reid™
Construction Systems
An ITW company and founding board member of AEFAC

PEL
Product Engineering Laboratory

Reid™ Product Engineering Laboratory
All testing has been performed by independent IANZ accredited testing laboratories. See below for details.

Reinforcement Technical Assessment

RTA-25/0016
of 02/10/2025

This Technical Assessment meets the testing requirements stipulated in clauses 8.7.5.2, 8.9.1.3, 8.6.11 of NZS 3101:2006 A3

Trade name of the construction product	ReidBar™ Steel Components: Couplers
Product family to which the construction product belongs	ReidBar™ Reinforcement System used in concrete structures sizes RB12, RBA16, RB20, RB25 & RB32
Manufacturer	ITW Concrete Systems 1 Ramset Drive Chirnside Park Victoria 3116 Australia
Manufacturing plant	ITW Concrete Systems
This Technical Assessment contains:	14 pages & 10 Annexes which form an integral part of this assessment.
This Technical Assessment for NZS3101 is in accordance with the requirements stipulated in NZS 3101:2006 A3 & NZTA Bridge Manual 3rd Edition A4	Tests performed by Melbourne Testing Services Reference reports: 25-0569-A1 (C8 Epoxy), 24-1406-A (RB12 C8 Epoxy), 24-1406-A (RBA16 C8 Epoxy), 24-1406-A1-A (RB20 C8 Epoxy), 24-1406-A (RB25 C8 Epoxy), 24-1406-A (RB32 C8 Epoxy), 25-0647-A Tests performed by LMATS Reference reports: LW25-0979-01 CVN Tests performed by Holmes Solutions Reference reports: 149862.00

1. Technical description of the product

ReidBar™ Steel Couplers are used as part of the ReidBar™ Mechanical Splicing System.

All ReidBar™ components in this report are Steel elements and the ReidBar reinforcing steel is Grade 500E (Seismic) produced in accordance with AS/NZS 4671:2019.

The illustration and the description of the product are given in Annex A1 and A2.

2. Specification of intended use

The performances given in Section 3 are only valid if the reinforcement mechanical splicing system is used in compliance with the specifications and conditions given in Annex B.

3. Performance of the product and references to the methods used for its assessment

3.1 Performance Requirement of Mechanical Connections

Criteria	Performance
Elongation at $0.7f_y$ NZS 3101:2006 A3: Cl 8.7.5.2 (b) NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (i)	See Annex C1
High Cycle fatigue NZS 3101:2006 A3: Cl 8.7.5.2 (c), 8.9.1.3 (b) NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (i)	See Annex C2
Alternating Large Strains NZS 3101:2006 A3: Cl 8.9.1.3 (a) NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (i)	See Annex C3
Ultimate Tensile Strength NZS 3101:2006 A3: Cl 8.6.11.1 & 8.6.11.2 NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (i)	See Annex C4
Mode of Failure NZS 3101:2006 A3: Cl 8.6.11.1, 8.6.11.2, 8.6.11.3 NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (i)	See Annex C5
Resistance to Brittle Fracture NZS 3101:2006 A3: Cl 8.6.11.4 NZTA Bridge Manual 3rd ed. A4: Cl 4.2.1 (f) (iv)	See Annex C6

3.2 Testing Methodology of Mechanical Connections

3.2.1 Elongation at $0.7f_y$ – Cl 8.7.5.2 (b) NZS 3101:2006 A3 & Cl 4.2.1 (f) (i) NZTA BM 3rd Edition A4

Test samples were assembled as per Annex B2, incorporating Ramset Epcon C8 as thread filler to minimize slip displacement in the coupler.

The slip properties of the couplers were calculated and assessed against the performance requirements for mechanical connections specified by NZS 3101-1:2006 (A1, A2, & A3) Concrete Structures Standard, Part 1: The Design of Concrete Structures – Clause 8.7.5.2 (b). Calculations were undertaken, using physical data and elongation values measured at the start of the Low-Cycle Fatigue ISO 15835-1&2:2009 test, to determine the elongation values at an applied tensile stress of $0.7f_y$ (350MPa for Grade 500E ReidBar). As per NZS 3101 (clause 8.7.5.2 (b)), the maximum permissible elongation at the target stress is specified to be twice that of an equal length of unspliced bar.

