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Tel: 780.982.8931

June 14, 2023

Our File: 2300195

Dustin Wilson
InStone Products (the Client)
15006 135 Ave NW
Edmonton, AB T5V 1R9

RE: SUNBELLY PRIVACY SCREENS - STRUCTURAL REVIEW
15006 135 AVE NW, EDMONTON, AB

Attention Mr. Wilson:

CVL Engineers Inc. (CVL) was retained to provide structural engineering services for the review of Sunbelly Aluminum Privacy Screens to determine their suitability for use as guardrails in Canada. CVL's scope was limited to conformance and compliance with sections 4.1.5.14 & 9.8.8.2 of the noted building codes only. No other review against building code requirements was included.

CVL was provided with detailed software modeling results of all twelve (12) of Sunbelly's privacy screen designs and documentation from independent testing agency "Intertek" reporting physical test results. This report is based on that documentation, which is detailed below:

1. Sunbelly Product Data Sheet
2. 2023-04-25 InStone Distribution 105159882COQ-001A Final Report - Privacy Screens - NBC 4.1.5.14 & 9.8.8.2
3. 2022-09-22 Sunbelly Privacy Screen 105159882COQ-001 Findings Letter Report
4. 2023-04-27 InStone Distribution 105159882COQ-001B Findings Letter Report
5. Solidworks Model outputs for 10 configurations on all 12 models.

See specific documents for details and methodology.

Assumptions

Our review was completed based on guidance from the

- National Building Code of Canada 2020 (NBC 2020),
- Ontario Building Code 2012 (OBC 2012),
- British Columbia Building Code 2018 (BCBC 2018), and
- National Building Code – Alberta Edition 2019 (NBC-AE 2019) Section 4.1.5.14 – Loads on Guards and Handrails and Section 9.8.8.2 – Loads on Guards.

Aluminum design was completed in accordance with CAN/CSA-S157, *Strength Design in Aluminum*.

Analysis and Findings

When comparing loading conditions, we found that the factored design loads utilized in testing and software modeling were larger then prescribed in the above-mentioned building codes. The prescribed load factor for live loads from the above-mentioned building codes is 1.5 while the testing and software modeling agencies utilized load factors ranging from 1.67 to 2.24, depending on assumed failure modes. This difference is due to the testing agency's use of safety factors rather than the prescribed load factor and results in a more conservative approach. See table below for factored loading conditions for individual tests.

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Table 1: Loading

Test	Building Code Factored Loading	Testing/Modeling Factored Loading
1. Outward In-Fill over 100x100mm	0.75 kN	0.83 kN
2. Vertical Uniform Load Applied at Top of Guard	2.25 kN/m	2.5 kN/m
3. Outward Horizontal Uniform Load	1.13 kN/m	1.26 kN/m
4. Outward Midspan Horizontal Concentrated Load	1.50 kN	1.67 kN
5. Outward Adjacent to Post Concentrated Load	1.50 kN	2.24 kN
6. Outward Top of Post Concentrated Load	1.50 kN	1.67 kN
7. Inward Horizontal Uniform Load	0.56 kN/m	0.63 kN/m
8. Inward Midspan Horizontal Concentrated Load	0.75 kN	0.83 kN
9. Inward Adjacent to Post Concentrated Load	0.75 kN	1.12 kN
10. Inward Top of Post Concentrated Load	0.75 kN	0.83 kN

When comparing the testing deflection results with the software modeling deflection results for privacy screen designs *"Blurred Lines"* and *"Parallel"* it was found that the results are generally comparable. See tables 2 & 3 below for deflection results.

Table 2: Blurred Lines

Test	Intertek Testing Deflection (mm)	Software Deflection (mm)	Difference (mm)
1. Outward In-Fill over 100x100mm	64.3	292.1	-227.8
2. Vertical Uniform Load Applied at Top of Guard	2.3	0.0	2.3
3. Outward Horizontal Uniform Load	47.4	40.9	6.5
4. Outward Midspan Horizontal Concentrated Load	139.9	584.1	-444.2
5. Outward Adjacent to Post Concentrated Load	57.3	39.0	18.3
6. Outward Top of Post Concentrated Load	14.1	26.3	-12.2
7. Inward Horizontal Uniform Load	69.9	20.4	49.5
8. Inward Midspan Horizontal Concentrated Load	122.8	49.3	73.5
9. Inward Adjacent to Post Concentrated Load	39.9	19.5	20.4
10. Inward Top of Post Concentrated Load	12.4	13.1	-0.7

Table 3: Parallel

Test	Intertek Testing Deflection (mm)	Software Deflection (mm)	Difference (mm)
1. Outward In-Fill over 100x100mm	92.2	1327.3	-1235.1
2. Vertical Uniform Load Applied at Top of Guard	8.1	1.1	7.0
3. Outward Horizontal Uniform Load	79.2	104.8	-25.6
4. Outward Midspan Horizontal Concentrated Load	150.8	2661.6	-2510.8
5. Outward Adjacent to Post Concentrated Load	86.8	39.3	47.5
6. Outward Top of Post Concentrated Load	32.4	26.2	6.2
7. Inward Horizontal Uniform Load	75.9	52.4	23.5
8. Inward Midspan Horizontal Concentrated Load	119.6	1327.3	-1207.7
9. Inward Adjacent to Post Concentrated Load	55.5	19.7	35.8
10. Inward Top of Post Concentrated Load	12.8	13.1	-0.3

When comparing testing deflections and software modeling deflections the negative difference values indicate a conservative software modeling value and the smaller positive values (<6 mm) can be neglected and approximated as equal due to the inaccuracy of measurements at that scale. There are, however, some larger difference values (>6mm) that indicate a larger testing deflection then the software modeling. Deflections are expected to occur and do not provide a suitable metric to evaluate the strength and stability of the guardrails. Ultimately, failure is what

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governs the design of guardrails. The failure mechanisms could include localized failure of the post or panel, or detachment of the panel.

Ultimately, no failure occurred throughout the testing of privacy screen designs *"Blurred Lines"* and *"Parallel"*. As a result and in conjunction with the used of conservative loading conditions, it is CVL's professional opinion that the remaining ten (10) privacy screen designs are adequate and suitable for use as guardrails.

In summary, it is CVL's professional opinion that InStone's twelve (12) Sunbelly privacy screen designs will be adequate and sufficient for use as guardrails as prescribed in Sections 4.1.5.14 and 9.8.8.2 of NBC 2020, OBC 2012, BCBC 2018, and NBC-AE 2019.

This report reflects our judgment in light of the information provided to us at the time that it was prepared. Any use of the report by third parties, or any reliance on or decisions made based on it, are the responsibility of such third parties. CVL does not accept responsibility for damages suffered, if any, by a third party as a result of their use of this report. We trust the above information to be complete and correct based on the information provided to CVL and visual inspection of the referenced assembly. If further questions arise, please do not hesitate to contact CVL to discuss.

Sincerely,

Michael Oleskiw, P.Eng.
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780-982-8931

PROFESSIONAL ENGINEER ALBERTA
MICHAEL OLESKIW
June 14, 2023
ID# 141070

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CVL ENGINEERS INC.
SIGNATURE
Date June 14, 2023
PERMIT NUMBER: P14266
The Association of Professional Engineers, Geologists and Geophysicists of Alberta
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