TEST REPORT

REPORT NUMBER: 101732288COQ-001B
ORIGINAL ISSUE DATE: July 11, 2014
REVISION DATE: June 15, 2016

EVALUATION CENTER

INTERTEK TESTING SERVICES NA LTD.
1500 BRIGANTINE DRIVE
COQUITLAM, BC V3K 7C1

RENDERED TO

GEO. BEZDAN SALES LTD.
4040 GRAVELEY STREET
BURNABY, BC V5C 3T6

PRODUCT EVALUATED: Decorative Spindles
EVALUATION PROPERTY: Proof Load Test

Report of Decorative Spindles for compliance with the selected requirements of the following criteria:

- **2010 National Building Code of Canada, Section 4.1.5.14 Loads on Guards, Subsection (2) *Individual Elements within the Guard***
- **2012 Ontario Building Code, Section 4.1.5.14 Loads on Guards, Subsection (2) *Individual Elements within the Guard***

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Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted proof load testing for Geo. Bezdan Sales Ltd. on several decorative spindles. Testing was conducted to determine compliance with the following:

- 2010 National Building Code of Canada (NBC), Section 4.1.5.14 *Loads on Guards,* Subsection (2) *Individual Elements within the Guard*
- 2012 Ontario Building Code (OBC), Section 4.1.5.14 *Loads on Guards,* Subsection (2) *Individual Elements within the Guard*

This report includes testing completed from December 2004 to July 2014.

2 Referenced Documents

1. Intertek Test Report 100182101COQ-002
2. Intertek Test Report 101033555COQ-002
3. Intertek Test Report 101732288COQ-001A
4. Engineering Evaluation Report 101732288COQ-001

3 Test Samples

3.1. SAMPLE AND ASSEMBLY DESCRIPTION

The samples were identified as the following:

- **TL15RD** – 1/2 in. round steel tube, 44 in. long
- **TL13 (formerly TL13DW)** – 1/2 in. square wavy tube, 44 in. long
- **TL58RDL** – 5/8 in. round steel tube, 46 in. long
- **TL120RD** – 1/2 in. round steel forged with 17-1/4 in. long decorative element spaced 9-1/2 in. from top, 44 in. long
- **TL230-1RD** – 9/16 in. round steel forged with 4 in. long decorative element spaced 19 in. from top, 43 in. long
- **TL230-2RD** – 9/16 in. round steel forged with two 4 in. long decorative elements spaced 18-3/4 in. apart and 11-5/8 in. from top, 43 in. long
- **TL101-1RD** – 1/2 in. round steel tube with one 5-3/4 in. long decorative element spaced 18-1/8 in. from the top, 44 in. long
- **TL101-2RD** – 1/2 in. round steel tube with two 5/3/4 in. long decorative elements spaced 16-1/2 in. apart and 12-3/4 in. from the top, 44 in. long
- **TL102-1RD** – 1/2 in. round steel tube with one 8 in. long decorative element spaced 17 in. from the top, 44 in. long
- **TL103-1RD** – 1/2 in. round steel tube with one 13-1/2 in. long decorative element spaced 14-1/4 in. from the top, 44 in. long
- **TL101-1** – 1/2 in. square steel tube with one 3-1/2 in. long decorative element spaced 19-1/4 in. from the top, 44 in. long
- **TL101-2** – 1/2 in. square steel tube with two 3-1/2 in. long decorative elements spaced 16-1/2 in. apart and 12-3/4 in. from the top, 44 in. long
- **TL205-1** – 1/2 in. square steel forged with 2-1/2 in. long decorative element spaced 17-1/2 in. from top, 44 in. long
- **TL205-2** – 1/2 in. square steel forged with two 2-1/2 in. long decorative elements

