Performance Testing
of an
Acrytec Panel Industries
"*ACRY-NC Series*" *NC-25*
(*Insulated)*
Rainscreen Cladding Panel System

Prepared for:

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1. Introduction

As part of a broader technical evaluation program Trow Associates Inc. (Trow) was retained by Acrytec Panel Industries (Acrytec) to carry out physical testing on a series of full-scale mock-up wall assemblies incorporating their new architectural, acrylic coated composite glass fibre-reinforced cement board (GFRC) "rain-screen" panel system, "*ACRY-NC Series*". The intent of the technical evaluation was to ensure that the subject architectural panel was suitable for use for low-rise and high-rise buildings in the Province of Ontario. Accordingly, the information provided in this report is intended to be supplemental in nature and outlines the results of air tightness, water tightness, wind load, and fire testing carried out on the *ACRY-NC Series NC-25 Insulated* mock-up wall assembly.

The air, water, and wind load testing was carried out in Trow's Building Science Laboratory in Brampton, Ontario. The fire tunnel testing was carried out by Exova in Mississauga, Ontario. A copy of the Exova Report is included in Appendix A of this report.

For the program, testing was carried out using the applicable Standard ASTM procedures for static air and water leakage, in addition to wind load resistance evaluations.

The primary tests conducted were:

- Air Tightness (infiltration) under incrementally increased positive static pressure differentials, up to a maximum of ≈300 Pascals;
- Water Tightness under incrementally increased positive static pressure differentials (simulated driving rain wind pressures) of 150, 200, 300, 400, 500, 600, and 700 Pascals with each pressure condition applied for a period of 15 minutes with the panel in a vertical position;
- Structural performance, *resistance to deflection including blow-out*, of the entire assembly under incrementally applied static pressure differentials, up to maximum design positive and negative loads of 3000 Pa;
- Structural performance, *resistance to deflection including blow-out*, of the 'rain-screen" portion of the assembly under incrementally applied static pressure differentials, up to maximum design positive and negative loads of 3000 Pa and 3500 Pa, respectively;
- Flame Spread and Smoke Developed Rating based upon triplicate sample testing conducted in accordance with CAN/ULC-S102-07.

The testing was conducted in Trow's Building Science Laboratory in Brampton, Ontario between April 1st and February 14th, 2011.

Please note that with respect to compliance of the rain-screen cladding panel system to a set of performance parameters, as no specific criteria were provided, Trow has endeavoured to ensure that the intent of the current Ontario Building Code Regulation (OBC) has been fulfilled taking into consideration the panel systems intended use for low-rise and high-rise applications.

As part of the cladding panel system evaluation, Trow has provided a comprehensive generic description outlining the components and fabrication of the sample. Deviations in design or fabrication of the system(s) described may affect the system performance and as a consequence negate the relevance of the test results outlined in this report. The specifier, fabricator, or reader is advised to read Section 2.0 of the report carefully to insure that the as-built quality of the cladding panel assembly is the same as the assembly evaluated.

2. General Description of Mock-up Test Sample

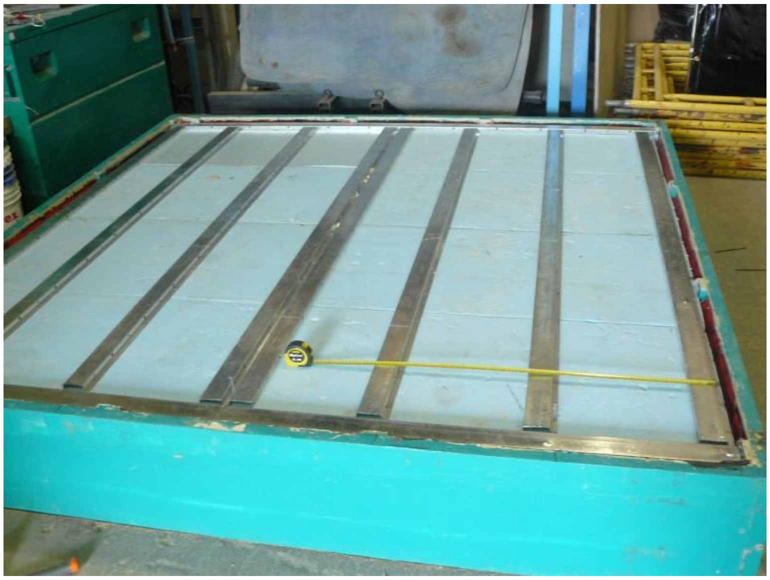
For the testing, Acrytec first constructed a 152 mm 18 gauge structural steel-stud back-up wall as described below. The stud wall was then anchored into a 38 mm x 286 mm sealed wood test buck (frame) using four standard hex-head M6 (6 mm diameter x 83 mm) bolts per side (one ≈ 50 mm from each corner and the remaining two at third-points (800 mm)) with a perimeter clearance between the stud wall and frame of ≈ 20 mm. In this configuration the interior face of the steel-stud wall was ≈ 85 mm from the interior face of the sealed wood test buck.

From the interior outward, the completed sample assembly consisted of the following component elements:

- Eighteen (18) gauge, structural steel studs ≈ 400 mm O.C.
- Fiberglass-mat-faced gypsum core sheathing (Georgia-Pacific, DensGlass®), 12.7 mm thick, mechanically fastened to the steel studs using screws (bugle head fine thread, rust-resistant, drill point drywall screws) at ≈ 200 mm O.C.
- Polyolefin membrane air retarder/moisture barrier, (Fiberweb, Inc., Typar®), 0.33 mm (12.9 mil) thick. The Polyolefin and gypsum sheathing were ultimately sealed to the

wood buck using a combination of spray-in-place polyurethane foam insulation and exterior side surface applied ultra-low modulus self-leveling neutral cure silicone sealant.

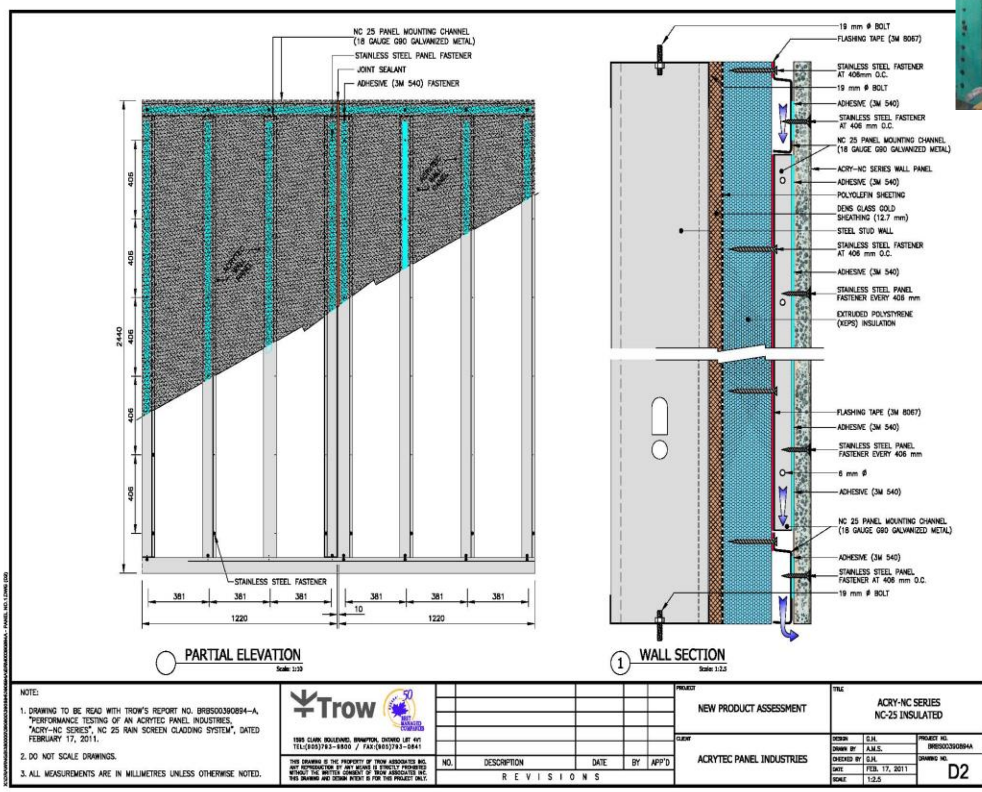
- Extruded expanded polystyrene insulation (XEPS), 100 mm thick mechanically fastened to the structural steel studs at 400 mm O.C.
- Eighteen (18) gauge roll-formed G90 galvanized steel, metal channels (NC 25) mounted horizontally at the top and bottom of the panel and vertically at 380 mm O.C., over the XEPS insulation. Prior to mounting the metal channels, strips of self-healing acrylic adhesive flashing tape (3M 8067) are adhered to the back of the channels to ensure a continuous water seal at the XEPS interface (i.e., ensures the channel mounting screws remain watertight). The NC 25 channels were mechanically fastened through the XEPS, membranes, and sheathing into the steel studs at ≈ 400 mm O.C. using 152 mm long stainless steel #10 Pan Head Self-Drilling screws. The NC 25 channels are equipped with 5 mm diameter vent/drainage holes at ≈ 100 mm O.C. These channels also provide a nominal 25 mm gap between the XEPS and the back of the composite rain-screen cladding panel..



