

CASCADIA CLIP®

MINOR COMBUSTIBLE COMPONENT

ABSTRACT

The Cascadia Clip®—a discreet and intermittent fiberglass thermal spacer used within the insulation layer of an exterior insulated cladding support system—is properly characterized as a *minor combustible component* per NBC (and all derivative Canadian building codes) Article 3.1.5.2.

The key findings below support this characterization, and include two code consultant approvals, government ruling by a Building & Safety Standards Branch, cladding stay-in-place analysis, and a real-world demonstration of performance through large-scale fire testing. Full reference documentation provided.

LMDG - CODE CONSULTANT APPROVAL LETTER

FULL REFERENCE - PAGE 2-3

- Provides a code consultant's opinion that the Cascadia Clip is properly characterized as a *minor combustible component* per Article 3.1.5.2 for the NBC 2015 and all derivative codes.

BC APPEAL BRANCH

FULL REFERENCE - PAGE 4

- Government Safety & Standards Branch confirms that the Cascadia Clip (known to be a discreet, intermittent spacer) is a *minor combustible component* per 3.1.5.2.(1)(h), and therefore 3.1.5.5 does not apply to the Clip or similar components that are permitted through 3.1.5.2.

B.R. THORSON CONSULTING – CODE CONSULTANT LETTER

FULL REFERENCE - PAGE 5-7

- Documents communication with the Canadian Codes Center at the National Research Council, confirming “Article 3.1.5.5 only applies when a building contains combustible cladding” (not other discreet wall components). 3.1.5.2 definition of *minor combustible component* properly characterizes the Cascadia Clip, through 3.1.5.2.(1)(g) and (h).

RDH CLADDING STAY-IN-PLACE ANALYSIS

FULL REFERENCE - PAGE 8-11

- The Cascadia Clip is an intermittent spacer that is used with through-fastening of outer cladding supports directly to inner structural walls. The analysis concludes that “in the hypothetical conditions where all Clips fail” ... “the stay-in-place capacity of the cladding attachment to structure would not be compromised, even if the Clips were fully consumed in a fire”.

NFPA 285 TEST

FULL REFERENCE - PAGE 12-14

- Although engineering analysis demonstrates safety and cladding attachment stay-in-place capacity through direct fastening, large-scale fire testing with a combustible cladding material was performed to the NFPA 285 standard.
- The most highly exposed Clips were charred by the fire but remained substantially intact. This observation was expected, as fiberglass material is a thermoset – a classification of polymers that do not melt from high temperatures.
- This still-intact condition of the most exposed Clip demonstrates that the scenario of the Clips being fully consumed by fire (for cladding stay-in-place analytical purposes) is indeed hypothetical.



FIRE PROTECTION & LIFE SAFETY SOLUTIONS

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April 8, 2020

VIA E-MAIL: mbousfield@cascadiawindows.com

Cascadia Windows Ltd.
#101 – 5350B 275th Street
Langley, BC
V4W 0C1

Attention: Mr. Michael Bousfield
Technical Director | Operations Manager – Cascade Clip

Dear Mr. Bousfield:

RE: CASCADIA THERMAL SPACER
NATIONAL BUILDING CODE 2015 INTERPRETATION Our File: 17-273

We are writing to confirm our interpretation that the typical application of Fibreglass Thermal Spacer manufactured by Cascadia Windows Ltd. (Cascadia) can be considered a “minor combustible component” per Article 3.1.5.2. of the National Building Code 2015 (NBC).

We understand the typical exterior wall application consists of the Thermal Spacers arranged in rigid patterns with spacings no closer than 24” by 16”.

As you are aware, the British Columbia Building Code Appeal decision #1704 (copy attached) confirmed this interpretation. Numerous projects across Canada have been constructed based on the Thermal Spacer classification as “minor combustible components”.

Please do not hesitate to contact our office if we can be of further assistance.

Sincerely,

LMDG BUILDING CODE CONSULTANTS LTD.

A handwritten signature in blue ink, appearing to read 'D. Steer'.

