GDC Consultants Ltd
Chartered Professional Engineers & Mediators

Fall Protection system
Structural Design check

- Geotechnical Investigation & Design
- Structural & Civil Design
- Earthquake Engineering & Assessments
- Traffic & Safety Assessments
- Road Design & Asset
- Management
- Water/Wastewater/Stormwater Design & Modelling
- Project & Construction
- Management
- Mediation
- Training
- Research & Development

Telarc. Registered
Quality ISO 9001

GDC Auckland Office
Entrance 2, 320 Ti Rakau Drive
East Tamaki
Auckland
+64 9 281 2248
auckland@gdcgroup.co.nz

GDC Hamilton Office
First Floor, 489 Anglesea Street
Street
PO Box 9403
Hamilton
+64 7 838 0090
hamilton@gdcgroup.co.nz

GDC Thames Office
1st Floor, Fay Building
516 Pollen Street
Thames
+64 7 869 0640
thames@gdcgroup.co.nz

GDC Napier Office
H B I House, 6C Taradale Road
PO Box 44, Napier
+64 6 281 2270
napier@gdcgroup.co.nz

GDC Rotorua Office
1289 Haupapa Street
PO Box 1468, Rotorua
+64 7 282 2173
rotorua@gdcgroup.co.nz

GDC Whitianga Office
19 Monk Street,
PO Box 292, Whitianga
+64 7 869 0640
whitianga@gdcgroup.co.nz

GDC Wellington Office
Davis Langdon House, Level 10,
49 Boulcott Street
Wellington
+64 4 282 0405

GDC Consultants Ltd

Chartered Professional Engineers & Mediators

Structural Design Report

This report has been prepared for Collins Corporation Ltd / Nick Collins by GDC Consultants Ltd (GDC). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval to fulfil a legal requirement

Fall Protection System

Structural Design Check

Status	For consent
Revision	0

Quality Assurance Statement		
Task	Responsibility	Signature & Date
Prepared by:	Alin Poanta MEngNZ No. 1027581	20.08.2019
Peer - Reviewed by	Matt Bishop CPEng. No. 243276	9 October 2019
Approved for Issue by:	Clement Fernando CPEng. No. 202146	10/10/2019

Job No: J002332
Date: August 2019

HBI House, 6C Taradale Road, Napier, 4110|

Offices in: Hamilton| Thames| Whitianga| Rotorua| Auckland| Napier| Asia

Website: www.gdcgroup.co.nz

Specialising in Civil, Structural, Environmental & Training

Table of Contents

Section 1 – Design Report

Structural Design

Design Report

The fall arrest consists of a flexible anchor line (cable, wire rope, fibre rope or webbing), attached to two or more anchor points. This type of fall protection system can be installed on top of structures such as roofs, but also in a wall or overhead situation. Users of the system shall connect themselves to the system by using a full-body harness and a lanyard.

The components and materials are adequate in strength according to the testing, not covered by the report. The Fall Protection System is able to withstand the Maximum Arrest Load (MAL) and Maximum Arrest Force (MAF) they are exposed to in the event of a fall.

The system was calculated to AS/NZS 1891.4:2009 standard for a force of 15kN (1,500kg) for a single person anchorage.

Purpose of the system: fall arrest or fall restraint.
Location of the system: roof, wall or overhead situation.
Installation surface: metal, concrete or timber. (connections to substrate is outside of current job scope)

GDC has designed all the structural components for an Importance Level 2 with a design life of 50 years.

Design Parameters & Assumptions

The design assumed that all specified members are suitably protected from excess moisture in accordance with Section E, E2, E3 of the Building Code B1.

The substrate has strength and stiffness to resist the Maximum Arrest Load. This must be confirmed on site. GDC design excludes the substrate design. A PS1 with design check is required to demonstrate that the fixings are adequate and in accordance with Building Code B1.

The Safetor SE015HP Height Safety Anchor has been tested to the AS/NZS 5532.2013 Anchor testing standard and the anchors meet the requirements of AS/NZS 1891.4:2000 which is the maintenance standard and not a testing standard.
Safetor shock absorber for lifeline to be Energy absorber class E4(45-115kg) according to Technical Information received from Collins Corporation Ltd.
The shock absorber was design and tested by the Collins Corporation Ltd to tear and extend, to reduce the forces on the worker in the event of a fall to less than 6kN. The shock absorber may increase the length of the lanyard by as much as 1.2m during a fall.

All fall arrest system components dimensions are specified in the calculation sheets attached and the design is valid for these dimensions only.
Any amendments of the fall arrest system dimensions, fabrication methods and materials should be reported to GDC.
As per AS/NZS 1891.4:2009 and manufacturer usage instructions, fall protection equipment users must carry out a full inspection on their gear before and after each use to ensure that the items are in good working order.

Environmental Considerations
Steel fixings requirements to be according with Table 4.1, 4.2, 4.3 NZS3604:2011, outside of current job scope.

Structural Design
The structural design includes the following:

1. Fall arrest system

Exclusions

1. Fall arrest components (Swageless Fork, Glider, etc). These are covered by the tests, attached to this report
2. Waterproofing details, flashing details
3. Fixings and the fixings substrate
4. Full body harnesses connected to the fall arrest system
5. Fall protection plan

References

1. Full technical information received from Collins Corporation Ltd
2. ASNZS 1891.2.2001, AS/NZS 1891.4:2009
3. AS/NZS 5532.2013 anchor testing Standard
4. CSAS16-09, CAN3-S157

Attachments

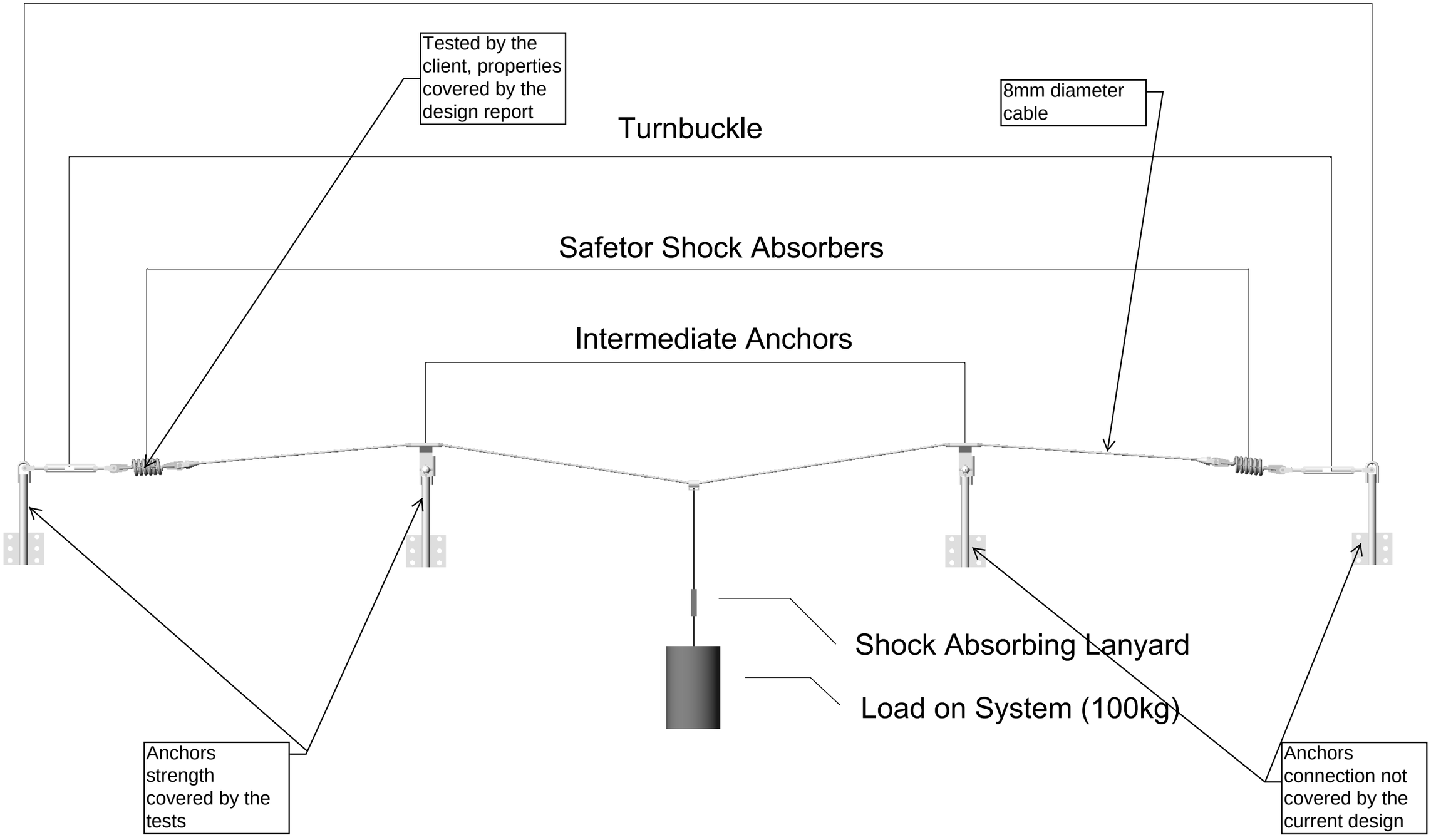
1. Calculations
2. Design Certificate
3. PS2
4. Details of the fall arrest system, material properties.

Fabricability
The components are manufactured according to ISO 16468:2015 which specifies technical requirements for castings produced by the investment-casting process. The International Standards specifying metallurgical material requirements for grade 2205 steel.

Section 2 - Calculations

This system has been analysed

End Anchors



Horizontal lifeline system - Multiple spans

Project: *Collins Roof Anchor*
Engineer's name: *Alin Poanta*
Firm: *GDC Consultants Ltd Napier*
Validated by: *Alin*
Date: *05 September 2019*

Cable		Anchorage	
Cable Diameter	5/16 in (7.9 mm)	Anchorage Type	SEO15HP, tested
Cable Weight w (N/m)	2.53	Post Length L_A (m)	0.5
F_{rupt} (kN)	34	M_r (kN.m)	25.3
E (Gpa)	64.8	M_{fmax} (kN.m)	19.54
A (mm²)	28.97	Material	Steel 350W
Cable FS	1.25	E_a (Gpa)	200
Construction	IWRC 7x19	I_A (10^6.mm⁴)	2.79

Number of spans	3
Total Cable Length	30 m

$M_{fmax}=\alpha_A \times L_A \times R_x$ with α_A = 1.5 (CAN/CSA Z259.16)
M_r calculated according to CSA S16-09 or CAN3-S157

Collins System		
Span length	L	10 m
Initial deflection	f_1	0.2 m
Initial tension	T_1	158.12 N
Maximum arresting force	F	15 kN
Maximum tension	T	27.13 kN
Maximum deflection	f_2	1.45 m
Horizontal reaction	R_x	26.05 kN
Vertical reaction	R_y	7.58 kN

