THERMAL BREAK WALL SYSTEMS

ACS Composite Systems Inc.
Introduces the A-Clip and S-Clip while meeting building codes and ASHRAE 90.1 2010 Requirements

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Disclaimer

Any use of ACS Composite Systems Inc. details, technical and structural data, shows your compliance to these terms.

All third party testing information provided in this brochure is proprietary to ACS Composite Systems Inc. This information is not to be used with any other non ACS Systems or Clip.

In no way can PROLOFT™ be used outside of ACS Systems without written consent from ACS Composite Systems Inc.

ACS Composite Systems Inc. or PROLOFT™ cannot be held accountable for any damages incurred through correct or incorrect use or interpretation of the information in this guide.

“With our systems, the wall thickness can be minimized to give maximum usable square footage”

ACS Composite Systems Inc.

The goal at ACS is to provide a solution with details and sound technical data to help you meet or exceed industry standards and building codes for now and in the future.

The following will give you information on our Thermal Break Wall Systems with our Canada/US Patent Pending “A-Clip” and “S-Clip”.
ASHRAE 90.1 Requirements for Steel-framed Construction

Helping you understand the prescriptive path requirements of ASHRAE 90.1 2010 that must be met:

- **Requirement 1:**
  
  Compliance with the prescriptive path of ASHRAE 90.1 2010 can be achieved by demonstrating that the required amount of insulation is met (i.e. R-13 insulation, plus R-7.5 continuous insulation for climate zones 4 to 8)

  **Continuous Insulation:** (As defined by ASHRAE), is an uninterrupted layer of thermal resistance that is only to be penetrated by fasteners or service openings. The amount of continuous insulation required by ASHRAE 90.1 2010 is R-7.5 for climate zones 4 to 8.

- **Requirement 2:**
  
  The second is meeting the total-assembly U-value, which means you have to calculate what your assembly’s total U-value is, and show the U-factor is less than the maximum allowable amount of 0.064 BTU/ (hr-ft²-°F) for climate zones 4 to 8.

  **U-Factor:** An overall U-factor of no more than 0.064 BTU/ (hr-ft²-°F) is required by ASHRAE 90.1 2010 version. The U-factor is the rate of heat transfer per unit area, per degree of temperature difference across the assembly.

The U-factors and R-values shown in ACS’s systems were calculated with the “A-clips” shown in the figures spaced at 36” vertically on centre. Horizontal Z-girts in Wall Type 5 are spaced at 36” vertically on centre. These calculations do not include head or sill tracks, nor do they account for seismic bracing or penetrations due to mechanical or electrical services.

Once one of ASHRAE 90.1 prescriptive path requirement is met, the second is no longer required. One must be able to show compliance by providing documentation to prove their claim either by describing the insulation strategy and showing how it meets the requirement of R-13 plus R-7.5 continuous or by doing a total-wall U-factor calculation to show that the overall value is less than 0.064 BTU/ (hr-ft²-°F).
ACS Thermal Break Wall Systems

All of ACS’s systems meet ASHRAE requirements on U-factor AND on continuous insulation, which provides more flexibility at the design end (we can meet prescriptive or performance targets).

ACS’s Thermal Break Wall Systems 1 through 6 give Architects, Envelope Consultants and Designers the ability to meet the industry standards.

ACS created Wall Systems 1 through 6 utilizing PROLOFT™ for the thermal break and retained the expertise of Levelton Consultants Ltd to conduct computer simulations of the thermal performances in our systems.

Our ACS Thermal Break Wall Systems have been designed to meet Building Codes with the ASHRAE 90.1 2010 prescriptive requirement.

More importantly, ACS’s Wall Systems deal with thermal bridging where it occurs in the assembly, which makes it easier for designers to meet all the criteria’s required by ASHRAE 90.1 2010 for wall assemblies.

PROLOFT™

PROLOFT™ strips have the highest R-value per inch thickness of any insulation available. The 10mm strips provide R-4 and can be doubled up for an R-8 thermal performance. ACS used PROLOFT™ in its Wall Systems to help achieve code requirements.

ACS’s Wall Systems have been designed to meet these requirements with 20mm of PROLOFT™ in our wall assemblies.

