



***Transverse Load Testing of a Steel Stud and Drywall Composite Wall System in Accordance with ASTM E72-02, "Conducting Strength Tests of Panels for Building Construction"***

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**Applicant:**  
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## 2 Preface

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## 3 Introduction

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Intertek Testing Services NA Ltd. (Intertek) was contracted to conduct a series of transverse load tests on Velocity Steel composite wall panels completed in November 2005. The composite walls utilize adjustable steel studs overlain with a gypsum or wallboard components. The limiting heights of the composite wall systems were estimated in Accordance with ICC-ES AC 86-95 "Acceptance Criteria for Determining Limiting Heights of Composite Walls Constructed of Gypsum Board and Steel Studs" with reference to; ASTM Internationals' E72-02 "Standard Test Methods of Conducting Strength Tests of Panels for Building Construction" (referred to as E72-02 in this report). The tested system configurations were supplied and assembled by the client. Evaluation of the system connection to the structure was not within the scope of this test program.

## 4 Materials and Methods

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### 4.1. SAMPLE SELECTION

Selection and construction of composite panels were provided by Velocity Steel Corporation as follows:

1. Two composite wall panels measuring 4 foot by 8 foot comprised of a top and bottom C-channel and 4 adjustable 8 foot studs connected on 16 in. centers, between 2 sheets of ½ inch regular drywall. Sample #1 was clad in Sheet Rock brand drywall while sample #4 was clad in ProRoc brand drywall.
2. Two composite wall panels measuring 4 foot by 8 foot comprised of a top and bottom C-channel and 4 adjustable 8 foot studs on 16 in. centers, between 2 sheets of 5/8 in. type X fire rated drywall. Sample #2 was clad in Sheet Rock brand drywall while sample #3 was clad in ProRoc brand drywall.

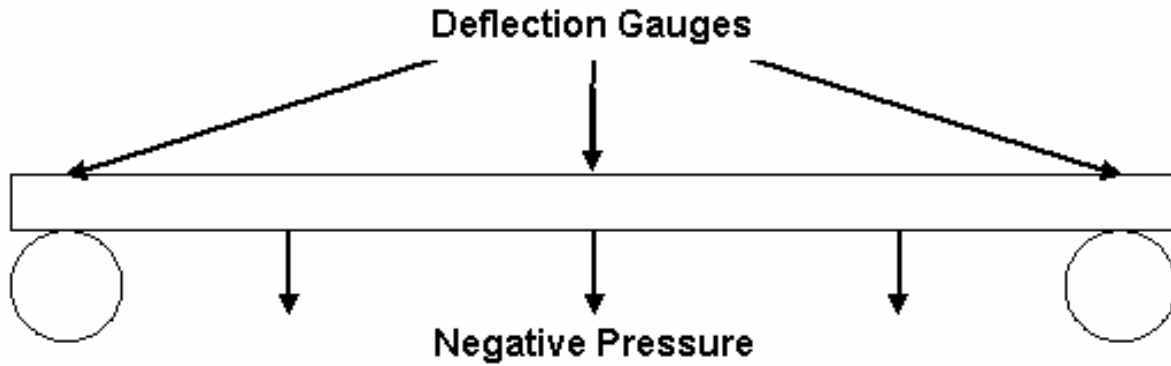
### 4.2. TEST PROCEDURES

#### 4.2.1. Conditioning

Before testing, the test specimens were conditioned for at least 24 hours at a temperature of  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and relative humidity of  $50 \pm 20 \%$ .

#### 4.2.2. Transverse Load Test

Samples of each configuration were incrementally loaded to failure using the uniform load vacuum chamber method. A wooden test frame was constructed so that the inside length and width of the frame was made approximately ½ in. greater than the length and width of the test panels to allow for free downward movement of the panels during testing. The panels were simply supported on 4 in. diameter steel rollers. Uniformly distributed loads were developed by sealing the outer side of the panels to the test frame (with a polyethylene film) to create an inner chamber, and then reducing the air pressure within that inner chamber.



Deflection gauges were placed as follows: two at mid-span of the panel directly over top of the two center studs, one midway between studs, and one on each end of the panel over the center of the roller on opposing center studs. The test procedure required loading the sample, taking an initial measurement, and then holding the pre-set load for 5 minutes to obtain a stabilized deflection reading prior to releasing the load. Deflection was measured under five increasing loads. Following the deflection measurements, incremental loads were held for 1 minute until failure occurred and an ultimate load was established. After the test, a visual inspection of the sample was conducted and the cause of failure was reported.