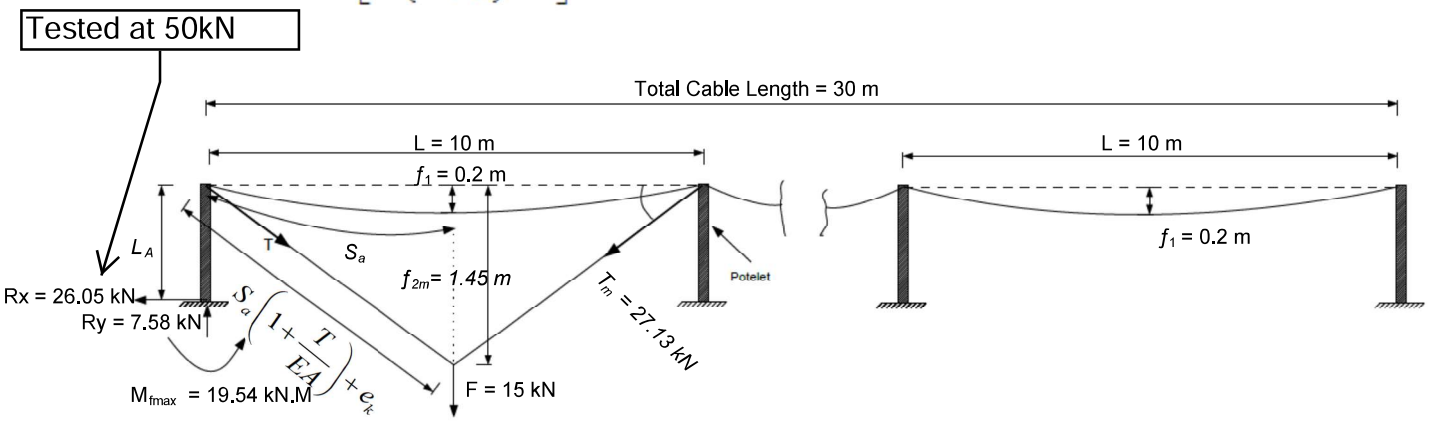
$$f_1 = \frac{wL^2}{8T_1} \qquad T^2 = \frac{F^2}{4\sin^2\alpha} = \frac{F^2}{4\left(1-\cos^2\alpha\right)}$$

$$f_2 = \frac{wL^2+2FL}{8T}$$

$$C_r = \frac{0.47\cdot n+1.53}{n+1} \qquad C_m = \frac{n+1}{0.4\cdot n+1.6}$$

$T_m = C_r \times T$ et $f_{2m} = C_m \times f_2$

With: $\cos\alpha = \dfrac{L}{2\left[S_a\left(1+\dfrac{T}{EA}\right)+e_k\right]}$ $\quad S_a = \dfrac{L}{2}+\dfrac{w^2L^3}{48T_1^2}$ $\quad e_k = \dfrac{T}{K_A}$ $\quad K_A = \dfrac{3E_AI_A}{L_A^3}$



Clearance computation

Project: *Roof Anchors*
Engineer's name: *Alin Poanta*
Firm: *GDC Consultants Ltd Napier*
Validated by:*Alin*
Date: *05 September 2019*

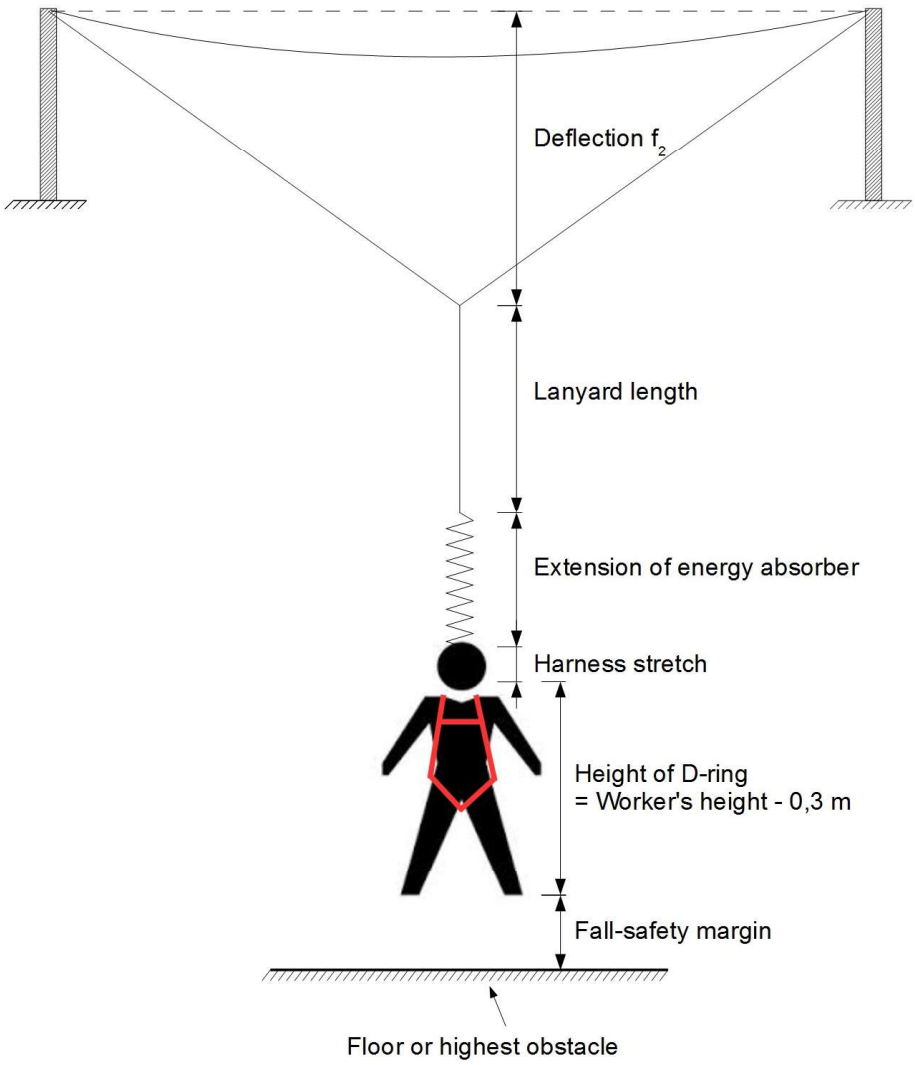
Deflection f_2 (m)	1.3
Lanyard length (m)	2
Energy absorber deployment (m)	1.01
Harness stretch (m)	0.2
Worker's height (m)	1.80
Safety margin (m)	0.73
Clearance (m)	6.74

Energy absorber deployment

$$d_a = \frac{Wh}{F_m - W}$$

Energy absorber class	E4 (45-115 kg)
Worker's Mass (kg)	115
Free fall height (m)	1.5
Energy absorber deployment (m)	1.01

h = free fall height (in m),
W = worker's weight in N (including his equipment)
Fm = 2,8 kN for an E4 class absorber,
4,2 kN for an E6 class absorber



Section 3 – References

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.

ANCHOR DEVICE SEO15HP

Testing of the Se015 anchor to 50.1kN.

Date: 24/02/2014		**Test Report : TR2014026**	Page 1 of 12
Department	**Height Safety**	Test: 15kN and 21kN fixed anchor point (Dynamic Drop Test)	**Ref: QSI 20140224-01**

Client: Collins Corporation Ltd
27 Giddis Ave
Napier

Client Ref: Nick Collins
Email: nick.roofanchors@clear.net.nz
Mobile: 021 448 004

Test specification: Compliance test to 6.3.2 dynamic testing procedures of AS/NZS 5532:2013, Manufacturing requirements for single-point anchor device used for harness based work at height.

Test items: Safetor fixed roof anchors
Two (2) Black permanent anchors attached to wooden structure.

Date of test: 23/02/2014

Checked by: Tanya Edmonds Date: 24/02/2014
Compliance Manager

Prepared & approved by Jason Myburgh Date: 24/02/2014
Quality Laboratory Manager

IANZ Accredited Signatory: Jason Myburgh

Aim

This test was done in order to determine the compliance of the fixed anchor point of the Safetor product range, with the dynamic test requirements of AS/NZS 5532:2013

The following table covers the test program conducted;

Designation / Attachment Points	Test	Description
Fixed anchor attached to wooden 90x45 double rafter and above purlin block as per Safetor roof anchor assembly instructions (Appendix 8)	6.3.2.2 fixed anchor devices as per table 1 dynamic testing criteria	**TEST 1** Dynamic drop test:- 15kN anchor rating with a 100kg rigid mass. Free fall distance 2000mm on 12mm three strand polyester hawser-laid rope.
Fixed anchor attached to wooden 90x45 double rafter and above purlin block as per Safetor roof anchor assembly instructions (Appendix 8)	6.3.2.2 fixed anchor devices as per table 1 dynamic testing criteria	**TEST 2** Dynamic drop test:- 21kN anchor rating with a 150kg rigid mass. Free fall distance 2000mm on 12mm three strand polyester hawser-laid rope.

Conclusion

The Safetor roof anchor when attached to wooden timber as per the Safetor installation instructions was able to demonstrate compliance with dynamic tests requirements table 1 of 6.3.2.2 of AS/NZS 5532:2013 for both the 15kN and 21kN drop test criteria.
(See appendix 8 for installation instructions)

Assessment

Test number DLT2014-14 (15kN Dynamic Drop Test)

The length of the rope measured 1970mm, mass of 100kg
Post examination of the anchor point showed slight movement in the wood mounting, and the anchor had bent to absorb some of the energy. Anchor retained the weight after the drop.
Refer to Appendix 4 for test graph and Appendix 6 for pictures
Assessment: **Pass**

Test number DLT2014-15 (25kN Dynamic Drop Test)

The length of the rope measured 1980mm, mass of 150kg
Post examination of the anchor point showed splitting of the wood mounting, and the anchor had bent to absorb some of the energy. Anchor retained weight after the drop but the timber was damaged.
Refer to Appendix 5 for test graph and appendix 7 for pictures
Assessment: **Pass**

Comments:
This dynamic test program covers Clause 6.3.2 (i),(ii)(a)(b) and (d) of AS/NZS 5532:2013[ð],

ð The Clause numbers indicated throughout this report refer to the respective Clauses of AS/NZS 5532:2013. Where a clause is followed by brackets '()', the contents of the brackets refers to part of the clause. i.e. paragraph number or subclause.

Appendix 1

TEST SPECIMEN DETAILS

Specimen Number	Description	Model	Serial No:	Date of manufacture
QSI20140223-01	Safetor Roof Anchor	SE015	5399	-
QSI20140223-02	Safetor Roof Anchor	SE015	5400	-
QSI20140223-03	12mm three strand polyester hawser-laid rope	SPR12	120871	02-2014
QSI20140223-04	12mm three strand polyester hawser-laid rope	SPR12	120561	02-2014
QSI20140223-05	12mm three strand polyester hawser	SPR12	120559	02-2014
QSI20140223-06	12mm three strand polyester hawser	SPR12	120872	02-2014
QSI20140223-07	12mm three strand polyester hawser	SPR12	120873	02-2014
QSI20140223-08	12mm three strand polyester hawser	SPR12	120870	02-2014
QSI20140223-09	12mm three strand polyester hawser	SPR12	120558	02-2014
QSI20140223-10	12mm three strand polyester hawser	SPR12	120560	02-2014

Appendix 2

TEST 1
15 kN TEST RESULTS
(100kg 2m drop)
Control

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Assessment
DT2014-19	QSI20140223-05	1970	2	14.05 kN	**Control 1 (1433 kg)**
DT2014-20	QSI20140223-06	1975	2	14.02 kN	**Control 2 (1430 kg)**
DT2014-21	QSI20140223-07	1970	2	14.60 kN	**Control 3 (1489 kg)**

100kg weight was dropped 2m onto 10 ton rigid anchor:
Average force after 3 Drops – 14.22 kN

Roof anchor fixed to wooden rafters
15 kN Test

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Highest Force averaged over 50m/s period	Assessment
DT2014-15	QSI20140223-01 QSI20140223-03	1970	2	10.69 kN	8.82 kN	**PASS (15kN)**

The roof anchor bent during the drop to reduce the force on the structure to 10.69 kN.