Multiple scenarios can be created in wall assemblies using PROLOFT™. Each new scenario will result in different thermal performance.
PROLOFT™ Data Sheet

PROLOFT™ HIGH PERFORMANCE INSULATION FOR BUILDING ENVELOPES

PROLOFT™ industry-leading thermal barrier strips are designed to provide thermal bridging protection for commercial and residential buildings. PROLOFT™ nanoporous aerogel thermal barrier strips are highly effective insulators with the highest R-value per inch (R-10) of any insulation on the market today.

PROLOFT™ thermal barrier strips exceed ASHRAE 90.1, 2010 requirements for both continuous insulation and overall U-factor making PROLOFT™ the ideal solution for building professional's obligation to meet today's building codes and standards.

PROLOFT™ can be custom cut for efficient installation in walls, roofs, floors, door and window frames. Flexible and easy to use, PROLOFT™ eliminates thermal bridging without compromising R-value from compression.

Save time and money using PROLOFT™ Thermal Barrier Strips to maximize the energy efficiency of your building envelope without compromising valuable space within your framing assemblies.

ADVANTAGES

► SUPERIOR THERMAL PERFORMANCE, REDUCED PROFILE

PROLOFT™ gives the best thermal resistance with the highest R-Value (R-10) per inch over other competing insulating products on the market today.

► FIRE RESISTANT, HYDROPHOBIC AND BREATHABLE

PROLOFT™ has a Class A Fire rating allowing for the construction of trapped framing assemblies. PROLOFT™ is a hydrophobic matter that repels liquid water while allowing vapor to pass through the material. This is a benefit for areas susceptible to mold.

► SAVE TIME, SPACE AND MONEY

PROLOFT™ can be custom cut to conform to any space or shape. With reduced material volume, high packaging density and low scrap rates, logistical costs are reduced by a factor of five or more compared to rigid insulation.

► PHYSICALLY ROBUST WITH UNCOMPROMISED PERFORMANCE

PROLOFT™ is soft and flexible with excellent springback. PROLOFT™ recovers its thermal performance even after compression events as high as 50 psi. PROLOFT™ insulates with nano-size cells of trapped air, which are compressible so PROLOFT™ will maintain its thermal performance once installed.

► ENVIRONMENTALLY FRIENDLY

PROLOFT™ is a reusable non-toxic beneficial disposable material with no respirable fiber content. PROLOFT™ can be custom ordered to fit your exact installation requirements minimizing waste.

CHARACTERISTICS

PROLOFT™ can be cut using conventional textile cutting tools including scissors, electric scissors, and router knives. The material can be dusty, and it is recommended to wear safety glasses and dust masks be worn when handling material. See MSDS for complete health and safety information.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Value (SI)</td>
<td>0.21 m²·K/W (0.0355 Btu/hr·f)</td>
</tr>
<tr>
<td>R-Value (US)</td>
<td>R-10.2 per inch (10.4 ft²·h·BTU/in³)</td>
</tr>
<tr>
<td>Thickness*</td>
<td>0.2 in (5 mm)</td>
</tr>
<tr>
<td>Width*</td>
<td>0.4 in (10 mm)</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>1.017 BTU·h·f/ft²·°F</td>
</tr>
<tr>
<td>Density</td>
<td>50 lb/ft³</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>8 psi stress at 10% compression</td>
</tr>
<tr>
<td>Fire Performance</td>
<td>Class A</td>
</tr>
<tr>
<td>Water Vapor Transmission</td>
<td>33 perms</td>
</tr>
<tr>
<td>Hygroscopic</td>
<td>Yes</td>
</tr>
<tr>
<td>Embedded CO₂</td>
<td>4.2 lb of CO₂/lb</td>
</tr>
</tbody>
</table>

* Nominal Values
Adjustable “A-Clip”

ACS’s Canada/US Patent Pending Thermal Break “A-Clip” is used in Wall Systems 1, 2 and 3. The adjustable clip is a unique assembly because the installers have the ability to adjust the depth of the clip to accommodate elevation differences in walls or soffits.

This “A-Clip” gives the installers the control to adjust for imperfections in buildings; such as new buildings with concrete walls or steel-stud walls that are not on the same vertical plane as the slab beams; or in renovated buildings with concrete, brick and steel studs that are non-parallel or otherwise inconsistent with each other.

Solid “S-Clip”

The ACS Canada/US Patent Pending Thermal Break “S-Clip” can be used in the same wall system as the “A-Clip”.

The main advantage to the solid clip is the cost savings. This is assuming the wall the clips are attaching to will need no adjustment.