David J. Steer, M.Eng., P.Eng., CP

DS/cy 17273040820.ltr.docx

cc: Paraic Lally, Business Development Manager, Cascadia Clip (Via E-mail: plally@cascadiawindows.com)

4/9/2020

BCAB #1704 - Minor Combustible Components, Article 3.1.5.2. - Province of British Columbia



BCAB #1704 - Minor Combustible Components, Article 3.1.5.2.

December 15, 2011

BCAB #1704

Re: Minor Combustible Components, Article 3.1.5.2.

Project Description

The project is an unsprinklered highrise building of residential occupancy. The building and the exterior wall assembly are of noncombustible construction.

Reason for Appeal

Within the exterior noncombustible wall assembly, it is proposed to use combustible fiberglass spacers.

Appellant's Position

The appellant contends that the fiberglass spacers can be considered similar minor combustible components per clause 3.1.5.2.(1)(h) as the combustibility and exposure would be similar or less than is permitted by Article 3.1.5.5. for wood blocking or foamed plastic air sealants. Further, Article 3.1.5.5. is not applicable because the cladding is noncombustible.

Building Official's Position

The building official maintains that the thermal spacers are not minor combustible components per Article 3.1.5.2. as they support a significant envelope component.

Further, sentence 3.1.5.5 requires non-loadbearing exterior wall assemblies incorporating combustible components to be tested to CAN/CSA S134. The thermal spacer is a combustible component in such a wall assembly. No such test has been provided.

Appeal Board Decision #1704

It is the determination of the Board that the fiberglass spacers are similar minor components per clause 3.1.5.2.(1)(h). Further, the Board determines that it is the intent of the code that the requirements of Article 3.1.5.5. do not apply to similar minor components permitted by Article 3.1.5.2.

George Humphrey, Chair

Building Code Appeal Board

c/o Building and Safety Standards Branch
PO Box 9844 Stn Prov Govt
Victoria BC V8W 9T2

December 15, 2011

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George Humphrey, Chair



B.R. Thorson Consulting Ltd.

Consulting Structural Engineer • Building Code Consultant

769 Roslyn Blvd, North Vancouver, B.C. V7G 1P4

Tel. 604-929-8520 Fax 604-929-8530 Cell 604-290-6569

September 24, 2011

RDH Building Engineering Ltd.

224 West 8th Avenue

Vancouver, B.C., V5Y 1N5

Att'n: Mr. Dave Ricketts, M.Sc., P.Eng.

**RE: Fiberglass Thermal Spacers
Building Code Interpretation – Minor Combustible Component**

Dear Dave,

As per your request, I have personally examined the new product, Cascadia Fiberglass Thermal Spacer, to determine its application in exterior wall construction in buildings that are required to be noncombustible construction.

As stated in Sentence 3.1.5.1.(1) of the 2006 BC Building Code (BCBC), buildings that are required to have noncombustible construction must be constructed of noncombustible materials, except as permitted in Sentences (2) to (4) and Articles 3.1.5.2. to 3.1.5.21, 3.1.13.4. and 3.2.2.16.

The definition of noncombustible in Division A, Article 1.4.1.2. states that the material must meet the acceptance criteria of CAN4-S114.

Since the fiberglass thermal spacers do not meet the acceptance criteria of CAN-S114, their use in noncombustible buildings is predicated on the exceptions described in Sentence 3.1.5.1.(1).

One of the exceptions included in Sentence 3.1.5.1.(1) is Article 3.1.5.2. "Minor Combustible Components". Clause 3.1.5.2.(1)(g) permits the use of wood blocking within wall assemblies intended for the attachment of handrails, and similar items mounted on the surface of the wall. Clause 3.1.5.2.(1)(h) permits the use of "similar minor components".