Appendix 3

TEST 2
21 kN TEST RESULT DETAILS
(150kg 2m drop)
Control

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Assessment
DT2014-16	QSI20140223-08	1970	2	20.91 kN	**Control 1 (2133 kg)**
DT2014-17	QSI20140223-09	1980	2	19.96 kN	**Control 2 (2036 kg)**
DT2014-18	QSI20140223-10	1965	2	20.78 kN	**Control 3 (2119 kg)**

150kg weight was dropped 2m onto 10 ton rigid anchor:
Average force after 3 Drops – 20.55 kN

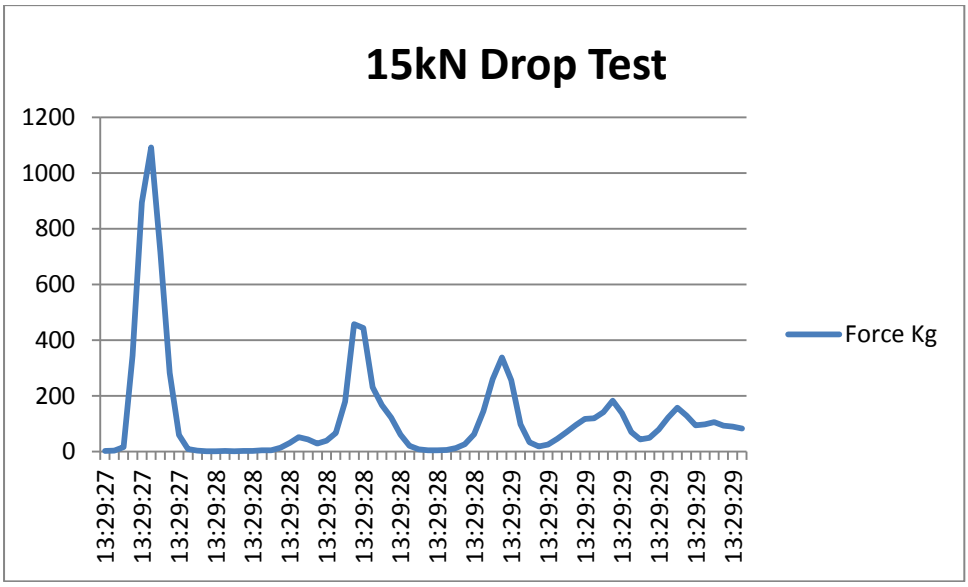
Roof anchor fixed to wooden rafters
21 kN Test

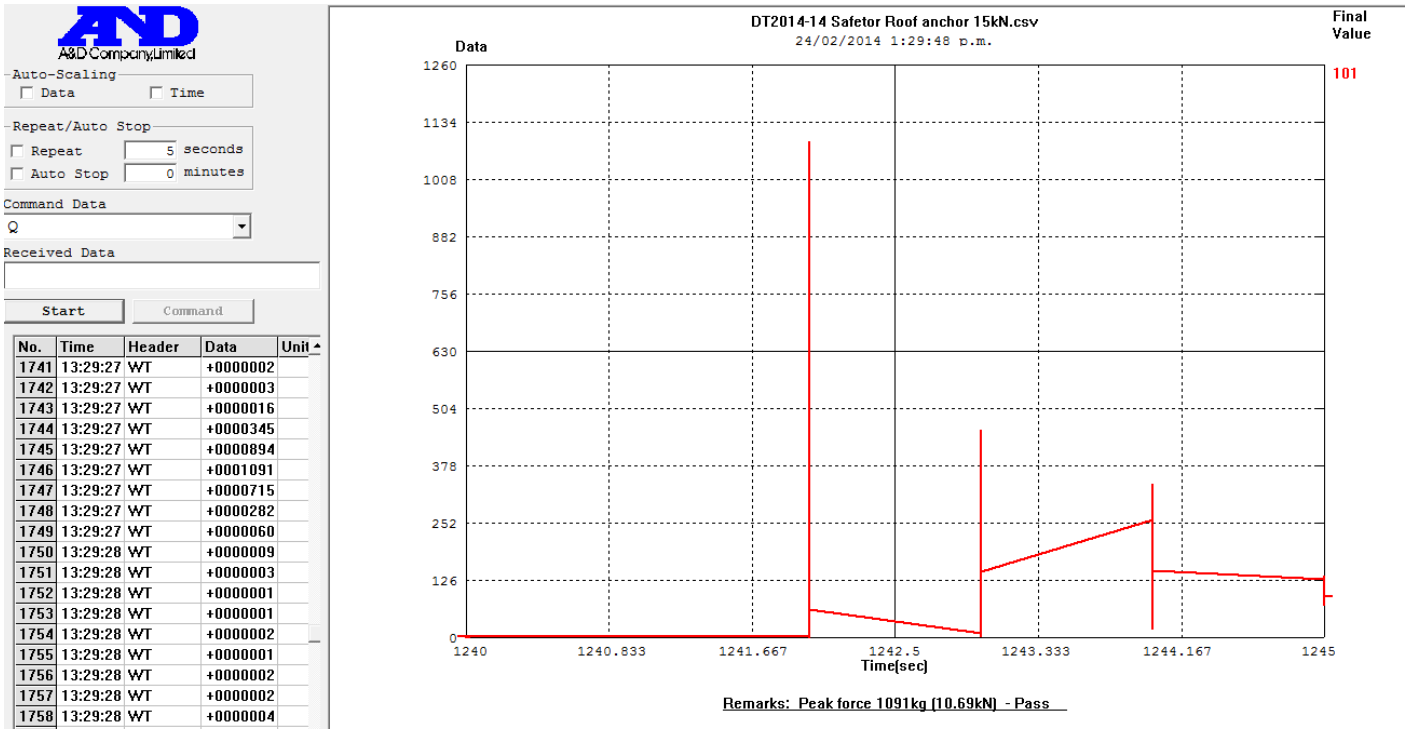
Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Highest Force averaged over 50m/s period	Assessment
DT2014-15	QSI20140223-02 QSI20140223-04	1980	2	14.12kN	13.75kN	**PASS (21kN)**

The roof anchor bent during the drop to reduce the force on the structure to 14.12 kN.

Appendix 4

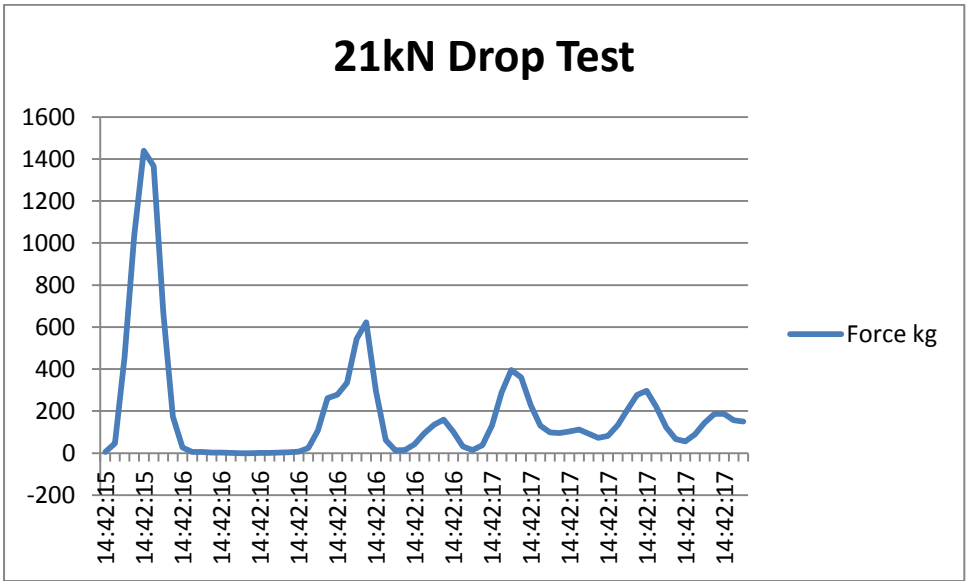
Test 1

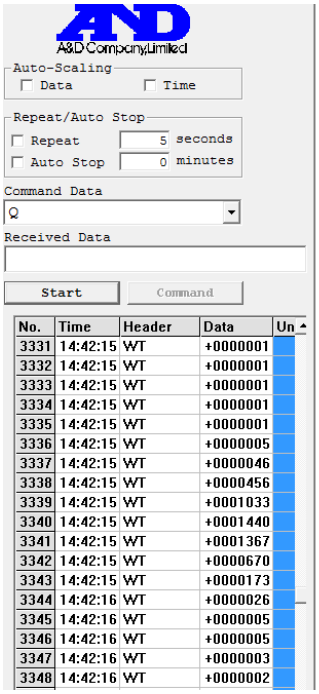




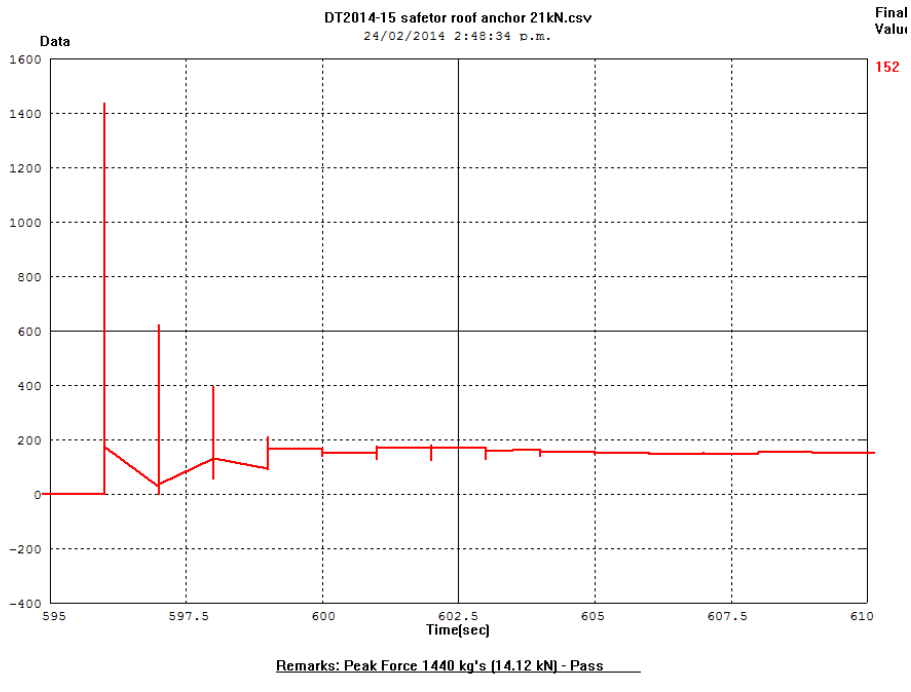
Appendix 5

Test 2





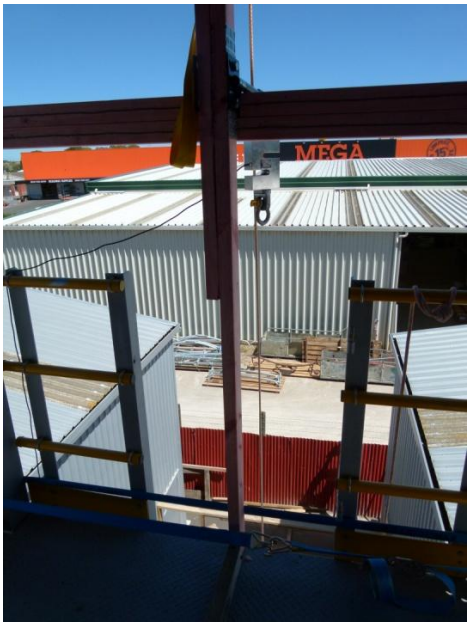
No.	Time	Header	Data	Un
3331	14:42:15	WT	+0000001	
3332	14:42:15	WT	+0000001	
3333	14:42:15	WT	+0000001	
3334	14:42:15	WT	+0000001	
3335	14:42:15	WT	+0000001	
3336	14:42:15	WT	+0000005	
3337	14:42:15	WT	+0000046	
3338	14:42:15	WT	+0000456	
3339	14:42:15	WT	+0001033	
3340	14:42:15	WT	+0001440	
3341	14:42:15	WT	+0001367	
3342	14:42:15	WT	+0000670	
3343	14:42:15	WT	+0000173	
3344	14:42:16	WT	+0000026	
3345	14:42:16	WT	+0000005	
3346	14:42:16	WT	+0000005	
3347	14:42:16	WT	+0000003	
3348	14:42:16	WT	+0000002	



Appendix 6

TEST 1 (15kN)

PICTURES BEFORE DROP



Appendix 6 (Continued)

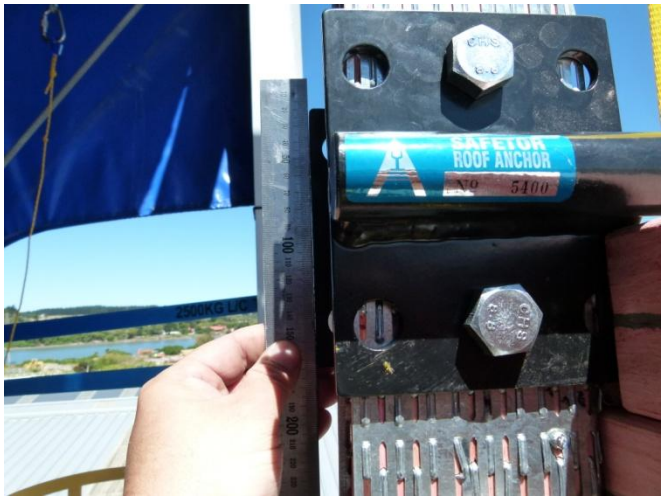
TEST 1 (15kN)

PICTURES AFTER DROP

Appendix 7

TEST 2 (21kN)