## 5 Test Results

The panel test results are summarized in Table 1 below. A full set of test data is included in Appendix A.

Table 1. Transverse Load Test Results		
Sample	Maximum Load (psf)	Stiffness EI (lbs-ft <sup>2</sup> )
<b>1/2 inch Drywall Assembly</b> <ul style="list-style-type: none"> <li>• 4 ft x 8 ft Sample #1 – Sheet Rock</li> <li>• 4 ft x 8 ft Sample #4 – ProRoc</li> </ul>	39.0 36.4	98286 141583
<b>5/8 inch Type X Assembly</b> <ul style="list-style-type: none"> <li>• 4 ft x 8 ft Sample #2 – Sheet Rock</li> <li>• 4 ft x 8 ft Sample #3 – ProRoc</li> </ul>	54.6 46.8	108052 144550

## 6 Conclusion

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The Velocity Steel panels identified and evaluated in this report have been tested in accordance with ASTM E72-02, "*Methods for Conducting Strength Tests of Panels for Building Construction*", and have shown transverse load characteristics as presented in Section 5 of this report. Tests conducted are insufficient to make a definitive claim as to the limiting heights of this composite wall system; however, estimated heights based on the AC 86 calculations are available. A complete test program would be required in order to qualify these results.

### INTERTEK TESTING SERVICES NA LTD.

Reported by:   
Ivo Tanner  
**Technician, Construction Products**

Reviewed by:   
Craig Lawson, NZCE (Mech.)  
**Project Manager, Construction Products**

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## **Appendix A: Test Data (4 pages)**

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# Intertek ETL SEMKO

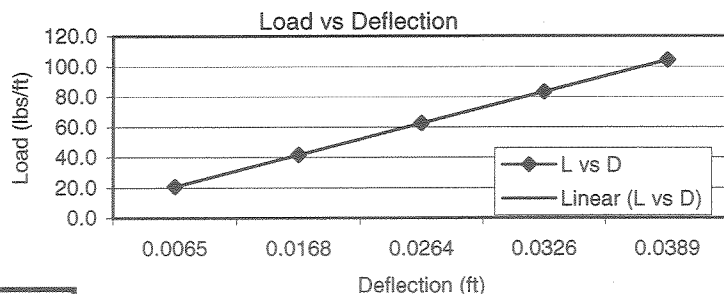
## Sample wall #1

Client: Velocity Steel  
 Project No: 3084159  
 Product: **1/2" Regular Gypsum Board and Steel Studs (Sheet Rock Brand)**  
 Technician(s): Ivo Tanner \_\_\_\_\_ Etienne Gobeil \_\_\_\_\_  
 Test Method(s): ASTM E72-02 - Conducting Strength Tests of Panels for Building Construction  
 12. Transverse Load - Specimen Horizontal (Chamber Method)  
 Load achieved within 1 minute

Span		Panel	
(in)	(ft)	Width (ft)	Length (ft)
90.5	7.54	4.0	8.0

Load (in WC)	Load (psf)	Time	End Gauge 1 (in.)	End Gauge 2 (in.)	Center Gauge 3 (in.)	Center Gauge 4 (in.)	Drywall Gauge 5 (in.)	Mean Midspan Panel (in.)	
0.3	1.6	immed.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1.0	5.2	immed.	0.0200	0.0215	0.0965	0.0945	0.1000	0.0748	
1.0	5.2	~5min	0.0210	0.0225	0.1005	0.0980	0.1005	0.0775	
0.3	1.6	immed.	0.0010	0.0015	0.0275	0.0245	0.0265	0.0248	
0.3	1.6	~5min	0.0005	0.0010	0.0260	0.0235	0.0255	0.0240	
2.0	10.4	immed.	0.0395	0.0415	0.2370	0.2320	0.2490	0.1940	
2.0	10.4	~5min	0.0415	0.0425	0.2480	0.2395	0.2555	0.2018	
0.3	1.6	immed.	0.0020	0.0030	0.0425	0.0400	0.0415	0.0388	
0.3	1.6	~5min	0.0010	0.0020	0.0405	0.0380	0.0395	0.0378	
3.0	15.6	immed.	0.0560	0.0560	0.3615	0.3560	0.3750	0.3028	
3.0	15.6	~5min	0.0590	0.0575	0.3805	0.3705	0.3910	0.3173	
0.3	1.6	immed.	0.0035	0.0050	0.0505	0.0510	0.0535	0.0465	
0.3	1.6	~5min	0.0020	0.0035	0.0530	0.0480	0.0510	0.0478	
4.0	20.8	immed.	0.0680	0.0675	0.4615	0.4595	0.4830	0.3928	
4.0	20.8	~5min	0.0710	0.0685	0.4650	0.4575	0.4845	0.3915	
0.3	1.6	immed.	0.0045	0.0060	0.0625	0.0590	0.0625	0.0555	
0.3	1.6	~5min	0.0030	0.0045	0.0620	0.0600	0.0560	0.0573	
5.0	26.0	immed.	0.0785	0.0765	0.5415	0.5380	0.5660	0.4623	
5.0	26.0	~5min	0.0800	0.0780	0.5490	0.5425	0.5705	0.4668	
0.3	1.6	Residual	0.0065	0.0065	0.0720	0.0640	0.0685	0.0615	
7.5	39.0	Failure	<b>Studs buckled</b>						