- Prefinished, 15 mm thick, acrylic coated composite glass fibre-reinforced cement board (GFRC) “rain-screen” panels (ACRY-NC Series). The two 1220 mm x 2440 mm panels were mechanically fastened to the metal NC 25 channels using a combination of; polyurethane adhesive sealant (3M 540 Polyurethane Sealant) applied in a continuous manor over the exterior face of the metal channels and, 33 mm long stainless-steel “self-tapping” #10 flat head screws at ≈ 600 mm O.C., countersunk to a depth of ≈ 4 mm. The screws were then concealed with the same acrylic coating employed on the exterior surface of the panel. Note: Prior to installation of the Acry-NC rain-screen cladding panel, a pressure tap had been installed near the centre of each panel at mid-height. This tap was employed to monitor the pressure differential across the rain-screen during the application of a pressure differential across the entire wall assembly.

- The exterior perimeter top, side and 12 mm joint between the panels, were weather sealed with a low modulus, neutral cure silicone caulking (Tremco Spectrem 3). The weather seal was not applied at the bottom of the panel to ensure proper drainage. For the wind load testing of the rain-screen panel alone, the weather seal was applied at the bottom of the panel.

Excluding the buck in its finished form, the mock-up panel had an overall dimension of 2450 mm (W) x 2440 mm (H).



3. Methods and Results

3.1 Summary of Results

The summary of results along with, where applicable, the anticipated building code performance requirements are shown in the following table.

Table 3.1: Summary of Test Results

Test	Test Parameters	Test Results	Result
Air Tightness at P = 75 Pa	N/A	Q/A = 0.22 (l/s·m^2)	N/A
Water Tightness	No water retention or penetration at Driving Rain Wind Pressure Loads given in Ontario Building Code – Supplementary Standard SB-1	No water leakage or penetration at a 700 Pa pressure differential.	Pass
Wind Load Resistance **Total** Assembly **Mechanically & Adhesive Fastened**	Mid-Span Deflection shall not be greater than 1/175 of length (13.94 mm) at a +/- 3000 Pa pressure differential. No damage, permanent deformation or member disengagement at +/- 3000 Pa pressure differential).	Maximum centerline mid-span panel deflection at -3000 Pa. Δ_{max} = 5.63 mm No damage at +/- 3000 Pa Residual Deflection $\Delta_{max\ residual}$ = 0.13 mm	Pass
Wind Load Resistance **Rain-Screen** Panel **Mechanically & Adhesive Fastened**	Mid-Span Deflection shall not be greater than 1/175 of length (13.94 mm) at a +/- 3000 Pa pressure differential. No damage, permanent deformation or member disengagement at +/- 3000 pressure differential.	Maximum centerline mid-span panel deflection at -3000 Pa. Δ_{max} = 2.57 mm No damage at +/- 3000 Pa Residual Deflection $\Delta_{max\ residual}$ = 0.37 mm	Pass
Resistance To Ultimate Negative Wind Load **Rain-Screen Panel**	No damage, or permanent deformation or member disengagement at maximum achievable pressure differential.	No observed damage prior to an Utimate Load of: ΔP_{max} < 7880 Pa	Pass
Surface Burning Characteristics	Testing in accordance with CAN/ULC –S102-07	Rounded Average Flame Spread Rating (FSR): 20 Rounded Average Smoke Developed Classification (SDC): 35	Pass

3.2 Air Tightness

The air tightness testing was carried out using procedures outlined in ASTM Standard E283 "Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".

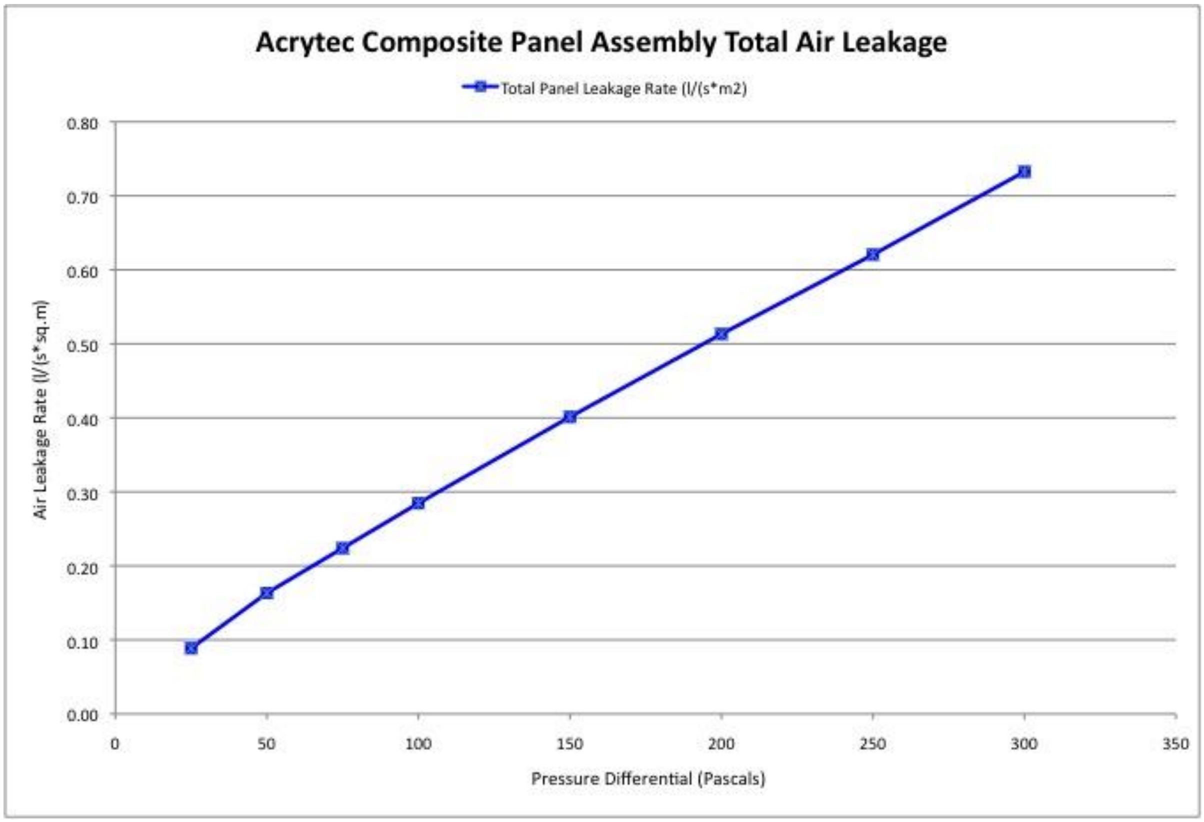
It should be noted, that as the test mock-up panel did not incorporate interior finishes such as, polyethylene vapour retarder and gypsum wall board, the mock-up was not considered a completed "airtight" wall assembly. In this sense, the mock-up was only equipped with an air retarder and drainage layer behind the rain-screen cladding. Accordingly, it was anticipated that the measured air leakages would likely be higher than those for a completed assembly. In this configuration the back-up wall assembly would be more air permeable, which would potentially result in higher imposed loads on the rain-screen portion of the cladding, making it a potentially "more severe"condition than would be the case for a complete wall assembly.