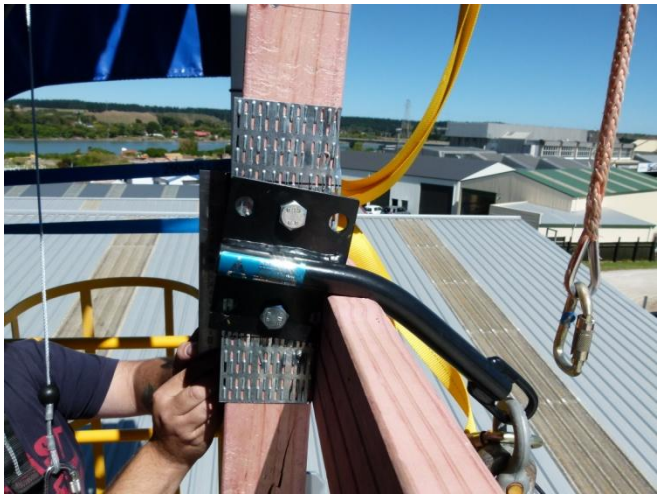
PICTURES BEFORE DROP

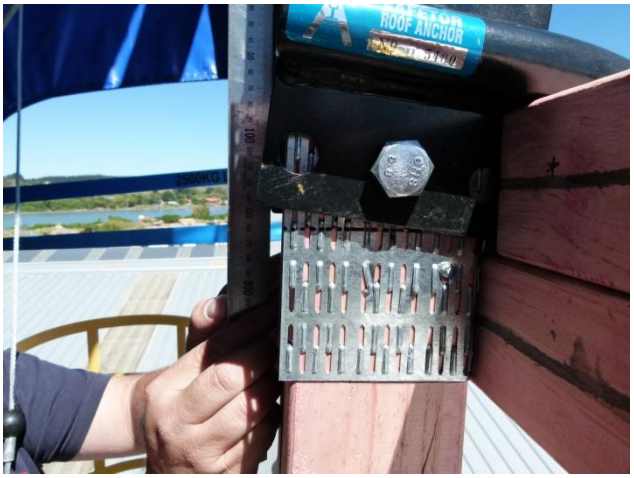


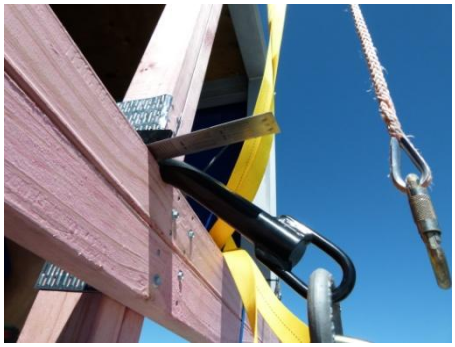
Appendix 7 (Continued)

TEST 2 (21kN)

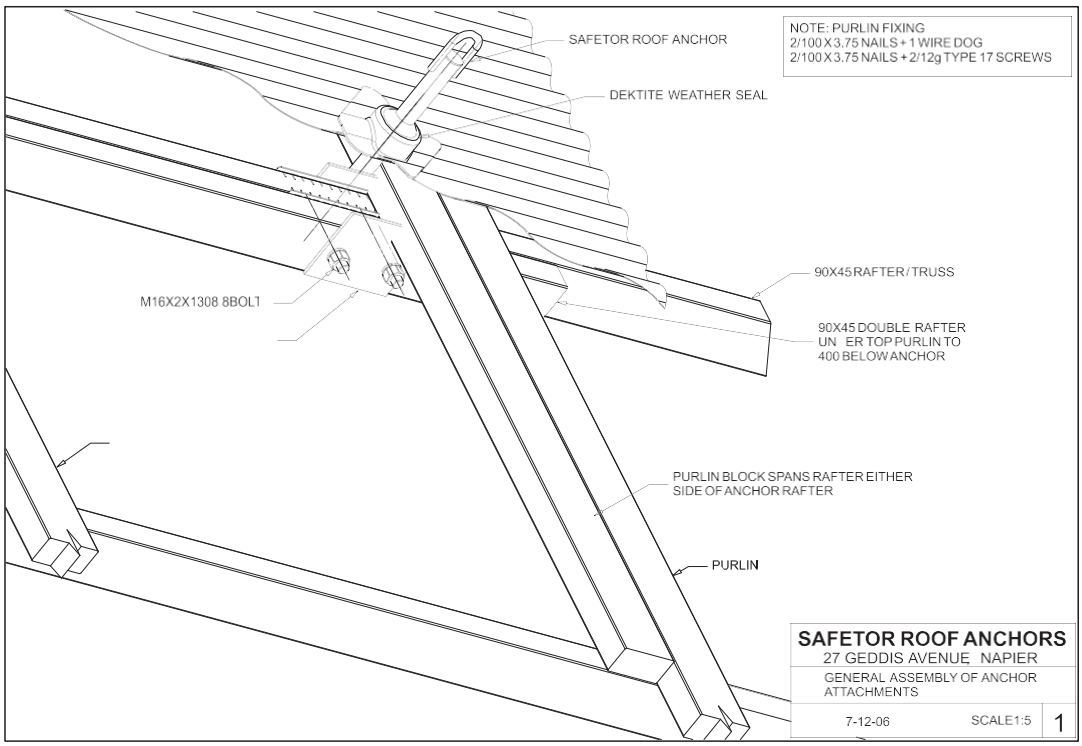
PICTURES AFTER DROP

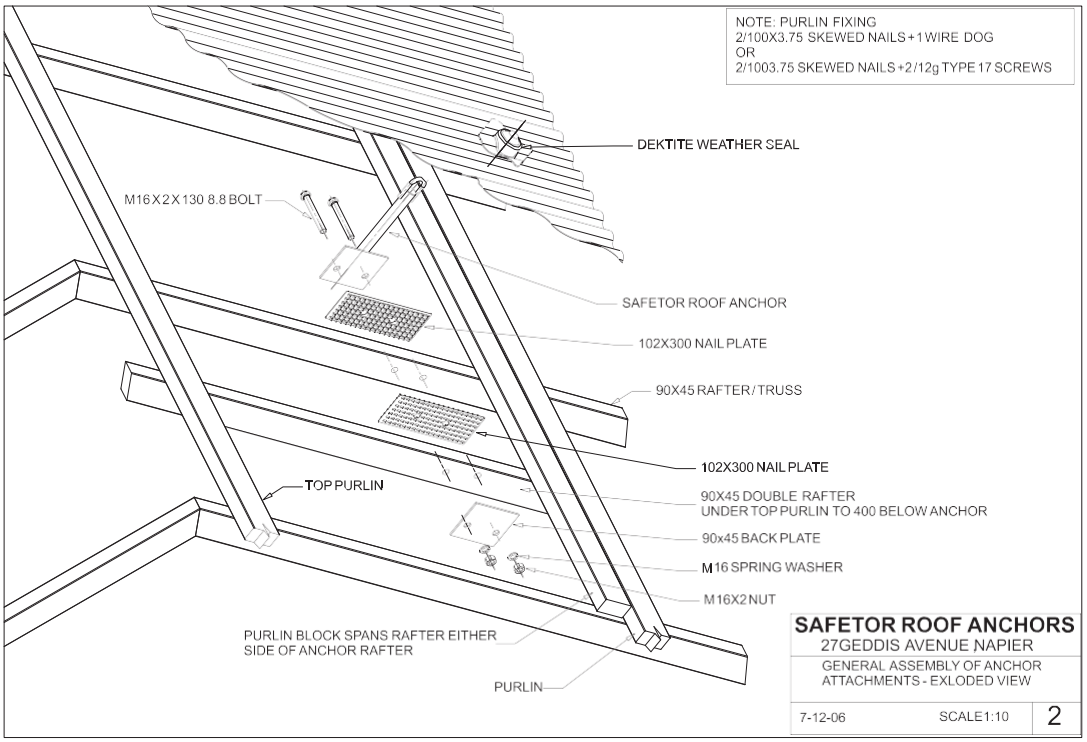






Appendix 8
Structure and fixing guidelines as per manufacturer

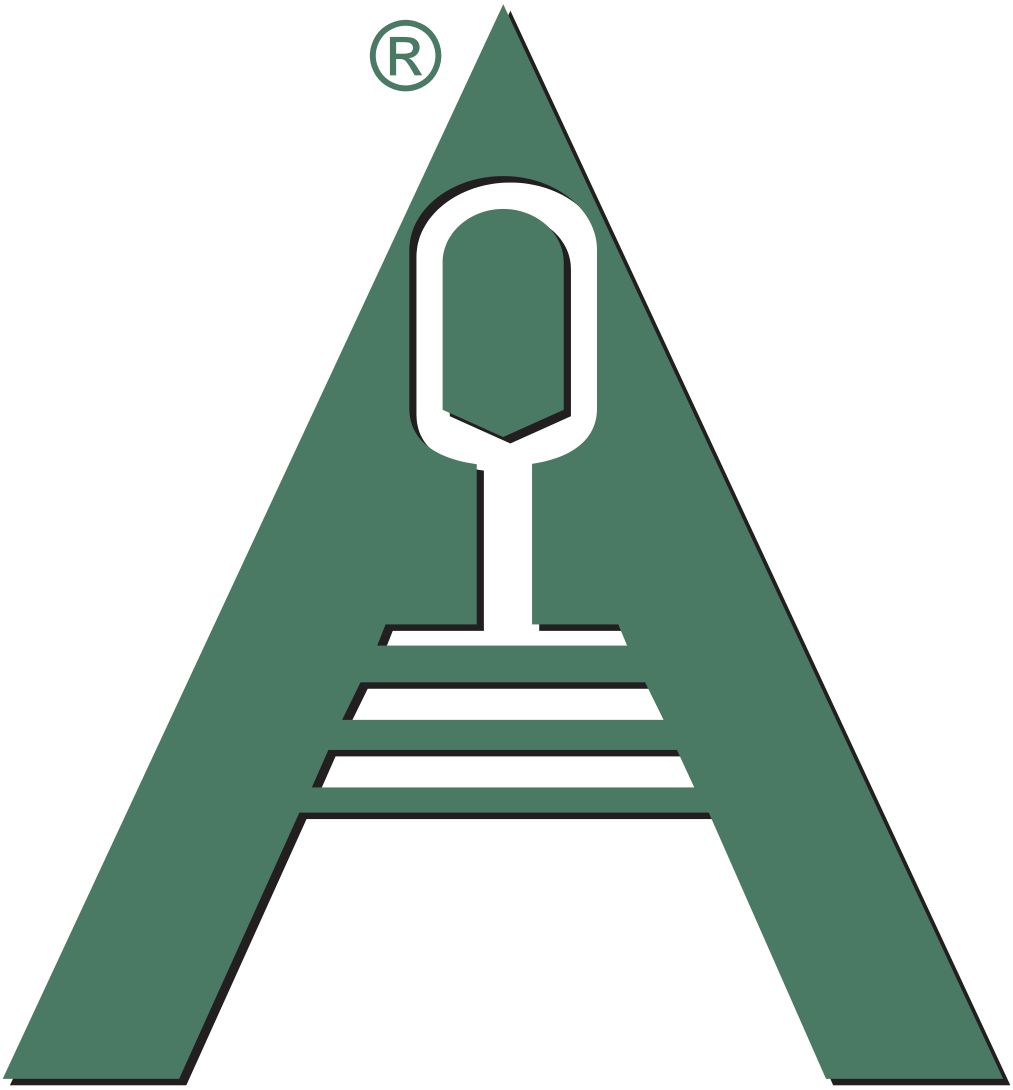




® SAFETOR ROOF ANCHORS

... when your life is on the line!!

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.



Safetor SEO15HP Fall-arrest / Abseil Anchor
Full Technical Information

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.

CONTENTS

®SAFETOR ROOF ANCHORS

... when your life is on the line!!

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.