Elongation values were measured using two (2) calibrated potentiometers arranged in a

symmetrical manner and located across the coupler. The centre spacing between the potentiometers is taken to be the gauge length and incorporates a length of plain ReidBar and the length of coupler. As reported herein, the elongation across the couplers is calculated via subtracting the theoretical elongation of plain ReidBar from the measured values across the gauge length utilised during physical testing.

Theoretical elongation values are calculated using a 200 GPa modulus of elasticity.

3.2.2 High Cycle fatigue – Cl 8.9.1.3 (b) NZS 3101:2006 A3 & Cl 4.2.1 (f) (i) NZTA BM 3rd Edition A4

As per the sampling plan for qualification testing specified by ISO 15835-3:2018 – TABLE 1, three (3) repeat assemblies of the largest coupler size were subjected to high-cycle fatigue testing. Tests were undertaken in a repeatable manner on spliced bar pieces assembled by Reid from the same batch of materials.

High cycle fatigue tests were performed using a calibrated servo-hydraulic testing machine. Tests were conducted in accordance with ISO 15835-2 CLAUSE 5.5.1 using the stress range specified within ISO 15835-1 CLAUSE 5.5.2.

Load was applied in a sinusoidal manner, by oscillating the testing machine actuator between a lower and upper stress level of 240 and 300MPa respectively. The upper stress corresponds to 60% of the nominal yield strength of the 500E grade ReidBar, and the stress range is 60MPa. The lower and upper stress levels were commensurate to an applied tension force of 192.96 and 241.2kN respectively. The tests were conducted as run-out tests for 2 $\times 10^6$ cycles at a frequency of 15Hz. The peak-to-peak force and displacement values were monitored throughout each test.

3.2.3 Alternating tension and compression test of large strains – Cl 8.9.1.3 (a) NZS 3101:2006 A3 & Cl 4.2.1 (f) (i) - NZTA Bridge Manual 3rd Edition A4

In preparation for testing, gauge marks were indented along the length of the control bar and each spliced bar for the determination of uniform elongation, A_{gt}.

A preliminary tensile test was performed on a plain length of rebar for the determination of mechanical properties including yield strength and yield strain (strain at onset of yielding).

Low-cycle loading tests were performed following the principles of ISO 15835-2:2009 – Clause 5.6.2. Testing was conducted using a calibrated servo-hydraulic testing machine. A pair of precision extensometers were fitted symmetrically across the splice connection using an overall gauge length L_g. The adopted gauge length is listed below, and was in the range of $L_1 + 8d \leq L_g \leq L_1 + 10d$, as defined in ISO 15835-2 clause 5.1 – Figure 2:

- L_g = 200mm for 12mm ReidBar
- L_g = 240mm for 16mm ReidBar
- L_g = 320mm for 20mm ReidBar
- L_g = 400mm for 25mm ReidBar
- L_g = 440mm for 32mm ReidBar

Tests were performed in three (3) distinct stages:

- Stage 1: Specimen tensioned to an applied strain of 0.70%, commensurate to twice the yield strain achieved by the plain length of rebar in the preliminary tensile test. Specimen then loaded to 250 MPa in compression. This procedure was repeated a total of four (4) times.
- Stage 2: Specimen tensioned to an applied strain of 1.75%, commensurate to five (5) times the yield strain achieved by the plain length of rebar in the preliminary tensile test. Specimen then loaded to 250 MPa in compression. This procedure was repeated a total of four (4) times.

- Stage 3: Specimen assembly tensioned until full tensile capacity was achieved and ductile necking had occurred.

The applied force, actuator displacement, and outputs from pair extensometers were continuously recorded throughout testing using a computerised data acquisition system.

Performance requirements are:

- Tensile strength: at least $R_{m,spec}$, or $R_{eH,spec}$ x $(R_m / R_{eH})_{spec}$
- Residual elongation: $u_4 \leq 0.3$mm, $u_8 \leq 0.6$mm

Where $R_{m,spec}$ is the nominal tensile strength value of the reinforcing bar, $R_{eH,spec}$ is the nominal yield strength value of the reinforcing bar, and $(R_m/R_{eH})_{spec}$ is the specified tensile/yield strength ratio of the reinforcing bar.