For the testing, the interior side of the test specimen was clamped in place and sealed to a large-scale test chamber using closed cell neoprene tape. A centrifugal fan connected to the test chamber was employed to provide pressure differentials of 25, 50, 75, 100, 150, 200, 250, and 300 Pa across the panel sample. The pressure differential was measured using Ashcroft XLDP pressure transducers and the airflow was measured using a laminar flow element. All Pressure and airflow data was continuously logged using the Omega OM-DAQPRO-5300 data logger at a rate of one (1) reading per second. The total panel air leakages were then divided by the area of the panel assembly to provide the air leakage rates for the test panel assembly.

The results of the air leakage testing across the test assembly are provided in the following tables and graph.

Table 3.2: Air Tightness Summary of Test Results

Pressure Differential across Panel (Pa)	Gross Panel Leakage (m^3/hr)	Gross Panel Leakage (l/s)	Panel Area (m^2)	Panel Leakage Rate (m^3/hr)m^{-2}	Panel Leakage Rate (l/s)m^{-2}
25	1.9	0.53	5.9536	0.32	0.09
50	3.5	0.97	5.9536	0.59	0.16
75	4.8	1.33	5.9536	0.81	0.22
100	6.1	1.69	5.9536	1.02	0.28
150	8.6	2.39	5.9536	1.44	0.40
200	11	3.06	5.9536	1.85	0.51
250	13.3	3.69	5.9536	2.23	0.62
300	15.7	4.36	5.9536	2.64	0.73



3.3 Water Tightness

The water tightness testing was carried out using the procedure outlined in ASTM Standard E331, "Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference".

To determine water tightness characteristics of the wall assembly, the panel assembly was subjected to uniform applied simulated driving rain wind pressures (DRWP's) of 150, 200, 300, 400, 500, 600, and 700 Pa, each for an individual test period of 15 minutes. These values were selected to cover (and exceed) the range of DRWP's given in the Ontario Building Code (OBC) Supplementary Standard SB-1, which provides base DRWP's between 80 and 200 Pascals. These values are then modified for specific applications using a calculated exposure factor (C_e) taking into consideration the height of the building and the characteristics of the terrain surrounding the building. For perspective, the following example illustrates a more extreme DRWP application requirement:

- For a 150 m high building (approximately 50 storeys) in an open terrain, 200 Pascal application pressure, the DRWP for the building would increase by a factor of 1.71 (i.e. C_e = 1.71) to a value of 342 Pascals.

During and upon completion of each test, the panel was visually reviewed for water penetration, retention, or presence on interior surfaces. For the test, a centrifugal fan was employed to provide the pressure differentials across the panel sample. A water spray grid mounted on a support frame suspended 450mm from the exterior surface of the sample was used to provide approximately 3.4 (L/min)/m^2 of water over the exterior face of the test specimen. The test panel was allowed to drain for a period of five (5) minutes between consecutive DRWP test levels. All pressure data was continuously logged during each test using the Omega OM-DAQPRO-5300 data logger at a rate of one (1) reading per second. This included the pressure differential across both the rain-screen and the total test assembly.

The results of the water tightness testing are provided in the following Table.

Table 3.3: Water Tightness Summary of Test Results

Total ΔP (Pa)	Rain-screen ΔP (Pa)	Observations
150	0	No water penetration through panel observed.
200	0	No water penetration through panel observed.
300	0	No water penetration through panel observed.
400	0	No water penetration through panel observed.
500	0	No water penetration through panel observed.
600	0	No water penetration through panel observed.
700	3	No water penetration through panel observed.

A post test examination of the panel afer the testing did not indicate water penetration past the rain-screen portion of mock-up assembly. During the testing conducted at the 700 Pascal DRWP level no water leakage was observed.

Based on the results of the testing, Trow would consider that the rain-screen panel evaluated meets or exceeds the intent of the OBC with respect to watertightness under conditions of wind driven rain as provided in Supplemental Standard SB-1.

3.4 Wind Load Resistance

3.4.1 Wind Load Resistance to Deflection

The wind load resistance to deflection testing was carried out in accordance with the procedures outlined in ASTM E330, "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference". In this case, testing was carried out first by subjecting the entire assembly to both positive and negative wind loads and measuring the centerline deflections of the adhesive attached and mechanically fastened rain-screen panel sections.

Upon completion of the initial testing, a square section, approximately 178 mm x 178 mm (7" x 7") of DenGlass sheathing, Typar building paper, and extruded expanded polystyrene insulation was removed at the midpoint of each of the rain-screen panel sections and the testing repeated. The weather seal was applied at the bottom of the panel. This testing was carried out to evaulate the effect of applying the entire wind load across the rain-screen cladding portion of the mock-up assembly, which would represent a worst case in-situ scenario.

For the testing, Novotechnik model TR-100 deflection transducers were installed on the test chamber structural members using magnetic clamps. Deflection was measured at the centre line of each rain-screen panel section to provide net mid-span deflection data. The panel was subjected to incrementally increasing pressure differentials of 50, 100, 200, 300, 400, 500, 750, 100, 1500, 2000, 2500, and 3000 Pa in the positive (inward) direction and the corresponding deflection measurements were recorded. The same procedure was employed in the negative (outward) direction. All pressure and deflection data was continuously logged using the Omega OM-DAQPRO-5300 data logger at a rate of one (1) reading per second. Trow first conducted the load testing on the intact sample (i.e., DensGlass sheathing and Typar intact). The load testing was then conducted with the pressure applied directly to the rain-screen portion of the panel sample at all pressure differentials in both directions.

Trow conducted structural blow-out testing by subjecting the sample to increasing pressure differential in the negative (outward) direction. The pressure differential was increased until the sample either achieved blow-out failure or exceeded the maximum capacity of the blower.

The results of the wind load resistance tests are outlined in Tables 3.4.1, 3.4.2, and subsequent graphs.

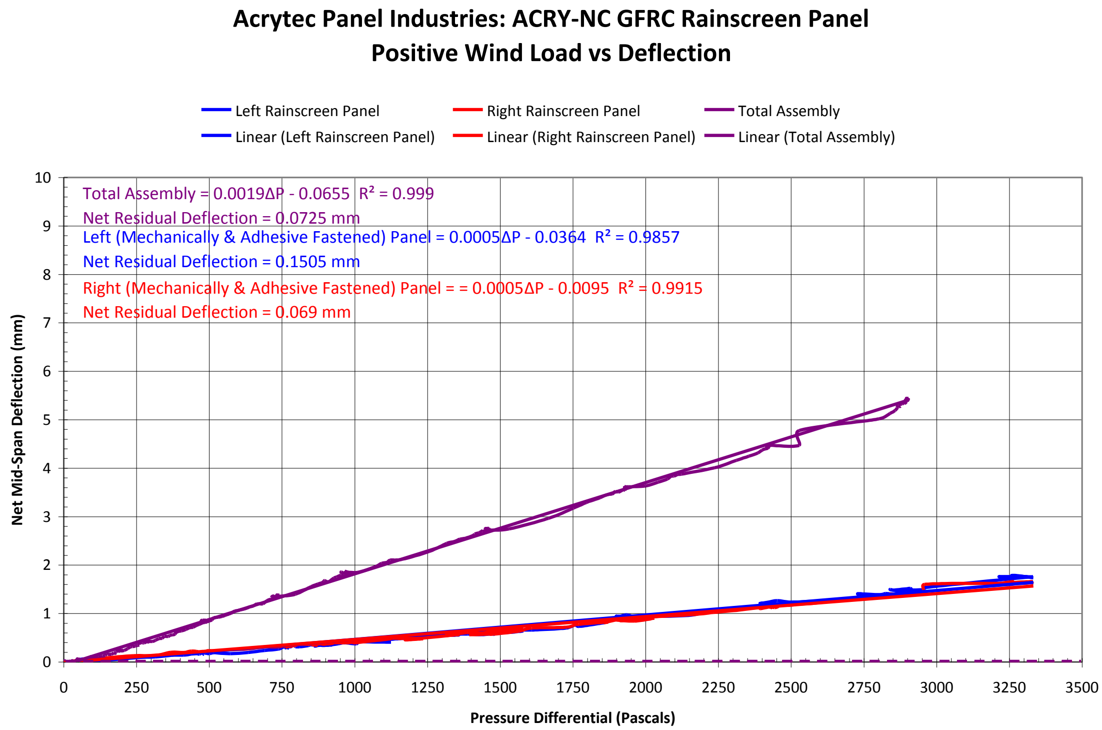
Table 3.4.1: Results of Resistance to Wind Load Testing (Total Panel)

