SATRA Technology Centre Ltd
Wyndham Way, Telford Way, Kettering,
Northamptonshire, NN16 8SD United Kingdom
Tel: +44 (0) 1536 410000
Fax +44 (0) 1536 410626
email: info@satra.co.uk
www.satra.co.uk

Customer details: AKM Fabrications Ltd
Unit 6, Yarrow Business Centre
Yarrow Road
CHORLEY
PR6 OLP

For the attention of: Graham Ross

SATRA reference: SPC0242879 /1607
Issue 2

Your reference:

Date of report: 18 May 2016

Samples received: 17 February & 17 May 2016

Date(s) work carried out: 2 March & 17 May 2016

TECHNICAL REPORT

Subject: Limited testing of guard rail described as “Evo Rail Standard (New)” in accordance with EN 13374: 2013

This replaces report reference SPC0245502/1618 dated 11th March 2016

Conditions of Issue:

This report may be forwarded to other parties provided that it is not changed in any way. It must not be published, for example by including it in advertisements, without the prior, written permission of SATRA.

Results given in this report refer only to the samples submitted for analysis and tested by SATRA. Comments are for guidance only.

A satisfactory test report in no way implies that the product tested is approved by SATRA and no warranty is given as to the performance of the product tested. SATRA shall not be liable for any subsequent loss or damage incurred by the client as a result of information supplied in the report.

The uncertainty of the results (UoM) in this report is based on a standard uncertainty multiplied by a coverage factor k=2, which provides for a confidence level of approximately 95%.

Report signed by: Daniel Harrison
Position: PPE Technologist
Department: Safety Product Testing

TECHNICAL REPORT

WORK REQUESTED

Samples of Guard Rail described as “Evo Rail Standard (New)” were received by SATRA on the 2nd March & 17 May 2016, for limited testing in accordance with EN 13374: 2013 Temporary edge protection systems clauses 5.1.1, 5.1.3, 5.2.1, 6.3.2 & 6.3.7

All metal work for use on the guard rail has a thickness of 1.5mm

CONCLUSIONS

SAMPLE REFERENCE	STANDARD	CLAUSE / PROPERTY	PASS / FAIL
Evo Rail Standard (New)	EN 13374: 2013	5.1.1 Basic requirements	PASS
		5.1.3 Principal guardrail	PASS
		5.2.1 Additional requirements – Edge protection system class A	PASS
		6.3.2 Static loads – Serviceability limit state	PASS
		6.3.7 Static loads – Ultimate limit state with accidental loads	PASS

TESTING

Testing was carried out in accordance with EN 13374: 2013 on the 2nd March & 17 March 2016 in the presence of representatives from AKM Fabrications Ltd

Testing was carried out on four samples of guardrail on a flat concrete surface, in both dry and wet conditions

Samples were tested as received, and were not subject to any pre-conditioning processes other than those stated in individual test clauses

Figure 1 – Guard Rail described as “Evo Rail Standard (New)” installed on a concrete surface

TEST RESULTS

Table 1 – Testing of guard rail described as “Evo Rail Standard (New)” in accordance with EN 13374: 2004 for a class A device

EN 13374: 2013 CLAUSE / TEST	EN 13374: 2013 REQUIREMENT	RESULT / COMMENT	UoM (See note 1)	PASS / FAIL
5.1.1 Basic requirements	An edge protection system shall comprise at least a principal guardrail and an intermediate guardrail or intermediate protection	Edge protection system includes principle and intermediate guard rail		PASS
	It shall be possible to attach a toe board	Toe board supplied		PASS
	All components in the system shall be designed to avoid accidental removal or displacement of any direction during use	Unintentional displacement unlikely during normal use	N/A	PASS
	The components shall be designed and manufactured so that injury to persons from puncturing or lacerating of the skin is prevented	No sharp edges or burrs that could add additional risk to user		PASS
5.1.3 Principal guardrail	The distance between the uppermost part of the edge protection and the working surface shall be at least 1.0 m measured perpendicular to the working surface	Nominal height of principle guard rail: 1.07 m	± 0.3 mm	PASS
	The principal guardrails shall be continuous and any horizontal gaps shall be less than 120mm	Principal guardrail is continuous with no gaps		PASS