3.2.4 Ultimate Tensile Strength – Cl 8.6.11.1 & 8.6.11.2 NZS 3101:2006 A3

NZS 3101 A3, at Clause 8.6.11.2, defines the Upper Bound Breaking Strength (UBBS) of the reinforcing bar as 1.25 times the Upper Characteristic Yield Strength of the bar. For ReidBar, being 500E grade, this corresponds to 750MPa. Mechanical anchorages, at Clause 8.6.11.1, and mechanical couplers, at clause 8.7.5.2 (a), are required to be capable of developing the Upper Bound Breaking Strength.

Specifically heat treated ReidBars are connected to the fittings to be tested against this requirement. The thermal treatment allows the bar to develop a tensile strength above the minimum 750MPa required for the test.

3.2.5 Mode of Failure – Cl 8.6.11.1 & 8.6.11.3 NZS 3101:2006 A3

This particular test is often paired with other tests, like the $0.7f_y$ or the ISO 15835 for large strains, to become the conclusive part of those tests. Once the main test is finished, the test sample is pulled to failure, and the Mode of Failure is recorded.

The failure mode must be by ductile yielding of the bar, with the bar developing its ultimate tensile strength at a location outside the mechanical connection, without thread stripping or evidence of significant distortion of the threads at the failure load of the bar.

3.2.6 Resistance to Brittle Fracture – Cl 8.6.11.4 NZS 3101:2006 A3 & Cl 4.2.1 (f) (iv) NZTA Bridge Manual 3rd Edition A4

As per Clause 8.6.11.4 of NZS 3101 A3, mechanical couplers and anchorages shall be proven, by an appropriate test method, to possess resistance to brittle fracture at the service temperatures at which they are intended for use. However, there is no indication on what an appropriate test method would be.

The NZTA Bridge Manual, at Clause 4.2.1 (f) (iv), provides more guidance on how to demonstrate resistance to brittle fracture through testing.

In accordance with AS 1544.2, a Charpy V-notched impact resistance equal to or greater than 27 Jules shall be achieved when standard 10mmx10mm test pieces are tested at 0°C. Test pieces of smaller cross section, as listed in AS/NZS 3678 Table 9, may be used when standard 10mmx10mm is impractical. For these smaller test pieces, the acceptance criteria shall correspond to the L0 impact designation given in Table 9 of AS/NZS 3678. An equivalent energy value is also provided, utilizing the equivalent energy factors from Table 2.6.5.5 (A) of AS 1210.

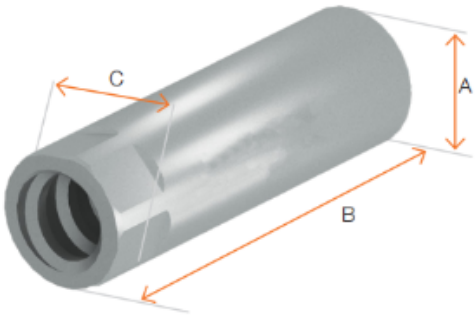
4 **Material Safety Data Sheet**

Refer to SDS ChemAlert SDS Date: 26 Apr 2022 Version No:1 (EPCON C8) for Safety Data Sheet according to New Zealand HSNO requirements.

ReidBar™ Steel Coupler

NEW

New Hex location.
For improved installation



Product Specs

Part No.	Description	Finish	Body Diameter (A) (mm)	Length (B) (mm)	Hex A/F (C) (mm)	Min Threaded Depth (mm)
RB12SCPB	12mm ReidBar Steel Coupler	Black	22	94	20	39
RB12SCPG	12mm ReidBar Steel Coupler	Galvanised	22	94	20	39
RBA16SCPB	16mm ReidBar Steel Coupler	Black	26	110	24	45
RBA16SCPG	16mm ReidBar Steel Coupler	Galvanised	26	110	24	45
RB20SCPB	20mm ReidBar Steel Coupler	Black	32	141	29	60
RB20SCPG	20mm ReidBar Steel Coupler	Galvanised	32	141	29	60
RB25SCPB	25mm ReidBar Steel Coupler	Black	40	172	36	73
RB25SCPG	25mm ReidBar Steel Coupler	Galvanised	40	172	36	73
RB32SCPB	32mm ReidBar Steel Coupler	Black	52	184	46	79
RB32SCPG	32mm ReidBar Steel Coupler	Galvanised	52	184	46	79

ReidBar™ Reinforcing bar RB12, RBA16, RB20, RB25, RB32

Seismic® 500E Micro Alloyed Reidbar™

Commercial reinforcing (E Class - Seismic) bar to AS/NZS 4671:2019

Product Characteristics	Value
Lower Characteristic yield strength $R_{ek.L}$ (MPa)	≥ 500
Upper Characteristic yield strength $R_{ek.U}$ (MPa)	≤ 600
Characteristic Minimum Ultimate to Yield ratio – R_m/R_e	≥ 1.15
Characteristic Maximum Ultimate to Yield ratio - R_m/R_e	≤ 1.40

Specifications of intended use

Mechanical connections subject to:

- Seismic, Static and quasi-static load.