Test No.	Test Pressure (Pa)	Deflection at Mid-Span of Left-Side Panel (mm)	Deflection at Mid-Span of Right-Side Panel (mm)	Maximum Allowable (L/175) (mm)
1	+ 3000	$\Delta_{max} = 3.52$ $\Delta_{Res} < 0.01$	$\Delta_{max} = 2.97$ $\Delta_{Res} = 0.13$	$\Delta_{max} = 13.94$ $\Delta_{Res} < 2.44$[1]
2	- 3000	$\Delta_{max} = 5.63$ $\Delta_{Res} = 0.05$	$\Delta_{max} = 5.34$ $\Delta_{Res} = 0.07$	$\Delta_{max} = 13.94$ $\Delta_{Res} < 2.44$[1]

Table 3.4.2: Results of Resistance to Wind Load Testing (Rain-Screen Panel)

Test No.	Test Pressure (Pa)	Deflection at Mid-Span of Left-Side Panel (mm)	Deflection at Mid-Span of Right-Side Panel (mm)	Maximum Allowable (L/175) (mm)
1	+ 3000	$\Delta_{max} = 1.46$ $\Delta_{Res} < 0.15$	$\Delta_{max} = 1.49$ $\Delta_{Res} = 0.07$	$\Delta_{max} = 13.94$ $\Delta_{Res} < 2.44$[1]
2	- 3000	$\Delta_{max} = 2.54$ $\Delta_{Res} = 0.39$	$\Delta_{max} = 2.57$ $\Delta_{Res} = 0.37$	$\Delta_{max} = 13.94$ $\Delta_{Res} < 2.44$[1]

[1] Based on an arbitrary value of 0.1% of the span of the member.


Acrytec Panel Industries: ACRY-NC GFRC Rainscreen Panel
Positive Wind Load vs Deflection
Left Rainscreen Panel
Right Rainscreen Panel
Total Assembly
Linear (Left Rainscreen Panel)
Linear (Right Rainscreen Panel)
Linear (Total Assembly)
Total Assembly = 0.0019ΔP - 0.0655 R² = 0.999
Net Residual Deflection = 0.0725 mm
Left (Mechanically & Adhesive Fastened) Panel = 0.0005ΔP - 0.0364 R² = 0.9857
Net Residual Deflection = 0.1505 mm
Right (Mechanically & Adhesive Fastened) Panel = = 0.0005ΔP - 0.0095 R² = 0.9915
Net Residual Deflection = 0.069 mm
Net Mid-Span Deflection (mm)
Pressure Differential (Pascals)

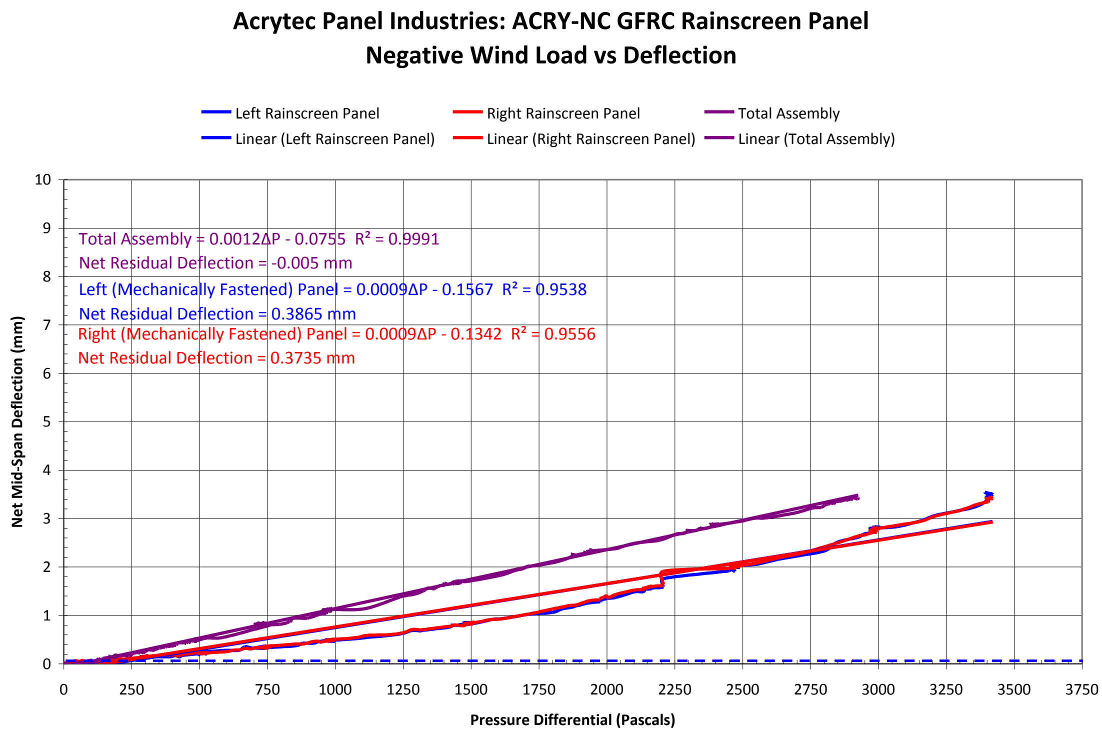

Acrytec Panel Industries: ACRY-NC GFRC Rainscreen Panel
Negative Wind Load vs Deflection
Left Rainscreen Panel
Right Rainscreen Panel
Total Assembly
Linear (Left Rainscreen Panel)
Linear (Right Rainscreen Panel)
Linear (Total Assembly)
Total Assembly = 0.0012ΔP - 0.0755 R² = 0.9991
Net Residual Deflection = -0.005 mm
Left (Mechanically Fastened) Panel = 0.0009ΔP - 0.1567 R² = 0.9538
Net Residual Deflection = 0.3865 mm
Right (Mechanically Fastened) Panel = 0.0009ΔP - 0.1342 R² = 0.9556
Net Residual Deflection = 0.3735 mm
Net Mid-Span Deflection (mm)
Pressure Differential (Pascals)

Table 3.4.3: Negative Wind Load Testing Pressure Distribution

ΔP_{Wall} (Pa)	$\Delta P_{rainscreen}$ (Pa)	$\Delta P_{rainscreen}$ (%)
-49	0	0
-103	4	-3%
-198	-1	0%
-291	2	-1%
-405	-1	0%
-488	1	0%
-737	-1	0%
-1009	-8	1%
-1454	-11	1%
-1999	-15	1%
-2528	-21	1%
-2902	-26	1%

Table 3.4.3 provides an account of the pressure differentials across the rain-screen versus those applied across the entire mock-up wall assembly. This table indicates that under essentially static wind loading, the pressure across the rain-screen does not exceed 1% of the total wind load applied across the wall. While this may suggest that the rain-screen panel does not experience in-situ wind loading, this is not the case. Actual wind loading on the rain-screen will be dynamic in nature and will be dependent on a number of variables including the performance attributes of the back-up wall (substrate) and the rain-screen installation method.