Load (psf)	Load (lbs/ft)	Defl. (in)	Defl. (ft)
5.2	20.8	0.078	0.0065
10.4	41.6	0.202	0.0168
15.6	62.4	0.317	0.0264
20.8	83.2	0.392	0.0326
26.0	104.1	0.467	0.0389



Max Load (PSF) =	39.0
Stiffness EI (lbs-ft <sup>2</sup> ) =	98286



# ETL SEMKO

## Sample wall #4

Client: Velocity Steel  
 Project No: 3084159  
 Product: **1/2" Regular Gypsum Board and Steel Studs (ProRoc Brand)**  
 Technician(s): Ivo Tanner \_\_\_\_\_ Etienne Gobeil \_\_\_\_\_  
 Test Method(s): ASTM E72-02 - Conducting Strength Tests of Panels for Building Construction  
 12. Tranverse Load - Specimen Horizontal (Chamber Method)  
 Load achieved within 1 minute

Span		Panel	
(in)	(ft)	Width (ft)	Length (ft)
90.5	7.54	4.0	8.0

Load (in WC)	Load (psf)	Time	End Gauge 1 (in.)	End Gauge 2 (in.)	Center Gauge 3 (in.)	Center Gauge 4 (in.)	Drywall Gauge 5 (in.)	Mean Midspan Panel (in.)	
0.3	1.6	immed.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1.0	5.2	immed.	0.0255	0.0210	0.0700	0.0680	0.0750	0.0458	
1.0	5.2	~5min	0.0240	0.0225	0.0740	0.0710	0.0780	0.0493	
0.3	1.6	immed.	0.0055	0.0045	0.0200	0.0155	0.0185	0.0128	
0.3	1.6	~5min	0.0045	0.0035	0.0185	0.0145	0.0175	0.0125	
2.0	10.4	immed.	0.0425	0.0430	0.1625	0.1545	0.1705	0.1158	
2.0	10.4	~5min	0.0450	0.0450	0.1700	0.1620	0.1780	0.1210	
0.3	1.6	immed.	0.0095	0.0065	0.0335	0.0270	0.0315	0.0223	
0.3	1.6	~5min	0.0080	0.0050	0.0300	0.0240	0.0280	0.0205	
3.0	15.6	immed.	0.0600	0.0595	0.2585	0.2475	0.2760	0.1933	
3.0	15.6	~5min	0.0625	0.0610	0.2615	0.2480	0.2740	0.1930	
0.3	1.6	immed.	0.0140	0.0090	0.0495	0.0405	0.0455	0.0335	
0.3	1.6	~5min	0.0120	0.0075	0.0465	0.0375	0.0430	0.0323	
4.0	20.8	immed.	0.0750	0.0730	0.3500	0.3305	0.3660	0.2663	
4.0	20.8	~5min	0.0780	0.0750	0.3595	0.3390	0.3730	0.2728	
0.3	1.6	immed.	0.0175	0.0120	0.0670	0.0575	0.0630	0.0475	
0.3	1.6	~5min	0.0165	0.0110	0.0645	0.0550	0.0610	0.0460	
5.0	26.0	immed.	0.0875	0.0840	0.4380	0.4130	0.4590	0.3398	
5.0	26.0	~5min	0.0935	0.0895	0.4725	0.4425	0.4890	0.3660	
0.3	1.6	Residual	0.0225	0.0165	0.0920	0.0795	0.0870	0.0663	
7.0	36.4	Failure	<b>Studs buckled</b>						