Cory P. Thorson

Barry R. Thorson B.A. Sc., P.Eng., C.P., FEC

Article 3.1.5.5. also discusses the use of combustible components in exterior walls. Due to a recent Appeal Board decision #1682, the use of any combustible component in exterior walls has come into question. Article 3.1.5.5. was first introduced in the 1990 National Building Code of Canada (NBCC) and was entitled “Combustible Cladding”. The 1995 NBCC amended the title of Article 3.1.5.5. to read “Combustible Components for Exterior Walls”. The intent of this revision was to permit not only combustible cladding but also other combustible components within an exterior wall assembly if such wall assembly met the acceptance criteria of the full scale furnace test of CAN/ULC S134.

Phillip Rizcallah, P.Eng. of the NRC has confirmed, as described in the email below, that the intent of the current NBCC is that Article 3.1.5.5. only applies when a building contains combustible cladding.

Standing Committee Deliberations Fire Protection March 22, 2011

Article 3.1.5.5. and 3.1.5.12. are independent permissions (or exemptions) to the application of Sentence 3.1.5.1.(1).

Depending on the nature of the building assembly or element in question, this implies that the user is not bound to meet any or all of the requirements listed in Articles 3.1.5.2. to 3.1.5.21. If the construction is such that one or more of the exceptions is used then they become requirements.

In the case where foam plastic or another type of combustible insulation is utilized as a component in a building required to be of noncombustible construction, the requirements stipulated under Article 3.1.5.12. must always be met.

Furthermore, Article 3.1.5.5. is not applicable where noncombustible cladding or cladding system is installed even if the wall assembly includes combustible insulation.

*Philip Rizcallah, P. Eng
Senior Technical Advisor and Coordinator Life Safety Division
Canadian Codes Centre
National Research Council*

Furthermore, George Humphreys, Chair of the BC Building Code Appeal Board, says that the intent of Article 3.1.5.5. is to address exterior walls that contain combustible cladding. He has recommended to both the NRC and the BC Building and Safety Standards Branch that both the NBCC and BCBC be amended to clarify the true intent. A copy of George’s email follows:

In essence, the NBC Task Group on foamed plastics is recommending to the parent standing committee on Fire protection that 3.1.5.5. revert to dealing with only with cladding. This is the same discussion and conclusion reached by the Standards Branch and the Appeal Board. Therefore BobThompson is proposing to look at the revision and using their proposed wording providing we agree with it. Even though any NBC change won't show up until the 2015 Code, a BC change at this time would be in sync with the NBC intention assuming the change recommendation proceeds to CCBFC approval.

Bob Thompson indicated that he intended to do a targeted consultation on the BC proposed "fix" before proceeding with a BC change. If response is mixed the Branch may go to a broader consultation. I intend to raise this issue again at the next Appeal Board meeting in June.

*Regards,
George Humphreys, Chair BC Building Code Appeal Board*

Based on this background material, it is my professional opinion that the fiberglass thermal spacers should be considered to be "minor combustible components" as permitted by Clause 3.1.5.2.(1)(h).

If a building that is required to be noncombustible construction has noncombustible cladding, then Article 3.1.5.5. is not applicable, and the use of the fiberglass thermal spacers is not regulated by Article 3.1.5.5.

If a building that is required to be noncombustible construction has combustible cladding, then Article 3.1.5.5. is applicable, and the entire exterior wall assembly, including the fiberglass thermal spacers, would have to meet the acceptance criteria of CAN/ULC S134 plus the additional requirements of Sentences 3.1.5.5.(2), (3) and (4).

The Building and Safety Standards Branch recently hosted a workshop in Vancouver on September 20, 2011. In that workshop the senior staff of the Branch emphasized the current goals of this government which include:

- A uniform building code across the Province (i.e. implementation of concurrent authority from the Community Charter)
- Consistent interpretations of the building code in a timely manner (it was noted that 2 years ago the Branch was given legislative authority to issue binding interpretations. The Branch is expected to release its very first "Directive" this Fall)
- Encouragement of the use of innovative materials, including reduction in red tape in getting such products to the market
- Improvements to energy efficiency in buildings

The fiberglass thermal spacers are a classic example of an innovative product that is safe, energy efficient and designed in B.C.