At the conclusion of each test, a visual examination of the panel was carried out. The results of the examination for all test configurations may be summarized as follows:

For the testing conducted on the ***whole wall assembly***:

- A visual review of the wall assembly revealed no damage or permanent deformation of the wall assembly (or any of its components) which would impair its intended function. The net residual deformation recorded on the exterior surface of the *Acry-NC Series NC-25 (Insulated)* panel, within five (5) minutes after loads shown in the tables and graphs were removed, were less than 0.1% of the mid-span centerline span.

For the testing conducted on the ***Acry-NC (Cladding) portion of the wall assembly***:

- For the adhesive/mechanically fastened rain-screen portion of the wall panels, a visual review of the subject rain-screen panels revealed no damage or permanent deformation of the *Acry-NC Series NC-25* panels or wall assembly (or any of its components) which would impair its intended function. The net residual deformations recorded on the exterior surface of the *Acry-NC Series NC-25* panel, within five (5) minutes after loads shown in the tables and graphs were removed, were less than 0.1% of the mid-span centerline span for each panel.

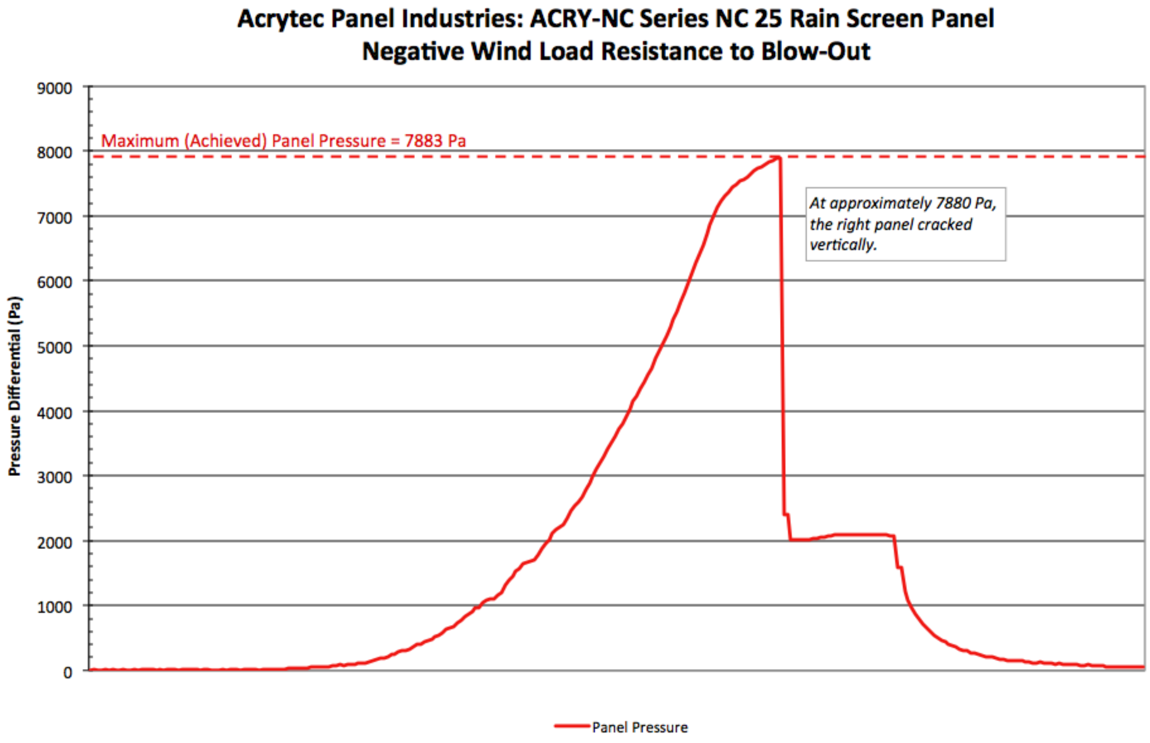
The results of the wind load testing clearly demonstrate that the adhesive/mechanically fastened *ACRY-NC Series NC-25* rain-screen panel assembly has the **lone** capacity to resist the full loads employed for the testing without exhibiting excessive deformation during live loading or permanent deformation upon release.

Accordingly, within the load conditions employed for testing, Trow is of the view that the ACRY-NC Series NC-25 (Insulated) adhesive/mechanically fastened rain-screen panel meets the intent of the OBC with respect to resistance to wind load.

3.4.2 Wind Load Resistance to Blow-Out (Ultimate Load)

The "Wind Load Resistance to Blow-Out" testing was again carried out in accordance with the procedures outlined in ASTM E330, "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference". In this case, testing was conducted to the more severe condition of, negative wind loads directly applied across the adhesive/mechanically fastened rain-screen panel sections alone. As previously stated, this testing was employed to evaluate the effect of applying the entire wind load across the rain-screen cladding portion of the mock-up assembly, which would represent a worst case in-situ scenario.

The results of the blow-out testing are given in the following graph and subsequent discussion.



At an approximate negative wind load of 7.88 kPa the right side rain screen panel cracked vertically and was permanently damaged, resulting in a loss of chamber pressure. A post test examination of the panel did not reveal evidence of any other damage to the ACRY-NC Series, NC 25 GFRC rain-screen cladding. In addition, the cladding did not detach from the substrate supports and remained in place on the sample wall.

Again, within the load conditions employed for the blow-out (i.e, ultimate load) testing, Trow is of the view that the adhesive/mechanically fastened ACRY-NC Series NC-25 (Insulated) rain-screen panels meet the intent of the OBC with respect to resistance to wind load.

3.5 Surface Burning Characteristics

The *Acry-NC Series* base panel is a non-combustible glass fibre reinforced cement board to which an architectural acrylic coating is applied. To establish the surface burning charicteristics of the finished *Acry-NC Series* rain-screen panel, Flame Spread and Smoke Developed Classifications based upon triplicate testing was conducted in accordance with CAN/ULC-S102-07. This testing was carried out by Exova and a copy of their report outlining the test methodoloy and results has been provided in Appendix B of this report.

As stated in the Exova report, "The method, designated as CAN/ULC-S102-07, "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies", is designed to determine the relative surface burning characteristics of materials under specific test conditions. Results of less than three identical specimens are expressed in terms of "Flame Spread Value" (FSV) and "Smoke Developed Value" (SDV). Results of three or more replicate tests on identical samples produce average values expressed as "Flame Spread Rating" (FSR) and "Smoke Developed Classification (SDC)". In this case, testing was carried out in triplicate to establish FSR and SDC values for the *Acry-NC Series* panels. The Acry-NC samples provided to Exova were labelled "Exterior Cladding Panel System (Red)".

From the Exova report:

Table 3.5.1: Summary of Results Surface Burning Characteristics.

