO.	DATE
1 of 2	10-29-2013

INGAL CIVIL PRODUCTS

INTENDED USE

Ezy-Guard Smart, a member of the Ezy-Guard family, is a fully compliant MASH TL3 longitudinal guardrail barrier system. It can be used in locations where maximum dynamic deflections of 65 inches [1650mm] or less is acceptable. This system must be anchored with a suitable terminal system, ideally a TL3 crashworthy terminal system. The Ezy-Guard Smart W-beam longitudinal barrier system consists of W-beam guardrail attached to Ezy-Guard Smart Z-section line post via a guardrail carriage system and attachment bolt. The standard post spacing is 79 inches [2000mm], with 75 inches [1905mm] post spacing an optional alternative.

COMPONENTS

Unit length = 157 inches [4000 mm]

Designator	Component	Quantity
10000977	W Beam 4000mm NLL	1
10004119	1600mm SMART Z-POST GALV	2
10004115	SMART CARRIAGE	2
10001832	M16 x 30mm Ezy-Guard Smart Post Bolt	2
10001248	M16 x 32 Splice Bolt Grade 8.8	8
10001239	M16 Oversize Nut	8

APPROVALS

CONTACT INFORMATION

Ingal Civil Products
57-65 Airds Road
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NSW 2566
Australia
+61 2 9827 3333

EZY-GUARD SMART

EZY-SM-100	
SHEET NO.	DATE
2 of 2	10-29-2013