I would encourage the Building and Safety Standards Branch to provide a binding interpretation in a timely manner to confirm that this product should be considered a minor combustible component and that it can be used in an exterior wall in a building that is required to be noncombustible construction.

Yours truly,

Barry Thorson, P.Eng., C.P., FEC



RDH Building Engineering Ltd

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TO **Mr. Michael Bousfield**
Cascadia Windows Ltd.
27050 Gloucester Way
Langley BC V4W 3Y5

3565.00 – Cascadia Windows Ltd.

November 26, 2013

EMAIL mbousfield@cascadiawindows.com

REGARDING **Cascadia Clip – Analysis of Cladding Integrity with Fire Damaged Support Spacers**

To whom it may concern:

RDH Building Engineering Ltd. (RDH) was retained by Cascadia Windows Ltd. to analyze, provide design tables and graphical aids, and comment on the structural performance of the Cascadia Clip® (the clip), a low-conductivity cladding subframing spacer for use in exterior insulated rainscreen wall assemblies.

1. BACKGROUND

Design aids and load tables for utilizing the Cascadia Clip are established in written design guidance published by the manufacturer (Cascadia Windows Ltd). A brief description of the structural design considerations for the clip under in-service load conditions is also provided in the published literature. This letter should be read in conjunction with these published design aids which are attached to this letter.

The focus of this letter is to provide additional information about:

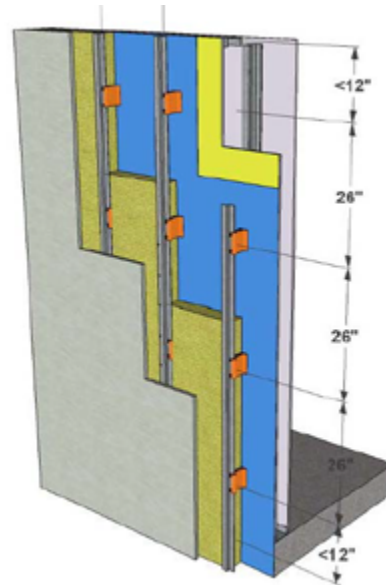
- the analysis and design rationale for the clip to transfer cladding loads to the structure under in-service conditions (dead load plus lateral loads)
- the load transfer mechanism and stay-in-place capacity of the cladding attachment system in the unlikely condition where the clip is damaged and cannot contribute to the load carrying capacity of the cladding attachment system. This latter scenario corresponds to a hypothetical condition where the clips are damaged by fire.

1.1. Typical Wall Assembly

A typical exterior insulated wall in a non-combustible building generally consists of the following (from interior to exterior):

- Backup wall (steel stud and sheathing) connected to the primary structure
- Water resistive barrier
- Rigid or semi-rigid insulation
- Cladding on metal girts

Traditionally, continuous or intermittent steel girts span from the backup wall to the cladding to transfer wind, seismic and cladding dead loads to the primary structure; however, steel supports significantly reduce the effective thermal resistance of the insulation layer. The Cascadia Clip, which has a much lower thermal conductivity than steel, can be added to this assembly between the water resistive barrier and the girt. The steel girts are therefore reduced in depth, and separate the cladding from the backup wall by the Cascadia Clip, and the thermal resistance of the wall is improved.



General arrangement of typical wall assembly with the Cascadia Clip

1.2. Attachment Method

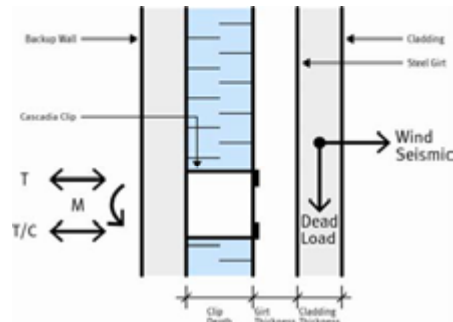
Cladding is generally attached to steel girts using self-tapping fasteners; the size and distribution of this attachment is dependent on the type of cladding and the applicable wind and seismic loads corresponding to the location and exposure of the building. The girts are secured directly to the backup wall with fasteners that pass through the Cascadia Clip. The clip includes holes for fasteners to provide a direct connection from girt to structure. The clip acts as a shim equal to the thickness of the insulation layer.