Test No.	FSV	SDV
1	20	34
2	18	34
3	19	37
Average:	19	35

Rounded Average Flame Spread Rating (FSR): 20

Rounded Average Smoke Developed Classification (SDC): 35

4. Conclusion

Based on the result of the result of the testing carried out on the Acrytec Panel Industries, ***Acry-NC NC-25 Insulated*** rain-screen cladding panel Trow concluded:

- The ***ACRY-NC Series NC-25 (Insulated)*** rain-screen functions as an effective rain-screen cladding with respect to resistance to wind driven rains. Testing indicates that when installed on a suitable back-up wall, such as that described in this report, the rain-screen assembly successfully prevents interstitial and indoor water penetration under driving rain wind pressure up to 700 Pa. This performance level exceeds the anticipated requirements for low and high-rise buildings in excess of fifty-stories given in the current Ontario Building Code Regulation.
- The ***ACRY-NC Series NC-25 (Insulated)*** rain-screen panel assembly, mechanically and adhesive fastened to a suitable back-up wall as described in this report, successfully resists full wind loads up to 7.88 kPa. That is, the testing indicates that the rain-screen cladding assembly successfully resists deformation and remains in place when the subject positive and negative pressures are applied solely across the rain-screen panel. The recorded net mid-span deflections are well below the anticipated requirements for cladding systems employed for low rise and many high-rise buildings given in the current Ontario Building Code Regulation. For the subject rain-screen panels, the levels of deflection measured under load were also below those required to cause cracking of the base GFRC boards employed for the ***Acry-NC Insulated*** rain-screen panel.
- The ***ACRY-NC Series (Insulated)*** rain-screen panels are non-combustible and have suitable "Surface Burning Characteristics" to meet OBC requirements for use as an exterior cladding material for low and high-rise buildings for both combustible and non-combustible construction, with a rounded "Average Flame Spread Rating (FSR): 20," and a rounded "Average Smoke Developed Classification (SDC): 35".

Trow Associates Inc.

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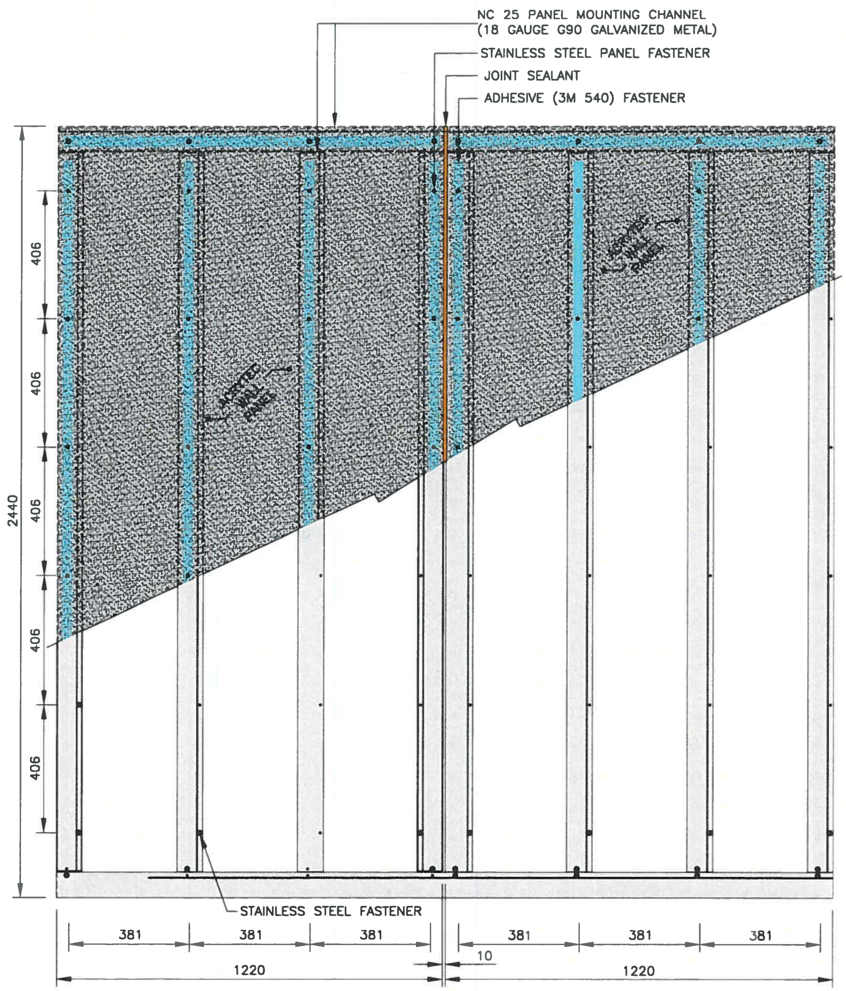
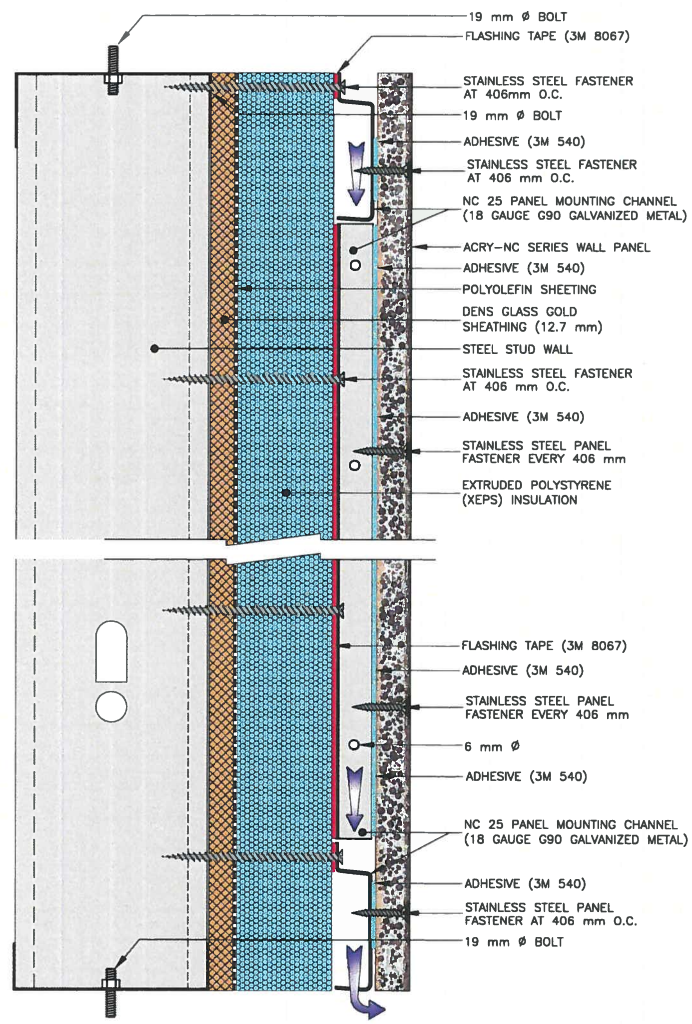
Appendix A:
Test Sample Drawing



PARTIAL ELEVATION

Scale: 1:10



1 WALL SECTION

Scale: 1:2.5

NOTE:

1. DRAWING TO BE READ WITH TROW'S REPORT NO. BRBS00390894-A, "PERFORMANCE TESTING OF AN ACRYTEC PANEL INDUSTRIES, "ACRY-NC SERIES", NC 25 RAIN SCREEN CLADDING SYSTEM", DATED FEBRUARY 17, 2011.
2. DO NOT SCALE DRAWINGS.
3. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Trow

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NO.	DESCRIPTION	DATE	BY	APP'D

REVISIONS

PROJECT	NEW PRODUCT ASSESSMENT
CLIENT	ACRYTEC PANEL INDUSTRIES
TITLE	ACRY-NC SERIES NC-25 INSULATED
DESIGN	G.H.
DRAWN BY	A.M.S.
CHECKED BY	G.H.
DATE	FEB. 17, 2011
SCALE	1:2.5
PROJECT NO.	BRBS00390894A
DRAWING NO.	D2

X:\DRAWINGS\39000\0390800\390894\390894A\BRM00390894A - PANEL NO.1.DWG (D2)

Appendix B:
Exova Report No. 10-002-495(A)

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CAN/ULC-S102 Surface Burning Characteristics of "Exterior Cladding Panel System (Red)"

A Report To:	**Acrylic Panel Industries** 20 Floral Parkway, Unit B Concord, Ontario L4K 4R1
Phone:	(905) 793-9800
Email:	chris.finlay@trow.com
Attention:	Chris Finlay
Submitted by:	Fire Testing
Report No.	10-002-495(A) 6 Pages
Date:	August 9, 2010

ACCREDITATION To ISO/IEC 17025 for a defined Scope of Testing by the Standards Council of Canada

SPECIFICATIONS OF ORDER

Determine the Flame Spread and Smoke Developed Classifications based upon triplicate testing conducted in accordance with CAN/ULC-S102-07, as per Trow P.O. # BR 10686 and Exova Quotation No. 10-002-6643 RV1 accepted July 6, 2010.