Depending on the Installers scenario, they have the option to use a combination of both clips when needed. Having this flexibility with the ACS Thermal Clips, the contractor can now feel comfortable knowing they able accommodate the unknowns of the industry.

The S-Clip is available in various sizes from ranging from 1” to 6”.

A-Clip and S-Clip Thermal Performance

ACS’s Clips with PROLOFT™ have a very low conductivity that reduces thermal bridging considerably, as well as meeting the Building Codes with ASHRAE 90.1 2010 requirements. Our “A-Clip / “S-Clip”, combined with PROLOFT™ in Wall Systems 1 and 2, greatly reduces the effects of thermal bridging. Therefore, the insulation value can be fully realized for higher thermal performance.

“Higher overall R-values to help with LEED Projects”
"A-Clip" Design

ACS’s Thermal Break A-Clips are made of Stainless Steel and are available in sizes from 2” to 6” to accommodate wall insulation and uneven wall construction.

Note: The pre-punched holes are spaced 3/4” in from the outside edges and the minimum lap of the adjustable "A-Clip" is 1.5” as per the structural specifications.
WALL SYSTEM #1
with "A-Clip" or "S-Clip"

interior finish 15mm (5/8") GWB
wall studs 140mm (5") x 16ga steel studs @ 406 o/c 16"
Sheathing (1/2")
vapour barrier (Scopraseal)
vertical Z bar (galv) 16ga x 38 x 25 x 38 (1.5"x1"x1.5")
12x14 self-drilling #3 drill point DT-2000
PROLOFT 10mm (3/8"), (inside and outside faces of clips)
back to back adjustable angle clips s.s. 16ga x 38 x 102 (1.5"x4")
Roxul insulation 102mm (4") R16.8

EFFECTIVE R-VALUE = 17.2
U-FACTOR = 0.058
BASED ON S.S. CLIP

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Canada: 1-778-351-2277

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WALL SYSTEM #3
VERTICAL OR HORIZONTAL Z-BAR

with "A-Clip" or "S-Clip"

interior finish
15mm (5/8") GWB

R20 insulation

wall studs
140mm (6") x
16ga steel studs
@ 400 o/c 16"

Sheathing (1/2")

Air barrier
(Sopraseal stick VP)

vertical Z bar (galv)
16ga x 38 x 25 x 38
(1.5"x1"x1.5")

12x14 self-drilling
#3 drill point
DT-2000

PROLOFT
10mm (3/8"), (both
faces of clips)

back to back
adjustable angle clips
s s 16ga x 38 x 102
(1.5"x4")

Roxul insulation
51mm (2") R8.4

EFFECTIVE R-VALUE = 18.7
U-FACTOR = 0.053
BASED ON S.S CLIP

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WALL SYSTEM #4
with PROLOFT and Z-Bar

EFFECTIVE R-VALUE = 18.9
U-FACTOR = 0.053

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WALL SYSTEM #5

with PROLOFT and Z-Bar

interior finish
15mm (5/6") GWB

wall studs
140mm (6") x 18ga steel studs @ 406 o/c 16"

Sheathing (1/2")

Air barrier
(Sopraseal stick VP)

horizontal Z bar
galv 18ga x 38 x 51 x 38 (1 1/2"x2"x1 1/2")

12x14 self-drilling
#3 drill point
DT-2000 (2 per vertical support)

PROLOFT
20mm (3/4")

51mm (2") Roxul Insulation R8.4

R20 insulation

EFFECTIVE R-VALUE = 16.7
U-FACTOR = 0.060

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WALL SYSTEM #6

with PROLOFT

interior finish
15mm (5/8") GWB

wall studs
140mm (6") x 18ga steel studs
@ 406 o/c 16"

Sheathing (1/2")

PROLOFT
10mm (3/8")

Air barrier
(Sopraseal stick VP)

R20 Insulation

EFFECTIVE R-VALUE = 17.9
U-FACTOR = 0.056

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Canada: 1-778-351-2277
Thermal Performance Data