The steel girt thickness is typically 18 gauge, which is suited to fit the connection channel in the Cascadia Clip. Common dimensions of the z-girt are 1.50"x1"x1.25", and the depth of the clip can vary to suit specific project requirements, but is generally between 3 and 6 inches.

Fasteners for connecting the girt and clip to the backup wall are typically Master Driller #14-1/4" screws with No. 2 drill point (for steel stud backup walls).

2. IN-SERVICE LOADING - STRUCTURAL CONSIDERATIONS

The structural load transfer mechanism for cladding systems using clips is well established in theory and in practice under standard in-service loading conditions. Vertical (dead load) and horizontal forces (seismic and wind) are transferred to the clip through the girt. The clips share vertical load equally (because of their equal stiffness) and receive horizontal loads based on their tributary areas. The design is generally controlled by the pullout resistance of the upper screw through the clip, which is under tension from the overturning moment caused by cladding dead load, and from wind suction pressures (and seismic loading). This load resistance path is applicable to both serviceability (deflection) and ultimate limit states.

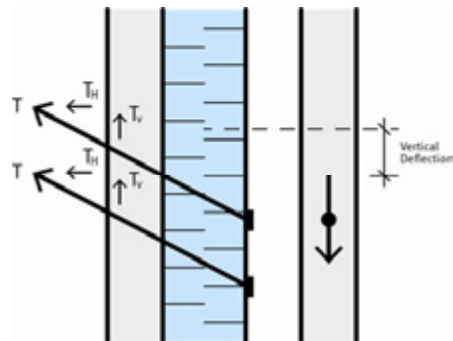


Cascadia Clip – In-service loading condition

As the depth of the clip increases, the significance of the cladding dead load on the overall design increases. For instance, for a wall with a 2" clip, wind load has a much larger effect on the design; whereas for a 6" clip, the cladding dead load is relatively more significant.

3. POST-FAILURE LOADING - STRUCTURAL CONSIDERATIONS

The theoretical condition where the clips are damaged by fire changes the load transfer mechanism of the cladding attachment system. The extreme condition where all of the clips within a section of cladding are assumed to fail (as if they had completed burned) will result in rigid body downward deflection of the cladding element. The deflection will result in downward rotation of the fasteners; the deflection will continue until the vertical component of the fastener tension force is equal to the weight of cladding. Compression of the semi-rigid insulation layer will equilibrate the horizontal forces and restrict the deflection.



Cascadia Clip – Post-failure loading condition

Load testing of exterior insulated cladding assemblies with girts fastened through exterior insulation with screws only (as completed by RDH and others) confirms that there is significant load transfer capacity for the attachment system, even if the clip were to be suddenly damaged (or consumed by fire). Deflection measurements taken during load testing of this wall condition correlate well with structural calculations; for heavy claddings (up to 20 psf), screw rotation in the order of 3° to 8° can be expected (dependent on insulation stiffness, girt size, etc).

A variation on this case considers the possibility that the clips progressively fail (from fire or other sources), and the cladding dead load is incrementally transferred to the remaining intact clips. It would be overly conservative to consider full design wind pressures in combination with this scenario. Accordingly, without considering design wind pressures, for the large majority of scenarios, even with relatively heavy cladding such as stucco or stone veneer, and 6" deep clips, the cladding could be fully supported by a single clip per floor per 16" stud width (with a factor of safety of nearly 2 on ultimate load resistances into 20 gauge studs). The reserve capacity is even greater for shallower clips, lighter cladding, and stronger substrates. In the unlikely case that the last clip also failed, the load transfer mechanism described earlier in this section would apply; the cladding would deflect vertically until the loads were resisted by the fasteners that remain intact at the locations of the consumed clips.