SAMPLE IDENTIFICATION (Exova sample identification number 10-002-S0495-1)

Exterior cladding panel system, identified as: "Red".

TEST PROCEDURE

The method, designated as CAN/ULC-S102-07, "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies", is designed to determine the relative surface burning characteristics of materials under specific test conditions. Results of less than three identical specimens are expressed in terms of Flame Spread Value (FSV) and Smoke Developed Value (SDV). Results of three or more replicate tests on identical samples produce average values expressed as Flame Spread Rating (FSR) and Smoke Developed Classification (SDC).

Although the procedure is applicable to materials, products and assemblies used in building construction for development of comparative surface spread of flame data, the test results may not reflect the relative surface burning characteristics of tested materials under all building fire conditions.

SAMPLE PREPARATION

For each test , the samples consisted of 3 sections of material, each approximately 533 mm in width by 2438 mm in length by 16 mm in thickness. The sections were butted together to form the requisite specimen length. Prior to testing, the samples were conditioned at a temperature of 23 ± 3°C and a relative humidity of 50 ± 5%. During testing, the samples were self-supporting.

The testing was performed on: Test #1: 2010-07-20 Test #2: 2010-07-22 Test #3: 2010-07-22

SUMMARY OF TEST PROCEDURE

The tunnel is preheated to 85°C, as measured by the backwall-embedded thermocouple located 7090 mm downstream of the burner ports, and allowed to cool to 40°C, as measured by the backwall-embedded thermocouple located 4000 mm from the burners. At this time the tunnel lid is raised and the test sample is placed along the ledges of the tunnel so as to form a continuous ceiling 7315 mm long, 305 mm above the floor. The lid is then lowered into place.

SUMMARY OF TEST PROCEDURE (continued)

Upon ignition of the gas burners, the flame spread distance is observed and recorded every 15 seconds. Flame spread distance versus time is plotted, ignoring any flame front recessions. Calculations are based on comparison with flame spread characteristics of select red oak, determined in calibration trials and arbitrarily established as 100. If the area under the curve (A) is less than or equal to 29.7 m·min, FSV = 1.85·A; if greater, FSV = 1640/(59.4-A). The Smoke Developed Value is determined by comparing the area under the obscuration curve for the test sample to that of inorganic reinforced cement board and red oak, established as 0 and 100, respectively.

TEST RESULTS

SAMPLE		FSV	SDV
"Exterior Cladding Panel System (Red)"	Test #1	20	34
	Test #2	18	34
	Test #3	19	37
	Average:	19	35

Rounded Average Flame Spread Rating (FSR): **20**

Rounded Average Smoke Developed Classification (SDC): **35**

Observations of Burning Characteristics

- The samples ignited approximately 2 to 2.5 minutes after exposure to the test flame.
- The flame fronts advanced to maximum distances of 1.5, 1.4 and 1.5 metres at approximately 4, 4, and 4.5 minutes into each respective test.
- Smoke Developed and temperature were recorded during the tests (see accompanying charts).

Note: This is an electronic copy of the report. Signatures are on file with the original report.

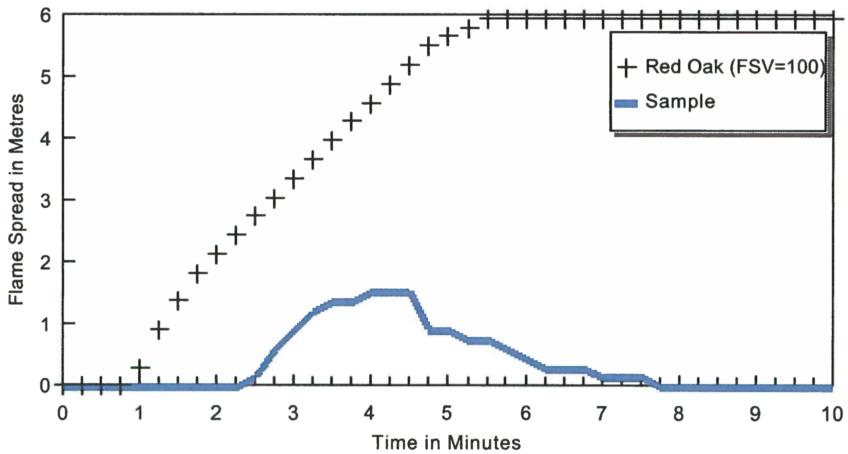
Robert A. Carleton,
Fire Testing.

Ian Smith,
Fire Testing.

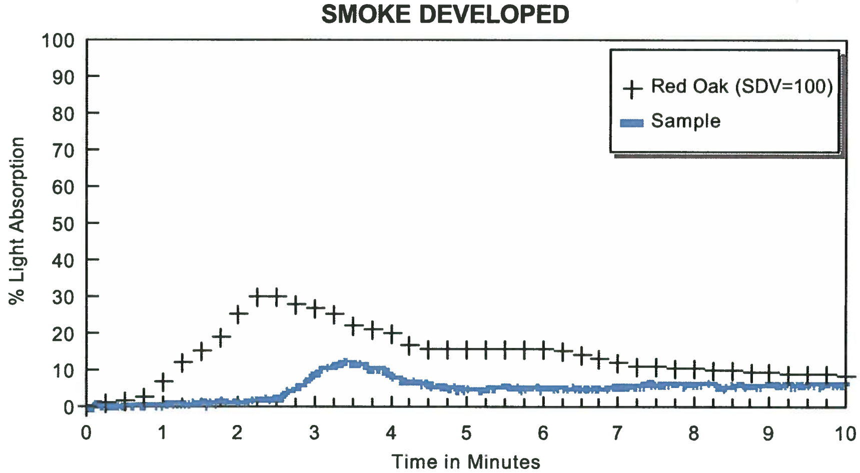
Sample:"Exterior Cladding Panel System (Red)"