<table>
<tr><th>EN 13374: 2013
CLAUSE / TEST</th><th>EN 13374: 2013
REQUIREMENT</th><th>RESULT / COMMENT</th><th>UoM
(See note 1)</th><th>PASS /
FAIL</th></tr>
<tr><td>5.2.1 Additional requirements – Edge protection system class A</td><td>The inclination of edge protection system class A shall not deviate from the vertical by more than 15 °

If an intermediate guardrail is provided, any gap shall be so dimensioned that a sphere of 470 mm diameter will not pass through the protection

If there is no intermediate guardrail or if it is not continuous, the edge protection system shall be so dimensioned that a sphere with a diameter of 250 mm will not pass through it</td><td>Angle of inclination: 9°

Distance between principal guardrail and intermediate guardrail: 453mm

Distance between intermediate guardrail and toe board: 442mm

Not applicable</td><td>

N/A

</td><td>PASS

PASS

N/A</td></tr>
<tr><td>6.3.2 Static loads – Serviceability limit state</td><td>Loads F_{Ti} shall act as follows

• Perpendicular to the edge protection system in the outward direction
• Vertical to the edge protection system in the donward direction

The loads shall act separately and on posts, guardrails and toe boards.

For posts and guardrails, F_{T1} = 300N

For toe boards, F_{T2} = 200N

Max average elastic deflection: 55mm

Maximum single value of elastic deflection: 60mm</td><td>Surface condition: Dry

Direction: Horizontal to edge protection

Position: Principle guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>5</td><td>8</td><td>3</td></tr>
<tr><td>2</td><td>4</td><td>6</td><td>2</td></tr>
<tr><td>3</td><td>2</td><td>8</td><td>6</td></tr>
<tr><td>4</td><td>2</td><td>8</td><td>6</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>4.25</td></tr>
</table>
Position: Intermediate guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>5</td><td>8</td><td>3</td></tr>
<tr><td>2</td><td>5</td><td>7</td><td>2</td></tr>
<tr><td>3</td><td>3</td><td>7</td><td>4</td></tr>
<tr><td>4</td><td>3</td><td>8</td><td>5</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>3.5</td></tr>
</table>
Position: Toe board
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>2</td><td>28</td><td>26</td></tr>
<tr><td>2</td><td>2</td><td>26</td><td>24</td></tr>
<tr><td>3</td><td>3</td><td>30</td><td>27</td></tr>
<tr><td>4</td><td>2</td><td>24</td><td>22</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>24.75</td></tr>
</table></td><td>± 50 N
See note 2</td><td>PASS</td></tr>
</table>

<table>
<tr><th>EN 13374: 2013
CLAUSE / TEST</th><th>EN 13374: 2013
REQUIREMENT</th><th>RESULT / COMMENT</th><th>UoM
(See note 1)</th><th>PASS /
FAIL</th></tr>
<tr><td>6.3.2 Static loads – Serviceability limit state (continued)</td><td>Loads F_{Ti} shall act as follows

• Perpendicular to the edge protection system in the outward direction
• Vertical to the edge protection system in the donward direction

The loads shall act separately and on posts, guardrails and toe boards.

For posts and guardrails, F_{T1} = 300N

For toe boards, F_{T2} = 200N

Max average elastic deflection: 55mm

Maximum single value of elastic deflection: 60mm</td><td>Surface condition: Dry

Direction: Vertical to edge protection

Position: Principle guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>2</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>3</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>4</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>3.25</td></tr>
</table>

Position: Intermediate guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>2</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>3</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>4</td><td>1</td><td>5</td><td>4</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>3.5</td></tr>
</table>

Position: Toe board
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>0</td></tr>
</table></td><td>± 50 N
See note 2</td><td>PASS</td></tr>
</table>

<table>
<tr><th>EN 13374: 2013
CLAUSE / TEST</th><th>EN 13374: 2013
REQUIREMENT</th><th>RESULT / COMMENT</th><th>UoM
(See note 1)</th><th>PASS /
FAIL</th></tr>
<tr><td>6.3.2 Static loads – Serviceability limit state (continued)</td><td>Loads F_{Ti} shall act as follows

• Perpendicular to the edge protection system in the outward direction
• Vertical to the edge protection system in the donward direction

The loads shall act separately and on posts, guardrails and toe boards.