Base materials

- Non-cracked and cracked concrete for reinforcing bars RB12 to RB32.
- Reinforced or unreinforced normal weight concrete for use in construction in accordance with NZS 3101:2006 A3 and NZTA Bridge Manual 3rd Edition A4.

Design:

- The Mechanical Spliced Connections are designed in accordance with the "Standards New Zealand NZS 3101:2006 A3 – Concrete Structures Standard" and the NZTA Bridge Manual 3rd Edition A4 under the responsibility of an engineer experienced in structural design and concrete work.
- Verifiable calculation notes and drawings are prepared taking into account the loads to be transferred over the spliced connection. The position of the anchor or connection is indicated on the design drawings.

Installation:

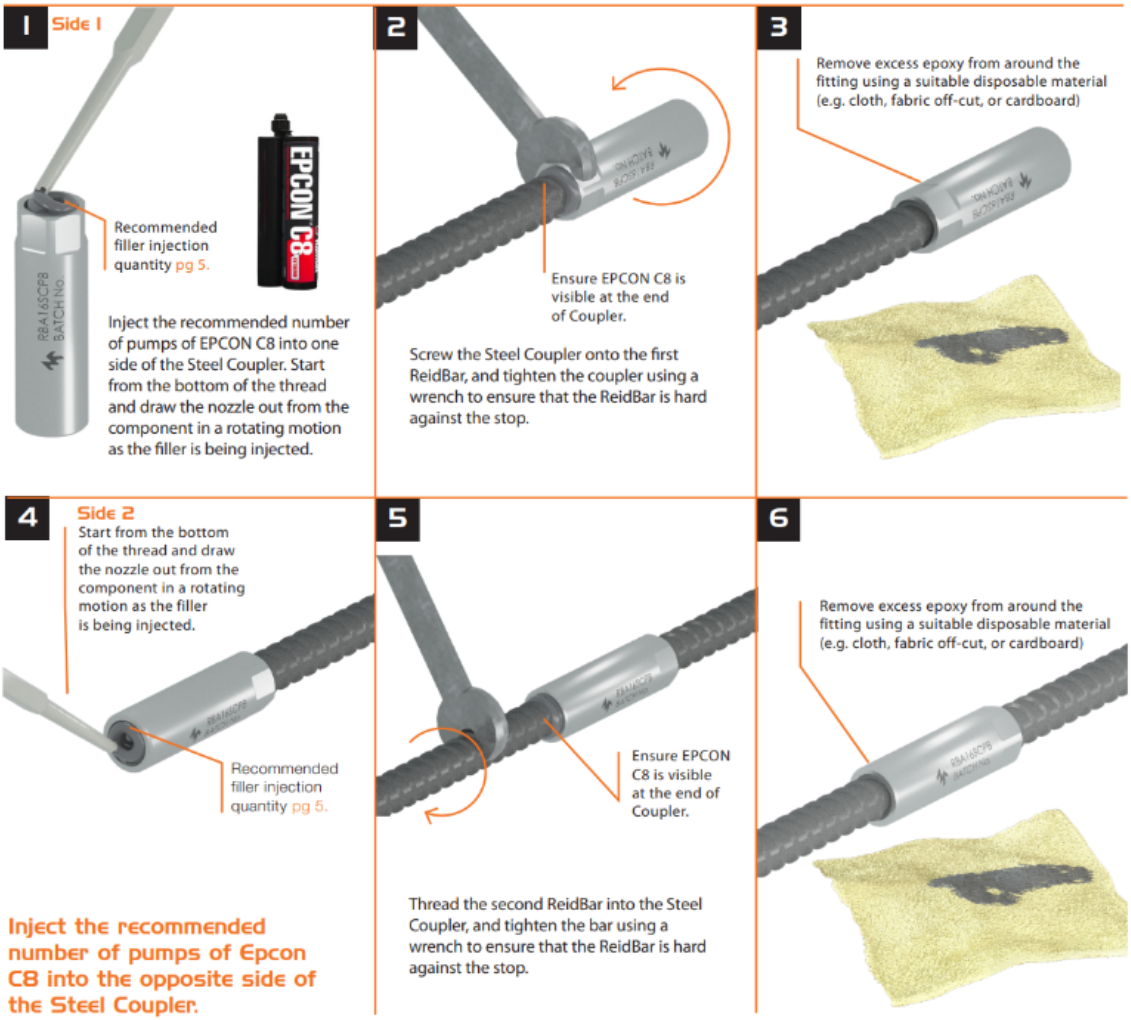
- Reinforcement installation carried out in accordance with ReidBar connection installation procedures (including the application of EPCON C8 thread filler in the ReidBar fitment) by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