Table 1 - Results of FRAMEplus models for all sections and wall types

<table>
<thead>
<tr>
<th>Wall Type</th>
<th>Configuration</th>
<th>Overall “U”</th>
<th>Overall “R”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R-8 continuous at sheathing, 10mm PROLOFT™ at either end of Stainless A-Clip, 4” Roxul (R16.8) (Clips at horizontal spacing of 36” o.c.)</td>
<td>0.33</td>
<td>0.058</td>
</tr>
<tr>
<td>2</td>
<td>R-8 continuous at sheathing, 10mm PROLOFT™ at either end of Stainless A-Clip, 2” Roxul (R8.4), R-20 batt in stud cavity</td>
<td>0.30</td>
<td>0.053</td>
</tr>
<tr>
<td>3</td>
<td>R-8 continuous at sheathing, 20mm PROLOFT™ on vertical galv. Z-bar, 2” Roxul (R8.4), R-20 batt in stud cavity</td>
<td>0.30</td>
<td>0.053</td>
</tr>
<tr>
<td>4</td>
<td>R-8 continuous at sheathing, 20mm PROLOFT™ on horizontal galv. Z-bar, 2” Roxul (R8.4), R-20 batt in stud cavity</td>
<td>0.34</td>
<td>0.060</td>
</tr>
<tr>
<td>5</td>
<td>R-20 batt in stud cavity, 10mm PROLOFT™ at either end of steel studs, (R-8 continuous)</td>
<td>0.32</td>
<td>0.056</td>
</tr>
</tbody>
</table>

Thermal Modeling

Thermal Modeling for Wall Systems 1 and 2 with ACS’s Thermal Break Stainless Steel A-Clip. R-17.2 FT².F.HR/FTU.
Structural Concept and Data

The A-Clip is an adjustable component of an exterior thermal break/rain-screen cladding system. It consists of a two-piece stainless steel clip attached to the exterior of the structure with two fasteners, and has PROLOFT™ insulation adhered to the inner and outer flanges. The A-Clip adjustability allows the installer to create an accurate plane for attaching cladding, compensating for the reality that most current cladding support systems have little allowance for uneven structural support. With most other cladding support systems, the lack of adjustability either requires extremely accurate structural framing that typically isn’t delivered in practice, or requires labour-intensive shimming by the installer.

A major advantage of the A-Clip in addition to its adjustability and meeting the ASHRAE 90.1 U-Factor Requirement is meeting the Continuous Insulation Requirement of ASHRAE 90.1. This is achieved using PROLOFT™ high performance insulation on both flanges. Since PROLOFT™ insulation is a semi-rigid material, the stress in the PROLOFT™ between the inner clip flange and the structure should be designed to limit the amount of self-weight deflection in the cladding assembly. The initial ACS design had limited the compressive strain to an allowable value of 15 psi in the Proloft™, but subsequent testing by Intertek Testing Services Ltd. found that the clips could resist higher loads and result in less deflection with the PROLOFT™ compressed about 1/8” per 3/8” thickness. This small preload allows the space between clips to be increased, reducing the overall number of A-Clips required for a given cladding area. Intertek has also confirmed that the small amount of compression is not detrimental to the insulation RSI value, due to the thermal characteristics of the PROLOFT™.

After attaching the inner component to the building, the A-Clips are adjusted by sliding the outer component in/out, and then terminating the A-Clip by installing at least two stainless steel #10 self-drilling/self-tapping screws through the web of the inner and outer sections. The outer A-Clip flange can support vertical or horizontal continuous sub-girts, depending on requirements of the cladding installation.

The following Table outlines the maximum tributary area per clip for a given assembly depth, cladding weight, and up to 30 psf specified wind load. Maximum tributary area per clip has been limited to four square feet, which correlates with 16” stud spacing and 36” vertical spacing. Other A-Clip spacing layouts that meet the tributary area limits may also be acceptable, provided that other components such as z-girts are structurally adequate.

Kalot Structural Engineering Ltd.
A-Clip – Maximum Tributary Area (square feet)

Up to 30 psf Wind

<table>
<thead>
<tr>
<th>Assembly Depth (in)</th>
<th>Cladding Weight (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2.5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.5</td>
<td>4</td>
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<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.5</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>5.5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Clip deflection limited to L/120

**Note:** tributary area shown may need to be reduced depending on the base structure material, base fasteners, high wind load, or deflection limits

To estimate the number of clips, divide the project cladding area by the table tributary area corresponding to the project wall assembly depth and cladding weight, then include a reasonable allowance for additional A-Clips due to openings, story heights, etc.