# ETL SEMKO

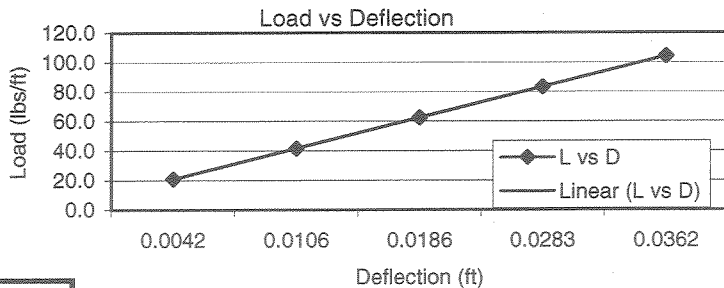
## Sample wall #2

Client: Velocity Steel  
 Project No: 3084159  
 Product: **5/8" Type X Gypsum Board and Steel Studs (Sheet Rock Brand)**  
 Technician(s): Ivo Tanner \_\_\_\_\_ Etienne Gobeil \_\_\_\_\_  
 Test Method(s): ASTM E72-02 - Conducting Strength Tests of Panels for Building Construction  
 12. Transverse Load - Specimen Horizontal (Chamber Method)  
 Load achieved within 1 minute

Span		Panel	
(in)	(ft)	Width (ft)	Length (ft)
90.5	7.54	4.0	8.0

Load (in WC)	Load (psf)	Time	End Gauge 1 (in.)	End Gauge 2 (in.)	Center Gauge 3 (in.)	Center Gauge 4 (in.)	Drywall Gauge 5 (in.)	Mean Midspan Panel (in.)	
0.3	1.6	immed.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1.0	5.2	immed.	0.0195	0.0170	0.0635	0.0685	0.0670	0.0478	
1.0	5.2	~5min	0.0210	0.0185	0.0670	0.0725	0.0705	0.0500	
0.3	1.6	immed.	0.0030	0.0020	0.0255	0.0305	0.0275	0.0255	
0.3	1.6	~5min	0.0025	0.0020	0.0250	0.0295	0.0270	0.0250	
2.0	10.4	immed.	0.0450	0.0380	0.1675	0.1745	0.1750	0.1295	
2.0	10.4	~5min	0.0465	0.0375	0.1655	0.1725	0.1730	0.1270	
0.3	1.6	immed.	0.0075	0.0050	0.0600	0.0630	0.0620	0.0553	
0.3	1.6	~5min	0.0065	0.0040	0.0570	0.0600	0.0590	0.0533	
3.0	15.6	immed.	0.0670	0.0535	0.2725	0.2855	0.2935	0.2188	
3.0	15.6	~5min	0.0705	0.0560	0.2840	0.2890	0.2955	0.2233	
0.3	1.6	immed.	0.0140	0.0095	0.1065	0.1065	0.1055	0.0948	
0.3	1.6	~5min	0.0130	0.0080	0.1010	0.1045	0.1045	0.0923	
4.0	20.8	immed.	0.0855	0.0695	0.4010	0.4170	0.4380	0.3315	
4.0	20.8	~5min	0.0880	0.0705	0.4160	0.4220	0.4335	0.3398	
0.3	1.6	immed.	0.0190	0.0140	0.1600	0.1655	0.1645	0.1463	
0.3	1.6	~5min	0.0175	0.0125	0.1570	0.1615	0.1610	0.1443	
5.0	26.0	immed.	0.1000	0.0835	0.5120	0.5250	0.5385	0.4268	
5.0	26.0	~5min	0.1015	0.0850	0.5215	0.5345	0.5445	0.4348	
0.3	1.6	Residual	0.0235	0.0185	0.2020	0.2130	0.2085	0.1865	
10.5	54.6	Failure	<b>Studs buckled</b>						

Load (psf)	Load (lbs/ft)	Defl. (in)	Defl. (ft)
5.2	20.8	0.050	0.0042
10.4	41.6	0.127	0.0106
15.6	62.4	0.223	0.0186
20.8	83.2	0.340	0.0283
26.0	104.1	0.435	0.0362