The hypothetical load transfer scenarios described above consider steel stud framed backup walls as a worst case scenario. Pullout resistance of similar sized fasteners in other substrates such as concrete are generally several times higher, and as a result, the structural attachment and load transfer capacity of these cladding systems is even more robust.

4. CONCLUSIONS


The design of the Cascadia Clip® to resist cladding loads from in-service conditions is well established and understood in theory and has been confirmed extensively with testing in practice.

Hypothetical conditions where some or all clips fail from are also described above. In each instance, the stay-in-place capacity of the cladding attachment to the structure would not be compromised, even if the Cascadia Clip were fully consumed in a fire.

Yours truly,

RDH Building Engineering Ltd.


Colin Shane M.Eng., P.Eng.
cshane@rdhbe.com
2013-11-26


Michael J. Wilson M.Eng., P.Eng., FCC
mjw@rdhbe.com
NOV 26 2013



February 6, 2014

Mrs. Christina Saunders
3A Composites USA, Inc.
3480 Taylorsville Highway
Statesville, NC 28625

RE: Summary Letter on NFPA 285 Performance of Exterior Wall System

Dear Mrs. Saunders,

This letter is in response to a request for a summary letter of the flame propagation performances of the exterior wall systems tested by Architectural Testing and provided by 3A Composites.

A detailed description of the testing can be found in ATI Test Report D2968.01-121-24. All test specimens except for the gypsum sheathing and steel framing were provided by the client and Architectural Testing accepts no responsibilities of any inaccuracies therein. Architectural Testing did not select the specimens and has not verified the composition, manufacturing techniques or quality assurance procedures. This letter does imply certification of the products by Architectural Testing.

Project Summary:

Report Number:

- D2968.01-121-24

Report Holder:

- 3A Composites

Test Laboratory:

- Architectural Testing, Inc.

Performance Standard:

- NFPA 285-2012, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.*

Test Date:

- December 5, 2013

Description of Assembly Tested:

- Interior Sheathing – 5/8" National Gypsum Type X Gypsum Board
- Steel Framing – 3-5/8" 16 Gauge Galvanized Steel Framing
- Exterior Sheathing – 5/8" Georgia Pacific DensGlass® Exterior Type X Gypsum Board
- Air/Vapor Barrier – Henry Blueskin SA
- Exterior Insulation – 3-1/2" x 24" x 48" ROXUL CavityRock® DD
- Installation System – Sobotec SL-2000 w/Fiberglass Cascadia Clips
- Exterior Cladding – 4mm Alucobond® PLUS FR Panels

130 Derry Court
York, PA 17406-8405
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fax: 717-764-4129
www.archtest.com

Summary Letter
Project No.: D2968.01-121-24
02/06/2014Summary of Results:

Test Requirements	Test Observations	Pass/Fail
Flames did not reach 10 ft. above the window opening.	Flames did not reach 10 ft. above the window opening header.	PASS
Flames did not reach a lateral distance of 5 ft. from the vertical centerline.	Flames did not reach a lateral distance of 5 ft. from the vertical centerline.	PASS
Flames did not propagate beyond the limits of the first story test room.	Flames did not propagate beyond the limits of the first story test room.	PASS
No Visible flaming in the second story test room	No visible flaming in the second story test room	PASS
TC's 11 and 14-17 (1000°F limit)	TC's 11 and 14-17 did not exceed their 1000°F limit.	PASS
TC's 18-19, 28, and 31-40 (1000°F limit)	TC's 18-19, 28, and 31-40 did not exceed their 1000°F limit.	PASS
TC's 49-54 (500°F above ambient)	TC's 49-54 did not exceed 500°F above their ambient temperatures.	PASS

The assembly tested and described in report D2968.01-121-24 met the *Condition of Acceptance* of NFPA 285. For a more detailed description of temperature rise and calibration data, flame propagation distances, product information, test observations, installation details, and photographs, please reference the full test report.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Matthew D. Freeborn".

Digitally Signed by: Matthew D. Freeborn

Matthew D. Freeborn
Program Manager - Fire Testing

MDF:ddr

NFPA 285 - POST-TEST PHOTOGRAPHY