**Example:**

Cladding area – 25,000 square feet
Overall assembly depth – 5 inches
Cladding weight – 5 psf
Maximum Tributary Area – From Table, 4 square feet
If assuming a 15% allowance due to windows, story height, etc., would require:
25,000/4 = 6250 for base amount, plus 15% x 6250 = 938
Total - 6250 + 938 = 7188 A-Clips
The A-Clips and fasteners are to be designed by a structural engineer experienced in cladding assembly to resist the cladding system self-weight in combination with wind suction. Even in high seismic zones, exterior wind suction normally governs over seismic force levels for wall assemblies, so the attached A-Clip design values were developed based on self-weight combined with wind pressure/suction. Variables that influence the A-Clip spacing and required attachment to the structure include, but are not limited to:

1) Wind – A factor of height, building exposure, building shape, tributary area
2) Cladding Self Weight
3) Wall Assembly Depth
4) Structure material – Steel stud, concrete, structural steel, wood

All structural design information is provided as a convenience for the user to determine the general suitability of the A-Clips as part of an overall cladding system.

**Fastener Data**

Light gauge metal framing:

<table>
<thead>
<tr>
<th>Leland Master Driller - #12-14 #3 Fastener x 2&quot; Long, DT2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stud Gauge</td>
</tr>
<tr>
<td>Nominal Member Thickness (in)</td>
</tr>
<tr>
<td>Tensile Capacity (lbs)</td>
</tr>
<tr>
<td>Allowable Tensile (lbs)</td>
</tr>
<tr>
<td>Ultimate Shear (lbs)</td>
</tr>
<tr>
<td>Allowable Shear (lbs)</td>
</tr>
</tbody>
</table>

**Note** – Factor of Safety (FS) for Table Allowable Values FS = 4

Concrete Support:

<table>
<thead>
<tr>
<th>ITW Buildex Tapcon Screw – 1/4&quot; Φ 1 3/4&quot; embedment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Strength (psi)</td>
</tr>
<tr>
<td>Tensile Capacity (lbs)</td>
</tr>
<tr>
<td>Allowable Tension (lbs)</td>
</tr>
<tr>
<td>Shear Capacity (lbs)</td>
</tr>
<tr>
<td>Allowable Shear (lbs)</td>
</tr>
</tbody>
</table>

**Note** – Factor of Safety (FS) for Table Allowable Values FS = 4
**Advantages of the ACS Adjustable “A-Clip” and Thermal Break Wall Systems**

- Meets BC and Ontario Building Codes
- Meets ASHRAE 90.1 2010 requirements
- Adjustable to allow for imperfect walls
- System provides lower overall heat loss
- Deals with thermal bridging where it occurs
- Assembly thermal performance is greatly improved
- Higher overall R-values to help with LEED projects
- Improves Energy Efficiency, saves money
- Non-combustible wall system
- With all of our systems, the wall thickness can be minimized to give maximum usable square footage

**LEED Projects**

ACS’s Thermal Break Wall Systems achieve higher overall R-values to help with LEED design building.

On a LEED Projects, ACS’s Thermal Break Wall Systems can qualify as an innovative design. This gives the LEED Design Team the opportunity to obtain a “bonus point” for their project.

**How to Specify ACS Thermal Break Wall System**

- ACS Thermal Break “A-Clip” in 2” to 6” in Stainless Steel
- Thermal Break Wall Systems 1 to 6
- PROLOFT™ 10mm or 20mm
- Steel Z-girts
  - 18 gauge; sizing by Engineer/Specifie
  - Finish Z-275
- Fasteners
  - Steel Stud - (Leland Industries, Master Drillers with washer #12-14 #3 Fastener x 2” Long, Drill point with DT 2000 coating) or approved alternative
  - Concrete – (Tapcon Anchors – Hex Head ¼ x 1 ¾ Blue Climaseal) or approved alternative
- Insulation
  - Cavity Rock ® DD by Roxul, or approved alternative
Building Design Team

ACS Composite Systems Inc. recommends that the building design team acquire the services of a qualified building science consultant for remodeling of the systems or to meet your specific needs within your specific climate zone.

Technical Information

If you have any technical questions about any of our Wall Systems, the Thermal Break “A-Clip” or PROLOFT™ please contact us.

Phone: 778-351-2277
Email: sales@acscompositesystems.com
Website: www.acscompositesystems.com

Sales Information

For pricing and information, please contact Convoy Supply Ltd. at:

Phone: 250-474-5733
Fax: 250-474-5770
Email: victoria@convoy-supply.com