spaced 16 in. apart and 9-1/2 in. from top, 44 in. long

- **TL200-1** – 1/2 in. square rippled steel forged with one 2-1/2 in. long decorative element spaced 20-3/4 in. from top, 44 in. long
- **TL200-2** – 1/2 in. square rippled steel forged with two 2-1/2 in. long decorative elements spaced 16 in. apart and 9-1/2 in. from top, 44 in. long
- **TL12-SS** – 1/2 in. square stainless steel tube spindle; 44 in. long (Coquitlam ID# VAN1301221130-001)
- **TL34RD-SS** – 3/4 in. diameter stainless steel tube spindle; 44 in. long (Coquitlam ID# VAN1301221130-002)
- **TL58RD-SS** – 5/8 in. diameter stainless steel tube spindle; 44 in. long (Coquitlam ID# VAN1301221130-003)
- **TL88D-1H** – 1/2 in. square double-pronged steel tube spindle with a decorative element 16 in. from one end; 46 in. long (Coquitlam ID# VAN1301221130-004)
- **TL88D-2H** – 1/2 in. square double-pronged steel tube spindle with two decorative elements spaced 20 in. apart, starting 6 in. from one end; 46 in. long (Coquitlam ID# VAN1301221130-005)
- **TL260-1 (formerly TL260D-1)** – 1/2 in. square steel spindle, 1 decorative element at 16-1/2 in. from end, 42 in. long
- **TL260-2 (formerly TL260D-2)** – 1/2 in. square steel spindle, 2 decorative elements at 9-1/2 in. and 23-3/4 in. from end, 42 in. long
- **TL101X-1** – 1/2 in. square steel spindle, 5-1/2 in. long decorative element at 15 in. from end with 2 twisted spindle sections, 44 in. long
- **TL105-1RD** – 5/8 in. diameter steel spindle, 6-1/2 in. long decorative element at 14-1/2 in. from end, 44 in. long
- **TL83 (formerly TL83D):** 1/2 in. square steel spindle, 23 in. long decorative element at 10-1/2 in. from end, 44 in. long
- **TL115** – 1-1/2 in. x 1/2 in. stainless steel spindle, 44 in. long
- **TL415RD** – 5/8 in. diameter steel spindle, 22-1/4 in. long decorative element at 11 in. from end, 44 in. long
- **TL450RD** – 5/8 in. diameter steel spindle, 22-1/4 in. long decorative element at 11 in. from end, 44 in. long
- **TL261-1RD** – 9/16 in. diameter steel spindle, 1 decorative element at 18 in. from end, 43 in. long
- **TL200-4** – 1/2 in. square steel spindle, textured, 44 in. long
- **TL261-2RD** – 9/16 in. diameter steel spindle, 2 decorative collars at 10 in. and 27 in. from end, 43 in. long
- **TL102-1/TL102X-1 (formerly TL102X-1)** – 1/2 in. square steel spindle, 8-1/2 in. long decorative element at 14 in. from end, 44 in. long
- **TL104-1RD** – 5/8 in. diameter steel spindle, 22-1/2 in. long decorative element at 6-1/2 in. from end, 44 in. long
- **TL261-4RD** – 9/16 in. diameter steel spindle, 43 in. long
- **TL12 / TL12X (formerly TL12D / TL12X)** – 1/2 in. square steel spindle, 44 in. long
- **TL12XA (formerly TL12XAD)** – 5/8 in. square steel spindle, 44 in. long
- **TL122 (formerly TL122D)** – 1/2 in. square steel spindle, 24-1/2 in. long decorative element at 6 in. from end, 44 in. long

4 Testing and Evaluation Methods

4.1. CONDITIONING

Samples were maintained in standard laboratory conditions for a minimum of 24 hours at a temperature of 23 ± 2°C (73 ± 4°F) and relative humidity of 50 ± 5% prior to testing.

4.2. NBC/OBC: Loads on Guards, Individual Elements within the Guard

Individual elements within the *guard*, including solid panels and pickets, shall be designed for a concentrated load of 0.5 kN applied over an area of 100 mm x 100 mm located at any point in the element or elements so as to produce the most critical effect.

Note: A live load factor of 1.67 was applied to the above loads.