For posts and guardrails, F_{T1} = 300N

For toe boards, F_{T2} = 200N

Max average elastic deflection: 55mm

Maximum single value of elastic deflection: 60mm</td><td>Surface condition: Wet

Direction: Horizontal to edge protection

Position: Principle guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>2</td><td>2</td><td>3</td><td>1</td></tr>
<tr><td>3</td><td>2</td><td>9</td><td>7</td></tr>
<tr><td>4</td><td>5</td><td>11</td><td>6</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>4.5</td></tr>
</table>

Position: Intermediate guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>1</td><td>4</td><td>3</td></tr>
<tr><td>2</td><td>1</td><td>3</td><td>2</td></tr>
<tr><td>3</td><td>1</td><td>9</td><td>8</td></tr>
<tr><td>4</td><td>3</td><td>6</td><td>3</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>4</td></tr>
</table>

Position: Toe board
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>1</td><td>26</td><td>25</td></tr>
<tr><td>2</td><td>3</td><td>25</td><td>22</td></tr>
<tr><td>3</td><td>1</td><td>26</td><td>25</td></tr>
<tr><td>4</td><td>2</td><td>30</td><td>28</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>25.0</td></tr>
</table></td><td>± 50 N
See note 2</td><td>PASS</td></tr>
</table>

<table>
<tr><th>EN 13374: 2013
CLAUSE / TEST</th><th>EN 13374: 2013
REQUIREMENT</th><th>RESULT / COMMENT</th><th>UoM
(See note 1)</th><th>PASS / FAIL</th></tr>
<tr><td>6.3.2 Static loads – Serviceability limit state (continued)</td><td>Loads F_{Ti} shall act as follows

• Perpendicular to the edge protection system in the outward direction
• Vertical to the edge protection system in the donward direction

The loads shall act separately and on posts, guardrails and toe boards.

For posts and guardrails, F_{T1} = 300N

For toe boards, F_{T2} = 200N

Max average elastic deflection: 55mm

Maximum single value of elastic deflection: 60mm</td><td>Surface condition: Wet

Direction: Vertical to edge protection

Position: Principle guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>2</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>3</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td>4</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>3.5</td></tr>
</table>

Direction: Vertical to edge protection

Position: Intermediate guard rail centre
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>2</td><td>2</td><td>4</td><td>2</td></tr>
<tr><td>3</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>4</td><td>0</td><td>4</td><td>4</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>3.5</td></tr>
</table>

Position: Toe board
<table>
<tr><th>Sample</th><th>δ1 (mm)</th><th>δ2 (mm)</th><th>δ2 - δ1 (mm)</th></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Mean</td><td>N/A</td><td>N/A</td><td>0</td></tr>
</table></td><td>± 50 N
See note 2</td><td>PASS</td></tr>
</table>

EN 13374: 2013 CLAUSE / TEST	EN 13374: 2013 REQUIREMENT	RESULT / COMMENT	UoM (See note 1)	PASS / FAIL
6.3.7 Static loads – Ultimate limit state with accidental loads	Load F_D shall act downwards within an angle of ±10° to the face of the edge protection system, anywhere along the top edge of the guardrails and toe boards. This also applies to any other component of the edge protection system, such as a fencing structure, which has gaps in excess of 100mm width. F_D = 1.25 kN Max 300mm deflection during load	Position: Centre of principal guardrail 1.25kN sustained for 1 minute without failure Deflection: 15mm	± 50 N See note 2	PASS

ADDITIONAL INFORMATION / NOTES

Note 1 – 'UoM' denotes estimated Uncertainty of Measurement for stated test results. This uncertainty value is based on a standard uncertainty multiplied by a coverage factor k = 2, which provides for a confidence level of approximately 95%

Note 2 – Estimated uncertainty of measurement applied at point of test (e.g. to applied force or to tolerance limits) to ensure product meets requirements of the standard

TERMS AND CONDITIONS OF BUSINESS

1. GENERAL
Work done or services undertaken are subject to the terms and conditions detailed below and all other conditions, warranties and representations, expressed or implied are hereby excluded.