ReidBar™ Components	**Annex B 1**
Intended use Specifications	

Installation instructions

Steps

ReidBar™ Steel Coupler Installation Guidelines.



Ensure the appropriate PPE is worn when working with Ramset™ EPCON™ C8 Xtrem™.
Refer to www.ramset.co.nz for EPCON™ C8 Xtrem™ MSDS Sheet.

Installation

ReidBar™ Steel Couplers are to be Installed utilising Ramset™ EPCON™ C8 Xtrem™

Recommended amount of EPCON™ C8 Xtrem™ injections

Part No.	No of Injections (each side)*	Approx. Fittings/cartridge**
RB12SCPB/SCPG	1	45
RBA16SCPB/SCPG	1	45
RB20SCPB/SCPG	2	22
RB25SCPB/SCPG	3	15
RB32SCPB/SCPG	5	9

*recommendations are based on the use of mixing nozzle type "ISNE". Quantities based on full pumps.
**Based on 90 pumps per EPCON™ C8 Xtrem™ cartridge.

ReidBar™ Steel Coupler	Annex B 2
Intended use Installation procedure	

Table C1: Elongation at $0.7f_y$: Cl 8.7.5.2 (b) NZS 3101:2006 A3
Cl 4.2.1 (f) (i) - NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	L_g Gauge length [mm]	L_c Coupler length [mm]	No. (of Sampl. Tested)	Max. Gauge Length Elong. at 350MPa $\Delta L_{g,350MPa}$	$0.7f_y$	Criteria assessed over L_c (coupler length)		Test report references
							Max. elong. (over coupl. Length)	Allw. max. elong. (over coupl. length)	
					[mm]	[kN]	[mm]	[mm]	
ReidBar Steel Couplers									
12mm Steel Coupler	RB12SCPB	200	94	3	0.306	39.55	0.121	0.329	MTS 25-0569-A1 (C8 Epoxy)
16mm Steel Coupler	RBA16SCPB	240	110	3	0.408	70.35	0.181	0.385	MTS 25-0569-A1 (C8 Epoxy)
20mm Steel Coupler	RB20SCPB	320	141	3	0.515	109.9	0.202	0.494	MTS 25-0569-A1 (C8 Epoxy)
25mm Steel Coupler	RB25SCPB	400	173	3	0.674	171.85	0.277	0.606	MTS 25-0569-A1 (C8 Epoxy)
32mm Steel Coupler	RB32SCPB	440	184	3	0.863	281.4	0.415	0.644	MTS 25-0569-A1 (C8 Epoxy)

Table C2: High Cycle Fatigue: Cl 8.7.5.2 (c) & 8.9.1.3 (b) - NZS 3101:2006 A3
Cl 4.2.1 (f) (i) - NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	No. (of Samples Tested)	In accordance with ISO 15835-1 & ISO 15835-2						Test report reference(s)
			Freq.	No. of cycles	Nomin. Yield Str. f_y	Cycle upper stress	Cycle lower stress	Result	
			[Hz]	`	[kN]	[kN]	[kN]		
ReidBar Steel Couplers									
32mm Steel Coupler	RB32SCPB	3	15	2,000,000	402.0	241.2	193.0	Pass	MTS 25-0647-A