4.3. PROOF LOAD TEST

Proof load tests were conducted in accordance with the 2010 NBC, Section 4.1.5.14, and 2012 OBC, Section 4.1.5.14, Subsection (2) for individual elements within a guard. Each end of the picket was rigidly fixed to the testing apparatus and spanned 40 in. apart. A load of 0.83 kN (188 lbs) was applied at the mid-span of the picket using a 100 mm^2 indenter. Test specimens were loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The loads were held for one minute and then released. The system was evaluated for failure, evidence of disengagements and/or visible cracking from any component. For specific testing details, refer to the Intertek test reports outlined in Section 3 of this report.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The product test results are shown in Table 1 below:

Table 1. Geo. Bezdan Sales Test Results

Report	Sample #	Sample Description	Proof Load
100182101COQ-002	1	TL15RD	Pass
	2	TL13	Pass
	3	TL58RDL	Pass
	4	TL120RD	Pass
	5	TL230-1RD	Pass
	6	TL230-2RD	Pass
	7	TL101-1RD	Pass
	8	TL101-2RD	Pass
	9	TL102-1RD	Pass
	10	TL103-1RD	Pass
	11	TL101-1	Pass
	12	TL101-2	Pass
	13	TL205-1	Pass
	14	TL205-2	Pass
	15	TL200-1	Pass
	16	TL200-2	Pass
101033555COQ-002	17	TL12-SS	Pass
	18	TL34RD-SS	Pass
	19	TL58RD-SS	Pass
	20	TL88D-1H	Pass
	21	TL88D-2H	Pass
101732288COQ-001A	22	TL260-1 (formerly TL260D-1)	Pass
	23	TL260-2 (formerly TL260D-2)	Pass
	24	TL101X-1	Pass
	25	TL105-1RD	Pass
	26	TL83 (formerly TL83D)	Pass
	27	TL115	Pass
	28	TL415RD	Pass
	29	TL450RD	Pass
	30	TL261-1RD	Pass
	31	TL200-4	Pass
	32	TL261-2RD	Pass
	33	TL102-1 / TL102X-1 (formerly TL102X-1)	Pass
	34	TL104-1RD	Pass
	35	TL261-4RD	Pass
	36	TL12 / TL12X (formerly TL12D / TL12X)	Pass
	37	TL12XA (formerly TL12XAD)	Pass
	38	TL122 (formerly TL122D)	Pass

6 Conclusion

The decorative metal spindles in this report have complied with the specified loads of the following:

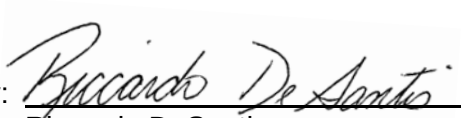
- 2010 National Building Code of Canada (NBC), Section 4.1.5.14 *Loads on Guards,* Subsection (2) *Individual Elements within the Guard*
- 2012 Ontario Building Code (OBC), Section 4.1.5.14 *Loads on Guards,* Subsection (2) *Individual Elements within the Guard*

The product test results are presented in Section 6 of this report.

INTERTEK TESTING SERVICES NA LTD.

Reported by: 

Chris Chang, P.Eng.
Engineer, Building Products

Reviewed by: 

Riccardo DeSantis
Manager, Building Products

REVISION SUMMARY

DATE	SECTION		SUMMARY	INTERTEK INITIALS	
				TECHNICIAN	REVIEWER
15-June-16	3.1	Sample and Assembly Description	Revised diameter from 1/2 in. to 9/16 in. for TL261-1RD, TL261-2RD, and TL261-4RD		

TEST REPORT

REPORT NUMBER: 102598632COQ-002
ORIGINAL ISSUE DATE: June 8, 2016

EVALUATION CENTER

INTERTEK TESTING SERVICES NA LTD.
1500 BRIGANTINE DRIVE
COQUITLAM, BC V3K 7C1

RENDERED TO

GEO. BEZDAN SALES LTD.
4050 GRAVELEY STREET
BURNABY, BC V5C 4A5
CANADA

PRODUCT EVALUATED: Decorative Spindles
EVALUATION PROPERTY: Proof Load Test

Report of Decorative Spindles for compliance with the selected requirements of the following criteria:

- ***2015 National Building Code of Canada, Section 4.1.5.14 Loads on Guards and Handrails***
  - ***Subsection (3) Individual Elements within the Guard***
  - ***Subsection (4) Size of Opening Between Vertical Elements***
- ***2012 Ontario Building Code, Section 4.1.5.14 Loads on Guards***
  - ***Subsection (2) Individual Elements within the Guard***

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2 Introduction

Intertek Testing Services NA Ltd. (Intertek) has conducted load testing for Geo. Bezdan Sales Ltd. on several decorative spindles. The testing was conducted in accordance with the following:

- 2015 National Building Code of Canada (NBC), Section 4.1.5.14 *Loads on Guards and Handrails*
  - Subsection (3) *Individual Elements within the Guard*
  - Subsection (4) *Size of Opening Between Vertical Elements*
- 2012 Ontario Building Code (OBC), Section 4.1.5.14 *Loads on Guards*
  - Subsection (2) *Individual Elements within the Guard*

The testing was completed during the month of June 2016.