ANCHOR DEVICE SEO15HP

SE015HP

APPLICATION AS PER AS/NZS 1891.4:2000

2 persons - Free fall arrest

2 persons - Restrained fall arrest

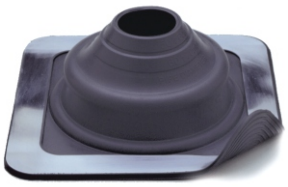
2 persons - Total restraint

Safetor Height Safety Structural Anchors Will:

1. Reduce loading on the Structure if a fall occurs
2. Absorbs energy without becoming brittle through stress loading or cold temperatures
3. Survive in the most severe environments without rusting or corroding
4. Comply to all building codes and standards
5. Safetor Anchors exceed the testing mandate. This is well-proven and fully documented
6. Our range of Structural anchors are manufactured in New Zealand

FINISH:

Kulorthene Series ABCITE® thermoplastic powder coatings have been developed specifically for enhanced long term corrosion protection, high impact strength and excellent exterior weathering.



DLM Dektite 5-55 Flashing System

DLM Flashing System

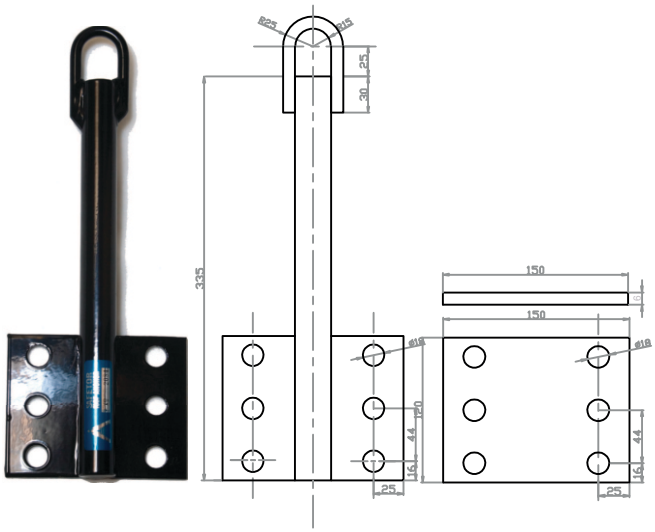
Dektite polymer flashings have been officially tested and conform to all Australian and New Zealand Standards.

Dynamic Drop Test: QSI

Compliance test to 6.3.2 dynamic testing procedures of AS/NZS 5532:2013, Manufacturing requirements for single-point anchor device used for harness based work at height.

Static Load Testing: MTL

Compliance test to 6.3.2 dynamic testing procedures of AS/NZS 5532:2013, Manufacturing requirements for single-point anchor device used for harness based work at height.



SE015HP

Installation:

The installation should only be carried out by a competent person as set out in the AS/NZS 1891.4:2009 Standards. It is the responsibility of the installer to supply to the building owner clear instructions as per the AS/NZS1891.2.2001 section 5.3 Installed systems A & B and a maintenance program for the care of their height safety anchor points. It is the responsibility of the Installer, Building Designer or Building Owner to ensure that the structure to which the anchor is attached to will support a load of at least 15kN as set out in the AS/NZS 1891.4:2009 Standards.

NB:

It is the responsibility of the installer to obtain a PS1 from a IPENZ Structural Engineer before installing any height safety anchor points and upon completion a PS3 or PS4 must be singed off to state the anchor has been installed as per the PS1.

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.

SAFETOR SE105HP-2PBP BRACING PLATES

The Safetor SE105HP-2PBP bracing plates have been designed to suit either the SE015HP or SE002LP anchors for steel or timber bracing to be fitted for added strength to the anchor and structure.

The SE105HP-2PBP bracing plates work in two ways.

1: They able you to attach a bracing member from the anchor to the purlin below or above the purlin the anchor is attached to.

2: The brackets form a triangle around the anchor stem giving a more solid 360º working area.

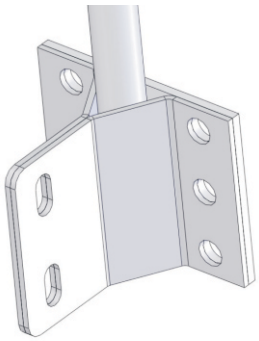
Either a steel purlin or double timber can be used when bracing between the anchor and the purlins.

A Structural Engineer should be consulted before installing anchor points

The SE105HP-2PBP bracing plate is designed to suit the mounting plates of the SE015HP and the SE002LP anchors

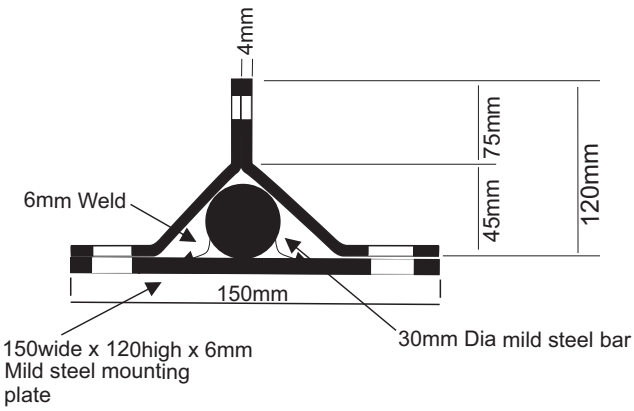
NB
As there are many different size purlins the galvanized mounting can be purchased from the purlin manufacturer

SE105HP-2PBP Bracing Plate



SE105HP-2PBP plates attach to the SE015HP mounting plate

A C Section purlin can be placed between purlins to form the brace



The SE105HP-2PBP bracing plate can be used on both timber and steel structures

Product: Safetor SE015HP
Company Collins Corporation Ltd

Product Description

Safetor SE015HP Height Safety Anchor has been specifically designed to provide safe anchors for safety lines that can be applied to a wide range of building sizes, roof shapes and construction modes.
The structural range of roof anchors have been tested to the AS/NZS 5532.2013 Anchor testing standard and the whole range anchors meet the AS/NZS 1891.4:2000. which is the maintenance standard and not a testing standard.

Scope of Use

SAFETOR Roof Anchors are designed to protect and save lives while people are working at height, giving them a solid point to attach safety lines for fall-restraint, fall-arrest and abseil.

Care must be taken when using any Safetor Roof Anchors.

Statement of Building Code Compliance

This product if designed, used, installed and maintained in accordance with the supporting technical information and additional conditions and limitations will meet the following provisions of the New Zealand Building Code:

AS/NZS 5532 : 2013 (Anchor Point Testing)
AS/NZS 1891.4: 2009 (Anchor Points)
AS/NZS 1891.2: 2001 (Horizontal Lifeline and Rail Systems)
AS/NZS 4488.1 & 2: 1997 (Industrial Rope Access Systems)
NZBC-Clause B1 Structure,B2 Durability, F4 Safety from Falling
NZ - BCA (Performance-based Building Code)
AS/NZS 1170 (Structural Design Actions)
AS/NZS 4600 (Cold Formed Steel Structures)
NZS 3604 (Timber Framed Buildings)
NZS 3404 (Steel Structures)

SE015HP

Evidence base to support compliance

This product has the following evidence to support the above solution type declaration:

In-house technical opinion
Appraisal
Independent testing

The Anchors have been tested to: AS/NZS 5532.2013 Standard by:
1. QSI who are an Accredited IANZ testing Laboratory and also certified ISO testing facility.
2. MTL who are an Accredited IANZ testing Laboratory MTL who are an IANZ approved Laboratory.

Safetor anchors meet all anchor testing standards

Validity Date

The validity date is dictated by the earliest renewal date of any relevant testing or appraisal documents. 03/11/2014

Installation Conditions

This product is code-compliant on the condition that it has been installed by:
Trade Qualified person

SUPER

DURABLE COATING SYSTEM

Kulorthene Series ABCITE® thermoplastic powder coatings have been developed specifically for enhanced long term corrosion protection, high impact strength and excellent exterior weathering.

Kulorthene ABCITE® THERMOPLASTIC POWDER COATINGS

Kulorthene Series ABCITE® thermoplastic powder coatings have been developed specifically for enhanced long term corrosion protection, high impact strength and excellent exterior weathering.

Environmental Conditions

- Does not suffer from premature failure through embrittlement
- Excellent coverage of edges and welds
- Tactile grip and warm feel
- Very good sound and electrical insulation properties
- Low flammability and low smoke and toxic fume emissions
- Environmentally friendly - 100% recyclable, no VOC's, plasticisers, TGIC, heavy metals or halogens
- Coating is easy to repair in-situ
- Long term corrosion protection to metal items
- Excellent adhesion without the need for primers
- Excellent resistance to exterior weathering, sun
- Excellent chemical resistance, including acids, alkalis and road salts
- Potable water certifications - suitable for contact with drinking water and food
- Vandal and graffiti resistance
- Excellent impact and abrasion resistance - will not chip or crack even at very low temperatures

Kulorthene Series Abcite®

Abcite® is a thermoplastic powder coating which melts and flows to form a very hard, flexible and impervious coating.

- Traditional (thermoset) powders must first melt and then chemically cross-link to develop their physical properties and adhesion.
- The curing/cross-linking schedule is therefore critical for traditional thermoset powder coatings to attain their full properties and appearance. This can require long oven cycle times.
- Abcite® only has to melt onto the surface to provide adhesion, and when the coating is cooled full appearance and physical properties are ensured. Abcite® can be applied from 200 to 3,000 microns.
- Traditional powder coatings are applied at 50 to 100 microns.

Kulorthene Abcite® coatings can be repaired in-situ using the same polymer system.

- Traditional powder coatings can only be repaired in-situ with a paint overcoat which may not have the same physical or weathering properties as offered by the original powder.

Benefits include

Exceptional resistance against salt spray,humidity, most common chemicals, acids,and alkalis. Abcite® coatings have high elongation properties, excellent mechanical resistance, are solvent free, have excellent substrate adhesion without the need for primers, superior chip resistance, and will provide superior substrate protection even to sub zero temperatures.

Product Description

Abcite® X60 A step up in chip and abrasion resistance**.**
Abcite® X60 is based on DuPont Surlyn resin the same polymer used for the tough outer skin of golf balls.
Abcite® X60 is a high build thermoplastic powder coating with superior edge coverage, substrate adhesion, and excellent corrosion and UV protection without the use of a primer. It is designed for various application techniques eg; electrostatic spraying, fluidised bed, and flame spraying.

Chemical Resistance

Abcite® X60 has excellent resistance to chemical attacks by both acids and alkalis however application-specific chemical resistance testing is recommended. It is also highly resistant to permeation by liquids. It also has good anti graffiti properties.

Typical Applications

Abcite® X60 is particularly suitable for outdoor light poles, sign posts, street and garden furniture, bike racks, marine fittings and fixtures, balustrades, railings and trellis, fencing panels, motorway guard rails, battery boxes, water pipes, valves and fittings, farm and agricultural equipment, mining and infrastructure in fact anywhere that increased hardness and abrasion resistance is required.

Independently Tested to ISO Standards

Abcite® X60 has been independently tested in Germany to ISO 12944-6. “Corrosion protection of steel structres by protective paint systems”. The coating meets the highest specifications of C5-M and Im3

Safetor Height Safety Structural Anchors are compliant to the AS/NZS 5532.2013 anchor testing Standard.

ANCHOR DEVICE SEO15HP

MTL Static Test

Testing of the SE015HP anchor to 50.1kN.

www.qsisafety.com

Date: 24/02/2014		**Test Report : TR2014026**	Page 1 of 12
Department	**Height Safety**	Test: 15kN and 21kN fixed anchor point (Dynamic Drop Test)	**Ref: QSI 20140224-01**

Client: Safetor Roof Anchors
27 Giddis Ave
Napier

Client Ref: Nick Collins
Email: nick.roofanchors@clear.net.nz
Mobile: 021 448 004

Test specification: Compliance test to 6.3.2 dynamic testing procedures of AS/NZS 5532:2013, Manufacturing requirements for single-point anchor device used for harness based work at height.

Test items: Safetor fixed SE015HP roof anchors
Two (2) Black permanent anchors attached to wooden structure.

Date of test: 23/02/2014

Checked by: Tanya Edmonds — Date: 24/02/2014
Compliance Manager

Prepared & approved by Jason Myburgh — Date: 24/02/2014
Quality Laboratory Manager

IANZ Accredited Signatory: Jason Myburgh

Aim

This test was done in order to determine the compliance of the fixed anchor point of the Safetor SE product range, with the dynamic test requirements of AS/NZS 5532:2013

The following table covers the test program conducted;

Designation / Attachment Points	Test	Description
Fixed anchor attached to wooden 90x45 double rafter and above purlin block as per Safetor roof anchor assembly instructions (Appendix 8)	6.3.2.2 fixed anchor devices as per table 1 dynamic testing criteria	**TEST 1** Dynamic drop test:- 15kN anchor rating with a 100kg rigid mass. Free fall distance 2000mm on 12mm three strand polyester hawser-laid rope.
Fixed anchor attached to wooden 90x45 double rafter and above purlin block as per Safetor roof anchor assembly instructions (Appendix 8)	6.3.2.2 fixed anchor devices as per table 1 dynamic testing criteria	**TEST 2** Dynamic drop test:- 21kN anchor rating with a 150kg rigid mass. Free fall distance 2000mm on 12mm three strand polyester hawser-laid rope.