Table C3: Large Strains: Cl 8.9.1.3 (a) - NZS 3101:2006 A3
Cl 4.2.1 (f) (i) - NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	No. (of Samples Tested)	Criteria assessed						Test report reference(s)
			ISO $u_4 \leq 0.3$mm [mm]		ISO $u_8 \leq 0.6$mm [mm]		UTS ≥575MPa [MPa]		
			$u_{4(min)}$	$u_{4(max)}$	$u_{8(min)}$	$u_{8(max)}$	$UTS_{(min)}$	$UTS_{(max)}$	
ReidBar Steel Couplers									
12mm Steel Coupler	RB12SCPB	3	0.02	0.05	0.12	0.14	667	671	MTS 24-1406-A (RB12 C8 Epoxy)
16mm Steel Coupler	RBA16SCPB	3	0.03	0.10	0.12	0.21	652	661	MTS 24-1406-A (RBA16 C8 Epoxy)
20mm Steel Coupler	RB20SCPB	3	0.02	0.07	0.18	0.20	685	688	MTS 24-1406-A1-A (RB20 C8 Epoxy)
25mm Steel Coupler	RB25SCPB	3	0.05	0.12	0.19	0.28	695	703	MTS 24-1406-A (RB25 C8 Epoxy)
32mm Steel Coupler	RB32SCPB	3	0.11	0.17	0.38	0.43	667	683	MTS 24-1406-A (RB32 C8 Epoxy)

Table C4: Ultimate Tensile Strength – Cl 8.6.11.1 & 8.6.11.2 NZS 3101:2006 A3
Cl 4.2.1 (f) (i) - NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	No. (of Samples Tested)	Criteria assessed with heat treated ReidBar			Test report reference(s)
			UTS ≥750MPa [MPa]		Mode of Failure	
			$UTS_{(min)}$	$UTS_{(max)}$		
ReidBar Steel Couplers						
12mm Steel Coupler	RB12SCPB	3	948	980	3 ReidBar break outside of coupler	Holmes Solutions 149862.00
16mm Steel Coupler	RBA16SCPB	3	898	956	3 ReidBar break outside of coupler	Holmes Solutions 149862.00
20mm Steel Coupler	RB20SCPB	3	975	1028	3 ReidBar break outside of coupler	Holmes Solutions 149862.00
25mm Steel Coupler	RB25SCPB	3	824	858	3 ReidBar break outside of coupler	Holmes Solutions 149862.00
32mm Steel Coupler	RB32SCPB	3	923	936	3 ReidBar break outside of coupler	Holmes Solutions 149862.00

Table C5: Mode of Failure – Cl 8.6.11.1, 8.6.11.2, 8.6.11.3 NZS 3101:2006 A3
Cl 4.2.1 (f) (i) NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	No. (of Samples Tested)	Criteria assessed			Test report reference(s)
			UTS [MPa]		Mode of Failure	
			$UTS_{(min)}$	$UTS_{(max)}$		
ReidBar Steel Couplers						
12mm Steel Coupler	RB12SCPB	3	667	671	3 ReidBar ductile failure clear of coupler	MTS 24-1406-A (RB12 C8 Epoxy)
16mm Steel Coupler	RBA16SCPB	3	652	661	3 ReidBar ductile failure clear of coupler	MTS 24-1406-A (RBA16 C8 Epoxy)
20mm Steel Coupler	RB20SCPB	3	685	688	3 ReidBar ductile failure clear of coupler	MTS 24-1406-A1-A (RB20 C8 Epoxy)
25mm Steel Coupler	RB25SCPB	3	695	703	3 ReidBar ductile failure clear of coupler	MTS 24-1406-A (RB25 C8 Epoxy)
32mm Steel Coupler	RB32SCPB	3	667	683	3 ReidBar ductile failure clear of coupler	MTS 24-1406-A (RB32 C8 Epoxy)

Table C6: Resistance to brittle fracture – Cl 8.6.11.4 NZS 3101:2006 A3
Cl 4.2.1 (f) (iv) NZTA Bridge Manual 3rd Edition A4

Sample	Part No.	No. (of Samples Tested)	Criteria assessed		Test report reference(s)
			Energy Absorbed at 0°C (≥ 27J Average for standard samples 10x10x55mm) [J]	Comments	
ReidBar Steel Couplers					
32mm Steel Coupler	RB32SCPB	3	42	(≥13J) for 10x5x55 samples*	LMATS LW25-0979-01 CVN

* Sub-size sample, value in brackets reports the equivalent average energy required for smaller samples as per AS/NZS 3678.