3 Test Samples

3.1. SAMPLE SELECTION

The client submitted six (6) different types of spindles to the Evaluation Center on June 3, 2016 and were identified with Coquitlam ID# VAN1606071253-001. Samples were not independently selected for testing.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The samples were identified as the following:

TL115: 1.5 in. x 0.5 in. x 44 in. long hollow steel spindle

TL78-1: 0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end

TL78-2: 0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end

TL98-1: 0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end

TL98-2: 0.5 in. square x 44 in. long hollow steel spindle with double rectangular 2 in. wide x 11.5 in. long center detail spaced 6 in. from end

TL98-3: 0.5 in. square x 44 in. long hollow steel spindle with triple rectangular 2 in. wide x 7.25 in. long center detail spaced 6 in. from end

Refer to Appendix B for photos of the different test samples.

4 Testing and Evaluation Methods

4.1. CONDITIONING

Samples were maintained in standard laboratory conditions for a minimum of 24 hours at a temperature of 23 ± 2°C (73 ± 4°F) and relative humidity of 50 ± 5% prior to testing.

4.2. REQUIREMENTS

2015 NBC: Section 4.1.5.14, Subsection (3) Individual Elements
2012 OBC: Section 4.1.5.14 Subsection (2) Individual Elements

Individual elements within the *guard*, including solid panels and pickets, shall be designed for a load of 0.5 kN applied outward over an area of 100 mm x 100 mm located at any point in the element or elements so as to produce the most critical effect.

Note: A live load factor of 1.67 is applicable to the above loads.

2015 NBC: Section 4.1.5.14, Subsection (4) Size of Opening Between Vertical Elements

The size of the opening between any two adjacent vertical elements within a *guard* shall not exceed 100 mm when each of these elements is subjected to a specified live load of 0.1 kN applied in opposite directions in the in-plane direction of the *guard* so as to produce the most critical effect.

4.3. PROOF LOAD TEST

Proof load tests were conducted in accordance with the 2015 NBC, Section 4.1.5.14, Subsection (3) and the 2012 OBC, Section 4.1.5.14, Subsection (2) for individual elements within a guard. Each end of the spindle was rigidly fixed to the testing apparatus at a span of 40 in. apart. A load of 0.83 kN (188 lbs) was applied at the mid-span of the picket using a 100 mm^2 indenter. Test specimens were loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The loads were held for one minute and then released. The system was evaluated for failure, evidence of disengagements and/or visible cracking from any component.

4.4. SIZE OF OPENING TEST

Size of opening tests were conducted in accordance with the 2015 NBC, Section 4.1.5.14, Subsection (4). For each type of spindle, two (2) spindles were assembled into a nominal 2x4 wood lumber test frame. Spindles were spaced at 4 in. on center per the client's instructions and were assembled with a span of 40 in. The midspan of each spindle was subjected to a load of 0.1 kN (22.5 lbs) in opposite directions in the in-plane direction of the guard. Each spindle was loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. Once the loads were reached, a 100 mm (4 in.) diameter sphere was then used to attempt to pass through the opening.

5 Testing and Evaluation Results

5.1. RESULTS AND OBSERVATIONS

The product test results are shown in Table 1 below (a complete set of test data is provided in Appendix A).