Conclusion

The Safetor roof anchor when attached to wooden timber as per the Safetor installation instructions was able to demonstrate compliance with dynamic tests requirements table 1 of 6.3.2.2 of AS/NZS 5532:2013 for both the 15kN and 21kN drop test criteria.
(See appendix 8 for installation instructions)

Assessment

Test number DLT2014-14 (15kN Dynamic Drop Test)

The length of the rope measured 1970mm, mass of 100kg
Post examination of the anchor point showed slight movement in the wood mounting, and the anchor had bent to absorb some of the energy. Anchor retained the weight after the drop.
Refer to Appendix 4 for test graph and Appendix 6 for pictures
Assessment: **Pass**

Test number DLT2014-15 (25kN Dynamic Drop Test)

The length of the rope measured 1980mm, mass of 150kg
Post examination of the anchor point showed splitting of the wood mounting, and the anchor had bent to absorb some of the energy. Anchor retained weight after the drop but the timber was damaged.
Refer to Appendix 5 for test graph and appendix 7 for pictures
Assessment: **Pass**

Comments:
This dynamic test program covers Clause 6.3.2 (i),(ii)(a)(b) and (d) of AS/NZS 5532:2013[a],

The Clause numbers indicated throughout this report refer to the respective Clauses of AS/NZS 5532:2013. Where a clause is followed by brackets '()', the contents of the brackets refers to part of the clause. i.e. paragraph number or subclause.

Appendix 1

TEST SPECIMEN DETAILS

Specimen Number	Description	Model	Serial No:	Date of manufacture
QSI20140223-01	Safetor Roof Anchor	SE015	5399	-
QSI20140223-02	Safetor Roof Anchor	SE015	5400	-
QSI20140223-03	12mm three strand polyester hawser-laid rope	SPR12	120871	02-2014
QSI20140223-04	12mm three strand polyester hawser-laid rope	SPR12	120561	02-2014
QSI20140223-05	12mm three strand polyester hawser	SPR12	120559	02-2014
QSI20140223-06	12mm three strand polyester hawser	SPR12	120872	02-2014
QSI20140223-07	12mm three strand polyester hawser	SPR12	120873	02-2014
QSI20140223-08	12mm three strand polyester hawser	SPR12	120870	02-2014
QSI20140223-09	12mm three strand polyester hawser	SPR12	120558	02-2014
QSI20140223-10	12mm three strand polyester hawser	SPR12	120560	02-2014

Appendix 2

TEST 1
15 kN TEST RESULTS
(100kg 2m drop)
Control

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Assessment
DT2014-19	QSI20140223-05	1970	2	14.05 kN	**Control 1 (1433 kg)**
DT2014-20	QSI20140223-06	1975	2	14.02 kN	**Control 2 (1430 kg)**
DT2014-21	QSI20140223-07	1970	2	14.60 kN	**Control 3 (1489 kg)**

100kg weight was dropped 2m onto 10 ton rigid anchor:
Average force after 3 Drops – 14.22 kN

Roof anchor fixed to wooden rafters
15 kN Test

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Highest Force averaged over 50m/s period	Assessment
DT2014-15	QSI20140223-01 QSI20140223-03	1970	2	10.69 kN	8.82 kN	**PASS (15kN)**

The roof anchor bent during the drop to reduce the force on the structure to 10.69 kN.

Appendix 3

TEST 2
21 kN TEST RESULT DETAILS
(150kg 2m drop)
Control

Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Assessment
DT2014-16	QSI20140223-08	1970	2	20.91 kN	**Control 1 (2133 kg)**
DT2014-17	QSI20140223-09	1980	2	19.96 kN	**Control 2 (2036 kg)**
DT2014-18	QSI20140223-10	1965	2	20.78 kN	**Control 3 (2119 kg)**

150kg weight was dropped 2m onto 10 ton rigid anchor:
Average force after 3 Drops – 20.55 kN

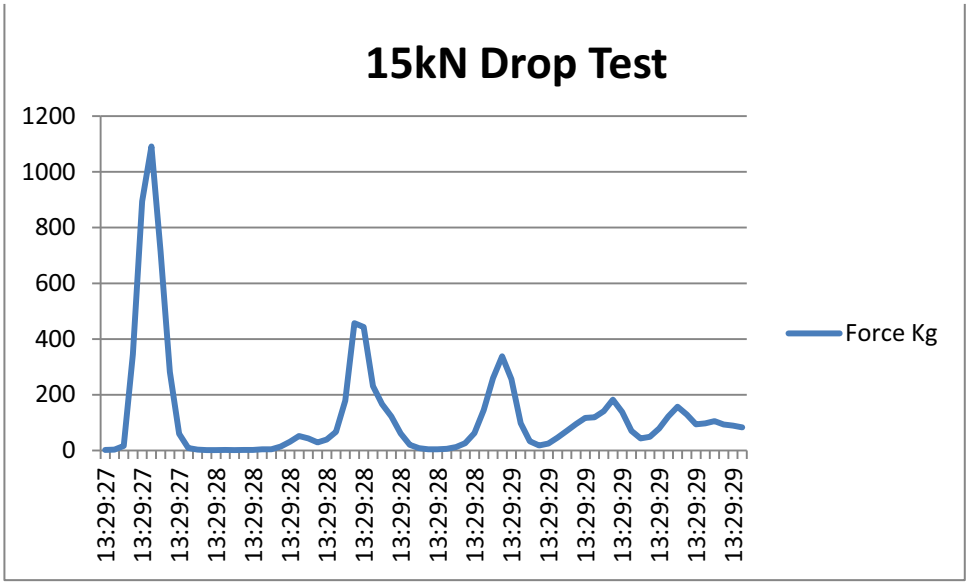
Roof anchor fixed to wooden rafters
21 kN Test

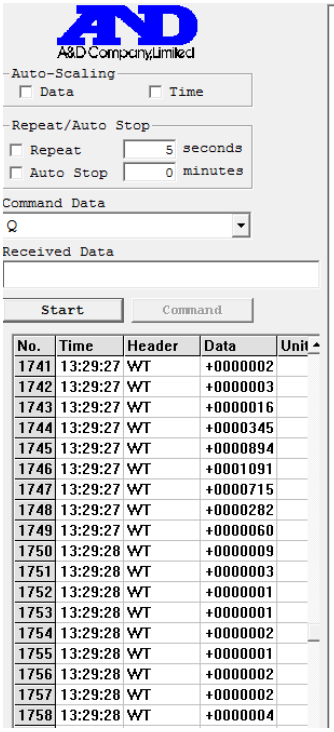
Test Number	Specimen Number	Overall Length (2000mm ± 50mm)	Drop Height (M)	Max Load (kN)	Highest Force averaged over 50m/s period	Assessment
DT2014-15	QSI20140223-02 QSI20140223-04	1980	2	14.12kN	13.75kN	**PASS (21kN)**

The roof anchor bent during the drop to reduce the force on the structure to 14.12 kN.

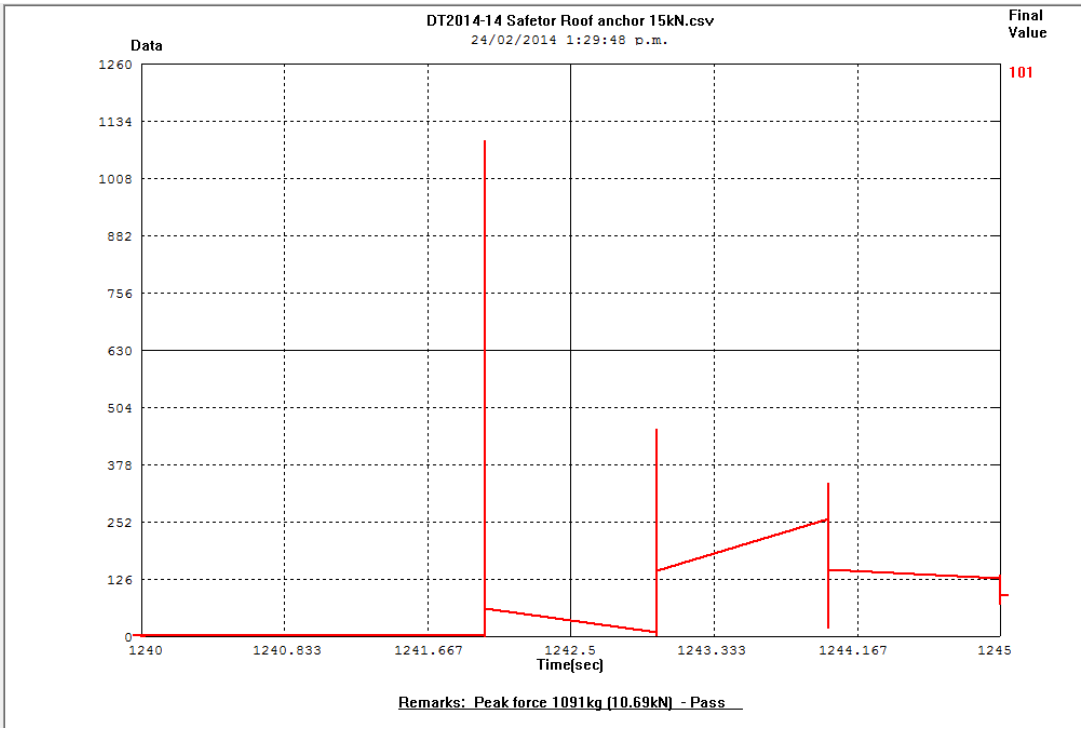
Appendix 4

Test 1



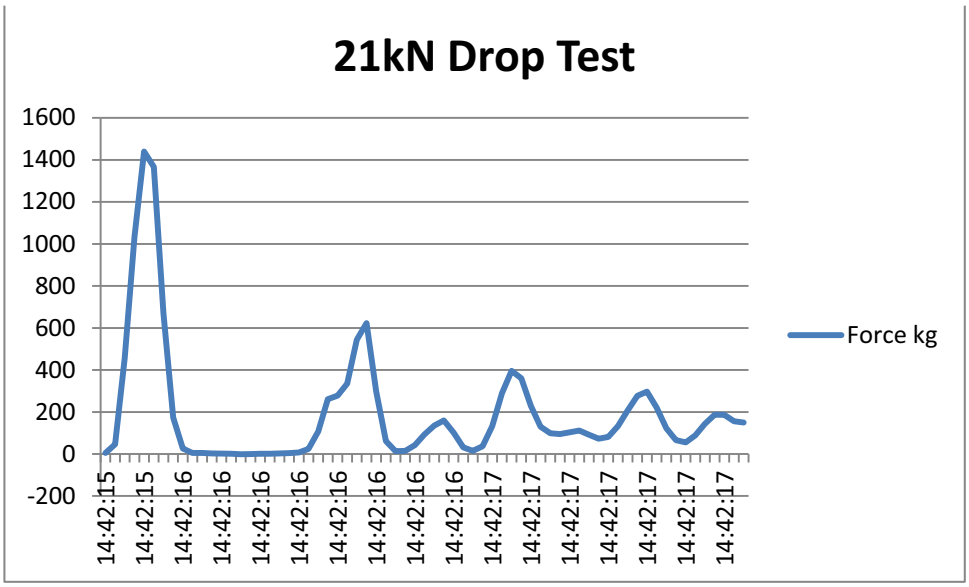


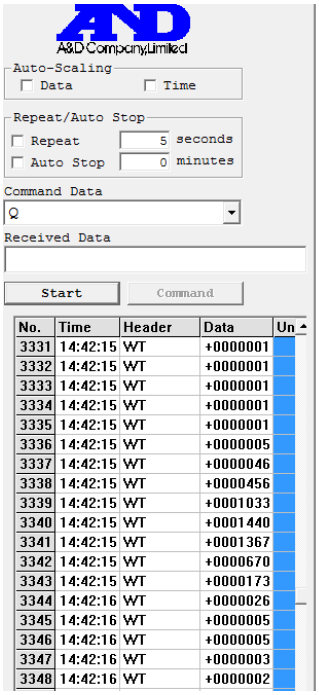
No.	Time	Header	Data	Unit
1741	13:29:27	WT	+0000002	
1742	13:29:27	WT	+0000003	
1743	13:29:27	WT	+0000016	
1744	13:29:27	WT	+0000345	
1745	13:29:27	WT	+0000894	
1746	13:29:27	WT	+0001091	
1747	13:29:27	WT	+0000715	
1748	13:29:27	WT	+0000282	
1749	13:29:27	WT	+0000060	
1750	13:29:28	WT	+0000009	
1751	13:29:28	WT	+0000003	
1752	13:29:28	WT	+0000001	
1753	13:29:28	WT	+0000001	
1754	13:29:28	WT	+0000002	
1755	13:29:28	WT	+0000001	
1756	13:29:28	WT	+0000002	
1757	13:29:28	WT	+0000002	
1758	13:29:28	WT	+0000004	