2. PRICES
Prices are based on current material and production costs, exchange rates, duty and freight and are subject to change without notice.

3. DELIVERY ESTIMATES
Delivery estimates are made in good faith and date from receipt of a written order and full information to enable us to proceed. While SATRA or its subsidiaries (hereafter referred to as "SATRA") make every effort to fulfil them, such estimates are subject to unforeseen events and if not maintained, cannot give rise to any claim. Offers "ex stock" are subject to prior sale.

4. CANCELLATION AND RETURNS
Cancellation of orders for goods, services, training or consultancy is only acceptable by prior agreement of SATRA and a charge will normally be made.

5. CLAIMS
Claims for errors, shortages etc should be notified within 10 days of date of receipt. In the event of goods damaged in transit, packing materials should be retained for examination; otherwise no liability can be accepted.

6. PAYMENT TERMS
Payment terms are net 21 days from date of invoice. Failure to comply with the terms of payment may result in delayed delivery of goods and services and a review of the Customer's credit account. Should the customer become subject to an administration order, or becomes bankrupt or goes into liquidation, SATRA has a right to cancel any contract and discontinue any work. SATRA reserves the right to adjust US Dollar and Euro sales price where customer exceeds credit terms and where the exchange rate has moved more than 10% since invoicing.

7. RETENTION OF TITLE
All goods remain the property of SATRA until paid in full. Under no circumstances will a customer's purchase order override SATRA's Retention of Title clause. In the case of software, the ownership of the software remains with SATRA. Payment of invoices in full will entitle the customer to use the software under licence until (a) they cease to be a member of SATRA or (b) they cease trading. In both instances, the licence shall then revert to SATRA.

8. GUARANTEE
All goods manufactured by SATRA are guaranteed both as regards material and workmanship. Any part returned carriage paid, within twelve months from date of supply and found defective, will be repaired or replaced at SATRA's option free of charge. SATRA admits no liability for loss, damage or delay consequent on any defect in any goods supplied by SATRA.

9. TEST REPORTS
Results given in test reports refer only to samples submitted for analysis and tested by SATRA. A satisfactory test report in no way implies that the product tested is approved by SATRA and no warranty is given as to the performance of the product tested. SATRA shall not be liable for any subsequent loss or damage incurred by the Customer as a result of information supplied in a test report.

10. TEST SAMPLES
Unless otherwise agreed in advance, test samples will be disposed of 6 weeks after the date of the final report. If required, samples can be returned at the Customer's expense.

11. RESPONSIBILITY
Every effort is made to ensure accuracy in description, drawings and other information in correspondence, catalogues, etc but no warranty is given in this respect and SATRA shall not be liable for any error therein. SATRA carries out all tests and/or advises only on the basis that the same are carried out, made or given without any responsibility whether for negligence or otherwise. SATRA and its servants or agents will not be liable for any damage or loss direct or indirect of whatsoever kind, whether or not the same results directly or indirectly from negligence on the part of SATRA or its servants or agents.

12. CONFIDENTIALITY
Unless specifically excluded in the terms of an individual contract between SATRA and its Customer, the following shall apply to all reports, advice, drawings, photographs, specifications or data:
   i. The above shall not be disclosed to third parties or used in litigation without the consent of SATRA.
   ii. Where SATRA has given consent to disclosure, the Customer shall draw the attention of the third party to these terms of business and the basis on which SATRA undertakes test, reporting and advising. The Customer shall indemnify SATRA for any failure to do so.
   iii. The above items are submitted to the Customer as confidential documents. Confidentiality shall continue to apply after completion of the business, but shall cease to apply to information or knowledge which may come into the public domain.

13. CONSTRUCTION AND ARBITRATION
The laws of England shall govern all contracts and the parties submit to exclusive jurisdiction of the courts of England, unless otherwise agreed.

Issue Date: 1st October 2009