Table 1. Test Results

Product	System Description	Pass/Fail	
		Individual Elements	Size of Opening between Vertical Elements
TL115	1.5 in. x 0.5 in. x 44 in. long hollow steel spindle	Pass	Pass
TL78-1	0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end	Pass	Pass
TL78-2	0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end	Pass	Pass
TL98-1	0.5 in. square x 44 in. long hollow steel spindle with single rectangular 2 in. wide x 24 in. long center detail spaced 6 in. from end	Pass	Pass
TL98-2	0.5 in. square x 44 in. long hollow steel spindle with double rectangular 2 in. wide x 11.5 in. long center detail spaced 6 in. from end	Pass	Pass
TL98-3	0.5 in. square x 44 in. long hollow steel spindle with triple rectangular 2 in. wide x 7.25 in. long center detail spaced 6 in. from end	Pass	Pass

6 Conclusion

The decorative metal spindles in this report have complied with the requirements specified in the following:

- 2015 National Building Code of Canada (NBC), Section 4.1.5.14 *Loads on Guards and Handrails*
  - Subsection (3) *Individual Elements within the Guard*
  - Subsection (4) *Size of Opening Between Vertical Elements*
- 2012 Ontario Building Code (OBC), Section 4.1.5.14 *Loads on Guards*
  - Subsection (2) *Individual Elements within the Guard*

The product test results are presented in Section 5 of this report.

INTERTEK TESTING SERVICES NA LTD.

Reported by: _____
Chris Chang, P.Eng.
Engineer, Building Products

Reviewed by: _____
Kal Kooner, P. Eng
Manager, Engineering Services

LICENSED PROFESSIONAL ENGINEER
K. S. KOONER
100155553
PROVINCE OF ONTARIO
06/10/16

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
K. S. KOONER
32877
ENGINEER
06/10/16

Reviewed by: _____
Dan Lungu, P.Eng.
Engineer, Manufactured Housing

APPENDIX A: Test Data (2 pages)

Company	Geo. Bezdan Sales Ltd.	Technician(s)	Chris Chang
Project No.	G102598632	Reviewer	Kal Kooner / Dan Lungu
Models	Various decorative spindles	Start/End Date	June 6, 2016
Product Name	Same as above	Sample ID	VAN1606071253-001
Standard	**2015 National Building Code, Section 4.1.5.14 / 2012 Ontario Building Code, Section 4.1.5.14**		

Test Data Package

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Test:	**Loads on Spindles and Size of Opening between Spindles**	Project #:	G102598632
Date:	6-Jun-16	Eng/Tech:	Chris Chang
Client:	Geo. Bezdan Sales Ltd.	Reviewer:	Kal Kooner
Product:	**See below for Sample Descriptions**		Dan Lungu

Method: 2015 NBC

Section 4.1.5.14 Loads on Guards and Handrails, Subsection (3) Individual Elements within the Guard

Section 4.1.5.14 Loads on Guards and Handrails, Subsection (4) Size of Opening Between Vertical Elements

2012 OBC

Section 4.1.5.14 Loads on Guards, Subsection (2) Individual Elements within the Guard

Resistance Factor	0.9	(steel)
Factor of Safety	1.67	

Test Span: 40 in.

Conditioning: Minimum 24 hours at a temperature of 23 ± 2°C and relative humidity of 50 ± 5%

Equipment: Instron 3382 Universal Testing Apparatus (Intertek ID# P60553, cal due July 2016)

Time/Temp/RH: 2:30PM / 22.9°C / 46.0%

Individual elements within the Guard				
Sample Description	**Required Load**		**Proof Load**	**Pass/Fail**
	(kN)	**(lbs)**	**(lbs)**	
TL115	0.5	112	188	Pass
TL78-1	0.5	112	188	Pass
TL78-2	0.5	112	188	Pass
TL98-1	0.5	112	188	Pass
TL98-2	0.5	112	188	Pass
TL98-3	0.5	112	188	Pass

Size of Opening Between Vertical Elements				
Sample Description	**Required Load**		**100mm Sphere**	**Pass/Fail**
	(kN)	**(lbs)**	**Pass Through?**	
TL115	0.1	22	No	Pass
TL78-1	0.1	22	No	Pass
TL78-2	0.1	22	No	Pass
TL98-1	0.1	22	No	Pass
TL98-2	0.1	22	No	Pass
TL98-3	0.1	22	No	Pass

APPENDIX B: Photos (2 pages)

Figure 1. Test Specimens
(Left to Right: TL115, TL78-1, TL78-2, TL98-1, TL98-2, TL98-3)

Figure 2. Test Specimens
(Left to Right: TL115, TL78-1, TL78-2, TL98-1, TL98-2, TL98-3)