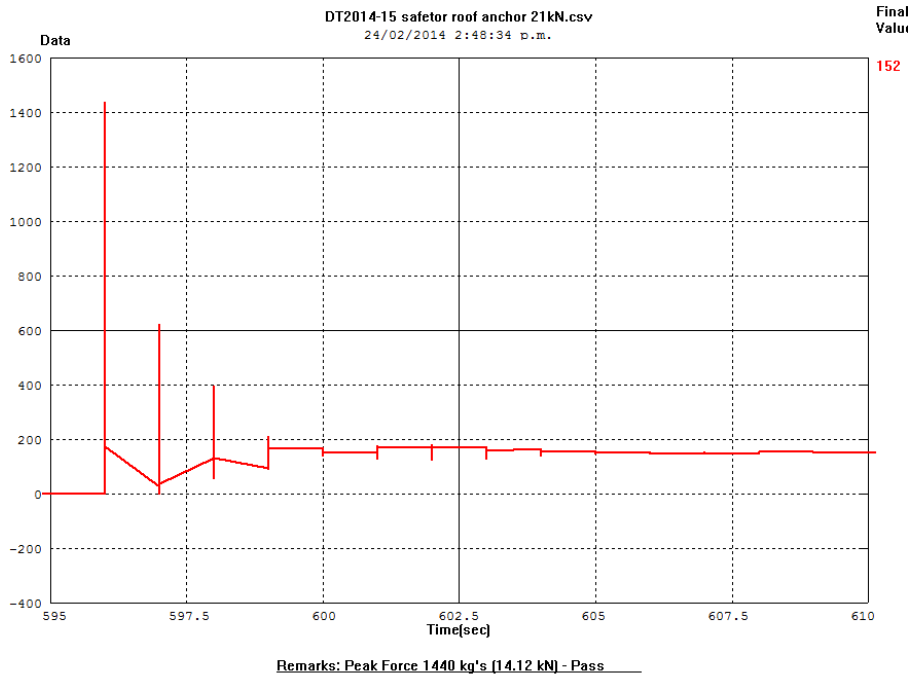
Appendix 5

Test 2





No.	Time	Header	Data	Un
3331	14:42:15	WT	+0000001	
3332	14:42:15	WT	+0000001	
3333	14:42:15	WT	+0000001	
3334	14:42:15	WT	+0000001	
3335	14:42:15	WT	+0000001	
3336	14:42:15	WT	+0000005	
3337	14:42:15	WT	+0000046	
3338	14:42:15	WT	+0000456	
3339	14:42:15	WT	+0001033	
3340	14:42:15	WT	+0001440	
3341	14:42:15	WT	+0001367	
3342	14:42:15	WT	+0000670	
3343	14:42:15	WT	+0000173	
3344	14:42:16	WT	+0000026	
3345	14:42:16	WT	+0000005	
3346	14:42:16	WT	+0000005	
3347	14:42:16	WT	+0000003	
3348	14:42:16	WT	+0000002	



Remarks: Peak Force 1440 kg's (14.12 kN) - Pass

Appendix 6

TEST 1 (15kN)

PICTURES BEFORE DROP

Appendix 6 (Continued)

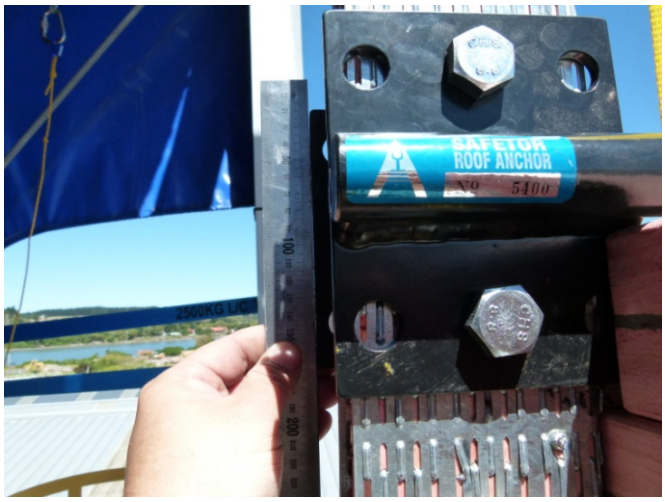
TEST 1 (15kN)

PICTURES AFTER DROP

Appendix 7

TEST 2 (21kN)

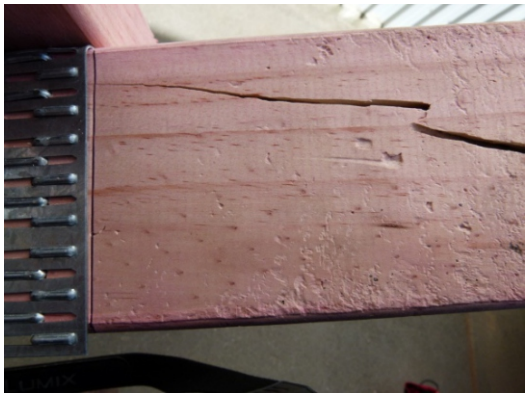
PICTURES BEFORE DROP



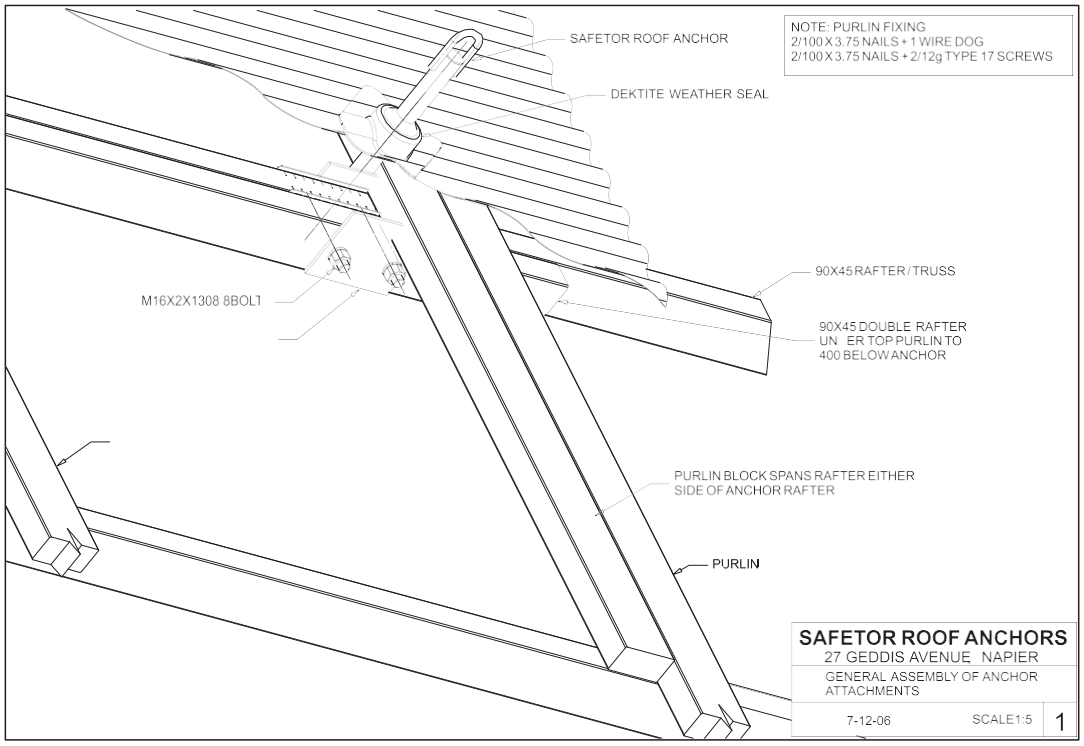
Appendix 7 (Continued)

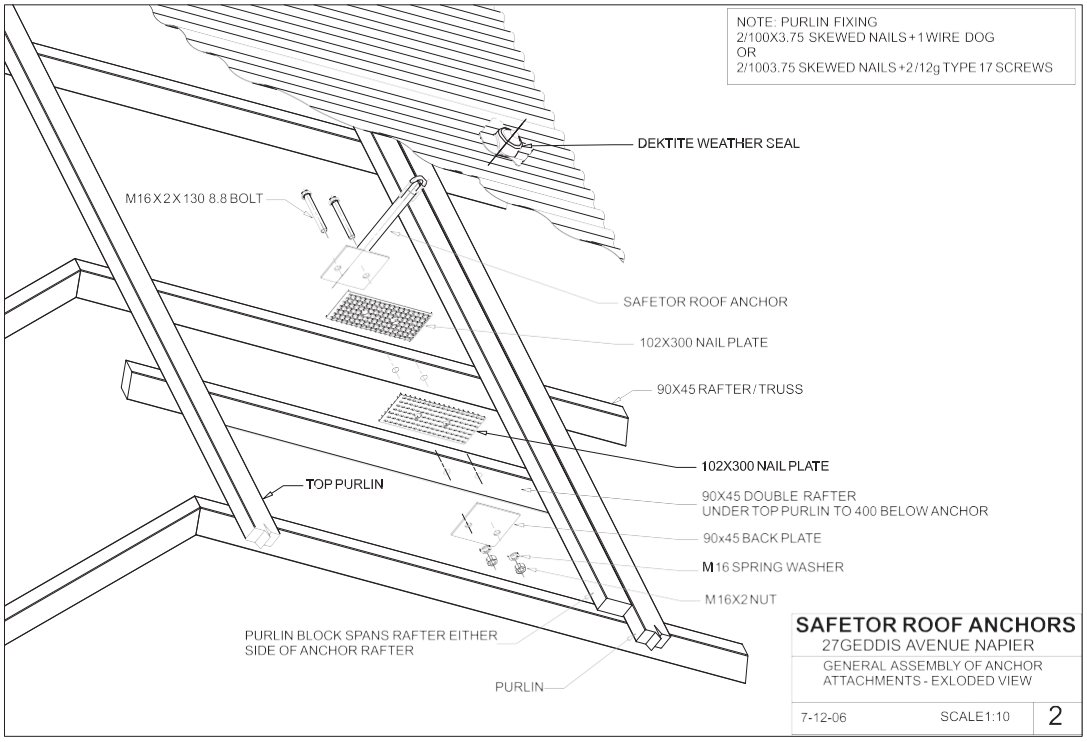
TEST 2 (21kN)

PICTURES AFTER DROP



Appendix 8
Structure and fixing guidelines as per manufacturer





SAFETOR® ROOF ANCHORS

... when your life is on the line!!

All Safetor anchors are certified to: ASNZS 5532.2013, ASNZS 1891.2.2001 and ASNZS 1891.4 2009

ANCHOR DEVICE: Safetor 3 in 1 Revolutionary Lifeline System

Design:
This lifeline system has been designed to be attached to any Safetor Structural / Concrete or Coolstore anchors that has a shaft diameter of 30mm that is in service on buildings today. This system is a 3 in 1 system, you have a combination of a Horizontal lifeline, Fall-Arrest and abseil anchor all in one. This system can also be used as a safe means of recovery by attaching to the anchor eye if a fall occurs.