Max Load (PSF) =	54.6
Stiffness EI (lbs-ft <sup>2</sup> ) =	108052

# Intertek ETL SEMKO

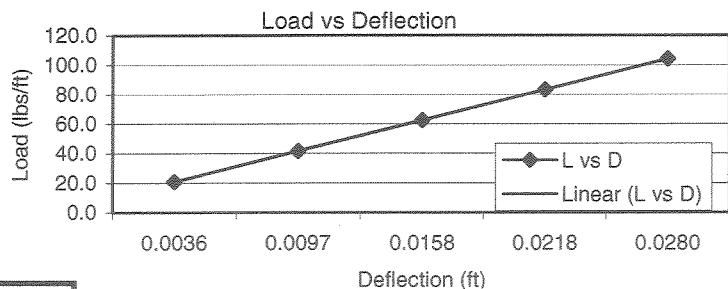
## Sample wall #3

Client: Velocity Steel  
 Project No: 3084159  
 Product: **5/8" Type X Gypsum Board and Steel Studs (ProRoc Brand)**  
 Technician(s): Ivo Tanner \_\_\_\_\_ Etienne Gobeil \_\_\_\_\_  
 Test Method(s): ASTM E72-02 - Conducting Strength Tests of Panels for Building Construction  
 12. Transverse Load - Specimen Horizontal (Chamber Method)  
 Load achieved within 1 minute

Span		Panel	
(in)	(ft)	Width (ft)	Length (ft)
90.5	7.54	4.0	8.0

Load (in WC)	Load (psf)	Time	End Gauge 1 (in.)	End Gauge 2 (in.)	Center Gauge 3 (in.)	Center Gauge 4 (in.)	Drywall Gauge 5 (in.)	Mean Midspan Panel (in.)	
0.3	1.6	immed.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1.0	5.2	immed.	0.0205	0.0140	0.0585	0.0565	0.0610	0.0403	
1.0	5.2	~5min	0.0220	0.0150	0.0630	0.0600	0.0640	0.0430	
0.3	1.6	immed.	0.0045	0.0020	0.0190	0.0185	0.0190	0.0155	
0.3	1.6	~5min	0.0040	0.0015	0.0175	0.0180	0.0175	0.0150	
2.0	10.4	immed.	0.0390	0.0325	0.1500	0.1530	0.1620	0.1158	
2.0	10.4	~5min	0.0405	0.0330	0.1530	0.1525	0.1595	0.1160	
0.3	1.6	immed.	0.0070	0.0030	0.0370	0.0365	0.0370	0.0318	
0.3	1.6	~5min	0.0060	0.0025	0.0345	0.0340	0.0350	0.0300	
3.0	15.6	immed.	0.0535	0.0455	0.2330	0.2360	0.2520	0.1850	
3.0	15.6	~5min	0.0565	0.0475	0.2420	0.2400	0.2535	0.1890	
0.3	1.6	immed.	0.0075	0.0045	0.0545	0.0505	0.0525	0.0465	
0.3	1.6	~5min	0.0065	0.0035	0.0520	0.0480	0.0500	0.0450	
4.0	20.8	immed.	0.0650	0.0575	0.3195	0.3240	0.3470	0.2605	
4.0	20.8	~5min	0.0660	0.0585	0.3255	0.3215	0.3375	0.2613	
0.3	1.6	immed.	0.0090	0.0065	0.0730	0.0660	0.0700	0.0618	
0.3	1.6	~5min	0.0085	0.0055	0.0705	0.0635	0.0670	0.0600	
5.0	26.0	immed.	0.0740	0.0685	0.3975	0.3965	0.4280	0.3258	
5.0	26.0	~5min	0.0765	0.0705	0.4120	0.4075	0.4275	0.3363	
0.3	1.6	Residual	0.0130	0.0100	0.0945	0.0850	0.0895	0.0783	
9.0	46.8	Failure	<b>Studs buckled</b>						

Load (psf)	Load (lbs/ft)	Defl. (in)	Defl. (ft)
5.2	20.8	0.043	0.0036
10.4	41.6	0.116	0.0097
15.6	62.4	0.189	0.0158
20.8	83.2	0.261	0.0218
26.0	104.1	0.336	0.0280



<b>Max Load (PSF) =</b>	<b>46.8</b>
<b>Stiffness EI (lbs-ft^2) =</b>	<b>144550</b>