Test #1 of 3

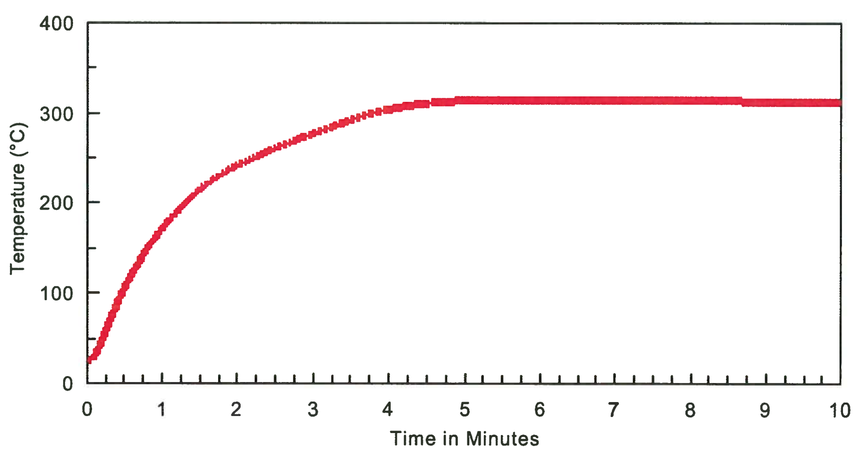
FLAME SPREAD



SMOKE DEVELOPED



TEMPERATURE



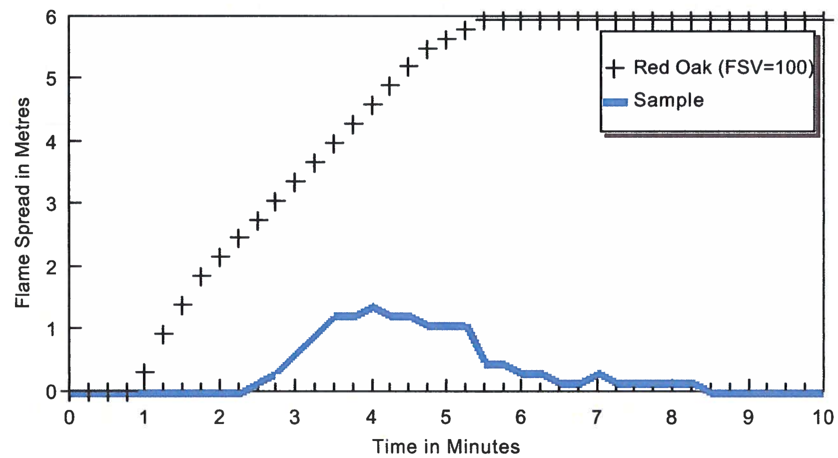
FSV	**SDV**
20	34

Exova

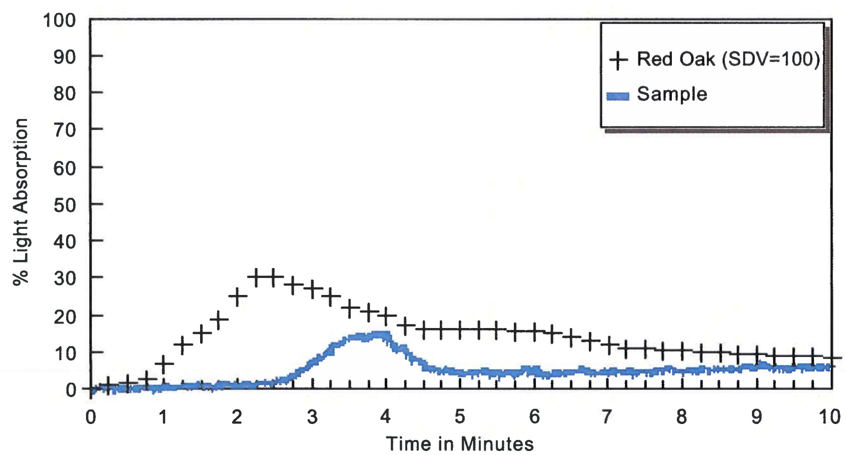
Sample: "Exterior Cladding Panel System (Red)"

Test #2 of 3

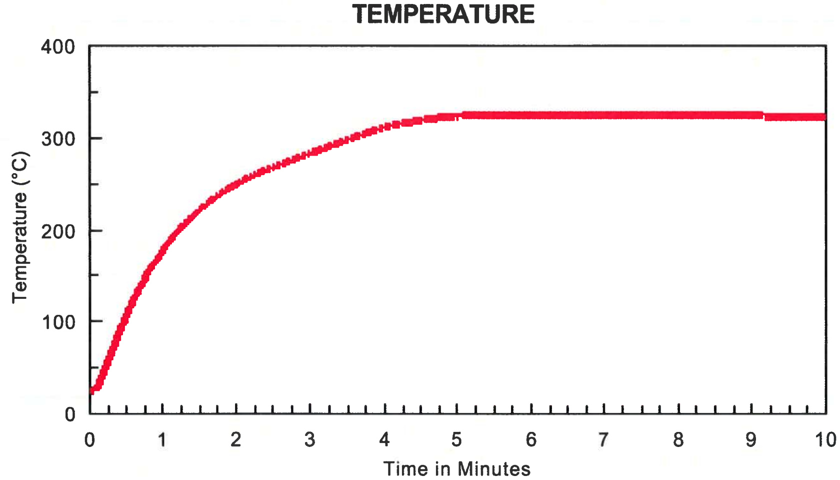
FLAME SPREAD



SMOKE DEVELOPED



TEMPERATURE

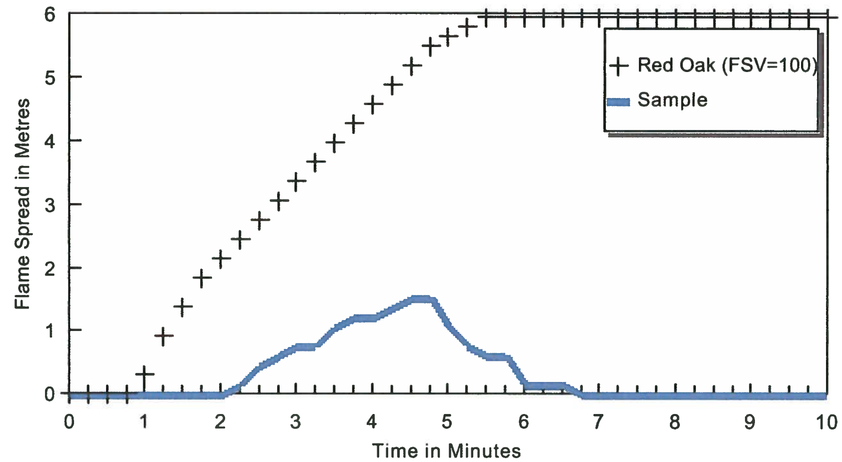


FSV	**SDV**
18	34

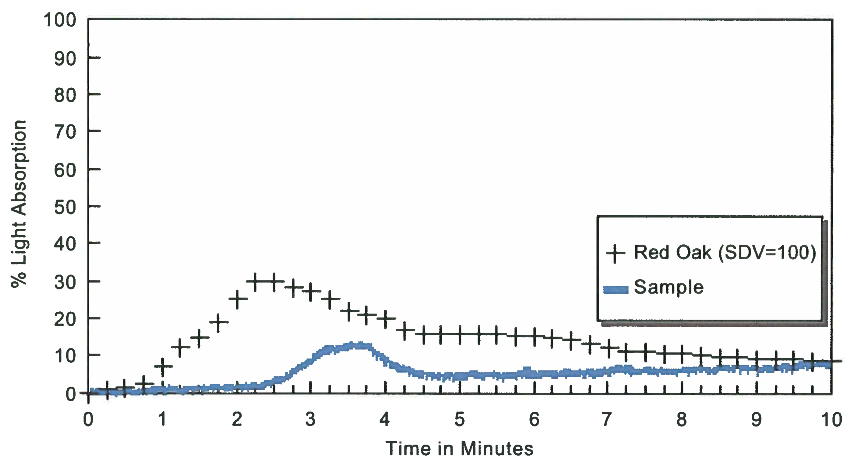
Sample: "Exterior Cladding Panel System (Red)"

Test #3 of 3

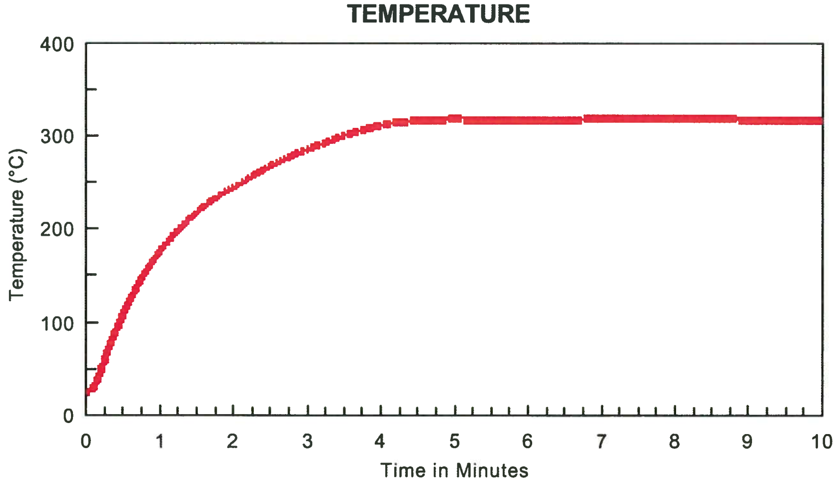
FLAME SPREAD



SMOKE DEVELOPED



TEMPERATURE



FSV	**SDV**
19	37