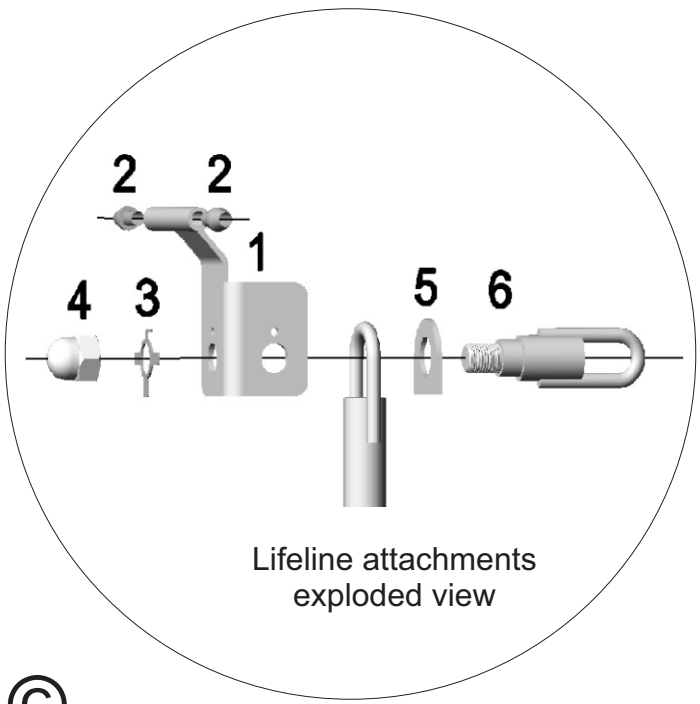
Safety value:
Collins Corp take height safety very seriously, as indicated in the products we have designed to date. Because our product is the first to combine both an anchor system and a lifeline system, it has a greater safety value and combines the two systems at the time of installation. It can also be retrofitted easily to our existing Structural, Tri Chem or Poly panel anchors.

Benefits of a combined system:
Benefits of a 3 in 1 system are: (1) Lifeline system. (2) Each anchor can be used for Fall-arrest. (3) Each anchor can be used for Abseiling.

Under the health and safely regulations when working at height, you cannot work in fall arrest as so many people do with other systems. By using our 3 in1 system we can offer everybody a secondary system to further reduce risk of serious harm or injury. The system also offers an instant recovery anchor point if a user does fall.

Safetor SE015HP anchor with
lifeline attachment, Fall-Arrest & Abseil eye

Safetor shock absorber for
lifeline

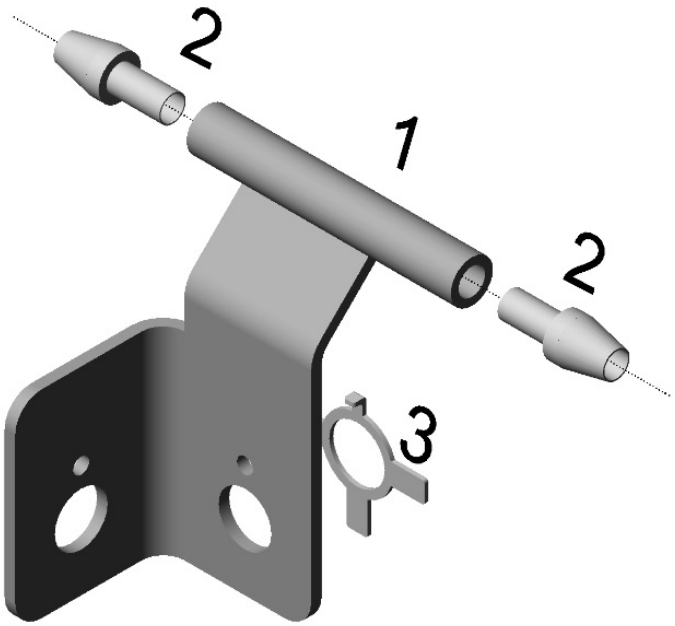


Lifeline attachments
exploded view

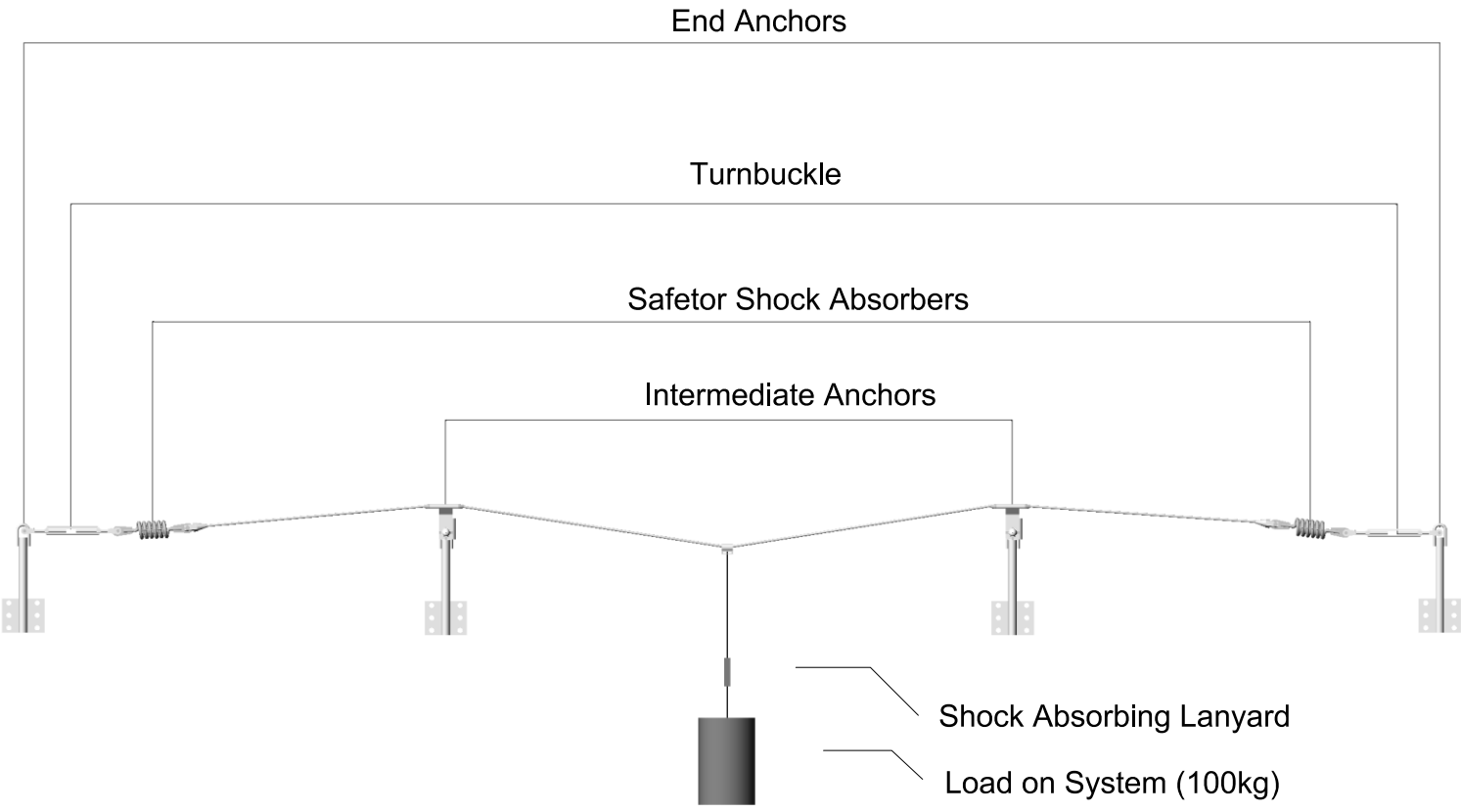
SAFETOR ROOF ANCHORS

... when your life is on the line!!

Lifeline system component price list



Completed Line System Assembly		
Number	Component Name	Material
1	Stainless Steel Connecter	Stainless Steel
2	Tapered Insert	Plastic
3	Lock Tab Washer	Stainless Steel



SAFETOR ROOF ANCHORS

... when your life is on the line!!

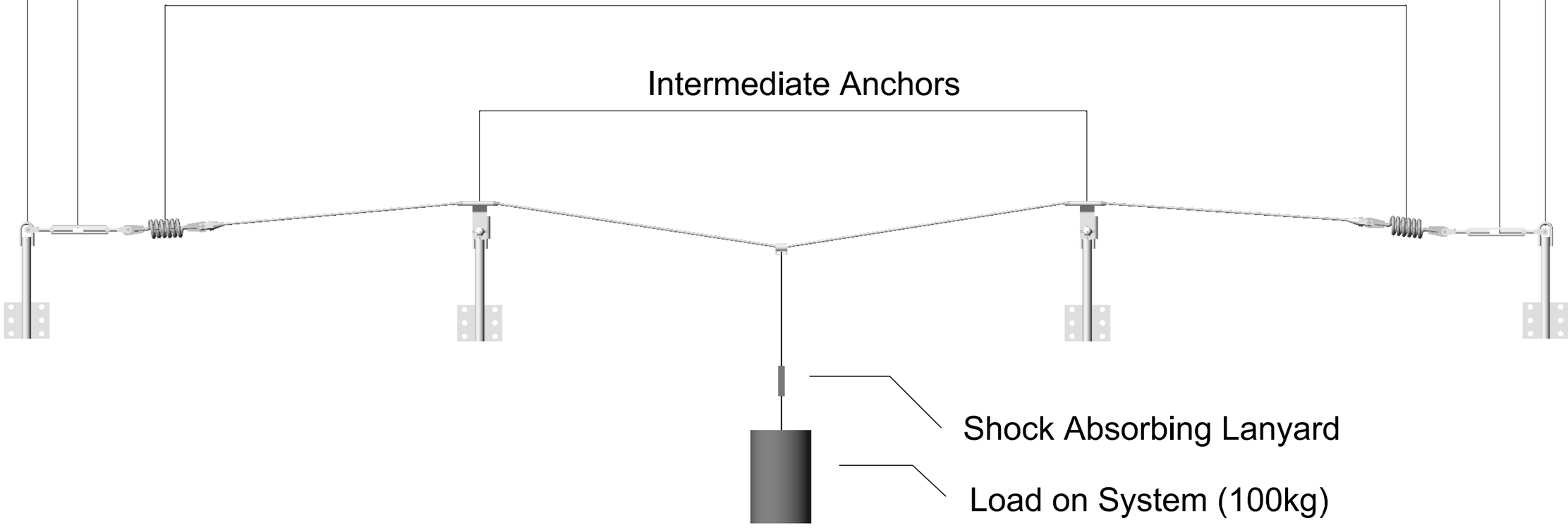
All Safetor anchors are certified to: ASNZS 5532.2013, ASNZS 1891.2.2001 and ASNZS 1891.4 2009

End Anchors

Turnbuckle

Safetor Shock Absorbers

Intermediate Anchors



Section 4 - Peer-review report

NZBC Clause B1 Structure - Design Review

GDC Consultants Ltd

Project number: 19071335 - 01

Project Type: Peer Review Report

Date: 09/10/2019

1. Overview

BVT has conducted a peer review of GDC Consultants J002332 (Rev 0 - August 2019) Safetor Roof Anchors - Fall Protection System structural design report. BVT has reviewed the structural calculations only. The scope of the structural calculations include the deflection of the Horizontal Lifeline cable and fall arrest clearance.

The following are specifically excluded from this review:

1. Fall arrest components (Swageless Fork, Gliderm etc).
2. Waterproofing details, flashing details
3. Fixings and fixings substrate
4. Full body harnesses connected to fall arrest system
5. Fall protection plan

Project Contacts

Design Engineer: Thomas Lau

Chartered Engineer: Matt Bishop CPEng CMEngNZ

Key Outcomes

The anchor line as specified in the J002332 (Rev 0 - August 2019) structural design report are reasonable for the intended uses, fall arrest and fall restraint. As per GDC's structural report, the components and materials are adequate in strength according to the testing performed, and will not be covered by the contents of this report.

The system has been reviewed in accordance to AS/NZS 1891.4:2009 with an allowance force of 15 kN (1500 kg) for a single person anchorage.

We believe that the design of the deflection of the Horizontal Lifeline cable and fall arrest clearances are in compliance with the New Zealand Building Code (NZBC), section B1.

This report has been prepared by BVT on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Any use or reliance by any person contrary to the above, to which BVT has not given its prior written consent, is at that person's risk.